| AD Botany | | | | |
|---|---|---|---|---|
| | **Semester** | **Course Code** | **Course Title** | **Credit Hrs.** |
| | **I$^{st}$** | BOT-3101 | Cell Biology | 3 (2-1) |
| | | BOT-3102 | Diversity of Plants | 3 (2-1) |
| | | GEN-3103 | Introduction to Environmental Science | 3 (2-1) |
| | | GEN-3104 | Quantitative Reasoning-I | 3 (3-0) |
| | | GEN-3105 | Functional English | 3 (3-0) |
| | | GEN-3106 | Applications of Information & Communication Technologies | 3 (2-1) |
| | | **Semester Total Credit Hours** | | **18** |

**BOT-3101 Cell Biology 3(2-1)**

**Course learning Outcomes:**

By the end of this Course, students will be able to:

- Understand the structure, function and molecular organization of plant cell and its organelles.
- Describe the processes of cell division in plants.
- Explain how cells transport materials across cellular membranes.
- Use microscopy to study plant cells.

**Course Contents:**

**Introduction to Cell Biology:** History and scope of Cell biology, Cell theory, Differences between prokaryotic and eukaryotic cells, Overview of plant cell vs. animal cell

**Structure and Function of Plant Cell Organelles**: Cell wall: composition and function, Plasma membrane: structure (fluid mosaic model), selective permeability, Cell Membrane and Transport, Membrane structure and dynamics, Passive transport: diffusion, osmosis, facilitated diffusion, Active transport: pumps and carrier proteins, Endocytosis and exocytosis, Cytoplasm and cytosol, Nucleus: nuclear envelope, nucleolus, chromatin, Chloroplasts: structure, function, and role in photosynthesis, Mitochondria: structure and energy production, Endoplasmic reticulum (smooth and rough), Golgi apparatus, Ribosomes, Vacuoles and tonoplast, Plasmodesmata

**Molecular Organization of Plant Cells;** Biomolecules: Carbohydrates, Proteins, Lipids, Nucleic acids

**Macromolecular assemblies:** membranes, cell walls, chromosomes, Cell communication and signaling in plants, Transport in plant tissues: symplastic and apoplastic pathways

**Cell Division in Plants:** Cell cycle: phases (G1, S, G2, M), Mitosis in plant cells: stages and significance, Cytokinesis in plants: cell plate formation, Meiosis: stages and significance in plant reproduction, Control of cell division and checkpoints

**Lab Outline**

1. Introduction to lab safety and microscope handling
2. Measurement and estimation of cell size
3. Observation of onion epidermal cells
4. Staining and observing plant nuclei and nucleoli
5. Identification of plastids in plant cells

6. Observation of mitotic stages in root tip cells (e.g., onion root)
7. Osmosis and plasmolysis experiments in plant cells
8. Study of stomata using leaf peels

**Recommended Books:**

1. Cell and Molecular Biology by Gerald Karp
2. Molecular Biology of the Cell by Alberts et al.
3. Botany for Degree Students – Cell Biology, Genetics, Ecology & Evolution by B.P. Pandey
4. Plant Cell Biology by William V. Dashek

**BOT-3102 Diversity of Plants 3(2-1)**

**Course Learning Outcomes**

By the end of this Course, students will be able to

- Identify major plant groups
- Describe the structure, function, reproduction, and adaptations of plants
- Assess the ecological role and significance of plant diversity in different environments

**Course Contents:**

Origin, diversity, and evolution of life: life forms, structure, reproduction, and ecological significance of: Viruses, Bacteria, and Cyanobacteria, Fungi, and Algae as predecessors of higher life forms.

Diversity and adaptation of Bryophytes on land environment: Habit, habitat, and reproduction of Hepaticopsida (Liverworts, Marchantia), Anthoceropsida (Hornworts, Anthoceros), and Bryopsida (Mosses, Funaria).

Pteridophytes (Fossils and fossilization, Psilopsida (Psilotum), Lycopsida (Selaginella) Sphenopsida (Equisetum), Pteropsida (Marsilea). Seed habit and evolution of the leaf.

Distinguishing features, diversity, and life cycle of gymnosperms.

Distinguishing features, diversity, and life cycle of angiosperms.

**Lab Outline:**

1. Culturing, maintenance, preservation, and staining of microorganisms.
2. Field visits for identification of Fungi, Algae, and other plant groups.
3. collection, preservation, and identification of representative type specimens for each group studied

**Recommended Books:**

1. Plant Systematics: A Phylogenetic Approach, Fourth Edition. 2016. Walter S. Judd, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens and Michael J. Donoghue.
2. Plant Systematics: A Phylogenetic Approach, 2007. Third Edition 3rd Edition Walter S. Judd and Christopher S. Campbell.
3. Peter M. Hollingsworth, Richard M. Bateman, Richard J. Gornall. 2002. Molecular Systematics and Plant Evolution CRC Press Book.
4. Soltis, Pamela S., Soltis, Douglas E., Doyle, J.J. (Eds.). 1992. Molecular Systematics of Plants. Springe

**GEN-3103 Introduction to Environmental Science 3(2-1)**

**Course Learning Outcomes:**

By the end of this Course, students will be able to:

- Understand basic concepts and the interdisciplinary nature of environmental science.
- Identify significant environment components, i.e., lithosphere, hydrosphere, atmosphere, and biosphere, and their interactions.
- Understand human-environment interactions and their implications for environmental management.

**Course Content:**

Environment: Introduction, scope, pressure, and interdisciplinary nature of environmental science. Major components of the environment, i.e., lithosphere, hydrosphere, atmosphere, and biosphere, and their interactions. Human-Environment Interactions and Their Implications for Environmental Management.

Pollution: definition, classification, and impact on habitats. Air pollution: Sources and effects of various pollutants (inorganic, organic) on plants, prevention, control, and remediation. Photochemical smog. Smog. Acid rain: 1. Theory of acid rain, Adverse effects of acid rain. Chlorofluorocarbons and their effects.

Water pollution: Major sources of water pollution and their impact on vegetation, prevention, control, remediation, eutrophication, and thermal pollution.

Sediment pollution: fungicides, pesticides, herbicides, major sources of soil pollution, and their impact. Prevention, control, and remediation.

Heavy metal pollution. Tanneries. Hospital waste. Treatments of sewage, sludge, and polluted waters.

Noise pollution, causes, impacts, and their solutions.

Radiation pollution (including nuclear): Measurement, classification, and effects; principles of radiation protection; waste disposal.

Pollution by Pesticides, impacts, and solutions.

Ozone Layer: Formation, Mechanism of Depletion, Effects of Ozone Depletion, Greenhouse Effect and Global Warming: Causes and Impacts.

Environmental Buffers. Forest importance, deforestation, desertification, and conservation.

Environmental Impact Assessment: (Sustainability of the Environment).

**Lab Outline:**

- Examination of industrial wastewater, municipal sewage, and sludge for;
- Total dissolved solids, pH, EC, BOD/COD, Chlorides, carbonate, and Nitrates.
- Effect of air pollutants on plants.
- Examination of the effects of automobile exhaust on the adjacent vegetation (Lead count, chlorophyll content, and their symptoms)

**Recommended Books:**

1. Eugene, E. D. and Smith, B. F. 2000. Environmental Science: A study of interrelationships. McGraw-Hill. USA.

2. French, H. 2000. Vanishing Borders: Protecting the Planet in the Age of Globalization. W. W. Norton and Company, NY.

3. Hall, C. A. S. and Perez, C. L. 2000. Quantifying Sustainable Development. Academic Press, UK.
4. Bazzaz, F. A. 2004. Plants in changing environments: Linking physiological, population, and community ecology. Cambridge Univ. Press.

**GEN-3104 Quantitative Reasoning-I 3(3-0)**

**Course learning Outcomes:**

By the end of this Course, students will be able to:

- Students will become familiar with the importance of quantitative reasoning skills in the modern age.

**Course Contents:**

**Numerical Literacy:** Number system and basic arithmetic operations; Units and their conversions, dimensions, area, perimeter and volume; Rates, ratios, proportions and percentages; Types and sources of data; Measurement scales; Tabular and graphical presentation of data; Quantitative reasoning exercises using number knowledge.

**Fundamental Mathematical Concepts:** Basics of geometry (lines, angles, circles, polygons etc.); Sets and their operations; Relations, functions, and their graphs; Exponents, factoring and simplifying algebraic expressions; Algebraic and graphical solutions of linear and quadratic equations and inequalities; Quantitative reasoning exercises using fundamental mathematical concepts.

**Fundamental Statistical Concepts:** Population and sample; Measures of central tendency, dispersion and data interpretation; Rules of counting (multiplicative, permutation and combination); Basic probability theory; Introduction to random variables and their probability distributions; Quantitative reasoning exercises using fundamental statistical concepts.

**Recommended Books:**

1. Quantitative Reasoning: Tools for Today's Informed Citizen by Bernard L. Madison, Lynn and Arthur Steen.
2. Quantitative Reasoning for the Information Age by Bernard L.

Madison and David M. Bressoud.

3. Fundamentals of Mathematics by Wade Ellis.
4. Quantitative Reasoning: Thinking in Numbers by Eric Zaslow.
5. Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis by Ethan Bueno de Mesquita and Anthony Fowler.
6. Using and Understanding Mathematics: A Quantitative Reasoning Approach by Bennett, J. O., Briggs, W. L., & Badalamenti, A.
7. Discrete Mathematics and its Applications by Kenneth H. Rosen.
8. Statistics for Technology: A Course in Applied Statistics by Chatfield, C.
9. Statistics: Unlocking the Power of Data by Robin H. Lock, Patti Frazer Lock, Kari Lock Morgan, and Eric F. Lock.

**GEN-3105 Functional English 3(3-0)**

**Course Learning Outcomes:** The Course is developed to enhance the language skills and critical thinking of students by

- Enabling them to correct the use of grammar and language structures
- Enabling them to communicate effectively

**Course Contents:**

Grammar:

- Basics of grammar
- Parts of speech and their use in communication
- Sentence structure
- Correct use of Tenses
- Active and passive voice
- Practice in unified sentences (unity and coherence)
- Analysis of Phrase, Clause and sentence structures
- Transitive and Intransitive Verbs
- Punctuation and Spellings

Reading skills:

- Comprehension skills
- Literal understanding of text, reading between lines (interpret text), reading beyond lines ( to assimilate, integrate knowledge)
- Answers to the questions on a given text

Discussion:

- General topics and everyday conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of the students)
- Introducing ourselves, describing things, recounting past events, agreeing and disagreeing, compare and contrast

Listening:

- To be improved by showing documentaries/ films carefully selected by subject teacher
- Listening and note taking

Translation Skills:

- Urdu to English

Writing Skills:

- Paragraph Writing
  Basic structure of paragraph and guidelines for writing an effective paragraph Speaking Skills:

- Presentation Skills
- Introduction (types of presentation, structure of presentation)
- Prepared and unprepared talks

*Note: Extensive reading is required for vocabulary building*

**Recommended Books:**

1. **Functional English**

a) Grammar

1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492
2. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

c) Reading/Comprehension

1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

d) Speaking


1) Ellen, K. 2002. Maximize Your Presentation Skills: How to Speak, Look and Act on Your Way to the Top
2) Hargie, O. (ed.) Hand book of Communications Skills
3) Mandel, S. 2000. Effective Presentation Skills: A Practical Guide Better Speaking
Mark, P. 1996. Presenting in English. Language Teaching Publications


**GEN-3106 Application of Information & Communication Technologies 3(2-1)**

**1. Introduction to Information and Communication Technologies:**

- Components of Information and Communication Technologies (basics of hardware, software, ICT platforms, networks, local and cloud data storage etc.).
- Scope of Information and Communication Technologies (use of ICT ineducation, business, governance, healthcare, digital media and entertainment, etc.).
- Emerging technologies and future trends.

**2. Basic ICT Productivity Tools:**

- Effective use of popular search engines (e.g., **Google,** Bing, etc.) to explore World Wide Web.
- Formal communication tools and etiquettes (Gmail, Microsoft Outlook, etc.).
- Microsoft Office Suites (Word, Excel, PowerPoint).
- Google Workspace (Google Does, Sheets, Slides).
- Dropbox (Cloud storage and file sharing), Google Drive (Cloud storage with Google Docs integration) and Microsoft OneDrive (Cloud storage with Microsoft Office integration).
- Evernote (Note-taking and organization applications) and OneNote (Microsoft's digital notebook for capturing and organizing ideas).

Video conferencing (Google Meet, Microsoft Teams, Zoom, etc.).

- Social media applications (LinkedIn, Facebook, Instagram, etc .).

**3. ICT in Education:**

- Working with learning management systems (Moodie, Canvas, Google Classrooms, etc.).
- Sources of online education courses (Coursera, edX , Udemy, Khan Academy, etc.).

- Interactive multimedia and virtual classrooms.

**4. ICT in Health and Well-being:**

- Health and fitness tracking devices and applications (Google Fit, Samsung Health, Apple Health, Xiaomi Mi Band, Runkeeper, etc.).
- Telemedicine and online health consultations (OLADOC, Sehat Kahani, Marham, etc.).

**5. ICT in Personal Finance and Shopping:**

- Online banking and financial management tools (JazzCash, Easypaisa, Zong PayMax, I LINK and MNET, Keenu Wallet, etc.).
- E-commerce platforms (Daraz.pk, Telemart, Shophive, etc.)

**6. Digital Citizenship and Online Etiquette:**

- Digital identity and online reputation.
- Netiquette and respectful online communication.
- Cyberbullying and online harassment.

**7. Ethical Considerations in Use of ICT Platforms and Tools:**

- Intellectual property and copyright issues.
- Ensuring originality in content creation by avoiding plagiarism and unauthorized use of information sources.
- Content accuracy and integrity (ensuring that the content shared through ICT platforms is free from misinformation, fake news, and manipulation).

## Practical Requirement

As part of the overall learning requirements, the course will include:

1. Guided tutorials and exercises to ensure that students are proficient in commonly used software applications such as word processing software (e.g., Microsoft Word), presentation software (e.g., Microsoft PowerPoint), spreadsheet software (e.g., Microsoft Excel) among such other tools. Students may be assigned practical tasks that require them to create documents, presentations, and spreadsheets etc.

2. Assigning of tasks that involve creating, managing, and organizing files and folders on both local and cloud storage systems. Students will practice file naming conventions, creating directories, and using cloud storage solutions (e.g., Google Drive, OneDrive).

3. The use of online learning management systems (LMS) where students can access course materials, submit assignments, participate in discussion forums, and take quizzes or tests. This will provide students with the practical experience with online platforms commonly used in education and the workplace.

**Reading Materials**

I."Discovering Computers" by Vermaat, Shaffer, and Freund.

2."GO! with Microsoft Office" Series by Gaskin, Vargas, and McLellan.

3. "Exploring Microsoft Office" Series by Grauer and Poatsy.

4. "Computing Essentials" by Morley and Parker.

5. "Technology in Action" by Evans, Martin, and Poatsy.