

DAV UNIVERSITY JALANDHAR



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

1st to 6th SEMESTER

2013 onwards

Instruction for candidates (Theory Paper)

- The question paper for end-semester examination will have a weightage of 25%. It will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two preannounced test will be conducted having a weightage of 25% each. Each preannounced test will consist of 20 objective type, 5 short questions/problems on the UGC-NET (objective type) pattern as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four objective/MCQ type surprise test will be taken. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive However, any other book may be followed.

* Wherever specific instructions are required these are given at the starting of that particular subject/paper

Instruction for candidates (Practical Paper)

- Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test.

B.Sc. Botany (Hons. School) Semester I

Paper: Plant Diversity I (Phycology, Mycology and Lichenology)

Course Code: BOT101

L	T	P	Credits	Marks	Min. Marks
4	1	0	4	100	40

Objective:

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

Learning Outcome

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

UNIT I

Plant Kingdom:

Three and five Kingdom classification system and criteria; six and eight kingdom classification; Diversity in habitat, forms, life span and nutrition; Evolution and phylogeny of land plants. **(5 Lectures)**

UNIT II

Algae:

General characteristics, classification, ecology and distribution of algae; Morphology; thallus organization, cell structure, pigment system, reserve food, reproduction of Cyanophyta (*Nostoc*), Chlorophyta (*Chlamydomonas*, *Chara*), Rhodophyta (*Laminaria*), Bacillariophyta (*Pinnularia*), Xanthophyta (*Vaucheria*) and Phaeophyta (*Sargassum*); Life cycles patterns; Economic importance of algae. **(15 Lectures)**

UNIT III

Fungi:

General characteristics, classification of fungi, Salient features and brief account of myxomycota (*Physarum*), oomycota (*Albugo*), chytridiomycota, (*Synchytrium*), zygomycota (*Rhizopus*), ascomycota (*Aspergillus*), basidiomycota (*Agaricus*), deuteromycetes (*Alternaria*); Life cycle patterns; Economic importance. **(15 Lectures)**

UNIT IV

Lichens:

Occurrence and general characteristics of lichens; Ecology and distribution; Growth forms in lichens; Nature of association of algal and fungal partners; Reproduction in lichens; Economic importance of lichens. **(8 Lectures)**

Paper: Plant Diversity I (Phycology, Mycology and Lichenology) Lab

Course Code: BOT102

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

1. To learn the principles and procedures of fixation and staining.
2. To study of morphology and cell structure of the prokaryotic algae (*Nostoc*), eukaryotic algae unicellular (*Chlamydomonas*), colonial (*Volvox*), Filamentous (*Ulothrix*, *Spirogyra*, *Oedogonium*) through temporary or permanent slides.
3. To study of vegetative and reproductive structures of *Chara*, *Vaucheria*, *Batrachospermum*, *Sargassum* through temporary or permanent slides.
4. To study of the following through temporary or permanent slides:
 - (a) *Asperillus*,
 - (b) *Rhizopus*
 - (c) *Agaricus*
 - (d) *Albugo*
5. To study of growth forms of lichens (crustose, foliose, fruticose) on different substrata.
6. To study of thallus and reproductive structures (isidia, soredia, apothecium) of lichens through permanent slides.

Reference Books:

1. Alexopolous, C.J., Mims, C.W., and Blackwell, M. *Introductory Mycology*. John Wiley and Sons: New York, 1996.
2. Hale, M.E. *The Biology of Lichens*. Arnold, London, 2001.
3. Kumar, H.D. *Introductory Phycology*. East West Press: New Delhi, 1999.
4. Lee, R.E. *Phycology*. Cambridge University Press: Cambridge, 2008.
5. Pelczar, M.J. *Microbiology*, 5th Edition, Tata Mc Graw-Hill Co.: New Delhi, 2001.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

B.Sc. Botany (Hons. School) Semester I

Course Title: Organic Chemistry

Course Code: CHE153

Time: 04 Hours

L	T	P	Credits	Marks	Pass Marks
4	0	0	4	100	40

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Organic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Compounds of Carbon

(8 Hours)

Differences in chemical and physical behavior as consequences of structure. Discussion (with mechanism) of reactions of hydrocarbons' ranging from saturated acyclic and alicyclic, unsaturated dienes and aromatic systems. Huckel rule; as applied to $4n+2$ systems. Industrial sources and utility of such compounds in daily life for medicine clothing and shelter.

PART B

Stereochemistry

(15 Hours)

Structure, reactivity and stereochemistry. Configuration and conformation. Optical activity due to chirality; d, l, meso and diastereoisomerism, sequence rules. Reactions involving stereoisomerism. Geometrical isomerism – determination of configuration of geometric isomers. E & Z system of nomenclature. Conformational isomerism – conformational analysis of ethane and n-butane; conformations cyclohexane, axial and equatorial bonds, conformations of monosubstituted cyclohexane derivatives. Newman projection and Sawhorse formula, Fischer and flying wedge formulae.

PART C

Alkyl Halides

(8 Hours)

Structure of alkyl halides and their physical properties. Preparation from alcohols, hydrocarbons, alkenes and by halide exchange method.

Reactions : (i) Nucleophilic substitution (SN_2 and SN_1) kinetics, mechanism, stereochemistry, steric and electronic factors, reactivity of alkyl halides, rearrangement, dependence on nucleophile, role of solvent (ii) Elimination E_2 and E_1 mechanism, stereochemistry, kinetics, rearrangement.

Alcohols

(4 Hours)

Structure, physical properties (Hydrogen bonding), Methods of preparation: Grignard synthesis (scope and limitations),

Reactions: Reactions with hydrogen halides. Mechanism and rearrangement, Reaction with Phosphorous trihalides, mechanism of Dehydration rearrangement.

PART D

Ethers

(2 Hours)

Structure, Physical properties, preparation (Williamson synthesis). Reactions: Cleavage, by acids, Electrophilic substitution in ethers.

Aldehydes and Ketones

(8 Hours)

Structure, Physical Properties; Methods of Preparation: Oxidation of Primary and secondary alcohols, Oxidation of methylbenzenes, Reduction of acid chlorides, Friedel- Crafts Acylation,

Reactions; Nucleophilic addition, Addition of Grignard reagents, Addition of cyanide. Addition of Bisulphite, Addition of derivatives of ammonia. Acetal Formation, Cannizzaro reaction, Aldol Condensation.

Reference Books :

1. Morrison R.N. and Boyd, R.N. *Organic Chemistry*, Pearson Education, Dorling Kindersley (India) Pvt. Ltd.
2. Finar, I.L. *Organic Chemistry* (Volume 1), Pearson Education, Dorling Kindersley (India) Pvt. Ltd.
3. Eliel, E.L. and Wilen, S.H. *Stereochemistry of Organic Compounds*, London: Wiley, 1994.
4. March, Jerry. *Advanced Organic Chemistry: Reactions, Mechanism and Structure*, John Wiley, 6th edition, 2007.

Course Title: Organic Chemistry Lab
Course Code: CHE154
Time: 04 Hours

L	T	P	Credits	Marks
0	0	3	2	50

Course Objectives:

This course is intended to learn the basic concepts of Organic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Calibration of Thermometer

80-82° (Naphthalene), 113-114° (acetanilide). 132.5-133° (Urea), 100° (distilled Water)

2. Determination of melting point

Naphthalene 80-82°, Benzoic acid 121.5-122° Urea, 132.5-133°, Succinic acid 184-185°
 Cinnamic acid 132.5-133°, Salicylic acid 157-5-158° Acetanilide 113-5-114°, m-Dinitrobenzene 90° P-Dichlorobenzene 52°. Aspirin 135°.

3. Determination of boiling points

Ethanol 78°, Cyclohexane 81.4°, Toluene 110.6°, Benzene 80°.

4. Mixed melting point determination

Urea-Cinnamic acid mixture of various compositions (1:4, 1:1, 4:1)

5. Distillation

Simple distillation of ethanol-water mixture using water condenser, Distillation of nitrobenzene and aniline using air condenser.

6. Crystallization

Concept of induction of crystallization Phthalic acid from hot water (using fluted filter paper and stemless funnel), Acetanilide from boiling water, Naphthalene from ethanol, Benzoic acid from water.

7. Decolorisation and crystallization using charcoal

Decolorisation of brown sugar (sucrose) with animal charcoal using gravity filtration. Crystallization and Decolorisation of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorising carbon) from ethanol.

8. Sublimation (Simple and Vacuum)

Camphor, Naphthalene, Phthalic acid and Succinic acid.

9. Extraction: the separatory funnel, drying agent:

Isolation of caffeine from tea leaves

10. Steam distillation

Purification of aniline/nitrobenzene by steam distillation.

Reference Books:

1. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. and Smith, P.W.G. *Vogel's Text Book of Practical Organic Chemistry*, 5th edition, ELBS, 1989.
2. Pavia, D.L., Lampanana, G.M. and Kriz, G.S. Jr. *Introduction to Organic Laboratory Techniques*, Thomson Brooks/Cole, 3rd edition, 2005.
3. Mann, F.G. and Saunders. P.C. *Practical Organic Chemistry*, London: Green & Co. Ltd., 1978.
4. Svehla, G. *Vogel's Qualitative Inorganic Analysis (revised)*, Orient Longman, 7th edition, 1996.
5. Bassett, J., Denney, R.C., Jeffery, G.H. and Mendham, J. *Vogel's Textbook of Quantitative Inorganic Analysis (revised)*, Orient Longman, 4th edition, 1978.

B.Sc. Botany (Hons. School) Semester I

Course Title: Animal Diversity I

Course Code: ZOO101

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: To acquaint students with the general characters and classification of invertebrate phyla and the affinities between different groups. To impart knowledge regarding the morphological, anatomical and physiological make up of a few representative organisms from each phylum.

UNIT-A **15 hours**

- Description of animal diversity. Principles of classification-salient features and classification upto orders in non-chordates. Structural organization in different classes of non-chordates.
- Prot zoa: locomotion, osmoregulation, nutrition and reproduction in Protozoa. Detailed Study of *Euglena*, *Amoeba*, *Paramecium*, *Plasmodium*

UNIT-B **18 hours**

- Origin of Metazoa-metamerism and symmetry.
- Porifera: skeleton and canal system. Detailed study of *Sycon*
- Coelenterata: corals and coral reefs, polymorphism in Hydrozoa. Detailed study of *Obelia*, Sea anemone.
- Platyhelminthes: reproduction, variation in life cycles, parasitic adaptations and evolution of parasitism in Helminthes. Detailed study of *Planaria*, *Fasciola*, *Taenia*
- Nematoda: pseudocoelom, parasitic adaptations. Detailed study of *Ascaris*

UNIT-C **15 hours**

- Annelida: coelom, metamerism, excretion. Detailed study of *Nereis*, *Pheretima*, *Hirudinaria*
- Arthropoda: vision, respiration and larval forms. Social life in insects. Detailed study of *Palaemon*, *Periplaneta*

UNIT-D **12 hours**

- Mollusca: torsion and detorsion, shell and respiration. Detailed study of *Pila*, *Unio*, *Sepia*
- Echinodermata: water vascular system and larval forms. Detailed study of *Asterias*.

Reference books:

1. Kotpal, R.L. *Modern Text Book of Zoology: Invertebrates*. 10th edition. Rastogi Publishers: Meerut, 2012.
2. Kotpal, R.L. *Minor Phyla*. 5th edition. Rastogi Publishers: Meerut, 2006.
3. Dhama, P.S., and Dhama, J.K. *Invertebrate Zoology*. 5th edition. R. Chand & Co.: New Delhi, 2004.
4. Parker, T.J., and Haswell, W.A. *Text book of Zoology: Invertebrates*. 7th edition. Vol. I (eds. A.J. Marshall & W.D. Williams), CBS Publishers & Distributors: Delhi, 1992.
5. Hyman L.H. *The Invertebrates*. Vol. I, II, III, IV and V. McGraw Hill Book Company. Inc.: New York, London, Toronto, 1959.

Course Title: Animal Diversity I Lab

Course Code: ZOO 102

L	T	P	Credits	Marks
0	0	1	2	50

General survey of invertebrate phyla through slides/specimens/charts/models/e-resources:

- **Protozoa:** *Amoeba, Euglena, Paramecium* and *Vorticella, Balantidium, Nyctotherus, Opalina*, Radiolarians and Foraminiferans.
- **Porifera:** *Sycon, Grantia, Spongilla, Euplectella, Hyalonema, Chalina, Euspongia*, Temporary mounts of gemmules and spicules of *Sycon*.
- **Coelenterata:** *Hydra, Obelia, Porpita, Velella, Physalia, Aurelia, Metridium, Alcyonium, Tubipora, Zooanthus, Madrepora, Favia, Fungia, Gorgoni, Pennatula, Sertularia, Plumularia, Pennaria, Bougainvillea*, statocyst of *Aurelia*.
- **Platyhelminthes:** *Planaria, Fasciola* (W.M. & T.S.), larval stages of *Fasciola, Taenia* (scolex, proglottids-mature and gravid), *Ascaris* (male and female).
- **Annelida:** *Pheretima*, T.S. of typhlosolar region, setae, pharyngeal nephridia, septal nephridium and integumentary nephridium of *Pheretima, Eutyphoeus, Lumbricus, Nereis, parapodium of Nereis, Heteronereis, Polynoe, Aphrodite, Amphitrite, Chaetopterus, Anodonta, Mytilus, Pholas, Pecten, Haliotis, Aplysia, Doris, Limax, Pila, Sepia, Octopus, Nautilus, Chiton* and *Anodonta. Arenicola, Hirudinaria, Pontobdella*.
- **Arthropoda:** *Peripatus, Lepisma*, cockroach, trachea and mouth parts of cockroach, grasshopper, praying mantis, earwig, dragonfly, termite (queen and other castes), ant, butterfly, moth, beetle, wasp, honeybee, crab, prawn, *Lepas, Balanus, Apus, Limulus*, scorpion, spider, millipede and centipede, *Cypris, Cyclops, Daphnia*, Prawn, Gill and statocyst of Prawn.
- **Mollusca:** *Anodonta, Mytilus, Pholas, Pecten, Haliotis, Aplysia, Doris, Limax, Pila, Glochidium* larva and radula of *Pila, Sepia, Octopus, Nautilus, Chiton* and *Anodonta*.

Demonstration of anatomy of the following animals through charts/e-resources/dissection of animal

- Earthworm: digestive, reproductive and nervous systems
- Cockroach: digestive, nervous and reproductive systems, mouth parts of cockroach
- Prawn: digestive and nervous systems. Appendages and gills of prawn.
- *Anodonta*: digestive and nervous systems,
- *Pila*: digestive and nervous systems, radula of *Pila* Asterias: Aristotle's lantern, tube feet.

Note: Practicals related to Animal Diversity I Lab are in accordance with UGC guidelines and have been approved by Dissection Monitoring Committee.

B.Sc. Botany (Hons. School) Semester I

Course Title: Biomolecules

Course Code: BCH 101

L	T	P	Credits	Marks
4	1	0	4	100

Course Objectives: This course introduces students to the importance of biochemistry and covers various biomolecules, with a brief overview of their chemistry, their functions and their relevance to physiology and disease.

Unit A

(15 hours)

Introduction to Biochemistry

Water as a biological solvent. Weak acids and bases. PH and buffers. Henderson-Hasselbalch equation. Physiological buffers. Fitness of the aqueous environment for living organisms.

Carbohydrates

Structure of monosaccharides. Stereoisomerism and optical isomerism of sugars. Reactions of aldehyde and ketone groups. Ring structure and anomeric forms, mutarotation. Reactions of sugars due to hydroxyl groups. Important derivatives of monosaccharides, disaccharides and trisaccharides (structure, function and occurrence of important ones). Structure, occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides - cellulose, chitin, agar, alginic acids, pectins, proteoglycans, sialic acids, blood group polysaccharides, glycogen and starch. Bacterial cell wall polysaccharides. Glycoproteins.

Unit B

(15 hours)

Proteins

Introduction to proteins. Classification based on solubility, shape, composition and functions. Amino acids: common structural features, stereoisomerism and RS system of designating optical isomers. Classification and structures of standard amino acids as zwitterion in aqueous solutions. Physical and chemical properties of amino acids. Titration of amino acids. Separation of amino acids. Essential amino acids.

Structure of peptide bond. Solid-phase synthesis of peptides. Peptide sequencing. Chemical and enzymatic cleavage of polypeptide chains and separation of peptides. Levels of structure in protein architecture. denaturation and renaturation of proteins. Behaviour of proteins in solutions. Salting in and salting out of proteins. Structure and biological functions of fibrous proteins (keratins, collagen and elastin), globular proteins (haemoglobin, myoglobin), lipoproteins, metalloproteins, glycoproteins and nucleoproteins.

Unit C

(15 hours)

Nucleic Acids

Nature of genetic material. Evidence that DNA is the genetic material. Composition of DNA and RNA. Generalized structural plan and Nomenclature of nucleic acids. DNA double helix. Structure and roles of different types of RNA. Size of DNA in prokaryotes and eukaryotes. Central dogma of molecular biology. Concepts of gene, genome and chromosome.

Porphyryns

Porphyrin nucleus and classification of porphyrins. Important metalloporphyrins occurring in nature. Detection of porphyrins. Bile pigments – chemical nature and physiological significance.

Unit D

(15 hours)

Lipids

Definition and classification of lipids. Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids. Essential fatty acids, prostaglandins. Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats – hydrolysis, saponification value, rancidity of fats, Reichert-Meissel Number and reaction of glycerol. Biological significance of fats. Glycerophospholipids (lecithins, lysolecithins, cephalins, phosphatidylserine, phosphatidylinositol, plasmalogens), sphingomyelins, glycolipids – cerebrosides, gangliosides. Properties and functions of phospholipids, isoprenoids and sterols.

Reference Books

1. Nelson, David L., and Cox, Michael M., *Lehninger Principles of Biochemistry*, 5th Edition, W.H. Freeman & Company, New York, 2008. Print.
2. Voet, Donald and Voet, Judith G., *Biochemistry*, 3rd Edition, John Wiley & Sons Inc., Singapore, 2004. Print.
3. Murray, R.K., Granner, D.K. and Rodwell, V.W. *Harper's Illustrated Biochemistry*, 27th Edition, McGraw Hill Company Inc. Singapore, 2006. Print.

Course Title: Biomolecules Laboratory

Course Code: BCH 102

L	T	P	Credits	Marks
0	0	3	2	50

Experiments:

1. Preparation of normal, molar and percent solutions.
2. Titration curve of Glycine.
3. Buffer preparation.
4. Qualitative tests for Carbohydrates, Lipids, Amino acids, Proteins, Nucleic acids
5. Preparation of casein from milk and determination of its isoelectric point.
6. Titrimetric analysis of Vitamin C.

B.Sc. Botany (Hons. School) Semester I

Course Title: Human Values and Ethics

Course Code: SGS - 101

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

- To sensitize students about the role and importance of human values and ethics in personal, social and professional life.
- To encourage students to read and realize the values of enlightened human beings.
- To enable students to understand and appreciate ethical concerns relevant to modern lives.

Learning Outcomes:

Students becoming responsible citizens and better professionals who practise Values and Ethics in every sphere of life.

Unit - A

Human Values

1. **Concept of Human Values:** Meaning, Types and Importance of Values. **2 hours**
2. **Human Values :** Lessons from the lives and teachings of great thinkers. **3 hours**
3. **Value Education :** The content of value education **2 hour**
4. Value crisis and its redressal. **1 hour**

Unit - B

Being Good and Responsible

1. Self-Exploration and Self Evaluation **2 hour**
2. Acquiring Core Values for Self Development **2 hour**
3. Living in Harmony with Self, Family, Society and Nature **3 hours**
4. Values enshrined in the Constitution: Liberty, Equality Fraternity and Fundamental Duties. **3 hours**

Unit - C

Value – based living

1. Vedic values of life **2 hour**
2. *Karma Yoga* and *Jnana Yoga* **2 hours**
3. *Ashta Marga* and *Tri-Ratna* **2 hours**
4. Truth, Contentment and Wisdom **2 hours**

Unit - D

Ethical Living:

Ethics: Difference between Ethics and Values

1. Personal Ethics **2 hours**
2. Professional Ethics **3 hours**
3. Ethics in Governance **2 hours**
4. Ethics in Education **2 hours**

Total = 35 hours

Reference Books:

1. Sreedharan, E. and Wakhlu, Bharat. Ed. *Restoring Values*. New Delhi: Sage Publications Ltd., 2010.
2. Nagarajan, K. *Indian Ethos and Values*. New Delhi: Tata McGraw Hill, 2011
3. Tripathi, A N. *Human Values*. New Delhi: New Age International Publishers, 2009
4. Sankar. *Indian Ethos and Values in Management*. New Delhi: Tata McGraw Hill Education Pvt. Ltd.
5. Osula. *Values and Ethics*. New Delhi: Asian Books, 2001.
6. Surbhiramanian, R. *Professional Ethics*. New Delhi: Oxford University Press, 2013.
7. Anand, Rishabh. *Human Values and Professional Ethics*, New Delhi: Satya Prakashan, 2012
8. Bhalla, Sanjeev. *Human Values and Professional Ethics*. New Delhi: Satya Prakashan, 2012.
9. Soryan, Ritu. *Human Values and Professional Ethics*. New Delhi: Dhanpat Rai & Co. Pvt. Ltd., 2010.
10. Jayshree, Suresh, and B S, Raghavan. *Human Values and Professional Ethics*. New Delhi: S Chand & Co. Ltd., 2007.
11. Shukla, Dr. R K, Misra, Anuranjan. *Human Values and Professional Ethics*, A B Publication, 2010.
12. Sharma, Vayu. *Human Values and Professional Ethics*. New Delhi: Education of India Language publishers, 2012.
13. Kannan, S, and Srilakshmi, K. *Human Values and Professional Ethics*. New Delhi: Taxmann Publication, Pvt. Ltd., 2009
14. Srivastava, Smriti. *Human Values and Professional Ethics*. New Delhi: S K Kataria & Sons, 2001
15. Singh, Yogendra, and Garg, Ankur. *Human Values and Professional Ethics*. New Delhi: Aitbs publishers, 2011.
16. Kumar, Vrinder. *Human Values and Professional Ethics*. Ludhiana: Kalyani Publishers, 2013.
17. Gaur, R R, Sangal, R. Bagaria, GP. *Human Values and Professional Ethics*. New Delhi: Excel Books, 2010.
18. Osula, Dr. Bramwell and Upadhyay, Dr. Saroj. *Values and Ethics*, New Delhi : Asian Books Pvt. Ltd., 2011.
19. *Complete works of Swami Vivekanand*, Calcutta: Advaita Ashram, 1931.
20. Radhakrishnan, S. *Indian Philosophy*, George Allen & Unwin Ltd., New York: Humanities Press INC, 1929.
21. Dwivedi, A N. *Essentials of Hinduism, Jainism and Buddhism*, New Delhi: Books Today– 1979
22. Saraswati, Maharishi Dayanand. *Light of Truth: Satyarth Parkash*. New Delhi: Arya Swadhyay Kendra, 1975.

23. Bhan, Suraj. *Dayanand : His life and work*. New Delhi : DAVCMC, 2001.
24. Raghavan, V, and Iyer, N. *Moral and Political Thoughts of Mahatma Gandhi*. New Delhi : Oxford University Press India, 2000.
25. Singh, Narain. *Guru Nanak Dev's view of life*. Amritsar: Bhagat Puran Singh All India Pingalwara Society, 2010.
26. Dwivedi, Kapil Dev. *Esence of Vedas*. Hoshiarpur : Katyayan Vedic Sahitya Prakashan,1990.
27. Chaubey,B B. *Vedic Concepts*. Hoshiarpur : Katyayan Vedic Sahitya Prakashan, 1990.
28. Radhakrishnan, Saravapalli. *Mahatma Gandhi : Essays and Reflections on his life*. Mumbai: Zaico Publication, 1977.
29. Hardayal, Lala. *Hints for Self Culture*, Mumbai:Jaico Publishing House, 1961.
30. Saraswati Dayanand, *The Light of Truth (The Satyārtha Prakashan)*.New Delhi:
31. Krishnamurti J. *The First and Last Freedom*
32. Maharishi, Sri Raman. *Who Am I*.
33. Balsekar, Ramesh S. *Peace and Harmony in Daily Living*. New Delhi: Yogi Impressions.

B.Sc. Botany (Hons. School) Semester I

Course Title: Environment Education

Course Code: EVS102

L	T	P	Credits	Marks
3	0	0	2	50

Course Objective: This course aims at understanding the students in aspects of environmental problems, its potential impacts on global ecosystem and its inhabitants, solutions for these problems as well as environmental ethics which they should adopt to attain sustainable development.

Unit 1

The multidisciplinary nature of environmental studies (2 Hours)

Definition, scope and importance, Need for public awareness

Natural Resources: Renewable and non-renewable resources: (8 Hours)

Natural resources and associated problems.

- (a) **Forest resources:** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
- (b) **Water resources:** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- (c) **Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- (d) **Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case Studies.
- (e) **Energy resources:** Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
- (f) **Land resources:** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
 - Role of an individual in conservation of natural resources.
 - Equitable use of resources for sustainable lifestyles.

Ecosystem: (4 Hours)

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids
- Introduction, types, characteristic features, structure and function of the following ecosystem:
 - a. Forest ecosystem
 - b. Grassland ecosystem
 - c. Desert ecosystem
 - d. Aquatic ecosystems (ponds, streams, lakes, rivers, ocean estuaries)

Unit II

Biodiversity and its conservation 4 Hours

- Introduction – Definition: Genetic, Species and Ecosystem Diversity
- Bio-geographical classification of India

- Value of biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values
- Biodiversity at global, national and local levels
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, global and national efforts.
- Genetically modified crops
- Cartagena Protocol
- Biodiversity Act

Environmental Pollution

8 Hours

- Definition, causes, effects and control measures of:
 - a. Air pollution
 - b. Water pollution
 - c. Soil pollution
 - d. Marine pollution
 - e. Noise pollution
 - f. Thermal pollution
 - g. Nuclear pollution
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides

Indoor Pollution:

2 Hours

- Practical tips on how to save the self from self-inflicted pollution.
- Basics of toxicity.
- Problems of lifestyle based diseases.
- Solutions needed for safety.

Unit III

7 Hours

Social Issues and the Environment

Population growth, variation among nations, Population explosion – Family Welfare Programmes.

- Environment and human health,
- From unsustainable to sustainable development
- Urban problems and related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- Wasteland reclamation
- Consumerism and waste products

- Environmental Laws: The Environment Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981; The Water (Prevention and control of Pollution) Act 1974; The Wildlife Protection Act, 1972; Forest Conservation Act, 1980.
- Issues involved in enforcement of environmental legislation
- Public Awareness

Unit IV

Human Population and Environment 5 Hours

- Population Growth and Variations among Nations
- Population Explosion
- Human Rights
- Value Education
- HIV / AIDS
- Women and Child Welfare
- Role of Information Technology in Environment and Human Health
- Case Studies

Global environmental issues

5 Hours

- Stockholm Conference
- Brundtland Commission
- Montreal Protocol
- Kyoto protocol
- Earth Summit
- World Summit

Field Work

5 Hours

- Visit to a local area to document environmental assets river/ forest/ grassland/hill/mountain
- Visit to a local polluted site – Urban / Rural / Industrial / Agricultural
- Study of common plants, insects, birds
- Study of simple ecosystems-Pond, river, hill slopes, etc (Field work equal to 5 lecture hours)

Reference Books:

1. Odum, EP. *Basic Ecology*. Japan: Halt Saundurs, 1983.
2. Botkin, DB, and Kodler EA. *Environmental Studies: The Earth as a living planet*. New York: John Wiley and Sons Inc., 2000.
3. Singh, JS, Singh, SP, and Gupta SR. *Ecology, Environment and Resource Conservation*. New Delhi: Anamaya Publishers, 2006.
4. De, AK. *Environmental Chemistry*. New Delhi: Wiley Eastern Ltd., 1990.
5. Sharma, PD. *Ecology and Environment*. Meerut Rastogi Publications, 2004

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

B.Sc. Botany (Hons. School) Semester II

Paper: Plant Diversity II (Bryophytes, Pteridophytes and Gymnosperms)

Course Code: BOT103

L	T	P	Credits	Marks	Min. Marks
4	1	0	4	100	40

Objective:

To make the students learn about morphology, biology and importance of the vascular plants.

Learning Outcome

The students will get to learn the origin of vascular systems, and seed habit from non-vascular plants.

UNIT I

Bryophytes: Salient features; Adaptations to land habit; Classification; Characteristic and comparative account of Muscophytina, Hepatophytina and Anthocerophytina; Variation in structure of gametophytes (Isophyllous e.g. *Funaria*; Anisophyllous e.g. *Porella* and thalloid e.g. *Marchantia*); Vegetative and asexual reproduction. **(15 Lectures)**

UNIT II

Pteridophytes: Salient features; Classification; Evolution of stelar system: Telome theory; The earliest known records of Pteridophytes with special reference to *Rhynia*; A general account and evolutionary significance of Psilotopsida (*Psilotum*), Lycopsida (*Selaginella*), Sphenopsida (*Equisetum*) and Pteropsida (*Pteris*). **(15 Lectures)**

Unit III

Gymnosperms: Salient features; Distribution in India; Classification; Morphology and life history (gametophyte, sex organs and embryo) of *Cycas* (Cycadales), *Pinus* (Coniferales), *Ephedra* (Ephedrales); Pteridospermic seeds and evolution of seed habit in gymnosperm. (developmental stages not included). **(15 Lectures)**

UNIT IV

Economic importance of Bryophytes, Pteridophytes and Gymnosperms; Ecological importance of bryophytes (pioneer colonizers, role in water conservation, prevention of soil erosion and management of forest floors, Phytoremediation and pollution monitoring). **(7 Lectures)**

Paper: Plant Diversity II Lab
Course Code: BOT104

L	T	P	Credits	Marks	Min. Marks
0	0	3	2	50	20

1. Morphological studies of *Funaria*, *Porella*, *Marchantia*, *Riccia*, *Anthoceros*.
2. Internal organization of thallus in *Anthoceros*, *Riccia*, *Marchantia*.
3. Structure of sporophytes in *Funaria*, *Marchantia*.
4. Study of morphology, anatomy and reproductive organs of *Selaginella* and *Equisetum*, *Pteris*.
5. Study of morphology, anatomy; and reproductive organs in the available Gymnosperms (*Pinus*, *Cycas*, *Ephedra*, *Zamia* and any other).

Reference Books

1. Bhatnagar, S.P. and Moitra, A. *Gymnosperms*. New Age International Limited: New Delhi, 1996.
2. Chopra, R.S. and Kumar, S.S. *Mosses of Western Himalaya and Adjacent Plain*. Chronica Botanica: New Delhi, 1981.
3. Coulter, J.M. and Chamberlain, C.J. *Morphology of Gymnosperms*. Chicago University Press: Chicago, 1921.
4. Gifford, E.M. and Foster, A.S. *Morphology and Evolution of Vascular Plants*. W.H. Freeman and Company: New York, 1989.
5. Parihar, N.S. *The Biology and Morphology of Pteridophytes*. The Central Book Depot: Allahabad, 1972.
6. Rashid, A. *An Introduction to Pteridophytes*. Vikas Publishing House Pvt. Ltd.: New Delhi, 1992.
7. Richardson, D.H.S. *Biology of Mosses*. Blackwell Scientific Publications: Oxford, 1981.
8. Sporne, K.R. *The Morphology of Pteridophytes-The Structure of Ferns and Allied Plants*. B.I. Publications, Bangalore, 1982.
9. Sporne, K.R. *The Morphology of Gymnosperms*. B.I. Publications, Bombay, 1974.
10. Sundara Rajan, S. *Introduction to Pteridophyta*. Wiley Eastern India: New Delhi, 1995.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

B.Sc. Botany (Hons. School) Semester II

Course Title: Spectroscopy

Course Code: CHE155

L	T	P	Credits	Marks	Min. Marks
4	0	0	4	100	40

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic of spectroscopy. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the spectroscopy and its applications. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

- The books indicated as text-book(s) are suggestive However, any other book may be followed.

PART A

Pure Rotational Spectra

(12 Hours)

Classification of molecules according to their moment of inertia. Rotational energy levels of hydrogen chloride. Determination of molecular geometry by rotational spectrum, isotopic substitution effects. Stark effect, Estimation of molecular dipole moments, Selection rules, Rotational Raman Spectra, anisotropic polarizability, specific selection rule in Raman Spectra, Stokes and anti – Stokes lines.

PART B

Vibrational Spectra

(12 Hours)

Diatomic molecules, Force constants, Fundamental vibration frequencies, anharmonicity of molecular vibrations and its effect on vibrational frequencies, second and higher harmonies. Frequencies of the vibrational transitions of HCl. Vibrational rotation spectra of CO. P, Q and R branches.

PART C

Infrared and Raman Spectra

(9 Hours)

Vibrations of polyatomic molecules. Examples of CO₂, H₂O. Mechanics of measurement of infrared and Raman spectra absorption of common functional groups. Their dependence on chemical environment (bond order, conjugation, hydrogen bonding), the number of active infrared and Raman active lines. Fermi resonance, combination bands and overtones, complications due to interactions of vibrations of similar frequency. Application of IR in structure elucidation of organic compounds.

PART D

UV and Visible Spectroscopy

(12 Hours)

Measurement technique, Beer – Lambert's Law, molar extinction coefficient, oscillator strength and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra. Chromophores, auxochromes, electronic spectra of polyatomic molecules.

Woodward rules for conjugated dienes, unsaturated carbonyl groups, extended conjugation. Red shift, blue shift, hypo and hyperchromic effects.

Reference Books:

1. Silverstein, R.M. and Webster, F.X. *Spectrometric Identification of Organic Compounds*, Wiley, 6th edition, 2007.
2. Kemp, W. *Organic Spectroscopy*, ELBS, 1996.
3. Banwell, C.N. *Fundamentals of Molecular Spectroscopy*, Tata McGraw Hill, 4th edition, 1995.
4. Sharma, Y.R. *Elementary Organic Spectroscopy; Principle and Chemical Applications*, S. Chand & Company Ltd., 2005.

**BSc (Physics, Botany, Zoology, Biotechnology, Microbiology, Biochemistry, mathematics)
(Semester 2)**

Course Title: Chemistry Lab

Course Code: CHE156

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Determine the strength of HCl solution by titrating against NaOH solution conductometrically.
2. Determination of total hardness of water (tap) using standard EDTA solution and Eriochrome black T indicator.
3. Determination of alkalinity of water.
4. Determination of surface tension of given liquid by using Stalagmometer.
5. Determination of residual chlorine in a water sample.
6. To determine the specific and molecular rotations of an optically active substance by using polarimeter.
7. To determine the composition of an unknown solution with a polarimeter.
8. Determination of the viscosity of given lubricating oil by using Redwood Viscometer.
9. Determination of distribution coefficient of I₂ between CCl₄ and Water.
10. To study the kinetics of hydrolysis of methyl acetate in the presence of hydrochloric acid.

Reference Books:

1. Levitt, B.P. *Findlays Practical Physical Chemistry*, London & New York: Longman Group Ltd. 8th edition, 1978.
2. Khosla, B.D., Garg, V.C. and Gulati, A. *Senior Practical Physical Chemistry*, New Delhi: R.Chand & Co., 11th edition, 2002.
3. Das, R.C. and Behra, B., *Experimental Physical Chemistry*, Tata McGraw Hill Publishing Co. Ltd., 1983.
4. *Vogel's Textbook of Quantitative Chemical Analysis* (revised by Jeffery, Bassett, Mendham and Denney), 5th edition, ELBS, 1989.
5. Svehla, G. *Vogel's Qualitative Inorganic Analysis (revised)*, 6th edition, New Delhi: Orient Longman, 1987.
6. Christian G.D. *Analytical Chemistry*, John Wiley & Sons Inc.

B.Sc. Botany (Hons. School) Semester II

Course Title: Animal Diversity II
Course Code: ZOO103

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: To acquaint students with the general characters and classification of chordates and the affinities between different groups. To impart knowledge regarding the morphological, anatomical and physiological make up of a few representative organisms from each phylum.

UNIT-A

15 hours

- Origin and general characters of chordates with detailed classification of each animal group with special emphasis on salient features and interrelationships
- Hemichordata: Hemichordates as link between non-chordates and chordates with detailed study of *Balanoglossus*
- Urochordata: development, affinities, retrogressive metamorphosis. Detailed study of *Herdmania*.
- Cephalochordata: development, affinities. Detailed study of *Branchiostoma*.

UNIT-B

15 hours

- Cyclostomata: migration. Detailed study of *Petromyzon*
- Pisces: scales, fins, migration, parental care. Detailed study of *Scoliodon*, and *Labeo*

UNIT-C

12 hours

- Amphibia: Respiration, Parental care. Detailed study of *Rana*
- Reptilia: Terrestrial adaptations, parental care. Detailed study of *Uromastix*

UNIT-D

18 hours

- Aves: Respiration, Flight, Endothermy. Detailed study of *Columba*
- Mammals: Integument, Dentition. Detailed study of *Oryctogalus*

Reference books

1. Dhama, P.S., and Dhama, J.K. *Chordate Zoology*. 5th edition. R. Chand & Co., New Delhi, 2006.
2. Kotpal, R.L. *Text Book of Zoology: Vertebrates*. Rastogi Publications: Meerut, 2012.
3. Parker, T.J., and Haswell, W.A. *A Text Book of Zoology: Vertebrates*, 7th edition. Vol. II (eds. Marshall A.J., and Williams, W.D.), Mac Millan: London, 1972.
4. Dodson, E.O. *A Text Book of Zoology*. CBS Publishers & Distributors: Delhi, 1976.

Course Title: Animal Diversity II Lab
 Course Code: ZOO104

L	T	P	Credits	Marks
0	0	1	2	50

General survey of chordates through slides/specimens/charts/models/e-resources:

- Hemichordata: *Balanoglossus*
- Protochordata - *Herdmania*, pharynx and spicules of *Herdmania*, *Molgula*, *Ciona*, *Ascidia*, *Botryllus*, *Pyrosoma*, *Salpa*, *Doliolum*, *Oikopleura* and *Branchiostoma*, T.S. *Branchiostoma* through different regions
- Cyclostomata – *Myxine*, *Petromyzon* and *Ammocoetes* larva. Chondrichthyes - *Zygaena*, *Pristi.*, *Narcine*, *Trygon* and *Rhinobatos*.
- Actinopterygii – *Polypterus*, *Acipenser*, *Lepidosiren*, *Mystus*, *Catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Cyprinus carpio*, *Hippocampus*, *Syngnathus*, *Exocoetus*, *Anabas*, *Diodon*, *Ostracion*, *Tetradon*, *Echeneis*, *Lophius*, *Solea* and *Anguilla*, cycloid and ctenoid scales of fishes.
- Dipneusti (Dipnoi) – Any of the lungfishes.
- Amphibia – *Necturus*, *Proteus*, *Amphiuma*, *Salamandra*, *Ambystoma*, *Triton*, *Hyla*, *Rhacophorus* *chthyophis* and *Axolotl* larva.
- Reptilia- Tortoise, Turtle, *Hemidactylus*, *Calotes*, *Draco*, *Varanus*, *Phrynosoma*, *Chamaeleon*, *Typhlops*, *Python*, *Ptyas*, *Bungarus*, *Naja*, *Hydrus*, *Vipera*, *Crocodilus*, *Gavialis* and Alligator.
- Aves : *Anas*, *Ardea*, *Milvus*, *Pavo*, *Tyto*, *Alcedo*, *Eudynamis*, *Casuaris*; and *Struthio*.
- Mammalia – *Echidna*, *Ornithorhynchus*, *Macropus*, *Erinaceus*, *Sorex*, *Loris*, *Macaca*, *Manis*, *Hystrix*, *Funambulus*, *Felis*, *Capra*, *Canis*, *Herpestes*, *Pteropus* and *Leo*.

Demonstration of anatomy of the following animals through charts/e-resources/dissection of animal

- *Herdmania*: General Anatomy, pharynx and spicules
Labeo: Digestive and reproductive systems, skeleton
Rana: Digestive, arterial, venous and reproductive systems. Skeleton
Varanus: Digestive, arterial, venous and reproductive systems. Skeleton
 Hen: Digestive, arterial, venous and reproductive systems. Skeleton
 Rat: Digestive, arterial, venous, urinogenital systems, skeleton

Note: Practicals related to Animal Diversity II Lab are in accordance with UGC guidelines and have been approved by Dissection Monitoring Committee.

B.Sc. Botany (Hons. School) Semester II

Course Title: Road Safety and Legal Awareness

Course Code: EVS103

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: This course aims to aware the students about safety measures taken during driving and commuting on roads.

Unit I

Road Safety

6 Hours

- Road safety: Concept and its importance.
- Attitude of people towards road safety
- Role of traffic police in road safety
- Traffic rules
- Traffic signs
- How to obtain driving license
- Traffic offences, penalties and procedures
- Common driving mistakes
- Significance of first-aid in road safety
- Role of civil society in road safety and Traffic police-public relationship
- Motor Vehicle Act 1998 (2010)

Unit II

Legal Awareness

4 Hours

- Legal literacy
- Child labour
- Domestic Violence
- Right to Education

Reference Books:

1. Botkin, DB, and Kodler EA. *Environmental Studies: The Earth as a living planet*. New York: John Wiley and Sons Inc., 2000.
2. Singh, JS, Singh, SP, and Gupta SR. *Ecology, Environment and Resource Conservation*. New Delhi: Anamaya Publishers, 2006.
3. Sharma, PD. *Ecology and Environment*. Meerut Rastogi Publications, 2004

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

B.Sc. Botany (Hons. School) Semester II

Course Title: General Knowledge and Current Affairs
Course Code: SGS102

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives

The study of General Knowledge and Current Affairs has become even more important today. It is not only a major constituent of most competitive examinations but also aids in acquiring general awareness.

The objectives of this course are:

- To introduce students with the course and contents of various competitive examinations
- To prepare a foundation for appearing in various competitive examinations
- To sensitize the students about the current issues and events of national and international importance
- To provide opportunity to the students to study inter disciplinary subjects like Geography, Science, Economy, Polity, History, International Relations etc.

Learning Outcomes:

- Students would get an opportunity to aspire, plan and prepare for various competitive examinations in advance.
- It would polish their personalities and sharpen the skills of debates, group discussions, communication, interview etc.
- Students would acquire general awareness of National and International Events.

Unit — A

General Geography

3 hours

World Geography:

The Universe, The Solar System, The Earth, Atmosphere, The World we live in, Countries rich in Minerals, Wonders of the World, Biggest and Smallest.

Indian Geography:

3 hours

Location, Area and Dimensions, Physical Presence, Indian States and Union Territories, Important sites and Monuments, Largest-Longest and Highest in India.

General History

3 hours

Glimpses of India History, Ancient Indian, Medieval India, Modern India, Various Phases of Indian National Movement, Prominent Personalities. Glimpses of Punjab history with special reference to period of Sikh Gurus.

Glimpses of World History

3 hours

Important Events of World History, Revolutions and Wars of Independence, Political Philosophies like Nazism, Fascism, Communism, Capitalism, Liberalism etc.

Unit — B

General Polity

3 hours

World Politics – Major Actors and their political relations, UNO and other organizations viz: WTO, EU, SAARC, ASEAN, BRICS, WTO, OIC, OAU, OPEC, GCC etc.

Indian Polity: Constitution of India: **3 hours**
Important Provisions, Basic Structure, Union Government, Union Legislature and Executive, State Government: State Legislature and Executive, Indian Judiciary, The Election Commission, Panchayati Raj System, RTI etc.

General Economy: **3 hours**
The process of liberalization, privatization, globalization and Major World Issues. Indian Economy, Indian Financial System, Major Economic Issues, Economic Terminology.

Unit — C

General Science: **3 hours**
General appreciation and understandings of science including the matters of everyday observation and experience. Inventions and Discoveries.

Sports and Recreation: **3 hours**
The World of Sports and recreation. Who's Who is sports, Major Events, Awards and Honours. Famous personalities, Festivals. Arts and Artists.

Current Affairs: **3 hours**
National and International Issues and Events in News. Governments Schemes and Policy Decisions.

India and Neighbours: **3 hours**
Current phase relations with China, Pakistan, Bangladesh, Nepal, Sri Lanka and Afghanistan

Unit — D

Miscellaneous Information

Who is who **2 hours**
Books and Authors, Persons in News, Awards and Honours, Abbreviations and Sports

Total: 35 Hours

Reference Books:

1. Aggarwal, R. S. *Advance Objective General Knowledge*, S. Chand Publisher (2013)
2. Sen, S. *Concise General Knowledge Manual 2013*, Unique Publishers, 2013
3. Verma, R P. *Encyclopedia of General Knowledge and General Awareness*, Penguin Books Ltd (2010)
4. Thorpe, Edgar. And Thorpe, Showick. *General Knowledge Manual 2013-14*, the Pearson, Delhi.
5. Mohanty, Muktikanta. *General Knowledge Manual 2013-14*, Macmillan Publishers India Ltd., Delhi.
6. India 2013, *Government of India (Ministry of Information Broadcasting)*, Publication Division, 2013.
7. Methew, Mammen. *Manorama Year Book 2013-14*, Malayalam Manorama Publishers, Kottayam, 2013.
8. *Spectrum's Handbook of General Studies – 2013-14*, Spectrum Books (P) Ltd., New Delhi
9. *Unique Quintessence of General Studies – 2013-14*, Unique Publishers, New Delhi.

Current Affairs

Magazines

Economic and Political Weekly, Yojna, the Week, India Today, Frontline, Spectrum.
Competition Success Review, Competition Master, Civil Services Chronicle, Current Affairs,
World Atlas Book

Newspapers the Hindu, Times of India, the Hindustan Times, the Tribune

B.Sc. Botany (Hons. School) Semester II

Course Title: Basic Communication Skills

Course Code: ENG151

No. of Lectures: 45

L	T	P	Credits	Marks
4	0	0	3	75

Course Objective:

- To enhance students' vocabulary and comprehensive skills through prescribed texts.
- To hone students' writing skills.

Learning Outcomes: Students will be able to improve their writing skills as well as will enrich their word power.

Unit – A Applied Grammar (Socio-Cultural Context)	
• Parts of Speech: Noun, Pronoun, Adjective, Verb, Adverb, Preposition, Conjunction, Interjection	4 hours
• Tenses (Rules and Usages in Socio-cultural contexts)	5 hour
• Modals: Can, Could, May, Might, Will, Would, Shall, Should, Must, Ought to	4 hours
• Passives	3 hours
• Reported/Reporting Speech	3 hours
Unit – B Reading (Communicative Approach to be Followed)	
• J M Synge: Riders to the Sea (One Act Play)	5 hours
• Anton Chekhov : Joy (Short Story)	4 hours
• Swami Vivekanand : The Secret of Work (Prose)	5 hours
Unit – C Writing	
• Paragraph and Essay Writing	4 Hours
• Letter Writing: Formal and Informal	4 hours
• Notice and Email	4 hours

References:

a. Books

1. Kumar, Sanjay and PushpLata. *Communication Skills*. India: OUP, 2012.
2. Vandana, R. Singh. *The Written Word* by. New Delhi: Oxford University Press, 2008.

b. Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.letterwritingguide.com
3. www.teach-nology.com
4. www.englishforeveryone.org
5. www.dailywritingtips.com
6. www.englishwsheets.com
7. www.mindtools.com

Course Title: Basic Communication Skills Lab

Course Code: ENG 152

No. Of Lectures: 30

L	T	P	Credits	Marks
0	0	2	1	25

Course Objective:

- To improve fluency in speaking English.
- To promote interactive skills through Group Discussions and role plays.

Learning Outcome: Students will get exposure to speaking through the above mentioned interactive exercises. In addition, they will develop a technical understanding of language learning software, which will further improve their communicative skills.

Unit – A Speaking/Listening	
• Movie-Clippings	10 hours
• Role Plays	10 hours
• Group Discussions	10 hours

Instructions:

1. Each student will prepare a scrap file on any of the topics given by class teacher. Student should be able to justify the contents of his/her Scrap file, which carries the weightage of 10 marks. Marks will be given for originality, creativity and presentation of thoughts.
2. In the end of semester, viva exam will be conducted. Viva will be for 10 marks. Spoken English will be the focus of exam. Examiner will ask questions related to scrap file and other general (non-technical) topics.
3. In the End-term exam, lab activity will carry the weightage of 10 marks.
4. Acknowledge all the sources of information in your scrap file.

Reference Books:

1. Gangal, J. K. *A Practical Course in Spoken English*. India: Phi Private Limited, 2012.
2. Kumar, Sanjay and Pushp Lata. *Communication Skills*. India: OUP, 2012.

Websites

1. www.youtube.com (to download videos for panel discussions)
2. www.englishforeveryone.org
3. www.talkenglish.com
4. www.mindtools.com

Course Title: Stenography
Course Code: SGS104

L	T	P	Credits	Marks
3	0	0	1	25

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of shorthand language and would be able to apply them in daily life. Completion of the course will improve their speed of writing and typing. They would be able to pronounce the English words correctly and can use effective English communication.

<p>Unit A I. The Consonants II. The Vowels III. Intervening Vowels and Position Grammalogues, Punctuation IV. Alternative Signs for r and h V. Diphthongs Abbreviated w. VI. Phaseography Tick the VII. Circle s and z—Left and Right Motion VIII. Stroke s and z IX. Large Circles sw and ss or sz X. Loops st and str.</p>	12 hours
<p>Unit B XI. Initial Hooks to Straight Strokes and Curves XII. Alternative Forms for fr, vr, etc. Intervening Vowels XIII. Circle or Loop Preceding Initial Hook XIV. n and f Hooks XV. Circles and Loops to Final Hooks.XVI The shun hook. XVII. The Aspirate. XVIII. Upward and Downward r.XIX. Upward and downward l and sh. XX. Compound consonants XXI. Vowel indication.</p>	12 hours
<p>Unit C XXII. The halving principle (section 1). XXIII. The halving principle (section 2). XXIV. The Doubling principle. XXV. Diphonic or two vowel signs. XXVI. Medial semicircle. XXVII. Prefixes negative words. XXVIII. Suffixes and terminations. XXIX. Contractions. XXX. Figures, etc .proper names.</p>	11 hours
<p>Unit D XXXI. Note taking, transcription, etc. XXXII. Essentials vowels. XXXIII. Special contractions. XXXIV. Advanced pharseography. XXXV. Intersections. XXXVI. Business phrases. XXXVIII. Banking and stockbroking phrases. XXXIX. Insurance and shipping phrases. XL. Technical and railway phrases. XLI. Legal phrases. XLIII. Special list of words. XLIV. Shorthand in practice.</p>	10 hours
Total	45 hours

Text Book:

Pitman Shorthand Instructor and Key, Pearson publisher.

Course Title: Stenography Lab
Course Code: SGS105

L	T	P	Credits	Marks
0	0	1	1	25

Course Objective: The course is to inculcate writing and listening skills among the students. This would act as building blocks for the learner to begin the study of stenography. As the learners are from the senior secondary background the course has been created keeping in mind their requirements for the future.

Learning Outcome:

After going through this course the participant would have understood the basic concepts of typing and would be able to apply them in daily life. Completion of the course will improve their speed of typing and typing skills.

Unit A Beginner : Basics-fjdk, sla;, ghty,vmbn,ruei,woqp,cx. .	04 hours
Unit B Shift keys, numeric pad, Digits and symbols	03 hours
Unit C Intermediate- Syllables and words.	04 hours
Unit D Expert- Paragraphs and Stories	04 hours
Total	15 hours

B.Sc. Botany (Hons. School) Semester III

Paper: Basics of Cell Biology
Course Code: BOT201

L	T	P	Credits	Marks	Min marks
4	1	0	4	100	40

Objective:

To acquaint the students prokaryotic, eukaryotic cell structure and function and various types of gene interactions.

Learning Outcome

The course will give the details of bacterial, and eukaryotic cell structure, function and cell reproduction. Further, the studies will make students learn various tools and techniques used in cell biology. The course has been designed to make the students learn the inheritance of gene, their different types of interactions and sex-linked inheritance also.

UNIT-I

The Cell: Cell Theory; structural and functional organization of prokaryotic and eukaryotic cells; Variation in cell size and cell structure. **(3 Lectures)**

Tools and techniques of Cell Biology: Microscopic-Principles of Light microscopy; Phase contrast microscopy; Electron microscopy (EM)-scanning EM and scanning transmission EM (STEM); Fluorescence microscopy; Cell fractionation and procedures; Autoradiography. **(6 Lectures)**

UNIT-II

Structure and function of cell organelle: Ultrastructure, chemical constituents of cell wall; Models of organization of cell membrane, various membrane proteins, lipids and carbohydrates; Origin, biogenesis, genome organization of mitochondria and chloroplast. **(10 Lectures)**

UNIT-III

Nucleus: Nuclear envelope, nucleoplasm, DNA (prokaryotic & eukaryotic), histones, different models of organization of DNA, centromere, and telomeres. **(4 Lectures)**

Structure and function of other cell organelle: Structure, types and functions of endoplasmic reticulum, golgi apparatus, lysosomes, microbodies (peroxisomes, glyoxysomes) ribosomes (prokaryotic and eukaryotic). **(12 Lectures)**

UNIT-IV

Cell Cycle: Cell division (mitosis, meiosis) and its significance; role of centromere, kinetochore, spindle apparatus; Chromosomes and Heredity: Physical and chemical structure of chromosomes, heterochromatin and euchromatin, Satellite chromosomes. **(5 Lectures)**

Paper: Basics of Cell Biology Lab
Course Code: BOT202

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. Study of cell structure using onion peel.
2. Electron micrograph of eukaryotic cell.
3. Study of Mitosis using appropriate plant material.
4. Study of meiosis using appropriate plant material.

Reference Bookss

1. Becker, W.M., Kleinsmith, L.J., Hardin. J., and Bertoni, G.P. *The World of the Cell*. 8th edition. Pearson Benjamin Cummings Publishing: San Francisco, 2010.
2. Cooper, G.M. and Hausman, R.E. *The Cell: A Molecular Approach*. 6th edition. ASM Press & Sunderland: Washington, D.C.; Sinauer Associates, Massachusetts, 2013.
3. De Robertis, E.D.P. and De Robertis, E.M.F. *Cell and Molecular Biology*. 8th edition. Lippincott Williams and Wilkins: Philadelphia, 2006.
4. Karp, G. *Cell and Molecular Biology: Concepts and Experiments*. 7th edition. John Wiley & Sons. Inc., 2010.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester III

Paper: Organization of Angiosperms

Course Code: BOT203

L	T	P	Credits	Marks	Minimum marks
4	0	0	3	75	30

Objective:

To impart the knowledge of organization, growth and development of body in higher plants.

Learning Outcome

The students will gain the knowledge of organization, structure and variation in root, stem and leaf of higher plants. Further, the students will acquire the knowledge of growth and development in higher plants.

UNIT I

Organization of higher plant body: The root and shoot systems; Variation in habit and longevity; Environmental influences; Diversity in plants (annuals, biennials and perennials); Convergence of evolution of tree habits in Gymnosperms, monocotyledons and dicotyledons. **(4 Lectures)**

Meristems and their functions: Root apical meristems (RAM), shoot apical meristems (SAM), lateral meristems and their functions. **(5 Lectures)**

Unit II

Root: Range and form of structure of roots; Their tissues and function; Modifications of roots; lateral roots; root hairs. **(5 Lectures)**

Shoot: Range and form of structure of shoots; Cytological and molecular analysis of shoot apical meristem (SAM); secretory ducts and laticifers; Shoot modifications. **(8 Lectures)**

Unit III

Leaf: Range and form of structure of leaf; Phyllotaxy; difference between monocot and dicot leaf; Regulations of leaf form variations; differentiation of epidermis (with special reference to stomata and trichomes) and mesophyll; Leaf modifications. **(4 Lectures)**

Unit IV

Regeneration: Regeneration in lower plants, regeneration in higher plants, reconstitution, restoration, reproductive regeneration. **(4 Lectures)**

Development in Plants: Types of symmetry; Establishment of symmetry in plants. **(3 Lectures)**

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Paper: Organization of Angiosperms Lab
Course Code: BOT204

L	T	P	Credits	Marks	Minimum marks
0	0	2	1	25	10

1. To study the monopodial and sympodial branching pattern in Turmeric, Colocasia and Ginger.
2. To study the morphology of monocot and dicot roots.
3. To study the morphology of monocot and dicot shoots.
4. To study the morphology of monocot and dicot leaf.
5. To study the phyllotaxy using different plants.
6. To study different types of seed germination (epigeal and hypogeal).
7. Study of apical meristems using permanent slides.
8. To study the modifications of roots.
9. To study the modifications of stems.
10. To study the modifications of leaves.

Reference Books

1. Atwell, B.J. Kriederussan, P.E., and Jumbull, C.G.N. (eds.) *Plant in Action: Adaptation in Nature, Performance in Cultivation*. MacMillan Education: Sydney, 1999.
2. Beck, C.B. *An Introduction to Plant Structure and Development: Plant Anatomy for the Twenty-First Century*. Cambridge University Press, 2010.
3. Bewley, J.D. and Black, M. *Seeds: Physiology of Development and Germination*. Plenum Press: New York, 1994.
4. Bhojwani, S.S. and Bhatnagar, S.P. *The Embryology of Angiosperms*. Vikas Publishing House, Delhi, 1975.
5. Eames, A.J. *Morphology of the Angiosperms*. Tata McGraw Hill Publishing Co., Bombay, 1961.
6. Fosket, D.E. *Plant Growth and Development – A Molecular Approach*, Academic Press, Oxford, 1994.
7. Maheshwari, P. *An Introduction to the Embryology of Angiosperms*. Tata McGraw Hill Publishing Co. Bombay – New Delhi, 2003.
8. Raghavan, V. *Developmental Biology of Flowering Plants*, Springer Verlag, New York, 1999.
9. Steeve, T.A., and Sussex, I.M. *Patterns in Plant Development*. 2nd edition. Cambridge University Press, Cambridge, 1989.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester III

Paper: Plant Systematics & Evolution

Course Code: BOT205

L	T	P	Credits	Marks	Minimum marks
4	0	0	3	75	30

Objective:

To make the students familiar of systematics and phylogeny of angiosperms.

Learning Outcome

These studies will gain the knowledge of origin, evolution, classification and nomenclature of plants.

UNIT I

Introduction: Aims, components and significance of systematics; Introduction to identification, classification, phylogeny and nomenclature of plants. **(2 Lectures)**

Systematics in Practice: Field inventory; Herbarium preparation and management; Important herbaria and botanical gardens of the world and India; Documentation (Floras, Monographs, Journals, Online Journals, indices). **(4 Lectures)**

Unit II

Taxonomic hierarchy: Concept of Hierarchy, taxa, categories and groups; Concept of species (taxonomic, biological, evolutionary), genus and family. **(2 Lectures)**

Terms and concepts: Homology; analogy; parallelism; convergence; monophyly; polyphyly; clades; phylogenetic tree; cladogram. **(3 Lectures)**

Botanical nomenclature: Principles and rules of nomenclature; ranks and names; type method, author citation, valid publication; rejection of names, principle of priority and its limitation; names of hybrids and cultivars; concept of biocode; International Code for Botanical Nomenclature. **(4 Lectures)**

Unit III

Phylogeny of Angiosperms: Origin and evolution of Angiosperms (with special reference to Bennettitalean, Gnetalean, Caytonialean, herbaceous origin theories); Primitive living angiosperms. **(5 Lectures)**

Introduction to Floral terms. **(3 Lectures)**

UNIT-IV

Salient Features and Economic Importance of Dicot Families: Ranunculaceae; Malvaceae; Brassicaceae; Rutaceae; Fabaceae; Cucurbitaceae; Asteraceae; Asclepiadaceae; Solanaceae; Lamiaceae; Euphorbiaceae. **(11 Lectures)**

Salient Features and Economic Importance of Monocot Families: Orchidaceae; Liliaceae; Cyperaceae; Poaceae. **(4 Lectures)**

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Paper: Plant Systematics & Evolution Lab
Course Code: BOT206

L	T	P	Credits	Marks	Minimum marks
0	0	2	1	25	10

1. Study of floral characters of the following families: Brassicaceae (*Brassica*), Malvaceae (*Hibiscus rosa sinensis*), Ranunculaceae (*Ranunculus*, *Delphinium*), Cucurbitaceae (*Luffa*), Fabaceae (Faboideae-*Lathyrus*; Ceasalpinioideae- *Ceasalpinia*, *Cassia*; Mimosoideae-*Mimosa*, *Acacia*), Asteraceae (*Helianthus*, *Ageratum*), Solanaceae (*Solanum*, *Withania*), Lamiaceae (*Ocimum*, *Salvia*), Euphorbiaceae (*Euphorbia*; *Phyllanthus*), Asclepiadaceae (*Calotropis*; *Asclepias*); Rutaceae (*Citrus*, *Muraya*); Poaceae (*Triticum*, *Hordeum*), Liliaceae (*Asphodelus*, *Asparagus*), Cyperaceae (*Cyperus*); Orchidaceae (Any Orchid).
2. Identification of selected taxa using taxonomic keys.
3. Familiarity with local flora and herbarium techniques.

Reference Bookss

1. Angiosperm Phylogeny Group. *An update of the Angiosperm Phylogeny Group classification for the orders and families of the flowering plants: APG III*. Botanical Journal of the Linnaean Society, 2009.
2. Chopra, G.L. *Angiosperms: Systematic and Life Cycle*. S. Nagin & Company: India, 1977.
3. Crawford, D.J. *Plant Molecular Systematics*. Cambridge University Press: Cambridge, UK, 2003.
4. Cronquist, A. *An Integrated System of Classification of Flowering Plants*. Columbia University Press: New York, 1981.
5. Datta, S.C. *Systematic Botany*. New Age International (P) Ltd. Publishers, 2003.
6. Hollingsworth, P.M., Bateman, R.M. and Gornall, R.J. *Molecular Systematics of Plant Evolution*. Taylor and Francis, London, 1999.
7. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. and Donoghue, M.J. *Plant Systematics- A Phylogenetic Approach*. Sinauer Associates Inc, Massachusetts, USA, 2008.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester III

Course Title: Inorganic Chemistry

Course Code: CHE253

Time: 04 Hours

L	T	P	Credits	Marks
4	0	0	4	100

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of Inorganic chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Atomic Structure and periodic properties (12 Hours)

Wave mechanical model of Hydrogen atom, The de Broglie relationship, The uncertainty principle, Schrodinger wave equation and its derivation, Significance of Ψ and Ψ^2 , Quantum numbers, Normal and orthogonal wave functions, Pauli's exclusion principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations. Concept of extra stability of half and completely filled electronic configuration, Electronic configuration of elements, Penetration and shielding (The Slater's rules). The origin and distribution of the elements, The structure of the periodic table, Atomic parameters and their variation in periodic table, Electronegativity and various scales.

PART B

Ionic Compounds (Bonding and structures) (12 Hours)

Properties of ionic substances, Occurrence of ionic bonding, The radius ratio rules, Efficiency of packing, Hexagonal close packing, Cubic close packing, Structures of different crystal lattices, Sodium chloride, Cesium chloride, Wurtzite, Zinc blende, Fluorite, Rutile, Cristobalite, Nickel arsenide, Calcium carbide, Lattice energy, Born-Haber cycle, The calculations of the lattice energy on the basis of Born-Lande equation, Covalent character in predominantly ionic compounds, Imperfections of crystals, Polarizing power and polarizability of ions, Fajan's rule.

PART C

Covalent Bond (12 Hours)

The Lewis theory, Valence bond theory - A mathematical approach, Resonance, Valence Shell Electron Pair Repulsion Model (VSEPR theory), Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory. Concept of hybridization, Rules for obtaining hybrid orbitals, Extent of d-orbital participation in molecular bonding (SO_2 , PCl_5 , SO_3), Molecular orbital theory (LCAO method), Symmetry of molecular orbitals, Applications of MOT to homo- and hetero-nuclear diatomic molecules, Molecular orbital energy level diagrams (Be_2 , N_2 , O_2 , F_2 , NO , CO , HCl , NO_2 , BeH_2).

PART D

Coordination chemistry (8 Hours)

Werner's theory, nomenclature of coordination complexes, isomerism in coordination complexes, chelating agents, metal chelates and chelate effects, names and abbreviations of important ligands, polydentate ligands, polypyrazolyborates, macrocyclic ligands, macrocyclic

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effect, ketoenolates, troplonates, tripod ligands, conformation of chelate rings, factors determining kinetic and thermodynamic stability.

Reference Books :

1. Shriver, D.F.C., Atkins, P.W. and Langford, C.H. *Inorganic Chemistry*, ELBS Oxford, 1991.
2. Huheey, J.E. Keiter, E.A. and Keiter, R.L. *Inorganic Chemistry*, 4th edition, Singapore: Pearson Education, 1999.
3. Lee, J.D. *Concise Inorganic Chemistry*, ELBS, Oxford, 1994.

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(Semester 3)

Course Title: Inorganic Chemistry Lab

Course Code: CHE254

L	T	P	Credits	Marks
0	0	3	2	50

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Inorganic Chemistry Laboratory. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various experiments have been designed to enhance laboratory skills of the undergraduate students.

Expected Prospective:

The students will be able to understand the basic objective of experiments in inorganic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

Qualitative Analysis

Identification of cations and anions in a mixture which may contain combinations of acid ions.

These must contain interfering acid anions and one, the insoluble.

a) Special Tests for Mixture of anions

I. Carbonate in the presence of sulphate.

II. Nitrate in the presence of nitrite

III. Nitrate in the presence of bromide and iodide.

IV. Nitrate in the presence of chlorate.

V. Chloride in the presence of bromide and iodide.

VI. Chloride in the presence of bromide.

VII. Chloride in the presence of iodide.

VIII. Bromide and iodide in the presence of each other and of chloride.

IX. Iodate and iodide in the presence of each other.

X. Phosphate, arsenate and arsenite in the presence of each other.

XI. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.

XII. Borate in the presence of copper and barium salts.

XIII. Oxalate in the presence of fluoride.

XIV. Oxalate, tartrate, acetate, citrate in the presence of each other.

b) Separation and identification of cations in mixtures

i) Separation of cations in groups.

ii) Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.

Reference Books:

1. Svehla, G. and Sivasankar, B. *Vogel's Qualitative Inorganic Analysis (revised)*, Pearson, 7th edition, 1996.
2. Bassett, R. C., Denney, G. H. and Jeffery, J. Mendham, *Vogel's Textbook of Quantitative Inorganic Analysis (revised)*, 4th edition, Orient Longman, 1978.

DAV UNIVERSITY, JALANDHAR

Course Title: ENGLISH

Course Code: ENG180

Total Lectures: 60

4	0	0	4		100
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Course Objective: To familiarize students of non-literary programmes with some of the basics of literary studies through a critical study of the prescribed texts

Learning Outcomes:

Unit – A <i>Never Never Nest</i> by Cedric Mount	
• Consumerist Lifestyle	3 hours
• Bank Loans and Modern Times	3 hours
• Character Analysis	5 hours
• Stylistic Analysis	4 hours
Unit – B <i>Guide</i> by R. K. Narayana	
• Interpersonal Relationships	4 hours
• Religious Beliefs/Rituals in Rural India	4 hours
• Character Analysis	4 hours
• Stylistic Analysis	3 hour
Unit – C <i>Twelfth Night</i> by Shakespeare	
• Salient Features of Shakespearean Comedy	5 hours
• Character Analysis	5 hours
• Stylistic and Thematic Analysis	5 hours
Unit – D <i>Animal Farm</i> by George Orwell	
• Marxist Principles	5 hours
• As a Progressive Text	5 hours
• Symbolic Analysis	5 hours

Reference Books:

1. Falvey, Peter ,Peter Kennedy. *Learning Language Through Literature: A Sourcebook for Teachers of English in Hong Kong*. HKU: Hong Kong University Press, 1997.
2. www.britishcouncil.com
3. Kumar, Sukrita Paul. *Language, Literature And Creativity*. New Delhi: Orient Blackswan Pvt Ltd, 2010.
4. Swann, Joan , Robert Pope and Ronald Carter. *Creativity in Language and Literature: The State of the Art*. USA : Palgrave MacMillan, 2011.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester IV

Paper: Basics of Genetics

Course Code: BOT207

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

UNIT-I

Heredity and variation: Mendel and his experiments, principles of segregation and independent assortment, test cross and back cross. **(2 Lectures)**

Non-Mendelian Inheritance: Maternal influence on inheritance; shell coiling in snails; cytoplasmic inheritance in *Yeast* (chloroplasts) and *Mirabilis jalapa* (mitochondria), Kappa particles in Paramecium; extra chromosomal inheritance. **(4 Lectures)**

UNIT II

Gene Interactions and modified dihybrid ratios: Complementary genes; supplementary genes; Duplicate genes (dominant and recessive interactions); Epistasis. **(3 Lectures)**

Multiple Alleles: Blood groups in human (ABO and Rh), eye colour in *Drosophila*, coat colour in mammals, self-sterility in plants. **(3 Lectures)**

UNIT-III

Linkage and recombination: Experiments with *Drosophila*, Sturtevant map, crossing over and recombination, two- and three-points test crosses; Chromosome mapping and its significance. **(6 Lectures)**

Quantitative genetics: Quantitative traits; Quantitative traits; Multiple factor hypothesis; descriptive statistics. **(3 Lectures)**

Sex chromosome: Sex determination in man and *Drosophila* and its mechanism; Sex linked inheritance in man and *Drosophila*; Sex limited characters. **(4 Lectures)**

UNIT-IV

Alteration in genetic makeup: Changes at genetic level (point and para-mutations, spontaneous and induced mutations, mutagens and their effects); Changes in chromosome structure (origin, types and effects of duplication, deletion, inversions and translocations); Changes in chromosome number (origin, types and effects of autopolyploidy and allopolyploidy; meiosis in nullisomics, trisomics and monosomics). **(15 Lectures)**

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Paper: Basics of Genetics Lab
Course Code: BOT208

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. Experiments in monohybrid and dihybrid ratios, gene interaction and modified dihybrid ratios.
2. Hybridization experiments: F₁ and available F₂ material analysis for specific characters.
3. Preparation of chromosome maps.
4. Preparation of karyotypes from dividing root tip cells.

Reference Books

1. Gardner, E.J., Simmons, M.J. and Snustad, D.P. *Principles of Genetics*. 8th edition. John Wiley & Sons: New York, 2006.
2. Gupta, P.K. *Cytogenetics*. Rastogi and Company: Meerut, India, 2005.
3. Gupta, P.K. *Genetics*, Rastogi Publications, Meerut, India, 2009.
4. Schulz-Schaeffer, J. *Cytogenetics*, Springer-Verlag: Berlin, 1980.
5. Singh, B.D. *Genetics*. Kalyani Publishers: India, 2004.
6. Singh, B.D. *Principals of Genetics*. Kalyani Publishers: India, 1992.
7. Sinnott, E.W., Dun, L.C., and Dobzhansky, T. *Principles of Genetics*. 5th edition. McGraw Hill: New Delhi, 2005.
8. Strickberger, M.W. *Genetics*. 2nd edition. Macmillan: New York, 1985.
9. Swanson, C.P., Merz, I. and Young, W.J. *Cytogenetics*. 2nd edition. Prentice Hall: New York, 1981.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester III

Paper: Plant Anatomy

Course Code: BOT209

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

Objective:

To acquaint students about the internal tissues of plants.

Learning Outcome

The course will impart the knowledge of various tissue systems in plants and internal structure of roots, stem and leaf.

UNIT-I

Introduction: History, scope and importance of plant anatomy. (2 Lectures)

Tissue Systems: (a) Epidermal: stomata, trichomes, nectaries, hydathodes; Transfer cells
(b) Fundamental: parenchyma, collenchyma, and sclerenchyma; distribution of mechanical tissue. (8 Lectures)

UNIT-II

Tissue Systems: (c) Vascular: Xylem (general structure of primary and secondary xylem cell types); Phloem (cell types, primary phloem, secondary phloem); Growth rings.

(9 Lectures)

Cambium: The origin of cambium and its activity; Anamalous secondary growth; Structure and activity of vascular and cork cambia; Role of pericycle, phellogen, phellem and phelloderm.. (5 Lectures)

UNIT-III

The Root: Differentiation of primary and secondary tissue; Primary and secondary state of growth; Monocot and Dicot root; Structural modifications for storage, respiration and reproduction. (6 Lectures)

The Shoot: Histological organization; vascularization of primary roots in monocotyledon and dicotyledon; Branching (monopodial, sympodial); Monocot and Dicot stem; Primary and secondary growth; Wood structure; Sap wood and Heartwood. (8 Lectures)

UNIT-IV

Leaf: Origin; Development; Arrangement; Diversity in shape and size; Basic structure and development of monocot and dicot leaves; Adaptation to water stress and aquatic habitat.

(4 Lectures)

Meristems: Structure of Shoot apex, root apex and floral apex; Theories of organizations; secondary meristems, origin and function.

(3 Lectures)

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Paper: Plant Anatomy Lab
Course Code: BOT210

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. T.S. of monocot roots and dicot roots (Sunflower, gram, maize, wheat) to show the internal tissues.
2. Anatomy of monocot stem and dicot stem (Sunflower, gram, maize, wheat, *Dalbergia*, *Pinus*) to show the internal tissues.
3. Anatomy of monocot leaf and dicot leaf (Sunflower, gram, maize, wheat) to show the internal tissues.
4. To study of wood anatomy (TLS of *Dalbergia* and *Pinus*).

Reference Books:

1. Esau, K. *Anatomy of Seed Plants*. 5th edition. John Wiley: New York, 1977.
2. Fahn, A. *Plant Anatomy*. Pergamon Press: Oxford, 1990.
3. Jane, F.W. *The Structure of Wood*. Adam. & Charles Black: London, 1970.
4. Metcalfe, C.R. and Chalk, L. *Anatomy of Dicotyledons*. Clarendon Press: Oxford, 1950.
5. Singh, V, Pande, P.C., Jain, D.K. *Anatomy of Seed Plants*. Rajsons Printers: New Delhi, India, 1998.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester IV

Course Title: Metabolism

Course Code: BCH103

L	T	P	Credits	Marks
4	1	0	4	100

Course Objectives: The course is designed to survey the major metabolic pathways involved in energy generation and synthesis of biomolecules.

Unit A (15 hours)

Introduction to Metabolism

General features of metabolism, experimental approaches to study metabolism – intact organisms, bacterial mutants, tissue slices, and radioisotopes.

Carbohydrate Metabolism

Reactions and energetics of glycolysis. Alcoholic and lactic acid fermentations. Reactions and energetics of TCA cycle. Gluconeogenesis, glycogenesis and glycogenolysis. Reactions and physiological significance of pentose phosphate pathway. Regulation of glycolysis and TCA cycle. Photosynthesis – a brief review.

Unit B (10 hours)

Electron Transport Chain and Oxidative Phosphorylation

Structure of mitochondria. Sequence of electron carriers. Sites of ATP production. Inhibitors of electron transport chain. Chemiosmotic hypothesis. Inhibitors and uncouplers of oxidative phosphorylation. Transport of reducing potentials into mitochondria.

Unit C (20 hours)

Lipid Metabolism

Introduction. Hydrolysis of triacylglycerols. Transport of fatty acids into mitochondria. B-oxidation of saturated fatty acids. ATP yield from fatty acid oxidation. Biosynthesis of saturated and unsaturated fatty acids. Metabolism of ketone bodies. Oxidation of unsaturated and odd chain fatty acids. Biosynthesis of triglycerides and important phospholipids, glycolipids, sphingolipids and cholesterol. Regulation of cholesterol metabolism.

Amino Acid Metabolism General reactions of amino acid metabolism – transamination, oxidative deamination and decarboxylation. Urea cycle. Degradation and biosynthesis of amino acids. Glycogenic and ketogenic amino acids.

Unit D (15 hours)

Nucleotide Metabolism

Sources of atoms in the purine and pyrimidine nucleotides. Biosynthesis and degradation of purines and pyrimidines. Regulation of purine and pyrimidine biosynthesis.

Porphyrim Metabolism

Biosynthesis and degradation of porphyrins. Production of bile pigments.

Reference Books

1. Nelson, David L., and Cox, Michael M., *Lehninger Principles of Biochemistry*, 5th Edition, WH Freeman & Company, New York, 2008. Print.
2. Voet, Donald and Voet, Judith G., *Biochemistry*, 3rd Edition, John Wiley & Sons Inc., Singapore, 2004. Print.
3. Murray, R.K., Granner, D.K. and Rodwell, V.W. *Harper's Illustrated Biochemistry*, 27th Edition, McGraw Hill Company Inc. Singapore, 2006. Print.

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4. Conn, E.E., Stumpf, P.K., Bruening, G., and Doi, R.H. *Outlines of Biochemistry*. 5th edition, John Wiley & Sons Inc, 1987. Print.

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Course Title: Metabolism Laboratory

Course Code: BCH 104

L	T	P	Credits	Marks
0	0	3	2	50

Experiments:

1. Estimation of blood glucose.
2. Estimation of cholesterol
3. Sugar Fermentation in Microorganisms.
4. Estimation of Glucose 6-P.
5. Assay of serum transaminases.
6. Estimation of Urea.
7. Estimation of Uric acid.
8. Estimation of Creatinine.

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B.Sc. Botany (Hons. School) Semester IV

L	T	P	Credits	Marks
4	1	0	4	100

Course Title: Fundamentals of Animal Physiology

Course Code: ZOO207

Course Objective: To acquaint the students with functioning of various systems of animal body.

UNIT-A 15 hours

- Aim and scope of Physiology-Cell Physiology, mammalian physiology, comparative physiology and applied physiology.
- Chemical foundations of physiology-solutions, osmotic pressure, diffusion, pK, pH, buffers.
- Heterotrophic forms of nutrition, transport and mixing of food in the alimentary canal, secretory functions of digestive tract, digestion, absorption and malfunctions of GIT.

UNIT-B 12 hours

- Blood-Composition and function of blood and lymph, blood groups, blood coagulation, structure and function of haemoglobin, Blood Homeostasis.
- Heart-Structure, Heart as a pump, origin, conduction and regulation of heart beat. Pulse, blood pressure, capillary pressure, Cardiac cycle and ECG.

UNIT-C 15 hours

- Mechanism and control of breathing. Pulmonary ventilation, physiological principles of gaseous exchange, transport of oxygen and carbon dioxide in blood, regulation of respiration.
- Structure and function of kidney, physiology of urine formation, control of extracellular fluid, osmolality and counter current mechanism, role of ADH and aldosterone

UNIT-D 18 hours

- Physiology of neuronal function. Functioning of excitable tissues, membrane potential, action potential and its propagation, synaptic and junctional transmission
- Physiology of sense organs and receptors
- An overview of endocrine glands, their hormones and disorders
- Physiology of male and female reproduction.
- Integration of tissue functions-neuronal and endocrine aspects.

Reference books

1. Guyton, A.X. *Text Book of Medical Physiology*. 7th edition. Saunders Company: USA, 1986.
2. Best, J.P. *Best and Taylor's Physiological Basis of Medical Practice*, 13th edition. William And Wilkins, 1985.
3. Hoar, W.S. *General and Comparative Physiology, Adaptation and Environment*. 3rd edition. Cambridge University Press: India, 1983.
4. Rhoades, R.A. and Tanner, G.A. *Medical Physiology*. 2nd edition. Lippincott Williams and Wilkins: USA, 2003.

DAV UNIVERSITY, JALANDHAR

Course Title: Fundamentals of Animal Physiology Lab
Course Code: ZOO210

L	T	P	Credits	Marks
0	0	3	2	50

- Identification of food stuffs-starch, sucrose, glucose, proteins and fats.
- Demonstration of osmosis and diffusion.
- Demonstration of the presence of amylase enzyme in saliva. Effect of pH and temperature on enzyme action.
- Determination of coagulation and bleeding time of blood.
- Determination of blood groups of human blood samples.
- Recording of blood pressure of man.
- Enumeration of red blood corpuscles and white blood corpuscles of man.
- Estimation of haemoglobin content in blood.

Note: Practicals related to Fundamentals of Animal Physiology Lab are in accordance with UGC guidelines and have been approved by Dissection Monitoring Committee.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester V

Paper: Phytopathology
Course Code: BOT301

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

Objective:

To expose the students to microbial studies, their interactions with hosts and significance of microbes.

Learning Outcome

The course will provide the knowledge of different types of microbes and the various diseases caused by them.

UNIT-I

Pathogen attack and defense mechanism: Physical, physiological, biochemical and molecular aspects; host-parasite interactions. **(5 Lectures)**

Plant disease epidemiology: Transmission and spread of plant pathogens, disease cycles, epidemics. **(3 Lectures)**

Plant disease management: Chemical, Biological, IPM systems, development of transgenics, biopesticides. **(4 Lectures)**

UNIT-II

Viruses, viroids and their diseases: Symptoms, transmission, structure, physical and chemical properties infection, multiplication and movement; Symptoms of plant diseases caused by viruses, MLOs, Spiroplasma, Viroids and Mycoviruses. **(10 Lectures)**

Bacteria and bacterial diseases: Structural, growth, reproduction and classification of bacteria. **(5 Lectures)**

UNIT-III

Mycoplasma and Plant diseases: Introduction, morphological features, diseases caused by mycoplasmas: grassy shoot disease of sugarcane, little leaf of Brinjal. **(5 Lectures)**

Etiology, epidemiology and control of following diseases:

i) Paddy: Paddy Blast, Brown Leaf Spot, Bacterial Blight

ii) Wheat: Rusts (black, brown, yellow), Bunt and Smuts, Tundu Disease **(10 Lectures)**

UNIT-IV

Etiology, epidemiology and control of following diseases:

iii) Sugarcane: Red Rot

iv) Grapes: Downy and Powdry Mildews

vi) Groundnut: Tikka disease

vii) Apple: Apple Scab

viii) Mustard: White Rust

ix) Potato: Early and Late Blight

xi) Damping off of the seedlings

xii) Ergot of Rye

(20 Lectures)

DAV UNIVERSITY, JALANDHAR

Paper: Phytopathology Lab
Course Code: BOT302

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

Study of symptoms and characteristic features of plant diseases caused by Viruses, Bacteria and Mycoplasmas; Defense mechanism; Host-parasite interactions.

Reference Books

1. Agrios, G.N. *Plant Pathology*. 5th edition. Elsevier Academic Press: New York, 2005.
2. Mehrotra, R.S., and Aggarwal, A. *Plant Pathology*. Tata McGraw Hill Publishing Campus: New Delhi, 2003.
3. Bos, L. *Introduction of Plant Virology*. Longman, New York, 1983.
4. Mathews, R.E.F. *Plant Virology*. Academic Press: New York, 1981.
5. Schliegel, H.S. *General Microbiology*. Cambridge University Press: Cambridge, 1995.
6. Smith, K.M. *A Text Book of Plant Virus Diseases*. Longman: Edinburgh, 1972.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester V

Paper: Plant Breeding
Course Code: BOT303

L	T	P	Credits	Marks	Minimum marks
4	0	0	3	75	30

Objective:

To make the students learn the various conventional and non-conventional methods of plant breeding.

Learning Outcome

The study will provide the knowledge of methods of improvement in plants, different factors responsible for causing male sterility.

UNIT-I

Introduction to plant breeding: History, objectives and achievements. **(1 Lecture)**

Types of plant reproduction: Vegetative, sexual and apomixes; mode of pollination. **(5 Lectures)**

UNIT-II

Methods of plant improvement: Pure line and mass selection; hybridization in self and cross pollinated crops; introduction and acclimatization; hybrid vigour. **(7 Lectures)**

UNIT-III

Mutation breeding: History, effects of mutation, procedure for mutation breeding, applications, limitations, achievements. **(4 Lectures)**

Male Sterility: Concept, classification, Self-incompatibility; genetic control and breeding utility. **(3 Lectures)**

UNIT-IV

Non-conventional breeding: Gene transfer strategies, direct and indirect methods of gene transfer, transgenic plants. **(4 Lectures)**

DAV UNIVERSITY, JALANDHAR

Paper: Plant Breeding Lab
Course Code: BOT304

L	T	P	Credits	Marks	Minimum marks
0	0	2	1	25	10

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

Reference Books

1. Singh, B.D. *Plant Breeding*. 9th edition. Kalyani Publishers: New Delhi, 2013.
2. Chaudhari, H.K. *Elementary Principles of Plant Breeding*. Oxford & IBH Publishing Co.: New Delhi, 1976.
3. Janick, J. *Plant Breeding Reviews*. John Wiley & Sons Inc. New York, 2001.
4. Singh, P. *Objective Genetics and Plant Breeding*. 2nd edition. Kalyani Publishers, New Delhi, 2003.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester V

Paper: Ethnobotany and Resource Utilization

Course Code: BOT305

L	T	P	Credits	Marks	Minimum marks
4	0	0	3	75	30

Objective

To acquaint the students about the various plants used by tribal people.

Learning Outcome

The study will be helpful in exploring the plants which are underutilized and are used by tribal or ancient people for medicinal or some other purposes.

UNIT-I

Introduction: Definition of ethnobotany, its scope, interdisciplinary approach and contribution to the modern world. **(2 Lectures)**

Status in India and World: Ethnic centers of the world with special reference to India; Major and minor tribes, life style, conservation practices of biodiversity by tribal communities. **(4 Lectures)**

UNIT-II

Documentation of traditional herbal medicine.

Systems of medicine: History and principles of Ayurveda, Homeopathy, Allopathy, Unani and Siddha System of medicine. **(6 Lectures)**

Active principles: A general idea of active principles of plants, their extraction and preparation of medicine in different systems. **(5 Lectures)**

UNIT-III

Herbaceous plants used for a various purposes with special reference to *Argemone mexicana*, *Boerhavia diffusa*, *Calatropis procera*, *Eclipta alba*, *Evolvulus alsinoides*, *Discorea deltoides*, *Tribulus terrestris*, *Mentha viridis*, *Asparagus racemosus*, *Cleome viscosa*, *Asphodelus*, *Asparagus*, *Stevia*, *Ocimum*. **(12 Lectures)**

UNIT-IV

Plant used for various purposes (Food, Fiber, species, aromatic and religious) by rural folk/tribals.

Plants used in medicine with special reference to *Aloe vera*, *Adhatoda vasica*, *Azdiarachta indica*, *Withania somnifera*, *Tinospora cordifolia*, *Hollarhina antidysenterica*, *Terminalia arjuna*, *T. chebula*, *T. bellerica*, *Commiphora mukul*. **(14 Lectures)**

DAV UNIVERSITY, JALANDHAR

Paper: Ethnobotany and Resource Utilization Lab
Course Code: BOT306

L	T	P	Credits	Marks	Minimum marks
0	0	2	1	25	10

1. Visit to nearby forest area.
2. Identification and description of some plants of ethnobotany.
3. Field identification of 10 plants used by tribals for household purpose.
4. Photography/assignment concerning the subject.

Reference Books

1. Jain, S.K. Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1986.
2. Hill, F., Albert. A text book of useful plants and plant products, McGraw-Hill Book Company, New York, 1951.
3. Sinha, R.K. Ethnobotany, INA Shree Publishers, Jaipur, 1996.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester V

Course Title: Physical Chemistry

Course Code: CHE353

Time: 04 Hours

Course Objectives:

This course is intended to learn the basic concepts of Physical Chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject. The various topics of the syllabus are grouped under different units in order to bring forth the importance of academic and laboratory skills for the undergraduate students.

Expected Prospective:

This course will equip students with the necessary chemical knowledge concerning the fundamentals in the basic areas of physical chemistry. The students will be able to pursue their career objectives in advance education, in scientific research and in teaching careers following graduation in the course.

PART A

Chemical Thermodynamics (15Hours)

Objectives and limitations of Chemical Thermodynamics, State functions, thermodynamic equilibrium, work, heat, internal energy, enthalpy.

First Law of Thermodynamics: First law of thermodynamics for open, closed and isolated systems. Reversible isothermal and adiabatic expansion/compression of an ideal gas. Irreversible isothermal and adiabatic expansion, Enthalpy change and its measurement, standard heats of formation and absolute enthalpies. Kirchhoff's equation.

Second and Third Law: Various statements of the second law of thermodynamics. Efficiency of a cyclic process (Carnot's cycle), Entropy, Entropy changes of an ideal gas with changes in P, V, and T, Free energy and work functions, Gibbs-Helmholtz Equation., Criteria of spontaneity in terms of changes in free energy, Third law of thermodynamics, Absolute entropies.

PART B

Chemical Equilibrium (5 Hours)

General characteristics of chemical equilibrium, thermodynamic derivation of the law of chemical equilibrium, Van't Hoff reaction isotherm. Relation between K_p , K_c and K_x . Temperature dependence of equilibrium constant-Van't Hoff equation, homogeneous & heterogeneous equilibrium, Le Chetalier's principle.

PART C

Chemical Kinetics (15 Hours)

Rates of reactions, rate constant, order and molecularity of reactions. Chemical Kinetics: Differential rate law and integrated rate expressions for zero, first, second and third order reactions. Half-lifetime of a reaction, Methods for determining order of reaction, Effect of temperature on reaction rate and the concept of activation energy, Reaction mechanism, Steady state hypothesis

Catalysis

Homogeneous catalysis, Acid-base catalysis and enzyme catalysis (Michaelis-Menten equation). Heterogeneous catalysis, Unimolecular surface reactions.

PART D

Electro-Chemistry (5 Hours.)

Specific conductance, molar conductance and their dependence on electrolyte concentration, Ionic Equilibria and conductance, Essential postulates of the Debye-Huckel theory of strong electrolytes, Mean ionic activity coefficient and ionic strength, Transport number and its

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relation to ionic conductance and ionic mobility, Conductometry titrations, pH scale, Buffer solutions, salt hydrolysis, Acid-base indicators.

Electrochemical cells

(5Hours.)

Distinction between electrolytic and electrochemical cells, Standard EMF and electrode potential, Types of electrodes, Reference electrode, Calculation of ΔG , ΔH , ΔS and equilibrium constant from EMF data, Potentiometric determination of pH, Potentiometric titrations.

Reference Books :

1. Atkins, P.W. *Physical Chemistry*, Oxford University Press, 8th edition, 2006 (Indian Print).
2. Engel, T. and Reid, P. *Physical Chemistry*, Pearson Education, 1st edition, 2006.
3. Castellan, G. W. *Physical Chemistry*, Wiley/Narosa, 3rd edition, 1985 (Indian Print).
4. Barrow, G. M. *Physical Chemistry*, New York: McGraw Hill, 6th edition, 1996.
5. Silbey, R. J., Albert, R. A. and Bawendi, Mounji G. *Physical Chemistry*, 4th edition, New York: John Wiley, 2005.

This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY, JALANDHAR

**BSc (Physics, Botany, Zoology, Biotechnology, Microbiology, Biochemistry,
Mathematics, Environmental Sciences)**

(Semester 5)

Course Title: Physical Chemistry Lab

Course Code: CHE354

L	T	P	Credits	Marks	Pass marks
0	0	3	2	50	20

Time: 04 Hours

Course Objectives:

To teach the fundamental concepts of Physical Chemistry and their applications. The syllabus pertaining to B.Sc. (Other branches.) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

Expected Prospective:

The students will be able to understand the basic objective of experiments in organic chemistry, properly carry out the experiments, and appropriately record and analyze the results through effective writing and oral communication skills. They will know and follow the proper procedures and regulations for safe handling and use of chemicals and solvents.

1. Treatment of experimental data

Recording of experimental data. Significant number, accuracy and precision, error analysis.

2. Liquids and Solutions

(i) To determine relative viscosities of aqueous solutions of glycerol at different concentrations. (ii) Calculate partial molar volume of glycerol at infinite dilution from density measurement.

(ii) To determine viscosity-average molecular weight, number-average molecular weight and mean diameter of polyvinyl alcohol molecule from intrinsic viscosity data.

3. Thermochemistry

(i) To determine heat capacity of a calorimeter and heat of solution of a given solid compound.

(ii) To determine heat of solution of Solid calcium chloride and calculate lattice energy of calcium chloride using Born-Haber cycle.

(iii) To determine heat of hydration of copper sulphate.

4. Distribution Law

(i) To determine distribution (i.e. partition) coefficient of a solute between water and a non-aqueous solvent.

5. Surface Phenomena

To study the adsorption of acetic acid/oxalic acid from aqueous solution on charcoal. Verify Freundlich and Langmuir adsorption isotherms.

6. Colorimetry

(i) To verify Lambert-Beer law.

7. pH-metry

(i) To titrate a strong acid against a strong base pH-metrically.

(ii) To titrate a weak acid against a strong base and determine the ionization constant of the weak acid.

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Reference Books

1. Levitt, B.P. *Findlays Practical Physical Chemistry*, London & New York: Longman Group Ltd., 8th edition, 1978.
2. Khosla, B.D., Garg, V.C. and Gulati, A. *Senior Practical Physical Chemistry*, New Delhi: R. Chand & Co., 11th edition, 2002.
3. Das, R.C. and Behra, B. *Experimental Physical Chemistry*, Tata McGraw Hill Publishing Co. Ltd. 1983.
4. *Vogel's Textbook of Quantitative Chemical Analysis* (revised by Jeffery, Bassett, Mendham and Denney), ELBS, 5th edition, 1989.
5. Svehla, G. *Vogel's Qualitative Inorganic Analysis (revised)*, 6th edition, New Delhi: Orient Longman, 1987.
6. Christian, G.D. *Analytical Chemistry*, Wiley, 6th edition.

This syllabus has been designed as per national syllabus suggested by UGC and covers 20% extra syllabus as per requisite of honors degree.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester V

Course Title: Fundamentals of Animal Development

Course Code: ZOO 301

L	T	P	Credits	Marks
4	1	0	4	100

Course Objective: To give students a brief overview of the developmental processes in animals.

UNIT-A 10 hours

- Introduction to developmental biology
- Gametogenesis: spermatogenesis and oogenesis, vitellogenesis, egg membranes.

UNIT-B 12 hours

- Fertilization: sperm-egg interactions-biochemical events, post fertilization events,
- Parthenogenesis
- Embryonic Development: Types of animal eggs, patterns of cleavage, blastulation, gastrulation, fate maps and cell lineage

UNIT-C 9 hours

- Implantation and Decidualization in mammals
- Extra embryonic membranes, types and physiology of placenta
- Cell Differentiation, Organizer-Concept, Induction process
- Organogenesis of heart, kidney, nervous system and sense organs.

UNIT-D 9 hours

- Post embryonic development-insects and amphibians
- Genes in development
- Regeneration in invertebrates and vertebrates, development of immune system in vertebrates
- Gerontology-ageing, concepts and models
- Teratogenesis

Reference books

1. Balinsky, B.I., and Fabian, B. C. *An Introduction to Embryology*. 5th edition. Saunders Company: Philadelphia, 2012.
2. Gilbert, S.F. *Developmental Biology*, 9th edition. Sinauer Associates Inc. Publishers: Massachusetts, 2010.
3. Browder, L.W. *Developmental Biology*, 3rd edition. Saunders College Publishing: 1991.
4. Muller, W.A. *Developmental Biology*. Springer Publishers, 1997.
5. Rastogi, V.B., and Jayaraj, M.S. *Developmental Biology*. Kedar Nath Ram Nath publications: Meerut, 2009.
6. Wolpert, L. et al. *Principles of Development*. 2nd edition. Oxford Publishers: 2001.
7. Wright, S.J. *A Photographic Atlas of Developmental Biology*. Morton Publishing Company, 2005.

DAV UNIVERSITY, JALANDHAR

**Course Title: Fundamentals of Animal Development
Laboratory
Course Code: ZOO304**

L	T	P	Credits	Marks
0	0	3	2	50

The following practicals will be conducted using animal material/charts/models/e-resources.

- Study of the slides showing the development of frog from zygote upto 7mm embryo.
- Study of the slides of *Amphioxus* and *Herdmania* larvae
- Study of life cycle of butterfly and moth
- Study of different invertebrate larvae

Note: Practical related to Fundamentals of Animal Development Lab are in accordance with UGC guidelines and have been approved by Dissection Monitoring Committee.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester VI

Paper: Fundamentals of Plant Ecology

Code: BOT307

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

Objective:

To learn the structure, processes and functions of abiotic and biotic components of environment and their significance.

Learning Outcome

The course has been designed in such a way so that students should learn the components of ecosystem and their interactions, the concept of speciation and its extinction and importance of ecology.

UNIT-I

Introduction: Holocoenotic nature of environment; limiting factors; ecological amplitude environmental factors (soil, water, atmosphere). **(5 Lectures)**

Ecosystem: Concept, components and organization, types, energy flow and material cycling within ecosystem, models of energy flow, characterization, the process within ecosystem, the trophic organization, food chains and food webs, ecological pyramids, ecosystem productivity and efficiency; major types of ecosystems. **(10 Lectures)**

Biogeochemical Cycles: Concept, types, discussion of carbon, nitrogen, phosphorus, sulphur and hydrological cycles. **(2 Lectures)**

UNIT-II

Organism Ecology: Individuals, species, populations and communities and their characteristics. **(3 Lectures)**

Population Ecology: Concept; density and pattern, age, natality, mortality, growth and fluctuations, population growth, carrying capacity, population regulation, r and k selection, population interactions. **(7 Lectures)**

Community Ecology: Community characteristics and their measurement, structure and organisation, species diversity (alpha, beta and gamma), stratification; niche. **(5 Lectures)**

UNIT-III

Ecological Succession: Principles and attributes, mechanism and types, climax and its nature. **(3 Lectures)**

Ecological Adaptations: Concept of ecads, ecotypes and coeno species and species adaptations in relation to soil and water. **(2 Lectures)**

Mechanism of speciation and extinction. **(2 Lectures)**

UNIT-IV

Aquatic Ecology: Freshwater, marine and estuarine ecology. **(5 Lectures)**

Plant Indicators and their role in Environmental Monitoring. **(2 Lectures)**

Phytogeography: General principles, major vegetation of India. **(3 Lectures)**

DAV UNIVERSITY, JALANDHAR

Paper: Fundamentals of Plant Ecology Lab
Code: BOT308

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. Determination of minimum quadrat size and number required to study a plant community.
2. Determination of density, frequency, abundance of vegetation by quadrat method.
3. Determination of species diversity index, index of dominance and index of evenness.
4. Evaluation of dominance and importance value index.
5. Determination of physical characteristics of soil like pH, temperature, moisture content, conductivity under different vegetation.
6. Impact of increasing population on germination and growth of other plants.
7. To study ecological adaptations in hydrophytes and xerophytes.

Reference Books

1. Ambasht, R.S. *A Text Book of Plant Ecology*. Students' Friends and Co.: Varanasi, 1990.
2. Botkin, D. and Keller, E. *Environmental Science*. John Wiley: New York, 1995.
3. Chapman, J.L. and Reiss, M.J. *Ecology, Principles and Applications*. Cambridge University Press: Cambridge, 1995.
4. Crawley, M.J. *Plant Ecology*. Blackwell Scientific Publications: London, 1985.
5. Dash, M.C. *Fundamentals of Ecology*. Tata McGraw-Hill: New Delhi, 1994.
6. Kumar, H.D. *Modern Concepts of Ecology*. Vikas Publishing House: New Delhi, 1997.
7. Mackenzie, A. et al. *Instant Notes in Ecology*, Viva Books Pvt. Ltd.: New Delhi, 1999.
8. Mishra, R. *Ecology Work Book*. Oxford & IBH, New Delhi, 1968.
9. Newman, E.I. *Applied Ecology*. Blackwell Scientific Publications: London, 1994.
10. Odum, E.P. *Basic Ecology*. Saunders: Philadelphia, 1983.
11. Sharma, P.D. *Ecology and Environment*. Rastogi Publications: Meerut, 2008.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.

DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester VI

Paper: Fundamentals of Plant Biotechnology
Course Code: BOT309

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

Objective:

To acquaint the students about the various plants tissue culture techniques.

Learning Outcome

The study will provide the knowledge of callus culturing, micropropagation, and in-vitro production of haploids.

UNIT-I

Plant Tissue Culture: Introduction, scope and importance; Regeneration; Concept of Totipotency, differentiation, de-differentiation and re-differentiation; Different growth media. **(7 Lectures)**

Types of Cultures: Seed Culture, Embryo culture, Callus culture, Organ culture and Cell culture. **(5 Lectures)**

UNIT-II

Micropropagation: Definition, introduction, factors affecting different stages of micropropagation (preparative stage, initiation of cultures, multiplication, differentiation, maintenance of plantlets and transfer to greenhouse conditions); its applications. **(10 Lectures)**

Anther and pollen culture: Procedure for production of haploids; Significance **(2 Lectures)**

UNIT-III

Callus Cultures: Introduction, Sources and isolation of plant tissues; Preparation of explants; Standard nutrient media; Organic growth factors; Solid, stationary and agitated liquid media; Preservation of cultures. **(9 Lectures)**

Cell Suspension Cultures: Introduction, nutrient media used, Maintenance of stock suspension cultures. **(3 Lectures)**

UNIT-IV

Aspects of Organization: Organogenesis; Cytodifferentiation; Somatic embryogenesis; Androgenesis. **(3 Lectures)**

In Vitro Production of Haploids: Introduction; Protoplast Culture: a brief account; Factors affecting haploid production **(4 Lectures)**

Conservation: Introduction, different types (in-situ, ex-situ, others); Cryopreservation. **(2 Lectures)**

DAV UNIVERSITY, JALANDHAR

Paper: Fundamentals of Plant Biotechnology Lab

Course Code: BOT310

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. Aseptic preparations of different explants and inoculations.
2. Preparation of tissue culture media, sterilization and inoculation of plant material.
3. Steam, dry and ultra violet sterilization, maintenance of aseptic conditions.
4. Nutrient media preparation and sterilization.
5. Incubation of cultures under different conditions.
6. To study concept of differentiation, re-differentiation and de-differentiation under controlled conditions.
7. To study various kinds of callus cultures.

Reference Books

1. Bhojwani, S.S. and Razdan, M.K. *Plant Tissue Culture Theory and Practices*. Elsevier Sciences Pub. Co. Inc.: New York, 1983.
2. Chawla, H.S. *Introduction to Plant Biotechnology*. Oxford & IBH Publishing Co. Pvt. Ltd.: New Delhi, 2002.
3. Razdan, M.K. *An Introduction to Plant Tissue Culture*. Oxford and IBH Publishing Co. Pvt. Ltd.: New Delhi, 1993.
4. Smith, R.H. *Plant Tissue Culture, Technique and Experiments*. Academic Press: New York, 2000.
5. Street, H. E. *Plant Tissue and Cell Culture*, Blackwell Scientific Publications, London, 1973.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester VI

Paper: Fundamentals of Plant Physiology

Course Code: BOT311

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

Objective:

To make students learn the vital physiological processes in plants.

Learning Outcome

The study will help them to have depth knowledge of plant-water relationships, organic and mineral nutrition, respiration and photosynthesis etc.

UNIT-I

Introduction: Introduction, definition, scope and significance of Plant Physiology.

(1 Lecture)

Plant-Water Relations : Water transport processes; diffusion and osmosis; water potential and chemical potential; absorption of water, water transport through tracheids and xylem; transpiration and its significance; factors affecting transpiration; mechanism of stomatal movement.

(5 Lectures)

Mineral Nutrition: Criteria of essentiality of elements; macro- and micronutrients; role of essential elements; mineral deficiency symptoms and plant disorders; nutrient uptake and transport mechanisms.

(3 Lectures)

UNIT-II

Photosynthesis : Historical background and significance; structure and photosynthetic apparatus; photosynthetic pigments; accessory pigments and the photoprotective carotenoids; reaction center complexes; photochemical reactions; Hill reaction; electron transport pathways in chloroplast membranes; photophosphorylation; the Calvin cycle; the C4 carbon cycle; crassulacean acid metabolism; photorespiration, factors affecting photosynthesis, Blackman's Law of limiting factors.

(10 Lectures)

Transport of Organic Substances: Transport of photosynthates; source-sink relationship; the mechanism of translocation in the phloem; assimilate partitioning.

(2 Lectures)

UNIT-III

Respiration: Glycolysis; the TCA cycle and its regulation; electron transport in mitochondria; oxidative phosphorylation; pentose phosphate pathway; cyanide-resistant respiration.

(6 Lectures)

Nitrogen Metabolism: Biological nitrogen fixation; mechanism of biological nitrogen fixation; Nodule formation and nod factors; nitrate and ammonium assimilation, role of leghaemoglobin; Factors affecting Biological nitrogen fixation.

(5 Lectures)

UNIT-IV

Growth and Development: General aspects – definitions, phases of growth; kinetics of growth; physiology of seed dormancy and seed germination; concept of photoperiodism; vernalization; Functions of Phytohormones – auxins, cytokinins, gibberellins, abscisic acid and ethylene; Plant movements – tropic and nastic.

(15 Lectures)

DAV UNIVERSITY, JALANDHAR

Paper: Fundamentals of Plant Physiology Lab
Course Code: BOT312

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. Preparation of molar and molal solutions and determination of solution volume of a compound.
2. To study the permeability of plasma membrane using different concentrations of organic solvents.
3. Comparative study of rate of respiration of various plant parts.
4. To extract and separate chloroplast pigments by solvent method and demonstration fluorescence in chloroplast extracts.
5. To determine the osmotic potential of vascular sap by plasmolytic method.
6. To determine the water potential of given tissue (any tuber).
7. To determine stomatal index, stomatal frequency and percentage of leaf area open through stomata. Also to study the effect of ABA on stomatal closure.
8. Role of light in germination of photoblastic seeds, e.g. *Lactuca sativa*.
9. To determine seed viability by TTC method.

Reference Books

1. Galston, A.W. *Life Processes in Plants*. Scientific American Library, Springer-Verlag: New York, 1989.
2. Hooykaas, P.J.J., Hall, M.A. and Libbenga, K.R. (eds.). *Biochemistry and Molecular Biology of Plant Hormones*. Elsevier Publishers: Amsterdam, The Netherlands, 1999.
3. Hopkins, W.G. *Introduction to Plant Physiology*. John Wiley & Sons, Inc.: New York, 1999.
4. Moore, T.C. *Biochemistry and Physiology of Plant Hormones*. 2nd edition. Springer-Verlag, New York, USA, 1989.
5. Pandey, S.N. and Sinha, B.K. *Plant Physiology*. Sangam Books Limited: India, 1997.
6. Salisbury, F.B. and Ross, C.W. *Plant Physiology*. 4th edition. Wadsworth Publishing Co.: California, 1992.
6. Taiz, L., and Zeiger, E. *Plant Physiology*. 5th edition. Sinauer Associates, Inc., Publishers: Massachusetts, 2010.
7. Mukherji, S., and Ghosh A.K. *Plant Physiology*. New Central Book Agency (P) Limited: New Delhi, 2009.

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DAV UNIVERSITY, JALANDHAR

B.Sc. Botany (Hons. School) Semester VI

Paper: Reproductive Biology of Angiosperms

Course Code: BOT313

L	T	P	Credits	Marks	Minimum marks
4	1	0	4	100	40

Objective:

To acquaint the students about the structure and development of different floral parts of angiosperms.

Learning Outcome

The study will make the students learn the morphology, structure, development of stamen and carpel, and fruit and seed.

UNIT I

Phanerogams, the seed bearing plants: General characteristics; Historical account of embryology of angiosperms. **(3 Lectures)**

Flower: Structure, Flower as modified shoot; Varieties of flower; Evolution, variations, genetic control of floral organs; Functions of flower; Inflorescence types. **(6 Lectures)**

UNIT-II

Stamen: Morphology, evolutionary trends, structure and development of anther tapetum; Microsporogenesis, structure and development of male gametophyte and aberrations; pollen tube growth. **(5 Lectures)**

Pollen: Structural organization, germinal furrows, wall development and ornamentation, role of callose and tapetum pollen development; pollen agglutinations, germination and storage, and allergenic aspects. **(3 Lectures)**

Carpel: Morphology, evolutionary trends; Structure, development and type of ovules; placentation; Archosporium; Megasporogenesis and embryo sac ontogenies; gene function and organization. **(7 Lectures)**

UNIT-III

Pollination: Anther dehiscence, pollen transfer mechanisms, pollinators, control of pollination; pollen pistil interaction. **(2 Lectures)**

Fertilization: Structure of stigma and style, stigma receptivity, post-pollination events leading to fertilization, syngamy and triple fusion; agamospermy and parthenocarpy, pseudogamy. **(8 Lectures)**

UNIT-IV

Endosperm: Types of development, cytology, and functions. **(3 Lectures)**

Embryogeny: Zygote, its structural organization, proembryo types, embryo development in monocots and dicots, nutrition of embryo.

Fruits: Development and maturation; Different types of fruits. **(6 Lectures)**

DAV UNIVERSITY, JALANDHAR

Paper: Reproductive Biology of Angiosperms Lab
Course Code: BOT314

L	T	P	Credits	Marks	Minimum marks
0	0	3	2	50	20

1. Study of basic structure of different flowers.
2. Study of pollen grains and various pollen agglutinations.
3. Study of various developmental stages; microsporogenesis, megasporogenesis and embryo development.

Reference Books

1. Barrett, S.C.H. *Major Evolutionary Transitions in Flowering Plant Reproduction*. University of Chicago Press, 2008.
2. Bhojwani, S.S. and Bhatnagar, S.P. *The Embryology of Angiosperms*. Vikas Publishing House: New Delhi, 1992.
3. Harder, L.D. and Barrett, S.C.H. *Ecology and Evolution of Flowers*, Oxford Univ. Press, 2006.
4. Johri, B.M. (ed.). *Embryology of Angiosperms*. Springer – Verlag: Berlin, 1984.
5. Maheshwari, P. *An Introduction to the Embryology of Angiosperm*. McGraw-Hill Inc.: New York, 1950.
6. Maheshwari, P. *Recent Advances in the Embryology of Angiosperms*, International Society of Plant Morphology: New Delhi, 1963.
7. Raghavan, V. *Developmental Biology of Flowering Plants*. Springer Verlag: New York, 2000.

This syllabus has been designed as per national syllabus suggested by UGC and cover 20% extra syllabus as per requisite of honour degree.