

AD Zoology Scheme 2025				
	Course Code	Course Title	Credit hour	Status
Ist Semester	ZOO-3101	Diversity of Invertebrates	3(2-1)	Major
	IDC-3101	Diversity of Plants	3(2-1)	Interdisciplinary
	GEN-3101	Quantitative Reasoning –I	3(3-0)	General
	GEN-3102	Introduction to Environmental Science	3(2-1)	General
	GEN-3103	Functional English	3(3-0)	General
	GEN-3104	Applications for Information & Communication Technologies	3(2-1)	General
		Total Credit Hours	18	

ZOO-3101

DIVERSITY OF INVERTEBRATES

3(2-1)

Course Title	Diversity of Invertebrates
Course Code	ZOO-3101
Credit Hours	3(2-1)
Learning Objectives of the Course	
On the completion of the course, the students will be:	
<ul style="list-style-type: none"> • Understand the distinguishing features and classification of invertebrate’s phyla • Explore the evolutionary relationships and phylogeny of these groups • Examine the anatomical and physiological adaptations of each group • Investigate the ecological roles and life histories of these organisms. 	
Contents	<p>Theory</p> <p>Introduction</p> <ul style="list-style-type: none"> • Classification of Organisms: • Evolutionary Relationships and Tree Diagrams: Patterns of organization

Animal-Like Protists: The Protozoa

- Introduction to Protozoans
- General characteristics and classification
- Major protozoan groups (e.g., Amoebozoa, Ciliophora, Apicomplexa, Euglenozoa)
- Modes of locomotion (pseudopodia, cilia, flagella)
- Feeding mechanisms and nutrition
- Reproduction and life cycles
- Ecological roles of protozoans

Multicellular and Tissue Levels of Organization

Phylum Porifera

- Characteristics and classification of Porifera (sponges)
- Anatomy, Physiology, and Ecology of Parazoa
- Modes of reproduction in sponges
- Ecological roles and importance of sponges

Phylum Cnidaria (Coelenterate) and Phylum Ctenophore:

- Introduction to Radiata
- Characteristics and classification of Cnidaria (e.g., hydroids, jellyfish, corals) and Ctenophora (comb jellies)
- General structure and function of cnidarians and ctenophores
- Modes of reproduction in cnidarians and ctenophores
- Ecological roles and importance of cnidarians and ctenophores

The Triploblastic and with Acoelomate Body Plan

Phylum Platyhelminthes

- Introduction to Protostomes
- Major protostome groups (e.g., Platyhelminthes, Nematoda, Mollusca, Annelida, Arthropoda)
- Characteristics and classification of Platyhelminthes
- Anatomy and physiology of flatworms, Reproduction and development

- Ecological roles and parasitism

Phylum Nematoda

- Characteristics and classification of Nematoda
- Anatomy and physiology of nematodes
- Reproduction and development

Phylum Annelida

- Characteristics and classification of Annelida
- Anatomy and physiology of annelids
- Reproduction and development
- Ecological roles and importance

Phylum Mollusca

- Characteristics and classification of Mollusca
- Anatomy and physiology of Mollusca
- Reproduction and development
- Ecological roles and economic importance

Phylum Arthropoda

- Characteristics and classification of Arthropoda
- The Hexapods and Myriapods:
- Anatomy and physiology of insects, myriapods crustaceans and chelicerates
- Characteristics and classification of of insects, myriapods crustaceans and chelicerates
- Comparative Analysis and Evolutionary Trends, of protozoans, parazoans, radiates, and protostomes
- Evolutionary trends and phylogenetic relationships

Phylum Echinoderms

- General characteristics of Echinoderms
- Water vascular system
- Maintenance Functions, Locomotion, feeding, and respiration
- Regeneration and Reproduction

	<ul style="list-style-type: none"> • Evolutionary Significance of Echinoderms • Evolutionary history, Classification, Diversity within Echinoderms <p>Practical</p> <p>Note: Classification of each member of each phylum up to order with adaptations in relation to habitat of the specimen. Preserved Specimen and or colored projection slide and or CD ROM projection of computer must be used.</p> <ul style="list-style-type: none"> • Study of Euglena, Amoeba, Entamoeba, Plasmodium, Trypanosome, Paramecium as representative of animal-like Protists. • Study of prepared slides of sponges, spicules of sponges, and their various body forms. Study of representatives of classes of Phylum Porifera. • Study of principal representatives of classes of Phylum Coelenterate. • Study of principal representatives of classes of Phylum Platyhelminthes. • Study of representatives of phylum Rotifer, Phylum Nematode. • Study of principal representatives of classes of Phylum Mollusca. • Study of principal representatives of classes of Phylum Annelida. • Study of principal representatives of classes of groups of Phylum Arthropoda • Study of representatives of classes of phylum Echinodermata. • Preparation of permanent mount of Leucosolenia, Obelia, Hydra, Proglottid of Tapeworm, Parapodia of Nereis and Daphnia. Drawing and labeling. • Preparation of permanent slide of mouthpart of insects (after dissection). Drawing and labeling. • How to make grade-wise series for preparation of temporary and permanent slides.
<p>Suggested Readings/ Reference Book</p>	<p>1. Miller, A.S. and Harley, J. B. 1999, 2002, 2007, 2009, 2012 and 2016 Zoology, 4th, 5th, 6th, 7th, 8th 9th& 10th Edition (International), Singapore: McGraw Hill.</p>

	<p>2. Hickman, C.P., Roberts, L.C. and Larson, A., 2018. Integrated principles of zoology, 15th Edition (International), Singapore: McG RAW-Hill.</p> <p>3. Hickman, C.P., Roberts, L.C/, AND Larson, A., 2007. Integrated principles of zoology, 12th & 13th Edition (International). Singapore: McGraw-Hill.</p> <p>4. Pechenik, J.A., 2015. Biology of invertebrates, 7th Edition, (International), Singapore: McGraw-Hill.</p> <p>5. Kent, G. C. and Miller, S., 2001. Comparative anatomy of vertebrates New York: McGraw-Hill.</p> <p>6. Campbell, N.A., 2002; Biology 6th Edition, Menlo Park, California; Benjamin Cummings Publishing Company, Inc.</p> <p>7. Miller, S.A., 2002. General zoology laboratory manual. 5th Edition (International), Singapore: McGraw-Hill.</p> <p>8. Hickman, C.P. and Kats, H.L., 2000. Laboratory Studies in integrated principal of zoology. Singapore: McGraw-Hill.</p> <p>9. Edward E. Ruppert, Richard S. Fox, Robert D. Barnes 2003 Invertebrate Zoology: A Functional Evolutionary Approach 7th Edition Cengage Learning</p> <p>10. Jan Pechenik 2015 Biology of the Invertebrates, 7th Edition McGraw Hill.</p> <p>11. Lecture notes of Prof. Dr. Zulfiqar Ali 2025</p>
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BOT-3101

DIVERSITY OF PLANTS

3(2-1)

Course Title	Diversity of Plants
Course Code	IDC-3101
Credit Hours	3(2-1)
Learning Objectives of the Course	
<ul style="list-style-type: none"> To introduce the students to the diversity of plants and their structures and significance 	
Contents	Theory

	<ul style="list-style-type: none"> • Comparative study of life form, structure, reproduction and economic significance of: <p>Viruses</p> <ul style="list-style-type: none"> • (RNA and DNA types) with special reference to TMV. • Bacteria and Cyanobacteria (Nostoc, Anabaena, Oscillatoria) with specific reference to biofertilizers, pathogenicity and industrial importance <p>Algae</p> <ul style="list-style-type: none"> • (Chlamydomonas, Spirogyra, Chara, Vaucheria, Pinnularia, Ectocarpus, Polysiphonia) <p>Fungi</p> <ul style="list-style-type: none"> • (Mucor, Penicillium, Phyllactinia, Ustilago, Puccinia, Agaricus), their implication on crop production and industrial applications. <p>Lichens</p> <ul style="list-style-type: none"> • (Phycia) <p>Bryophytes</p> <ul style="list-style-type: none"> • (Riccia, Anthoceros and Funaria) <p>Pteridophytes</p> <ul style="list-style-type: none"> • (Fossils and fossilization, Psilopsida (Psilotum), Lycopsida (Selaginella) Sphenopsida (Equisetum), Pteropsida (Marsilea) and Seed Habit) <p>Gymnosperms</p> <ul style="list-style-type: none"> • (Cycas, Pinus and Ephedra) <p>Practical:</p> <ul style="list-style-type: none"> • Culturing, maintenance, preservation and staining of microorganisms • Study of morphology and reproductive structures of the types mentioned in theory • Identification of various types mentioned from prepared slides and fresh collections
<p>Suggested Readings/</p>	<ol style="list-style-type: none"> 1. Lee, R.E. 1999. Psychology. Cambridge University Press, UK 2. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology. 4th ed. John Wiley and Sons Publishers.

Reference Book	3.	Agrios, G.N. 2004. Plant pathology. 8th ed. Academic press London.
	4.	Vashishta, B.R. 1991. Botany for degree students (all volumes). S. Chand and Company. Ltd. New Delhi.
	5.	Andrew, H. N. 1961. Studies in Paleobotany. John Willey and Sons.
	6.	Mauseth, J.D. 2003. Botany: An Introduction to Plant Biology 3rd ed., Jones and Bartlett Pub. UK
	7.	Marti.J. Ingrouille& Plant: Diversity and Evolution. 2006 CUP
	8.	Taylor, T.N. & Taylor, E.D. 2000. Biology and Evolution of Fossil Plants. Prentice Hall. N.Y.

GEN-3101 **QUANTITATIVE REASONING-I** **3(3-0)**

Course Title	Quantitative Reasoning-I
Course Code	GEN-3101
Credit Hours	3(3-0)
Learning Objectives of the Course	
<ul style="list-style-type: none"> • Introduction, understanding of the basic mathematical and statistical tools, and real-life applications of quantitative reasoning 	

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- 3102 Introduction to Environmental Science 3(2-1)

Course Title	Introduction to Environmental Science
Course Code	GEN-3102
Credit Hours	3(2-1)

Learning Objectives of the Course
<ul style="list-style-type: none"> • To understand and provide up dated knowledge of environmental problems • To provide a basic introduction sustain able environmental management.

Course Contents:

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: 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- 3103

Functional English

3(3-0)

Course Title	Functional English
Course Code	GEN-3103

Credit Hours	3(3-0)
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Learning Objectives of the Course
The course is developed to enhance the language skills and critical thinking of students <ul style="list-style-type: none"> • Enabling them to correct 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 Françoise 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. Brian 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-3104 Applications of Information & Communication Technologies 3(2-1)

Course Title	Applications of Information & Communication Technologies
Course Code	GEN-3104
Credit Hours	3(2-1)

Learning Objectives of the Course
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- Explain the fundamental concepts, components, and scope of Information and Communication Technologies (ICT).
- Identify uses of various ICT platforms and tools for different purposes.

Course Contents:

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 in education, 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 Docs, 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 (Moodle, 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

1. "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.