

**COURSE CONTENTS OF COMPULSORY/GENERAL FACULTY COURSES FOR BS (2<sup>nd</sup> SEMESTER)  
PROGRAM IN BOTANY (Session started in Fall 2023)**

Year	Semester	Course Code	Course Title	Credit Hrs.
Year-I	2 <sup>nd</sup>	GEN-3201	Expository Writing	3(3-0)
		GEN-3202	Arabic/Kashmir Studies/Introduction to History	2(2-0)
		GEN-3203	Application of Information & Communication Technologies	3(2-1)
		BOT-3204	Diversity of Plants	3(2-1)
		ZOO-3205	Animal Diversity-I	3(2-1)
		CHM-3206	Inorganic Chemistry	4(3-1)
<b>Total credit hours.</b>			<b>18</b>	

**GEN-3201**

**Expository Writing**

**3(3-0)**

**Course Objectives:** The course is developed with the aim to enable the students to meet their real-life communication needs by

- Helping them learn and understand basic concepts of communication process.
- Practically implementing theoretical aspects in the real-life situations

**Course Contents:**

What is Communication?

- Process of communication, effective steps of communication, basic communication skills

Paragraph Writing.

- Practice in writing a good, unified, and coherent paragraphs.
- Paragraph writing leading towards the writing of five to seven paragraphs long essay.
- Stages of writing (brainstorming, researching, drafting, and editing)
- Methods of writing (cause and effect, problem solutions, comparison, and contrast)

Essay Writing.

- Basic structure of essay, topic sentence, supporting sentence, concluding sentence, thesis statement
- Unity and Coherence, Introduction and Conclusion

CV and Job Application.

- Preparing a Curriculum Vitae
- Writing a formal job application

Translation Skills.

- Urdu to English

(Practice at advanced level)

Study Skills.

- Skimming and scanning, intensive, extensive and speed reading
- Summary and precis writing
- Comprehension (at advanced level)
- (sQ3R and Sq4r methods)

#### Academic Writing.

- Letter/ Memo writing, Minutes of Meeting, use of Dictionary, Library, and Internet

#### Presentation Skills.

- Personality development (emphasis on content, style, and pronunciation)
- Preparation stage, audience analysis, handling and asking questions, managing time, handling non-verbal means, feedback.

#### Academic Writing.

- How to write a research proposal for research paper/term paper?
- How to write a research paper/ term paper?
- (Emphasis on style, content, language, form, clarity, consistency)

#### Report Writing.

- Technical Report writing
- Progress report writing
- Preparation and planning

#### E-mail writing.

- Creating e-mail account
- Writing and sending e-mails

#### Preparing for Interview and Research proposal/ research paper defense

*Note: Documentaries to be shown for discussion and review*

### **Recommended Books:**

#### **Communication Skills**

##### a) Grammar

1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press 1986. ISBN 0 19 431350 6.

##### b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).

##### c) Reading

1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
2. Reading and Study Skills by John Langan
3. Study Skills by Richard York.

##### d) Speaking

4. Ellen, K. 2002. Maximize Your Presentation Skills: How to Speak, Look and Act on Your Way to the Top
5. Hargie, O. (ed.) Handbook of Communications Skills

6. Mandel, S. 2000. Effective Presentation Skills: A Practical Guide Better Speaking  
Mark, P. 1996. Presenting in English. Language Teaching Publications

GEN-3202

Arabic

2(2-0)

Objectives of the Course	<p>۱۔ طلباء کو عربی زبان کی علوم اسلامیہ میں اہمیت سے آگاہ کرنا</p> <p>۲۔ طلباء کو علم صرف اور نحو کے بنیادی قواعد سے آگاہ کرنا تاکہ اسلامی علوم سے کما حقہ استفادہ کیا جا سکے</p> <p>۳۔ طلباء کو علم صرف کے بنیادی اصولوں سے آگاہ کرنا</p> <p>۴۔ قرآن مجید سے قواعد عربیہ کی عملی مشق کروانا۔</p>
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Week	Lecture No.	قواعد	عملی مشق	
Week 1	Lecture 1	• اسم کی پہچان	• تعوذ اور سورۃ الفاتحہ (4-1)	
	Lecture 2	• هُوَ، هُمْ، ...ضمانز منفصلہ	• سورۃ الفاتحہ (5-7)، تکبیر، ثناء، تَسْبِيحَات	
Week 2	Lecture 3	• لِي، مِنْ، عَنْ، مَعَ حروف جار	• تشهد، درود، دعا	
	Lecture 4	• فعل ماضی: فَعَلَ	• سورۃ الإخلاص	
Week 3	Lecture 5	• فعل مضارع: يَفْعَلُ	• سورۃ الفلق	
	Lecture 6	• فعل امر، فاعل، مفعول، فعل	• سورۃ النَّاس	Quiz # 01
Week 4	Lecture 7	• نَصَرَ، عَبَدَ	• سورۃ النصر	Assignment# 01
	Lecture 8	• ضَرَبَ، ظَلَمَ، سَمِعَ، عَلِمَ	• سورۃ الكافرون	
Week 5	Lecture 9	• کمزور أفعال: وَهَبَ، وَعَدَ	• سورۃ البقرۃ: 5-1	

	Lecture 10	• كمزور أفعال: قَالَ، زَادَ	• سورة البقرة: 6-10	
		• <b>Mid Term</b>		
Week 6	Lecture 11	• بمزه والے أفعال: أَمَرَ	• سورة البقرة: 11-13	
	Lecture 12	• بكساں حروف والے أفعال: ظَنَّ، ظَلَّ	• سورة البقرة: 14-18	
Week 7	Lecture 13	• فعل مجهول: نُصِرَ، جُعِلَ	• سورة البقرة: 19-20	
	Lecture 14	• فعل مجهول: وُعدَ، أَمَرَ	• سورة البقرة: 21-22	
Week 8	Lecture 15	• مزيد في: حَاسَبَ	• سورة البقرة: 23-25	
	Lecture 16	• مزيد في: اِسْتَلَمَ، اِخْتَلَفَ	• سورة البقرة: 26-29	
Week 9	Lecture 17	• مزيد في: اِسْتَعْفَرَ	• سورة البقرة: 30	Quiz # 02
	Lecture 18	• مزيد في: تَدَبَّرَ، تَدَارَسَ، اِنْقَلَبَ	• سورة البقرة: 31-35	
Week 10	Lecture 19	• مزيد في: وَلَّى	• سورة البقرة: 36-37	Assignment# 02
	Lecture 20	• مزيد في: نَادَى، اَقَامَ	• سورة البقرة: 38-42	
Week 11	Lecture 21	• مزيد في: اِتَّقَى، سَتَقَامَ	• سورة البقرة: 43-46	
	Lecture 22	• مؤنث ضمائر	• سورة البقرة: 47-50	
Week 12	Lecture 23	• مؤنث فعل كا ثبيل	• سورة البقرة: 51-53	
	Lecture 24	• مؤنث فعل كا ثبيل، تننيه (دو) ثبيل	• سورة البقرة: 54-57	
Week 13	Lecture 25	• فعل مجهول (مزيد في) عَلِمَ، اَنْزَلَ	• سورة البقرة: 58-59	
	Lecture 26	• فعل: كَرَّمَ، ثُمَّ اور فعل مضارع	• سورة البقرة: 60-61	
Week 14	Lecture 27	• لَمْ اور مضارع مزيد في افعال	• سورة البقرة: 62	

	Lecture 28	• لُنْ اور فعل مضارع , اسم مكان	• سورة البقرة: 63-66	
Week 15	Lecture 29	• اسم مكان	•	
	Lecture 30	• جمع تكسير ، جمله اسميه	• سورة البقرة: 67-70	
Week16	Lecturer 31	• جمله فعليہ	• سورة البقرة: 71-73	
	Lecturer 32	• مضاف، مضاف اليه، موصوف، صفت	• سورة البقرة: 74	
Week 17		<b>Terminal Examination</b>		

#### نصابی کتب

نام کتاب	نام مصنف	نمبر شمار
عربی کا معلم (چاروں حصے)	عبدالستار خان	1
تمرین صرف	معین اللہ ندوی	2
تمرین النحو	محمد مصطفیٰ ندوی	3
معلم الانشاء	مولانا عبدالماجد ندوی	4
مختار النحو	مولانا مختار احمد	5

#### حوالہ جاتی کتب

نام کتاب	نام مصنف	نمبر شمار
النحو الواضح	علی جارم	1
اساس عربی	نعیم الرحمن	2
مبادئ العربية في الصرف و النحو	رشید الشراطوی	3
کتاب النحو	عبدالرحمن امرتسری	4
تمرین النحو	محمد مصطفیٰ ندوی	5
قواعد القرآن	عبدالرحمن طاہر	6
اللغة العربية لغير الناطقين بها	جامعة الملك السعود، ریاض	7
قرآنی عربیک	ڈاکٹر ابراہیم سورتی	8

OR

**GEN-3202**

**Kashmir Studies**

**Credit Hours: 2(2-0)**

**Objectives:** To impart the knowledge about the multicultural historical legacy, religious and cultural heritage.

**Course Contents:**

**Unit I: Geographic and Administrative Profile of divided State of Jammu & Kashmir**

- a. Geographic and Administrative Profile of Azad Jammu & Kashmir and Gilgit Baltistan.
- b. Geographic and Administrative Profile of Indian Occupied Jammu and Kashmir.
- c. Geographic and Administrative Profile of Indian Occupied Jammu and Kashmir,
- d. Current Political Status of divided regions of disputed state of Jammu and Kashmir,

**Unit II: Sources of Kashmir History:**

- a. Famous ancient and Medieval historians
- b. Famous books on ancient and Medieval history of Kashmir Ancient

**Unit III: Ruling Dynasties in Kashmir**

- a. Earlier inhabitants and Introduction to ancient ruling dynasties up to 1320 (selective Famous Ancient Rulers)
- b. Introduction to ancient Religions of Kashmir,
- c. Rise and fall of Buddhism in Kashmir
- d. Causes for decline of Hindu Rule in Kashmir

**Unit IV: Muslim Rule in Kashmir**

- a. Advent of Islam in Kashmir
- b. First Muslim Rule in Kashmir (1320-23)

**Unit V: Shah Miri Dynasty**

- a) Rise of Muslims in Kashmir
- b) Shahmir and his successors
- c) Zainul-ul-Abidin

- a) Successors of Zainulabidin
- b) Rule and development of Kashmir

**Unit VI: Development of Art and Culture during Shahmiri dynasty**

- a- Development of Art and Culture during Shahmiri dynasty
- b- Development of Industries
- c- Causes for the decline of Shahmiri dynasty.

**Unit VII: Role of Sufi Saints for spread of Islam in Kashmir**

- a. Role of Shah Hamdan for spread of Islam in Kashmir
- b. Role of Shah other Saints for spread of Islam in Kashmir
- c. Development of Islamic Culture in Kashmir and role of Sufi Saints

**Unit VIII: Chak Rule in Kashmir**

- a- Causes for decline of Chak Rule in Kashmir and Mughals' occupation of Kashmir.
- b- Ruling Era of Mughals and governing methods
- c- Condition of Kashmir during Mughal Era

d- Causes for decline of Mughal Rule in Kashmir

**Unit IX : Kashmir under Afghans**

- a) Ruling Era of Afghans and governing methods
- b) Condition of Kashmir during Mughal Era
- c) Causes for decline of Afghan Rule in Kashmir

**Unit X: Occupation of Kashmir by Sikhs**

- a. Ruling Era of Sikhs and governing methods
- b. Condition of Kashmiris during Sikh Rule
- c. Rise of Dogras' Treaty of Lahore and Treaty of Amritsar

**Unit XI: Kashmir under Dogra rule in Kashmir**

- a. Successors of Gulab Singh in Kashmir
- b. Condition of Kashmiris during Dogra Rule, Muslim Subjects of Kashmir and Dogra rulers and Resistance movements in Kashmir during Dogra Rule

**Unit XII: Jammu and Kashmir in after 1947**

- a. Indian occupation
- b. Kashmir issue: genesis
- c. Kashmir issue in the United Nations
- d. Human rights violations in Indian Occupied Kashmir

**Unit XIII: Economic Resources of Jammu and Kashmir Cultural Heritages of Kashmir**

**Unit XIV: Languages Spoken in Kashmir**

**Recommended Books:**

1. Kalhana Pandit. (1991), Rajatarangint, Mirpur Verinag Publishers AJ& K
2. GMD Sufi (1962), Kashir, Lahore: University of Punjab
3. Somnath Dhar. Jammu & Kashmir. India: National Book Trust, 2013.
4. Ram Chandra Kak. Ancient Monuments in Kashmir. London: 1993.
5. Dr. S.C. Ray Early History and Cultural of Kashmir. New Dehli: 1969.
6. Dr. A.N. Rania. Geography & Jammu & Kashmir. New Dehli 1972.
7. Walter Lawrence. The Valley of Kashmir. London 1895.
8. G.M Rabani. Kashmir Social and Cultural History: Srinagar Gulshan Books 2007.
9. Muhammad Yusuf Saraf, Kashmiris Fight for Freedom.

OR

**GEN-3202**

**Introduction to History**

**Credit Hours: 2(2-0)**

**Course Objectives:**

The purpose of this course is:

- To make students aware of the nature of historical knowledge and research.
- To introduce to the students, the basic concepts and controversies related to historical understanding.

**Course Content:**

**Unit I: What is History?**

Literal, terminological and conceptual meaning of history

History as Fact

History as Process

History as Narrative

**Unit II: Memory, Record and History**

**Unit III: Nature of History:**

Being and becoming.

Continuity and Change; Evolution, Progress and Development Macrocosm & Microcosm: Time, Space, Causation, Facts, and opinion/ objectivity & Subjectivity

**Unit IV: Utility, Benefits & importance of History:**

History as a corrective/cohesive force.

History as a repetitive force

Continuity of History from Past to Future

Lessons from Past

Historical determinism, etc.

History as Mother of All Sciences/Knowledge

**Unit V: Epistemological nature of History:**

Relationship of History with other forms of knowledge:

Natural Sciences

Social Sciences

Literature and Arts

**Unit VI: Forms and Classification of History**

**Suggested Readings:**

1. Burke, Varieties of Cultural History, Cornell University Press, 1977
2. Carlo, Ginzburg. Clues. Myths, and the Historical Method, John Hopkins: University Press, 1992
3. Carr, E. H., What is History? Harmondsworth: Penguin, 1961
4. Cohn, Bernard. An Anthropologist among Historians and Other Essay, Oxford University Press, 1988
5. Collingwood, R. G. The Idea of History. Oxford: Oxford University Press, 1978.
6. Daniels, Studying History: How and Why, New Jersey, 1981.
7. Gertrude Himmelfarb. The New History and the Old, Cambridge: Harvard University Press, 1987
8. Govranski. History Meaning and Methods, USA, 1969
9. Hegel. Elements of the Philosophy of Right. Cambridge University Press, 1991
10. Qadir, Khurram, Tarikh Nigari Nazriyat-o-Irtiqa, Lahore: Palgrave, 1994.
11. Qureshi, Muhammad Aslam. A Study of Historiography. Lahore: Pakistan Book Centre, Latest Edition.
12. Steedman. Caroline, Dust: The Archive and Cultural History, Manchester University Press, 2002
13. Stern Fritz, Varieties of History: from Voltaire to the Present, Vintage, 2nd Edition 1975
14. Tahir Kamran, The Idea of History Through Ages, Lahore: Progressive Publisher, 1993
15. Lemon, M. C., Philosophy of History, London: Routledge, 2003



16. Marwick, Arthur, *The New Nature of History*, London, 1989, pp.31-35.
17. Roberts, Geoffrey, ed., *History and Narrative Reader*, London: Routledge, 2001.
18. Shafique, Muhammad, *British Historiography of South Asia: Aspects of Early Imperial Patterns and Perceptions*, Islamabad, NIHCR, Quaid-i-Azam University, 2016

## APPLICATIONS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

## UGE Policy V 1.1 : General Education Course

**Credits:** 03 (Class Credits: 02; Lab Credits: 01)  
**Pre-Requisite:** Nil  
**Offering:** Undergraduate Degrees (including Associate Degrees)  
**Placement:** 1 - 4 Semesters  
**Type:** General Education  
**Fields:** All

**DESCRIPTION**

This course is designed to provide students with an exploration of the practical applications of Information and Communication Technologies (ICT) and software tools in various domains. Students will gain hands-on experience with a range of software applications, learning how to leverage ICT to solve daily life problems, enhance productivity and innovate in different fields. Through individual and interactive exercises and discussions, students will develop proficiency in utilizing software for communication, creativity, and more.

**COURSE LEARNING OUTCOMES**

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

1. Explain the fundamental concepts, components, and scope of Information and Communication Technologies (ICT).
2. Identify uses of various ICT platforms and tools for different purposes.
3. Apply ICT platforms and tools for different purposes to address basic needs in different domains of daily, academic, and professional life.
4. Understand the ethical and legal considerations in use of ICT platforms and tools.

**SYLLABUS**

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.

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**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, ILINK 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 REQUIREMENTS**

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.

**SUGGESTED INSTRUCTIONAL/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.

*Strayed*

**Aims and Objectives**

To introduce the students to the diversity of plants and their structures and significance.

**Course Contents**

Comparative study of life form, structure, reproduction, and economic significance of:

- a. Viruses (RNA and DNA types) with special reference to TMV.
- b. Bacteria and Cyanobacteria (Nostoc, Anabaena, Oscillatoria) with specific reference to biofertilizers, pathogenicity and industrial importance.
- c. Algae (Chlamydomonas, Spirogyra, Chara, Vaucheria, Pinnularia, Ectocarpus, Polysiphonia)
- d. Fungi (Mucor, Penicillium, Phyllactinia, Ustilago, Puccinia, Agaricus), their implication on crop production and industrial applications.
- e. Lichens (Phycia)
- f. Bryophytes (Riccia, Anthoceros and Funaria)
- g. Pteridophytes (Fossils and fossilization, Psilopsida (Psilotum), Lycopsida (Selaginella) Sphenopsida (Equisetum), Pteropsida (Marsilea) and Seed Habit)
- h) Gymnosperms (Cycas, Pinus and Ephedra)

**Practical:**

1. Culturing, maintenance, preservation and staining of microorganisms.
2. Study of morphology and reproductive structures of the types mentioned in theory.
3. Identification of various types mentioned from prepared slides and fresh collections.

**Recommended Books:**

1. Lee, R.E. 1999. Phycology. Cambridge University Press, UK
2. Prescott, L.M., Harley, J.P. and Klein, A.D. 2004. Microbiology, 3<sup>rd</sup> ed. W.M. C. Brown Publishers.
3. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology. 4th ed. John Wiley and Sons Publishers.
4. Agrios, G.N. 2004. Plant pathology. 8th ed. Academic press London.
5. Vashishta, B.R. 1991. Botany for degree students (all volumes). S. Chand and Company. Ltd. New Delhi.
6. Andrew, H. N. 1961. Studies in Paleobotany. John Willey and Sons.
7. Ingrouille, M. 1992. Diversity and Evolution of Land Plants. Chapman & Hall.
8. Mauseth, J.D. 2003. Botany: An Introduction to Plant Biology 3rd ed., Jones and Bartlett Pub. UK
9. Marti.J.Ingrouille & Plant: Diversity and Evolution. 2006 CUP

Taylor, T.N. & Taylor, E.D. 2000. Biology and Evolution of Fossil Plants. Prentice Hall. N.Y.

**Course Objectives:**

- 1.To provide the knowledge of evolutionary/ phylogenetic relationships (from simple to complex organisms).
- 2.To impart the basic taxonomic characteristics and classification of all the invertebrate phyla.
- 3.To provide understanding of body organization, Feeding and Digestive system, Other Organ System.
- 4.To provide the description of mode of Reproduction and Development
- 5.To provide the information of their economic and ecological importance

**Course Learning Outcomes:**

This course will be based on following outcomes:

1. Acquire the basic concepts of invertebrates with explanation of evolutionary origin and diversification.
2. Understand invertebrate organismal concepts in laboratory and field.
3. Demonstrate major evolutionary innovations for invertebrates with functional importance.
4. Understand how reproduction and development occurred and able to breed animal in the laboratory/field.

5. Analyze economic and ecological importance of invertebrates.

**Course Contents:**

Note: The minimum details of the titles in the content must be of the principal book Zoology by Miller and Harley. This must be kept in view in teaching and assessments.

**INTRODUCTION**

- a. Classification of Organisms:
- b. Evolutionary Relationships and Tree Diagrams: Patterns of organization.

**ANIMAL-LIKE PROTISTS: THE PROTOZOA**

- c. Evolutionary perspective; Life within a single plasma Membrane.
- d. Symbiotic Lifestyles.
- e. Protozoon Taxonomy; (up to Phyla, subphyla, and super Classes, wherever applicable).
- f. Pseudopodia and Amoeboid Locomotion; Cilia and other pellicular structures.
- g. Nutrition; Genetic Control and Reproduction; Symbiotic ciliates.
- h. Further Phylogenetic Consideration.

**MULTICELLULAR AND TISSUE LEVELS OF ORGANIZATION**

- i. Evolutionary Perspective:
- j. Origins of Multicellularity; Animal Origins.

**Phylum Porifera**

- a. Characteristics and classification. Cell Types, Body Wall, and Skeletons.
- b. Water Current and Body Forms.
- c. Maintenance Functions, Reproduction.

**Phylum Cnidaria (Coelenterate)**

- a. Characteristics and classification. The body Wall and Nematocysts: Alteration of Generations.
- b. Maintenance Functions; Reproduction and
- c. Classification up to Class.

**Phylum Ctenophore.**

- a. Characteristics, body organization

**THE TRIPLOBLASTIC AND WITH ACOELOMATE BODY PLAN PHYLUM PLATYHELMINTHES**

- a. Evolutionary Perspective; Classification up to class.
- b. The Free-Living Flatworms and the Tapeworms, adaptive modification for parasitic lifestyle

**Phylum Numerate:** Characteristics, body organization.

**Phylum Gastrotrich:** Characteristics, body organization

2. **PSEUDOCOELOMATE BODY PLAN**

**PHYLUM ASCHELMINTHS**

- a. Evolutionary perspective; General Characteristics; Classification up to order with External Features.
  - b. Feeding and Digestive system; Other Organ System; Reproduction and Development including Phylum **Rotifera**, Phylum **Nematoda** and Phylum **Kinorhyncha**.
  - c. Some Important Nematode Parasites of Humans.

3. **PHYLUM MOLLUSCA**

- a. Evolutionary perspective; Relationship to other animals; Origin of the Coelom.
- b. Molluscan Characteristics, Classification up to class. The Characteristics of Shell and Associated Structures,
- c. Feeding, Digestion, Gas Exchange, Locomotion,

- d. Reproduction and Development, Other maintenance Functions and Diversity in Gastropods, Bivalves and Cephalopods:

4. **PHYLUM ANNELIDA**

- a. The Metameric Body Form; Evolutionary perspective; Relationship to other animals,
- b. Metamerism and Tagmatization, Classification up to Class. External Structure and Locomotion,
- c. Feeding and the Digestive system, Gas Exchange, and Circulation,
- d. Nervous and Sensory Functions, Excretion,
- e. Regeneration, Reproduction and Development, in Polychaeta, Oligochaeta and Hirudinea, Further Phylogenetic Consideration.

5. **PHYLUM ARTHROPODA:**

- a. Evolutionary Perspective: Classification and Relationship to other Animals.
- b. Metamerism and Tagmatization
- c. The Exoskeleton; Metamorphosis.
- d. Classification up to Class; Further Phylogenetic Consideration.

**The Hexapods and Myriapods:**

- a. Evolutionary Perspective: Classification up to class. External Structure and Locomotion,
- b. Nutrition and the Digestive system, Gas Exchange, Circulation and Temperature Regulation,
- c. Nervous and Sensory Functions, Excretion, Chemical Regulation,
- d. Reproduction and Development in Hexapoda,
- e. Insects Behavior, Insect and Human.

6. **PHYLUM ECHINODERMS**

- a. Evolutionary Perspective: Relationship to other Animals; Echinoderm Characteristics; Classification up to class.
- b. Maintenance Functions, Regeneration,
- c. Reproduction, and Development in Asterozoa, Ophiurozoa, Echinozoa, Holothurozoa and Crinozoa.

**SOME LESSER-KNOWN INVERTEBRATES.**

- a. The Lophophorates, Entoprocts, Cyclophores, and Cheatognaths.

**Practical:**

**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.

1. Study of Euglena, Amoeba, Endameba, Plasmodium, Trypanosome, Paramecium as representative of animal like Protists.
2. Study of prepared slides of sponges, spicules of sponges, and their various body forms. Study of representatives of classes of Phylum Porifera.
3. Study of principal representatives of classes of Phylum Coelenterate.
4. Study of principal representatives of classes of Phylum Platyhelminthes.
5. Study of representatives of phylum Rotifer, Phylum Nematode.
6. Study of principal representatives of classes of Phylum Mollusca.
7. Study of principal representatives of classes of Phylum Annelida.
8. Study of principal representatives of classes of groups of Phylum Arthropoda
9. Study of representatives of classes of phylum Echinodermata.
10. Preparation of permanent mount of Leucosolenia, Obelia, Hydra, Proglottid of Tapeworm, Parapodia of Nereis and Daphnia. Drawing and labeling.
11. Preparation of permanent slide of mouthpart of insects (after dissection). Drawing and labeling.

12. How to make grade-wise series for preparation of temporary and permanent slides.

**Teaching Methodology:**

- Lecturing
- Written Assignments
- Guest Speaker
- Research project.
- Presentation

**Assignments & Presentation (10%)**

**Recommended Principal Reference Book:**

1. Miller, A.S. and Harley, J.B.; 1999, 2002., 2007, 2009, 2012 & 2016 Zoology, 4<sup>th</sup>, 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup> & 10<sup>th</sup> Edition (International), Singapore: McGraw Hill.

**Additional Readings:**

1. Schierwater, B., & DeSalle, R. (2021). Invertebrate zoology: a tree of life approach. CRC Press.
  2. Hickman, C.P., Roberts, L.C/, AND Larson, A., 2018. INTEGRATED PRINCIPLES OF ZOOLOGY, 15<sup>th</sup> Edition (International), Singapore: McGRAW-Hill.
  3. Mandal, F. B. (2017). Biology of non-chordates. PHI Learning Pvt. Ltd.
  4. Pechenik, J.A., 2015. BIOLOGY OF INVERTEBRATES, 7<sup>th</sup> Edition, (International), Singapore: McGraw-Hill.
  5. Hickman, C.P., Roberts, L.C/, AND Larson, A., 2007. INTEGRATED PRINCIPLES OF ZOOLOGY, 12<sup>th</sup> & 13<sup>th</sup> Edition (International). Singapore: McGraw-Hill.
  6. Sandhu, G. S. (2005). Textbook of invertebrate zoology (Vol. 1). Campus Books International.
  7. Campbell, N.A., 2002; BIOLOGY 6<sup>th</sup> Edition, Menlo Park, California; Benjamin Cummings Publishing Company, Inc.
  8. Kent, G. C. and Miller, S., 2001. COMPARATIVE ANATOMY OF VERTEBRATES New York: McGraw-Hill.
- BOOKS FOR PRACTICAL**
9. Verma, P. S. (2010). A Manual of Practical Zoology: Invertebrates. S. Chand Publishing.
  10. Miller, S.A., 2002. GENERAL ZOOLOGY LABORATORY MANUAL. 5<sup>th</sup> Edition (International), Singapore: McGraw-Hill.
  11. Hickman, C.P. and Kats, H.L., 2000. Laboratory Studies in integrated principle of zoology. Singapore: McGraw-Hill.

**CHM-3206**

**Inorganic Chemistry**

**4(3-1)**

**Course Objectives:** Students will not only be able to understand and acquire knowledge about basic concept of inorganic chemistry, but this course will also help in developing their knowledge about the modern periodic table and basic theories of chemical bonding. This course will provide a rigorous description of chemical equilibrium phenomena and their application during chemical reactions or analysis. They will be able to understand the acid base concepts and relative strength of acids and bases. They can understand the abnormal behavior of the p-block elements, general properties and important uses of these elements and their compounds. Students will also be able to know about basic laboratory ethics and necessary precautionary measures required to carry out chemical reactions in the laboratory and will be able to prepare some important compounds in the laboratory. They will also be able to analyze different radical present in the salts.

**Course Contents:**

1. **Periodicity:** Modern periodic table, similarities and differences among first row elements, their diagonal and vertical relationship with other elements, group trends and periodic properties in s, p, d and f block elements i.e., atomic radii, ionic radii, ionization potentials, electron affinities, electronegativities and redox potential.
2. **Theories of Chemical Bonding:** Nature and types of chemical bonding. Concept of valence bond theory (VBT) and molecular orbital theory (MOT), Valence shell electron pair repulsion (VSEPR)

theory. Directed valence bond theory (hybridization) and their applications to homo and hetero diatomic inorganic molecules. Metallic bonds.

**3. Acid-Base Concept:** Theories of acids and bases, applications of soft and hard acid-base (SHAB) concept. pH, pKa, pKb and their significance. Relative strength of acids and bases based on pka values. Leveling effect. Buffers, indicators, and theory of indicators.

**4. Essentials of Chemical Analysis:** Law of mass action and its applications, precipitation and solubility product, common ion effect and its application, co-precipitation, fractional precipitation.

#### **5. Chemistry of p-Block Elements**

(a) Boron and Aluminum: General characteristics, group anomalies, structure, bonding and properties of boron and aluminum hydrides.

(b) Carbon and Silicon: General characteristics, comparison of carbon and silicon, allotropic forms of carbon. Structure and industrial applications of carbides, silicates and silicones.

(c) Nitrogen and Phosphorus: General characteristics, group anomalies. Role of oxides of nitrogen in the environment, preparation of nitric acid and ortho phosphoric acid.

(d) Oxygen and Sulphur: General characteristics, group anomalies, role of oxides of sulfur in air pollution. Preparation of sulfuric acid. Preparation of hypo and its use in photography.

(e) Halogens: General characteristics, anomalous behavior of fluorine, industrial preparation and uses of fluorine. Structure and properties of Interhalogens and pseudohalogens.

(f) Noble Gases: Discovery of noble gases, structure and properties of xenon fluorides, Industrial uses of noble gases and their compounds.

#### **6. Chemistry of d-Block Elements:**

Electronic configuration and general characteristics of d-block elements. Industrial applications of transition metals. Werner's concept and nomenclature of coordination compounds.

#### **Inorganic Chemistry Practical**

**1. Laboratory Ethics and Safety Measures:** Awareness about the toxic nature of chemicals and their handling, cleaning of glassware, safe laboratory operations

**2. Qualitative Analysis:** Analysis of four ions (two cations and two anions) from mixture of salts.

#### **3. Quantitative Analysis**

1. Determine the %age purity of NaCl (rock salt) by Mohr's method.

2. Determination of number of water molecules (x) in  $\text{CuSO}_4 \cdot x\text{H}_2\text{O}$  iodometrically.

3. Determination of amount/dm<sup>3</sup> of  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  with  $\text{K}_2\text{Cr}_2\text{O}_7$  by both internal and external indicators.

4. Determination of %age of iron in Ferric alum  $(\text{NH}_4)_2\text{SO}_4 \cdot \text{Fe}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$  using  $\text{K}_2\text{Cr}_2\text{O}_7$  by both internal and external indicators.

5. Standardization of EDTA solution by Magnesium Sulfate/Zinc Sulfate solution by complexometry.

6. Find out the amount of  $\text{Ca}^{2+}$  in the given sample of marble (limestone) by complexometry.