UNIVERSITY OF SARGODHA
OFFICE OF THE REGISTRAR
(ACAD BRANCH)

NOTIFICATION

On the recommendations of Academic Council made in its 24th (1/2025) meeting held on 26.08.2025, the Syndicate in its 72nd (4/2025) meeting held on 12.09.2025 has approved the revised curricula of following programs for implementation w.e.f. **Fall 2025**.

I.	BS in Zoology	(Annex-'**A**')
II.	Associate Degree in Zoology	(Annex-'**B**')

(WAQAR AHMAD)
Additional Registrar (General)

No. SU/Acad/25/1345 Dated: 03.12.2025

Distribution:

- Chairman, Department of Zoology
- Controller of Examinations
- Director Academics

C.C:

- Dean Faculty of Sciences
- Director, QEC
- Additional Registrar (A & R) *{With the request to forward the notification alongwith curriculum to all Principals of affiliated colleges concerned}*
- Secretary to the Vice-Chancellor
- PA to Registrar
- Notification File

SCHEME OF STUDIES FOR ASSOCIATE DEGREE IN ZOOLOGY

(Applicable from 2025)

DEPARTMENT OF ZOOLOGY

UNIVERSITY OF SARGODHA

SARGODHA - PAKISTAN

1. **Title of Degree Program:** AD in Zoology
2. **Program Learning Objectives:** The Department of Zoology comprises of diverse and enthusiastic faculty members and researchers who aim to develop the best possible research environment among the students in the field of Zoology. We intend to train the student in a wide range of basic and applied field of Zoology like Vertebrate and Invertebrate Zoology, Cell Biology, Physiology, Behaviour, Developmental Biology, Ecology, Evolution and Entomology.

3. **Program Structure:**

Duration	2 years (4 semesters)
Admission Requirements:	**Eligibility:** Students with Pre-Medical combination in HSSC / A-level with Biology as an elective subject after 12-years of education
Degree Completion Requirements:	Comprises of 4 semesters with 73 credit hours; the outline of the courses is as under:

General Education	GE	(35 CHs)
Interdisciplinary	ID	(06 CHs)
Disciplinary / Major	D	(30 CHs)
Total		**71**

4. **General Education (Gen Ed) Requirements: (Mandatory/Core Curses):**
The minimum requirement for Gen Ed is 34 credits hours and will be offered in first four semesters only.

Sr. No.	Semester	Course Code	Course Title	Credit Hours	Prerequisite
1.	1	URCG-5129/ URCG-5131	Understanding of Holy Quran-I/ Ethics-I	1(0-1)	Nil
2.	1	URCG-5118	Functional English	3(3-0)	Nil
3.	1	URCG-5105/ URCG-5126	Islamic Studies (OR) Religious Education/Ethics	2(2-0)	Nil
4.	1	URCG-5123	Applications of Information and Communication Technologies (ICT)	3(2-1)	Nil
5.	2	URCG-5112	Fables, Wisdom and EPICS	2(2-0)	Nil
6.	2	URCG-5116	Science of Society – I	2(2-0)	Nil
7.	2	URCG-5120	Exploring Quantitative Skills	3(3-0)	Nil
8.	2	URCG-5127	Seerat of the Holy Prophet (SAW)	1(1-0)	Nil
9.	2	URCG-5128	Pakistan Studies	2(2-0)	Nil
10.	3	URCG-5119	Expository Writing	3(3-0)	Nil
11.	3	URCG-5121	Tools for Quantitative Reasoning	3(3-0)	Nil
12.	3	URCG-5122	Ideology & Constitution of Pakistan	2(2-0)	Nil
13.	3	URCG-5130/ URCG-5132	Understanding of Holy Quran-II/ Ethics-II	1(0-1)	URCG-5129/ URCG-5131
14.	4	URCG-5125	Civics and Community Engagement	2(2-0)	Nil
15.	4	URCG-5115	The Science of Global Challenges	3(2-1)	Nil
16.	4	URCG-5124	Entrepreneurship	2(2-0)	Nil
General Education Courses Credit Hours Total				**35**	

Scheme of Studies

Associate Degree in Zoology
(For Affiliated Colleges)

Semester-I

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
Major-01	ZOOL-5101	Diversity of Invertebrates	3(2-1)	Nil
GE-01	URCG-5129/ URCG-5131	Understanding of Holy Quran – I/ Ethics-I	1(0-1)	Nil
GE-02	URCG-5118	Functional English	3(3-0)	Nil
GE-03	URCG-5105 URCG-5126	Islamic Studies (OR) Ethics for non-Muslim students	2(2-0)	Nil
GE-04	URCG-5123	Applications of Information & Communication Technologies (ICT)	3(2-1)	Nil
Major-02	ZOOL-5102	Animal Form & Function- I (*Comparative Anatomy*)	3(2-1)	Nil

Semester Total Credit Hours: 15

Semester-II

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
Major-03	ZOOL-5103	Cell Biology	3(2-1)	Nil
Major-04	ZOOL-5104	Diversity of Chordates	3(2-1)	ZOOL-5101
ID-01	BOTN-5104	Biodiversity & Conservation	3(3-0)	Nil
GE-05	URCG-5112 URCG-5113	Fables, Wisdom Literature and EPICS or Space, Place and Experience	2(2-0)	Nil
GE-06	URCG-5116	Science of Society-I	2(2-0)	Nil
GE-07	URCG-5120	Exploring Quantitative Skills	3(3-0)	Nil
GE -08	URCG-5127	Seerat of the Holy Prophet (SAW)	1(1-0)	Nil
GE -09	URCG-5128	Pakistan Studies	2(2-0)	Nil

Semester Total Credit Hours: 19

Semester-III

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
Major-05	ZOOL-5105	Animal Ecology	3(2-1)	Nil
Major-06	ZOOL-5106	Animal Behavior	3(3-0)	Nil
ID-02	AIDE-5205	Applied Artificial Intelligence	3(2-1)	Nil
GE-10	URCG-5119	Expository Writing	3(3-0)	Nil
GE-11	URCG-5121	Tools for Quantitative Reasoning	3(3-0)	Nil
GE-12	URCG-5122	Ideology and Constitution of Pakistan	2(2-0)	Nil
GE-13	URCG-5130/ URCG-5132	Understanding of Holy Quran-II*/ Ethics-II	1(0-1)	URCG-5129/ URCG-5131

Semester Total Credit Hours: 18

Semester-IV

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
Major-07	ZOOL-5107	Evolution	3 (3-0)	Nil
Major-08	ZOOL-5108	Animal Form & Function-II (Comparative Physiology)	3(2-1)	ZOOL-5102
Major-09	ZOOL-6109	Entomology	3(2-1)	Nil
Major-10	ZOOL-6110	Developmental Biology	3(2-1)	Nil
GE-14	URCG-5125	Civics and Community Engagement	2(2-0)	Nil
GE-15	URCG-5115	The Science of Global Challenges	3(2-1)	Nil
GE-16	URCG-5124	Entrepreneurship	2(2-0)	Nil

Semester Total Credit Hours: 19

Degree Total Credit Hours: 71

Note: Courses of Understanding of Holy Quran-I/II should be for Muslim students only

SEMESTER I

Course Code	ZOOL-5101	Course Title	Diversity of Invertebrates	Credit Hours	3(2-1)

Course Brief:

This course will provide the knowledge of evolutionary/phylogenetic relationship. It imparts the basic taxonomic characteristics and classification of all the invertebrate phyla. This includes more than 95% of all of the described species of animals and far more than 99% of all of the individual animals on the planet. The central theme running throughout this course will be phylogeny. It provides understanding of body organization, mode of feeding, digestion, reproduction and development of invertebrates. It delivers information to students about economic and ecological importance of invertebrates. Students will understand invertebrate organismal concepts in laboratory and field.

Course Learning Objectives:

The primary objectives for the laboratory section of this course includes; introduction of structure, function and behavior of selected invertebrate types through the observation of both living and preserved specimens, to reinforce basic laboratory skills of students like microscopy, dissection and careful observation, to provide students with the ability to recognize the major groups of invertebrate and to increasing understanding of the methods of investigating animal evolution.

Course Contents:

1. Introduction: classification of organisms, evolutionary relationships and tree diagrams: patterns of organization.
2. Animal-like protists: the protozoa: evolutionary perspective; life within a single plasma membrane, symbiotic life-styles, Protozoon taxonomy, pseudopodia and amoeboid locomotion; cilia and other pellicular structure, nutrition; genetic control and reproduction; symbiotic ciliates, further phylogenetic consideration.
3. Multicellular and tissue levels of organization: Evolutionary Perspective, Origins of Multicellularity; Animal Origins, Phylum Porifera, Cnidaria, Ctenophora, Characters and Classification, Maintenance functions.
4. The triploblastic and with acoelomate body plan: Phylum Platyhelminthes, Phylum Nematode, Gastrotricha, evolutionary perspective; classification up to class, body plan and functions.
5. Pseudocoelomate body plan: Phylum Aschelminths, evolutionary perspective; general characteristics; classification up to order with external features, feeding and digestive system; other organ system; reproduction and development including Phylum Rotifera, Phylum Nematoda and Phylum Kinorhyncha. some important nematode parasites of human.
6. Phylum Mollusca: evolutionary perspective; relationship to other animals; origin of the coelom; characteristics, classification up to class. the characteristics of shell and associated structures, feeding, digestion, gas exchange, locomotion, reproduction and development, other maintenance functions and diversity in gastropods, bivalves and cephalopods.
7. Phylum Annelida: the metameric body form; evolutionary perspective; relationship to other animals, metamerism and tag-matization, classification up to class. external structure and locomotion, feeding and the digestive system, gas exchange and circulation, nervous and sensory functions, excretion, regeneration, reproduction and development, Polychaeta, Oligochaeta and Hirudinea, Further phylogenetic consideration.
8. Phylum Arthropoda: evolutionary perspective: classification and relationship to other animals; metamerism and tagmatization; the exoskeleton; metamorphosis; classification up to class.
9. The Hexapods and Myriapods: evolutionary perspective: classification upto class. external structure and locomotion, nutrition and the digestive system, gas exchange, circulation and temperature regulation, nervous and sensory functions, excretion, chemical regulation, reproduction and development in hexapoda, insects' behavior, insect and human.
10. Phylum Echinoderms: evolutionary perspective: relationship to other animals; echinoderm characteristics;

classification up to class, maintenance functions, regeneration, reproduction, and development in Asteroida, Ophiuroidea, Echinoidea, Holothuridea and Crinoidea.

11. Some lesser-known Invertebrates: Lophorates, Entoprocts, Cycliophores, and Cheatognaths.

Practical

Note: Classification of each member of each phylum upto order with adaptions in relation to habitat of the specimen. Preserved specimen and colored projection slide and 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 representatives of Phylum Porifera and prepared slides of spicules of sponges
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 Echinodermta.
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).
12. How to make grade-wise series for preparation of temporary and permanent slides.

Recommended Texts:

1. Miller, A. S., & Harley, J. P. (2016 & 2019). *Zoology* (10 & 11) Singapore: McGraw Hill
2. Hickman, C. P., Roberts, L. S., Keen, S. L., Larson, A., I'Anson, H & Eisenhour., D. J. (2009). *Integrated principles of zoology* (14th ed.). Singapore: McGraw-Hill.
3. Hickman, C. Jr., Keen, S., Eisenhour, D., Larson, A., I'Anson, H., (2019). *Integrated principles of zoology* (18th ed.). Singapore: McGraw-Hill.

Suggested Readings:

1. Hickman, C. P., Roberts, L. S., & Larson, A. (2018). *Integrated principles of zoology* th (15 ed.). Singapore: McGraw-Hill.
2. Hickman, C., Jr., Keen, S., Eisenhour, D., Larson, A., I'Anson, H., (2019). *Integrated principles of zoology* (18th ed.). Singapore: McGraw-Hill.
3. Pechenik, J. A. (2015). *Biology of invertebrates* (7th ed.). Singapore: McGraw-Hill

Annex-'A'

URCG-5129

Model Course Outline
for the Course Understanding of Quran – I

Course Title: Understanding of Quran – I
Course Book: Muallim ul Quran (Volume 1, 2 & 3) by Dr Ubaid ur Rahman
Credit Hours: 1 (0-1)
Contact Hours: 3 per week
Weeks: 15-16 (45-48 hours)

Course Learning Outcomes:

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

1. Develop the ability to understand basic words of the Quran, phrases and sentences that do not contain verbs (unit 1 to 5 of Muallim ul Quran Book) and then sentences having present tense (first half of unit 6 of Muallim ul Quran Book).
2. Acquire a strong foundation for understanding long verses of the Quran with clarity.
3. Comprehend Quranic vocabulary, particles (operative & non operative particles) , compounds (Adjective & Possessive compound), pronouns (singular & plural) and types of plural through hundreds of Quranic sentences.
4. Recognize and understand different styles of Quranic sentences, including nominal sentence, emphatic sentence, double emphatic sentence, negative sentence, interrogative sentence, oath –based sentences.
5. Strengthen understanding of fundamental Quranic linguistic styles, expressions and idioms.
6. Understand at least 30 to 40 % of each page of the holy Quran.

Provision of material, content and books:

- **Paper book:** All volumes are available in printed book form.
- **Tutorial videos:** Teaching video of each lesson available on YouTube.
- **Confirmation Videos:** A complete series of confirmation videos of all lessons is available in which the student can confirm his answers.
- **A flipbook:** A flipbook edition is also accessible.
- **Helping material:** Helping material for the teachers like quizzes, question papers and images is available on website.

Course Outline:

Weeks	Lectures (1.5 hrs)	Units	Lessons	Assignments/Home Task	Linguistic Rules
1.	1.	1	1-6	Writing the meaning of Quranic words Lesson 1-8	Proper Noun Masculine & Feminine
	2.	1	9-14	Writing the meaning of Quranic words 9-14	Two kinds of plural Concept of (و) "And" Common Noun
2.	1.	1	15-17	Writing the meaning of Quranic words, phrases & translation of Sentences 15-17	Demonstrative Noun (This & That for Masculine (هذا- هذه) Demonstrative Noun (This & That for Feminine) (تلك- تلك)
	2.	1	18-19 & Revision (Unit 1)	Writing the meaning of Quranic words , phrases & translation of Sentences 17-19 Quiz	Laam for emphasis (لام التاكيد) Superlative Degree like اكبر Revision of all Quranic Sentences
3.	1.	Unit 2	1-3	Writing the meaning of Quranic words, phrases & translation of Sentences 1-3	Emphatic Particle إن Preposition "For" (اللام) Preposition (في)
	2.	2	4-6	Writing the meaning of Quranic words, phrases & translation of Sentences 4-6	Preposition (على- من- إلى)
4.	1.	2	7-9	Writing the meaning of Quranic words & translation of Sentences 7-9	Preposition (الباء) Absolute Negation Particle Exceptive Particle (لا النافية للجنس)(ما النافية)(إلا)
	2.	2	10-13 & Revision (Unit 2)	Writing the meaning of Quranic words, phrases & translation of Sentences 10-13 Quiz	Subordinating Conjunction(أن), Was (كان), Vocative Particle(حرف النداء)

5.	1.	Unit 3	1-2	Writing the meaning of Quranic phrases 1-2	Quranic Adjective Compounds (صفة ومرصوف)
	2.	3	3-5	Writing the meaning of Quranic phrases & translation of sentences 3-5	Quranic Possessive Construction (مضاف ومضاف إليه)
6.	1.	3	6 -7	Writing the meaning of Quranic phrase translation of sentences 6-7	Quranic Possessive Construction (مضاف ومضاف إليه)
	2.	3	8-10 & Revision (Unit 3)	Writing the meaning of Quranic phrase & translation of sentences 8-10 Quiz	Active Participle (اسم الفاعل), Passive Participle (اسم المفعول), Dual (مثنى)
7.	1.	Unit 4	1-2	Writing the meaning of Quranic phrase & translation of sentences 1-2	Personal Pronoun He (هو المنفصل) Possessive Pronoun His (ـه المتصل)
	2.	4	3-4	Writing the meaning of Quranic phrase & translation of sentences 3 -4	Possessive Pronoun with prepositions like في بيته Pronoun "His" with prepositions like له، منه، فيه
8.	1.	4	5-8	Writing the meaning of Quranic sentences 5-8	Personal Pronoun You (أنت المنفصل) Possessive Pronoun Your (ك المتصل) Possessive Pronoun with prepositions like في بيتك Pronoun "your" with prepositions like لك، منك، فيك
	2.	Mid Term			

9.	1.	4	9-12	Writing the meaning of Quranic phrases & sentences 9-12	Personal Pronoun She(هي المنفصل) Possessive Pronoun Her ها المتصل) Possessive Pronoun with prepositions like لي بيتها Pronoun "Her" with prepositions like لها
	2.	4	13-16	Writing the meaning of Quranic phrases & sentences 13-16	Personal Pronoun I (انا المنفصل) Possessive Pronoun Her ي المتصل) Possessive Pronoun with prepositions like لي بيتيPronoun "My" with prepositions like لي
10.	1	4	17 & Revision Unit 4	Revision of all Quranic sentences of Unit 4 Quiz	Adverb (حال)
	2.	Unit 5	1-2	Writing the meaning of Quranic phrases & sentences 1-2	Masculine Plural جمع المذكر السالم و جمع المذكر السالم للسيرق بحرف الجر
11.	1.	5	3-4	Writing the meaning of Quranic phrases & sentences 3-4	Possessive Construction with Plurals جمع المذكر السالم للسيرق بالاضافة
	2.	5	5-6	Writing the meaning of Quranic phrases, sentences & verses 5-6	Personal Pronoun They (هم المنفصل) Possessive Pronoun Their هم المتصل)
12.	1.	5	7-8	Writing the meaning of Quranic phrases, sentances & verses 7-8	Possessive Pronoun with prepositions like بيتهمPronoun "Their" with prepositions like لهم
	2.	5	9-11	Writing the meaning of Quranic phrases, sentences & verses 9-11	Personal Pronoun You (انتم المنفصل) Possessive Pronoun Your كم المتصل) Possessive Pronoun with prepositions

					like في بيتكم
13.	1.	5	12-14	Writing the meaning of Quranic phrases & sentences & verses 12-14	Pronoun "Your" with prepositions like لكم Personal Pronoun We (نحن المنفصل) Possessive Pronoun Our نا المتصل)
	2.	5	15-16	Writing the meaning of Quranic sentences & verses 15-16	Possessive Pronoun with prepositions like في بيتنا Pronoun "Our" with prepositions like لنا
14.	1.	5	17-18	Writing the meaning of Quranic sentences & Verses 17-18	Demonstrative Pronoun These, Those (هؤلاء- أولئك)
	2.	5	19-23	Writing the meaning of Quranic sentences & Verses 19-23	ما / إلا، إن / إلا، إنما، ليس، ما ، (أ/أم، أن، بل، كأن (الا، ليس، اليوم، يومئذ، سبحان، مايشاءما، قل، إذن، بئس، نعم، كلا، ما أدراك، حسب، أعلم ب، مصير، مرجع، دينا(تمييز)
15.	1.	5	Revision Unit 5	Quiz	
	2.	5	1-3 (till Page 16)	Writing the meaning of Quranic Verbs &Translation of Quranic Sentences & Verses (1-3)	Introduction of Present Tense(فعل مضارع) & Verbal Sentence (جملة فعلية) Present Tense الفعل المضارع صيغة المفرد يعلم
16.	1.	6	3 (From Page 17) & 4 -5	Translation of Quranic Sentences & Verses 3-5	Present Tense الفعل المضارع صيغة المفرد يعلم
	2.	6	6	Translation of Quranic Sentences & Verses	Present Tense الفعل المضارع صيغة الجمع يعلمون

Ethics-I **URCG-5131** **1 (0-1)**

1-Course Description

The Ethics-I course is designed to provide students with a comprehensive understanding of ethical principles, practices, and theories in various societal contexts. Throughout this degree program, students will explore the complexities of ethical theories of semitic and non-semitic religions along with decision-making and develop critical thinking skills to navigate moral dilemmas. This course will also enable the students to interact with others religious identities with humanistic, inclusive and holistic approach

2- Learning Objectives

This course aims to:

1. Introduce students to the fundamental concepts, scope, and importance of ethics.
2. Explore the relationship between law, morality, and social values.
3. Develop a clear understanding of virtuous and immoral ethics and their impact on individual and collective life.
4. Study the role of major religious figures in the moral development of human society and enable students to apply ethical principles for personal development, conflict resolution, and social harmony.

3- Learning Outcomes

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

1. Students will be able to identify and analyze major ethical theories, values, and their scope in social and individual life.
2. Differentiate between law and ethics, and analyze their interrelationship.
3. Identify types of virtuous and immoral ethics and assess their social impacts.
4. Examine the ethical teachings of major religions and their relevance in contemporary society.
5. Apply ethical principles to address modern challenges in personal and professional life.

4-Course Structure

1. Interactive lectures, Group discussions and debates
2. Reflection papers and presentations
3. Assignments and Quiz

Course Contents

Unit 1: Introduction and Fundamentals of Ethics

1. Literal and terminological definition of ethics
2. Literal and terminological definition of values
3. Relationship between law and ethics
4. Need, importance, and scope of ethics

Unit 2: Types of Ethics and Their Impact on Society

- Virtuous ethics: concept, types, benefits, and outcomes
- Immoral ethics: concept, types, and harms
- Role of ethics in social refinement and establishment of peace

Unit 3: Virtuous Ethics (Akhlaq-e-Hasanah)

- Concept, need, and importance of virtuous ethics
- Scope of virtuous ethics in the light of religions
- Major virtues in revealed and non-revealed religions
- Impact of virtuous ethics on individual and collective life

Unit 4: Immoral Ethics (Akhlaq-e-Razilah)

- Concept of immoral ethics
- Social problems caused by immoral ethics
- Practical consequences of immoral ethics
- Major vices in revealed and non-revealed religions

Unit 5: Role of World Religious Figures in Moral Development

- Prophet Moses (AS): introduction, miracles, and role in moral refinement
- Prophet Jesus (AS): introduction, miracles, and role in moral refinement
- Prophet Muhammad (ﷺ): introduction, miracles, and role in moral refinement

Textbook

1. Izutsu, T. (2002). *Ethico-Religious Concepts in the Qur'ān*. McGill-Queen's University Press.

Suggested Readings

1. Gert, B. (2005). *Morality: Its Nature and Justification*. Oxford University Press.
2. MacIntyre, A. (2007). *After Virtue: A Study in Moral Theory*. University of Notre Dame Press.
3. Al-Ghazali, Abu Hamid (2001). *The Alchemy of Happiness*. Islamic Texts Society.
4. Nasr, S. H. (1994). *The Heart of Islam: Enduring Values for Humanity*. Harper One.
5. Beauchamp, T. L., & Childress, J. F. (2019). *Principles of Biomedical Ethics*. Oxford University Press.
6. Hasan, Z. (2010). *Ethics in Islam: Key Concepts and Contemporary Challenges*. Islamic Research Institute.

Course Code	URCG-5118	Course Title	Functional English	Credit Hours	3(3-0)

Course Brief:

The course aims at providing understanding of a writer's goal of writing (i.e. clear, organized and effective content and to use that understanding and awareness for academic reading and writing. The objectives of the course are to make the students acquire and master the grammatical academic writing skills. The course would enable the students to develop argumentative writing techniques. The students would be able to logically add specific details on the topics such as facts, examples and statistical or numerical values.

Course Learning Objectives:

The course will also provide insight to convey the knowledge and ideas in an objective and persuasive manner. Furthermore, the course will also enhance the students' understanding of ethical considerations in writing academic assignments and topics including citation, plagiarism, formatting and referencing the sources as well as the technical aspects involved in referencing.

Course Contents:

1. Developing Analytical Skills
2. Transitional devices (word, phrase and expressions)
3. Development of ideas in writing
4. Reading Comprehension
5. Precis Writing
6. Developing argument
7. Sentence structure: Accuracy, variation, appropriateness, and conciseness
8. Appropriate use of active and passive voice
9. Organization and Structure of a Paragraph
10. Organization and structure of Essay
11. Types of Essays

Recommended Texts:

1. Bailey, S. (2011). Academic writing: A handbook for international students (3rd ed.). New York: Routledge.
2. Eastwood, J. (2011). A Basic English grammar. Oxford: Oxford University Press.
3. Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3rd ed.). Ann Arbor: The University of Michigan Press.
4. Swan, M. (2018). *Practical English usage* (8th ed.). Oxford: Oxford University Press.

Suggested Readings:

1. Biber, D., Johansson, S., Leech, G., Conrad, S., Finegan, E., & Quirk, R. (1999). *Longman grammar of spoken and written English*. Harlow Essex: MIT Press.
2. Cresswell, G. (2004). *Writing for academic success*. London: SAGE.
3. Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
4. Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*? Washington: American Psychological Association
5. Thomson, A. J., & Martinet, A. V. (1986). *A Practical English Grammar*. Oxford: Oxford University Press

Course Code	URCG-5105	Course Title	Islamic Studies	Credit Hours	2(2-0)

Course Brief:

Islamic Studies engages in the study of Islam as a textual tradition inscribed in the fundamental sources of Islam; Qur'an and Hadith, history and particular cultural contexts. The area seeks to provide an introduction to and a specialization in Islam through a large variety of expressions (literary, poetic, social, and political) and through a variety of methods (literary criticism, hermeneutics, history, sociology, and anthropology). It offers opportunities to get fully introductory foundational bases of Islam in fields that include Qur'anic studies, Hadith and Seerah of Prophet Muhammad (PBUH), Islamic philosophy, and Islamic law, culture and theology through the textual study of Qur'an and Sunnah.

Course Learning Objectives:

1. To make students understand the relevance and pragmatic significance of Islam in their lives.
2. To make learners comprehend the true spirit of Islam with reference to modern world.
3. To generate a sense of Islamic principles as a code of living that guarantee the effective solutions to the current challenges of being.
4. To provide Basic information about Islamic Studies
5. To enhance understanding of the students regarding Islamic Civilization
6. To improve Students skill to perform prayers and other worships
7. To enhance the skill of the students for understanding of issues related to faith and religious life

Course Contents:

Introduction to Qur'anic Studies

1. Basic Concepts of Qur'an
2. History of Quran
3. Uloom-ul-Quran

مطالعہ قرآن)تعارف قرآن ، منتخب آیات کا ترجمہ و تفسیر: سورۃ البقرہ آیات 1-5، 482-482؛ سورۃ الحجرات آیات 1-18؛
،سورۃ الفرقان آیات 26-77؛ سورۃ المومنون آیات 1-11؛ ،سورۃ االحزاب آیات 2، 41، 64- 66؛، 24، 52- 55؛ سورۃ االنعام آیات 151-156؛،
سورۃ الصف آیات 1- 12؛ الحشر آیات 18- 44؛ آل عمران آیات 154- 154؛ النحل آیات 14-12؛ لقمن
آیت 44، حم السجدہ آیت 65(

Introduction to Sunnah

1. Introduction of Hadith
2. Legal Status of Hadith
3. History of the compilation of Hadith 4. Kinds of Hadith

حدیث کا تعارف ،حدیث کی دینی حیثیت، حفاظت و تدوین حدیث، حدیث کی اقسام
متن، حدیث: 1درج ذیل موضوعات پر احادیث کا مطالعہ
1۔ اعمال کا اجر نیت پر منحصر ہے۔ 4۔ بہترین انسان قرآن کا طالب علم اور اس کا معلم ہے۔6.کتا ب وسنت گمراہی سے بچنے کا ذریعہ ہیں2۔
ارکان اسالم 5۔ اسالم ، ایمان ، احسان اور قیامت کی نشانیاں، 2بچوں کی نماز کی تلقین 7۔ دین کا گہرا فہم ہلا کی خاص عنایت ہے 8۔ حصول
علم، تالو ت قرآن اور عمل کی اہمیت و فضیلت، 5 ۔روز محشرکا محاسبہ، 14۔ حقوق ہلا کے
ساتھ ساتھ حقوق العباد کا لحاظ رکھنا بھی الزم ہے11۔ حسن خلق کی عظمت اور فحش و بد گوئی کی مذمت 14۔ دنیا و آخڑت کی بھالئی
کی ضامن چار چیزیں، 16۔ ہالک کر دینے والی سات چیزیں،12۔ بے عمل مبلغ کا عبرت ناک انجام 15۔ ہر شخص
نگران ہے اور ہر شخص مسئول

1. Sirah of the Prohet

2. Importance of the Study of Sirah
3. Character building method of the Prophet

(سیرت النبیﷺ) مطالعہ سیرت کی ضرورت و اہمیت ، تعمیر،سیرت و شخصیت کا نبوی منہاج اور عملی نمونے ، اقامت دین کا نبوی طریق کار، اقامت دین بعہد خالفت راشدہ، میثاق مدینہ ، خطبہ حجۃ الوداع، اخالقی تعلیمات ، تشکیل اجتماعیت اور ت نبوی ﷺ کے مقاصد و حکمتیں

Islamic Culture & Civilization

1. Basic Concepts of Islamic Culture & Civilization
2. Historical Development of Islamic Culture & Civilization
3. Characteristics of Islamic Culture & Civilization
4. Islamic Culture & Civilization and Contemporary Issues

2. اسالمی تہذیب و تمدن) اسالمی تہذیب کا مفہوم، اسالمی کے عوامل و عناصر، اسالمی تہذیب کی خصوصیات، ، اسالمی تہذیب ، علمی ، معاشرتی اور سماجی اثرات ، تہذیبوں کے تصادم کے نظریے کا تنقیدی جائزہ، تہذیبی تصادم کے اثرات و نتائج، طبعی ، حیاتیاتی اور معاشرتی علوم میں مسلمانوں کا کردار، نام ور مسلمان سائنسدان(سوہ حسنہ ،قرآن مجید میں سیرت سرور عالم کا بیان، غزوا

Recommended Texts:

1. Hameed ullah Muhammad, —Emergence of Islam, IRI, Islamabad
2. Hameed ullah Muhammad, —Muslim Conduct of State
3. Hameed ullah Muhammad, _Introduction to Islam
4. Ahmad Hasan, —Principles of Islamic Jurisprudencel Islamic Research, Institute, International Islamic University, Islamabad (1993)

Suggested Readings:

1. Dr. Muhammad Zia-ul-Haq, —Introduction to Al Sharia Al Islamial Allama Iqbal Open University, Islamabad (2001)
2. Dr. MuhammadShahbaz Manj, Teleeemat-e- Islam

Course Code	URCG-5126	Course Title	ETHICS	Credit Hours	2(2-0)

Course Contents:

1. Meaning and Scope of Ethics.
2. Relation of Ethics with:
(a) Religion
(b) Science
(c) Law
3. Historical Development of Morality: (a). Instinctive Moral Life.
(b). Customary Morality. (c). Reflective Morality.
4. Moral Theories:
(a). Hedonism (Mill) (b). Intuitionism (Butler)
(c). Kant's Moral Theory.
5. Moral Ethics and Society.
(a). Freedom and Responsibility. (b). Tolerance
(c). Justice
(d). Punishment (Theories of Punishment)
6. Moral Teachings of Major Religions: a). Judaism
b). Christianity c). Islam 7. Professional
Ethics:
a). Medical Ethics b). Ethics of Students
c). Ethics of Teachers d). Business Ethics

Recommended Texts:

1. William Lille. An Introduction to Ethics., London Methuen & Co. latest edition.
2. Titus, H.H. Ethics for Today. New York: American Book, latest edition.
3. Hill, Thomas. Ethics in Theory and Practice. N.Y. Thomas Y. Crowel, latest edition

Suggested Readings:

1. Ameer Ali, S. The Ethics of Islam. Culcutta: Noor Library Publishers, latest edition
2. Donaldson, D.M. Studies in Muslim Ethics. London: latest edition. 6. Sayeed, S.M.A.(Tr.) Ta'aruf-e-Akhlaqiat. Karachi: BCC&T, Karachi University.

Course Code	URCG-5123	Course Title	Applications of Information Communication Technologies (ICT)	Credit Hours	3 (2-1)

Course Brief:

The course introduces students to information and communication technologies and their application in the workplace. Objectives include basic understanding of computer software, hardware, and associated technologies. How computers can be used in the workplace, how communications systems can help boost productivity, and how the Internet technologies can influence the workplace.

Course Learning Objectives:

Students will get basic understanding of computer software, hardware, and associated technologies. They will also learn how computers are used in the workplace, how communications systems can help to boost productivity, and how the Internet technologies can influence the workplace.

Course Contents:

1. Introduction, Overview of Information Technology.
2. Hardware: Computer Systems & Components, Storage Devices.
3. Software: Operating Systems, Programming and Application Software.
4. Databases and Information Systems Networks.
5. File Processing Versus Database Management Systems.
6. Data Communication and Networks.
7. Physical Transmission Media & Wireless Transmission Media.
8. Applications of smart phone and usage.
9. The Internet, Browsers and Search Engines.
10. Websites and their types.
11. Email Collaborative Computing and Social Networking.
12. E-Commerce.
13. IT Security and other issues.
14. Cyber Laws and Ethics of using Social media.
15. Use of Microsoft Office tools (Word, Power Point, Excel) or other similar tools depending on the operating system.
16. Other IT tools/software specific to field of study of the students if any.

Recommended Texts:

1. Discovering Computers 2022: Digital Technology, Data and Devices by Misty E. Vermaat, Susan L. sebok; 17th edition.

Suggested Readings:

1. Computing Essentials 2021 by Timothy J. O'Leary and Linda I. O'Leary, McGraw Hill Higher Education; 26th edition.
2. Computers: Understanding Technology by Fuller, Floyd; Larson, Brian: edition 2018.

Course Code	ZOOL-5102	Course Title	Animal Form and Function-I (*A Comparative Perspective*)	Credit Hours	3(2-1)

Course Brief:

This course teaches about animal diversity adapted strategically for performance of their similar functions through modifications in body parts in past and present times. It imparts understanding of diverse structural adaptations in each of the functions of integumentary, skeletal, muscular, nervous, sensory, endocrine, circulatory and respiratory systems for effective survival in their specific conditions.

Course Learning Objectives:

The course mainly aims to teach the students about animal diversity adapted in different ways for their functions through modifications in body parts, about the diversity in integumentary, skeletal, muscular, nervous and sensory, endocrine, circulatory, respiratory, nutritive, excretory, osmoregulatory and reproductive systems according to strategies to survive in their specific conditions. It will also introduce about organ systems, their specialization and coordination with each other and constantly changing internal and external environment, inside and outside the animal's body along with the basic structure of each system that determines its particular function of animal body.

Course Contents:

1. Protection, support, and movement: protection: the integumentary system of invertebrates and vertebrates; movement and support: the skeletal system of invertebrates and vertebrates; movement: non-muscular movement; an introduction to animal muscles; the muscular system of invertebrates and vertebrates
2. Communication I: nerves: neurons: structure and function.
3. Communication II: senses: sensory reception: baroreceptors, chemoreceptors, georeceptors, hygroreceptors, phonoreceptors, photoreceptors, proprioceptors, tactile receptors, and thermoreceptorsof invertebrates lateral line system and electrical sensing, lateral-line system and mechanoreception, hearing and equilibrium in air and water, skin sensors of mechanical stimuli, sonar, smell, taste and vision in vertebrates.
4. Communication III: The Endocrine System and Chemical Messengers: Chemical messengers: hormones chemistry; and their feedback systems; mechanisms of hormoneaction, Hormones with principal function each of porifera, cnidarians, platyhelminthes, nemerteans, nematodes, molluscs, annelids, arthropods, and echinoderms invertebrates; an overview of the vertebrate endocrine system; endocrine systems of vertebrates, endocrine systems of birds and mammals
5. Circulation and immunity: internal transport and circulatory systems in invertebrate's characteristics of invertebrate coelomic fluid, hemolymph, and blood cells, transport systems in vertebrates; characteristics of vertebrate blood, blood cells and vessels; the hearts and circulatory systems of bony fishes, amphibians, reptiles, birds and mammals; the human heart: blood pressure and the lymphatic system; immunity: nonspecific defenses, the immune response.

Practical

1. Study of insect chitin, fish scale, amphibian skin, reptilian scales, feathers and mammalianskin. 2.Study and notes of skeleton of Labeo (*Labeorohita)*, Frog (*Hoplobatrachustigerinus*), Varanus (*Varanusbengalensis)*, fowl *(Gallus domesticus)* andrabbit (*Oryctolaguscuniculus)*.

Note: Exercises of notes on the adaptations of skeletons to their function must bedone.

3. Earthworm or leech; cockroach, freshwater mussel, Channa or *Catla catla* or Labeo or any other local fish, frog, pigeon and rat or mouse and rabbit's dissections as per availability.
4. Study of heart, principal arteries and veins in a representative vertebrate (dissection of representative fish/mammals

Recommended Texts:

1. Miller, A. S., & Harley, J. P. (2016 & 2019). *Zoology (*10th & 11TH ed). Singapore: McGraw Hill
2. Hickman, C. P., Roberts, L. S., Keen, S. L., Larson, A., I'Anson, H & Eisenhour., D. J. (2009). *Integrated*

*principles of zoology (*11 ed.). Singapore: McGrawHill.

Suggested Readings:

1. Hickman, C., Jr., Keen, S., Eisenhour, D., Larson, A., I'Anson, H., (2019). *Integrated principles of zoology* (18 ed.). Singapore: McGraw-Hill.
2. Pechenik, J. A. (2015). *Biology of invertebrates* (7th ed.). Singapore: McGraw-Hill
3. Kent, G. C., & Miller, S. (2001). *Comparative anatomy of vertebrates*. New York: McGraw-Hill.

SEMESTER II

Course Code	ZOOL-5103	Course Title	Cell Biology	Credit Hours	3(2-1)

Course Brief:

The course aims to impart knowledge about the animal cell and its complex organization and architecture. It enables students to understand various ultra-structural, molecular and functional aspects of the cells. Students will be able to describe and discuss the properties and biological significance of the major classes of molecules found in living organisms and the relationship between molecular structure and biological function, can relate how cell movement and cell-cell communication occur and discuss mechanisms of signal transduction and the lab work will provide platform to became familiar with various cell types through techniques of slide preparation.

Course Learning Objectives:

Understanding of microscopy to study cell structure and cellular compartmentalization will be provided to learners. Main emphasis of course is to develop familiarity with structure and function of cells at the molecular level, including the flow of information from genes to proteins, and regulation of cellular processes, signaling and proliferation in eukaryotic cells.

Course Contents:

1. Introduction to prokaryotic and eukaryotic cells: plasma membrane, its chemical composition structure and functions of plasma membranes, cell permeability, active transport, endocytosis, phagocytosis.
2. Cytoskeleton: microfilaments, microtubules, intermediate filaments.
3. Cytoplasmic Organelles: Membrane system, structural and functional commonalities.
4. Ultrastructure, chemical composition and functions of endoplasmic reticulum and their role in protein synthesis and drug metabolism, golgi apparatus its role in synthesis of glycoprotein,
5. Mitochondrial respiration and its significance as semi- autonomous organelle;
6. Lysosome, its diverse roles due to hydrolytic activity of enzymes, Peroxisome, its role in metabolism of hydrogen peroxide, glycoxysome with reference to glyoxylic acid cycle.
7. Nucleus: chromatin, heterochromatin, euchromatin, chromosome structure, coiling and nucleosome during different phases of cell cycle.

Practical

1. Preparation of whole mount.
2. Preparation of human blood smear and identification of Leucocytes.
3. Tissues (permanent slides of epithelial tissues, striated muscle, smooth muscle, cartilage, bone).
4. Squash preparation of onion root tip for mitotic stages
5. Mounting of polytene chromosome (Drosophila/Chironomous.) Demonstration.
6. Cultural and staining of bacteria.

Recommended Texts:

1. Cooper, G. M., & Adams, K. (2022). *The cell: A molecular approach* (9th ed.). Massachusetts: Sinauer Associates.
2. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., Martin, K. C., Yiffe, M., &Amon, A. (2021). *Molecular cell biology* (9th ed.). New York: W. H. Freeman.
3. Karp, G., Iwasa, J., & Marshall, W. (2020). *Karp's cell and molecular biology: concepts and experiments* (9th ed.). New Jersey: John Wiley and Sons.

Suggested Readings:

1. De-Robertis, E. D. (2014). *Cell and molecular biology* (8th ed.). New York: Lea & Febiger.
2. Alberts, B., Hopkin, H., Johnson, A., Morgan, D., Walter, P., & Heald, R. (2023). *Essential cell Biology* (6th ed.). New York: W. W. Norton & Company.
3. Hofmann, A., & Clokie, S. (2018). *Wilson and Walker's principles and techniques of Biochemistry and molecular biology* (8th ed.). Cambridge: Cambridge University Press.

Course Code	BOTN-5104	Course Title	Biodiversity & Conservation	Credit Hours	3(3-0)

Course Brief:

The depletion of biodiversity is driven by habitat loss, resource overexploitation, climate change, diseases, pollution, and poaching. To address this, governments and organizations emphasize biodiversity conservation, recognizing that humans benefit from biodiversity and must preserve it for future generations. Conservation efforts focus on protection, enhancement, and scientific management of biodiversity to maintain ecological processes and life support systems. The goal is to sustain species variety and ensure ecosystems are used sustainably for both current and future populations.

Course Learning Objectives:

The Biodiversity and Conservation course explores biodiversity definitions, types, and threats like deforestation and pollution. It covers measuring biodiversity through alpha, beta, and gamma diversity, and examines conservation strategies, including in situ and ex situ methods. Students will study biodiversity hotspots, international treaties, and the role of herbariums and botanical gardens. The course also addresses sustainable resource use, ecological services and the Global Biodiversity Information Facility (GBIF).

Course Contents:

1.Basic concepts • Introduction to biodiversity and its tangible and intangible value • Biodiversity hotspots (tropical and coral reef ecosystems) • Introduction and levels of biodiversity (Alpha, Beta and Gamma) • Biodiversity distribution, importance and Reduction. • Major and Current threats to biodiversity • Inventorying and monitoring of Biodiversity: baseline data (study) • Policies and legislation related to biodiversity loss and conservation • Different types of protected areas for biodiversity conservation • Understanding opportunities and challenges of biodiversity conservation

2. Cause and depletion of biodiversity • Concept of habitat and niche • Habitat loss • Habitat fragmentation • Concept of speciation • Loss of existing species • Origin of new species

3. Species inventory and its utilization • Baseline data of biodiversity • Use of species inventory in EIA (Environmental Impact Assessment) • Preparing species inventory at first level • Monitoring of biodiversity • Red data books and lists

4. Species extinction • How do species become endangered? • How species become threatened? • Criteria for recognizing different categories of threatened species • IUCN threatened species categories • Concept of extinct and extant species • Extinction of species • Theory of mass extinction

5. Species invasion and its impacts on local biodiversity • Concept of invasive, alien and native species • Species invasion and its major types • Intensively invasive species and its out-competing potential for native species • Concept of direct and indirection competition of local resources

6. Biodiversity conservation • Introduction to conservation, its history, guiding principles, and characteristics • In situ conservation – conservation at species and population level • Ex situ conservation – conservation in man-made ecosystems, croplands, cities. • Reconfirmation assays of existing biodiversity • Museums, arboretums, herbarium, zoos • Natural parks, sanctuaries, and biosphere reserves • Gene bank management and operation

7. Biodiversity conservation – role of masses • Public awareness strategies • Population explosion role of herbaria and botanical gardens in conservation • Legal protection of species and habitats • National and international laws and agreements for species and habitat Protection

8. National conservation strategy of Pakistan • Major prioritized sites for conservation • Priorities in conservation and conservation planning (case studies & exercises) • National Conservation Strategy of Pakistan • Major protected areas and national parks of Pakistan

Recommended Texts:

1.Baldauf, C. (2020). Participatory Biodiversity Conservation: Concepts, Experiences and Perspectives. Springer Publishers. ISBN: 978-3-030-41686-7.

2. Dar, G.H., Khuroo, A.A. (2020). Biodiversity of the Himalaya: Jammu and Kashmir State. Springer Publishers. ISBN 978-981-329-174-4.

Suggested Readings:

1.Holl, K.D. (2020). Primer of Ecological Restoration. Island Press. ISBN: 9781610919722.
2. Prach, K., Walker, L.R. (2020). Comparative Plant Succession among Terrestrial Biomes of the World. Cambridge University Press. ISBN: 9781108561167.
3. Wang, Y. Terrestrial Ecosystems and Biodiversity (2nd Ed.). CRC Press – Taylor & Francis Group. ISBN: 9781138333918

Course Code	ZOOL-5104	Course Title	Diversity of Chordates	Credit Hours	3(2-1)

Course Brief:

This course will enable students to understand the taxonomic characteristics of protochordates andchordates. It provides knowledge about the phylogenetic relationships of protochodates and various classes ofchordates. Students will understand the phylogenetic relations, physiological adaptations, behavior and diversity of Pisces, amphibians, reptiles andmammals and able to analyze the process of micro evolution within chordates. After this course the students will understand what the chordates are, can recognize different categories of chordates, understands the level of organization in chordate subphylum, can comprehend the general characters of chordates and know about the origin and evolutionary relationship in different subphylum of chordates.

Course Learning Objectives:

Upon successful completion of this subject students will be able to describe unique characters of urochordates, cephalochordates and fishes, can recognize difference in life functions of urochordates and fishes, will understand the ecological role of different groups of chordates and understand the diversity of chordates. Identification of the morphological and anatomical structure for the major groups of vertebrates from an evolutionary point of view will be discussed.

Course Contents:

1. Protochordates: classification of protochordates. Structure, anatomy and organ systems of acorn worms, urochodates and cephalochodates, reproduction; life histories and metamorphosis of protochodates. phylogenetic relationships.
2. Fishes: vertebrate success in water. Phylogenetic relationships of Pisces.Classification of Chondrichthyes, Osteichthyes, Dipnoiand Holocephalli. Locomotor adaptations, nutrition and the digestive system, circulation, gas exchange, nervous and sensory functions, excretion and osmoregulation, reproduction and development of Chondrichthyes (Scoliodon) and Osteichthyes (*Cyprinuscarpio*and*Wallagoattu*).
3. Amphibians: The first terrestrial vertebrates. Characteristics of amphibian's Phylogenetic relationships. Classification of amphibians and characteristics of order Caudata, Gymnophiona, and Anura. Structure and locomotor adaptations, nutrition and the digestive system, circulation, gas exchange, temperature regulation, nervous and sensory functions, excretion and Osmoregulation, reproduction, development, and metamorphosis of caudate, anura and Gymnophiona.
4. Reptiles: The First Amniotes and cladistic interpretation of the amniotic lineage. General characteristics of reptiles. Characteristics of Order Testudines or Chelonia, Rhynchocephalia, Squamata, and Crocodilia. Adaptations in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, and temperature regulation, nervous and sensory functions, excretion and osmoregulation, reproduction and development of chelonia, squamata, Rhynchocephalia and crocodilian. Further phylogenetic considerations
5. Birds: Classification, feathers, flight and endothermy. Phylogenetic relationships; ancient birds and the evolution of flight. Diversity of modern birds. Adaptation in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, and regulation, nervous and sensory systems, excretion and osmoregulation, reproduction and development. Migration and navigation.
6. Mammals: Classification, Specialized teeth, endothermy, hair and viviparity. Diversity of mammals. Adaptations in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, and temperature regulation, nervous and sensory functions, excretion and osmoregulation, behavior, reproduction and development.

Practical

1. Classification and study of lab specimens of hemichordates, fishes, amphibians, reptiles, birds and mammals.

2. Visit to PMNH for the study of diversity of chordates.

Recommended Texts:

1. Miller, A. S., & Harley, J. P. (2016 & 2019). *Zoology (*10 & 11 ed.). Singapore: McGraw Hill.
2. Hickman, C. P., Roberts, L. S., Keen, S. L., Larson, A., I'Anson, H & Eisenhour., D. J. (2009). *Integrated principles of zoology* (14 ed.). Singapore: McGraw-Hill.
3. Hickman, C., Jr., Keen, S., Eisenhour, D., Larson, A. & I'Anson, H., (2019). *Integrated principles of zoology* (18 ed.). Singapore: McGraw-Hill.

Suggested Readings:

1. Hickman, C. P., Roberts, L. S., & Larson, A. (2018). *Integrated principles of zoology* (15 ed.). Singapore: McGraw-Hill.

2. Hickman, C., Jr., Keen, S., Eisenhour, D., Larson, A. & I'Anson, H., (2019). *Integrated principles of* th *zoology* (18ed.). Singapore: McGraw-Hill.

3. Peckenik, J. A. (2015). Biology of Invertebrates. 7 Ed Singapore: McGraw-Hill.

Course Code	URCG-5112	Course Title	Fables, Wisdom and EPICS	Credit Hours	2(2-0)

Course Brief:

The course will enable students to explore human experiences, cultivate an appreciation of the past, enrich their capacity to participate in the life of their times, and enable an engagement with other cultures and civilizations, both ancient and modern. But independently of any specific application, the study of these subjects teaches understanding and delight in the highest achievements of humanity. The three components of the course, including fables, wisdom literature and epic, will enable the learners to explore and understand the classic tradition in literature.

Course Learning Objectives:

Development of personal virtue, a deep Sufi ethic and an unwavering concern for the permanent over the fleeting and the ephemeral are some of the key themes explored in the contents that will develop an intimate connection between literature and life.

Course Contents:

1. Fables
    - The Fables of Bidpai
    - The Lion and the Bull
    - The Ring-dove
        - The Owls and the Crows
    - Selected poem from Bang-i-Dara
2. Gulistan-e- Sa'di
    - Ten ḥikāyāt from John T. Platts, *The Gulistan*
3. Epic
    - THE SHĀHNĀMA OF FIRDAUSI

Recommended Texts:

1. Chishti, Y.S. (1991). Sharaḥ-i bāng-i darā. Lāhaur: Maktaba-i ta'mīr-i insāniyat
2. John T. P. (1876). *The Gulistan; or, Rose Garden of Shaikh Muslihu'd- Dīn Sa'dī of Shīrāz*. London: Wm. II. Allen.

Suggested Readings:

1. Thackston, W. (2000). A Millennium of Classical Persian Poetry. Maryland: Ibex Publishers.
2. Wood, R. (2013). Kalila and Dimna: Fables of Conflict and Intrigue. United

Course Code	URCG-5116	Course Title	Science of Society-I	Credit Hours	2 (2-0)

Course Brief:

This course will introduce students with the subject matter of social science, its scope, nature and ways of looking at social phenomenon. It will make the participants acquaintance with the foundations of modern society, state, law, knowledge and selfhood. While retaining a focus on Pakistani state and society, students will encounter theoretical concepts and methods from numerous social science disciplines, including sociology, politics, economics anthropology and psychology and make them learn to think theoretically by drawing on examples and case studies from our own social context. Students will be introduced to the works of prominent social theorists from both western and non-western contexts. Instruction will include the use of written texts, audio-visual aids and field visits.

Course Learning Objectives:

The course has following outcomes: It will

- Introduce student with the nature of human social behavior and foundations of human group life
- Analyze the reciprocal relationship between individuals and society.
- Make student aware with the nature of societies existing in modern world
- Make students familiar with the philosophy of knowledge of social sciences
- Introduce students with the works of prominent theories explain human group behavior
- Help students to understand the foundations of society including culture, socialization, politics and economy
- Introduce students with various dimensions of social inequalities with reference to gender, race, ethnicity and religion
- Make them aware about the understanding of various themes pertains to social science in local context
- Help them recognize the difference between objective identification of empirical facts, and subjective formulation of opinionated arguments

Course Contents:

1. **Introduction to Social Sciences**
   - Social world, Human Social behavior, Foundations of society
   - Evolution of Social sciences
   - Philosophy of Science
   - Scope and nature of social sciences
   - Modernity and social sciences
   - Branches of social science: Sociology, Anthropology, Political Science, Economics

Society and Community, Historical evolution of Society

   - Types of Societies
   - Foraging society, Horticultural society, Pastoralist society
   - Agrarian societies, Industrial society, Postindustrial society

2. **Philosophy of Knowledge in social Science and social inquiry**
   - Understanding social phenomenon
   - Alternative ways of knowing
   - Science as a source to explore social reality
   - Objectivity, Value-Free research
   - Positivism vs Interpretivism
   - Qualitative vs Quantitative

3. **Culture and Society**

- Idea of Culture, Assumptions of Culture
- Types, Components, Civilization and culture
- Individual and culture. Cultural Ethnocentrism, Cultural Relativism
- Outlook of Pakistani culture
- Global Flows of culture, Homogeneity, Heterogeneity

4. **Social Stratification and Social inequality**
   - Dimensions of inequality, Social class
   - Gender, Race, Religion, Ethnicity, Caste
   - Patterns of social stratification in Pakistan
   - Class, caste system in agrarian society
   - Ascription vs Achievement, Meritocracy
   - Global stratification in modern world, Global patterns of inequality
5. **Personality, Self and Socialization**
   - Concept of self, Personality
   - Nature vs Nurture, Biological vs Social
   - Development of Personality
   - Socialization as a process, Agents of socialization
   - Socialization and self/group identity
6. **Gender and Power**
   - Understanding Gender
   - Social construction of Patriarchy
   - Feminism in Historical context, Gender Debates
   - Gender and Development
   - Gender issues in Pakistani society, Women Participation in politics, economy and education
   - Toward a gender sensitive society, Gender mainstreaming

Pakistan: State, Society, Economy and Polity

- Colonialism, colonial legacy, National identity
- Transformation in Pakistani society: Traditionalism vs Modernism
- Economy, Informality of Economy, Modern economy and Pakistan
- Political Economy, Sociology of Economy

Recommended Texts:

1. Giddens, A. (2018). Sociology (11th ed.). UK: Polity Press.
2. Henslin, J. M. (2018). Essentials of Sociology: A Down-to-Earth Approach. (18th Edition) Pearson Publisher.
3. Macionis, J. J. (2016). Sociology (16th ed.). New Jersey: Prentice-Hall.
4. Qadeer, M. (2006) Pakistan - Social and Cultural Transformation in a Muslim Nation.
5. Smelser, N.J. and Swedburg, R., The Handbook of Economic Sociology, Chapter 1 'Introducing Economic Sociology', Princeton University Press, Princeton.

Suggested Readings:

1. Systems of Stratification | Boundless Sociology (no date). Available at: https://courses.lumenlearning.com/boundless-sociology/chapter/systems-of-stratification/
2. Jalal, A. (ed.) (1995) 'The colonial legacy in India and Pakistan', in Democracy and Authoritarianism in South Asia: A Comparative and Historical Perspective. Cambridge: Cambridge University Press (Contemporary South Asia)
3. Zaidi, S. A. (2015) Issues in Pakistan's Economy: A Political Economy Perspective. Oxford University Press. Chapter 26
4. Akhtar, A. S. (2017) The Politics of Common Sense: State, Society and Culture in Pakistan. Cambridge: Cambridge University Press.
5. Smelser, N.J. and Swedburg, R., The Handbook of Economic Sociology, Chapter 1 'Introducing Economic Sociology', Princeton University Press, Princeton.

General Education Cluster: Quantitative Reasoning

URCG-5120 **Exploring Quantitative Skills** 3(3-0)

This is an introductory-level undergraduate course that focuses on the fundamentals related to the quantitative concepts and analysis. The course is designed to familiarize students with the basic concepts of mathematics and statistics and to develop students' abilities to analyze and interpret quantitative information. Through a combination of theoretical concepts and practical exercises, this course will also enable students cultivate their quantitative literacy and problem solving skills while effectively expanding their academic horizon and breadth of knowledge of their specific major / field of study.

Course Learning Outcomes

By the end of this course, students shall have:

1. Fundamental numerical literacy to enable them work with numbers, understand their meaning and present data accurately;
2. Understanding of fundamental mathematical and statistical concepts;
3. Basic ability to interpret data presented in various formats including but not limited to tables, graphs, charts, and equations etc.

Contents

1. Numerical Literacy:
    i. Numbers system and basic arithmetic operations;
    ii. Units and their conversions, dimensions, area, perimeter and volume;
    iii. Rates, ratios, proportions and percentages;
    iv. Types and sources of data;
    v. Measurement scales;
    vi. Tabular and graphical presentation of data;
    vii. Quantitative reasoning exercises using number knowledge.
2. Fundamental mathematical concepts:
    i. Basics of geometry (lines, angles, circles, polygons etc.);
    ii. Sets and their operations;
    iii. Relations, functions, and their graphs;
    iv. Exponents, factoring and simplifying algebraic expressions;
    v. Algebraic and graphical solutions of linear and quadratic equations and inequalities;
    vi. Quantitative reasoning exercises using fundamental mathematical concepts.
3. Fundamental Statistical Concepts:
    i. Population and sample;
    ii. Measures of central tendency, dispersion and data interpretation;
    iii. Rules of counting (multiplicative, permutation and combination);
    iv. Basic probability theory;
    v. Introduction to random variables and their probability distributions;
    vi. Quantitative reasoning exercises using fundamental statistical concepts.

Recommended Texts

1. Sevilla, A., & Somers, K. (2012). *Quantitative reasoning: tools for today's informed citizen*. New Jersey, John Wiley & Sons.
2. Burzynski, D., & Ellis, W. (2008). *Fundamentals of mathematics*. USA, Saunders College Publishing.

Suggested Readings

1. Zaslow, E. (2020). *Quantitative reasoning: thinking in numbers*. Cambridge, Cambridge University Press.
2. de Mesquita, E. B., & Fowler, A. (2021). *Thinking clearly with data: A guide to quantitative reasoning and analysis*. New Jersey, Princeton University Press.
3. Bennett, J., & Briggs, W. (2019). *Using & understanding mathematics: a quantitative reasoning approach*. Pearson.
4. Rosen, K. H., & Krithivasan, K. (2012). *Discrete mathematics and its applications* (Vol 6). New York: McGraw-Hill.
5. Chatfield, C. (2018). *Statistics for technology: a course in applied statistics*. Routledge.
6. Lock, R. H., Lock, P. F., Morgan, K. L., Lock, E. F., & Lock, D. F. (2020). *Statistics: Unlocking the power of data*. New Jersey, John Wiley & Sons.

Seerat of the Holy Prophet مطالعہ سیرت النبی صلی اللہ علیہ وسلم

Course Code URCG-5127

Title	Description
Semester	
Nature of Course	
No. of C.Hrs.	1(1-0)
Total Teaching weeks	18
Objectives of the Course	۱۔ طلباء کو مطالعہ سیرت طیبہ کی ضرورت و اہمیت سے آگاہ کرنا ۲۔ تعمیر شخصیت میں مطالعہ سیرت طیبہ کے کردار کو واضح کرنا ۳۔ بعثت نبوی کے موقع پر اقوام عالم کی عمومی صورت حال سے آگاہ کرنا ۴۔ رسول اکرم صلی اللہ علیہ وسلم کی مکی اور مدنی زندگی کا اس طرح مطالعہ کروانا کہ طلباء ان واقعات سے نتائج کا استنباط کر سکیں ۵۔ طلباء کو عہد نبوی کی معاشرت، سیاست، معیشت سے آگاہ کرنا

Course Description

S.No.	Title	Description
1	حضور صلی اللہ علیہ وسلم کے ابتدائی حالات زندگی	۱۔ حضور صلی اللہ علیہ وسلم کا خاندانی حسب و نسب ۲۔ پیدائش اور ابتدائی تربیت ۳۔ لڑکپن اور جوانی کے حالات زندگی
2	بعثت نبوی کے وقت دنیا کے حالات (I)	۱۔ بعثت نبوی کے وقت اہم تہذیبیں ۲۔ عرب، مصر، حبشہ، بازنطینی، ساسانی
3	بعثت نبوی	۱۔ مکی عہد میں دعوت اسلام
4	بعثت نبوی	۱۔ مدنی عہد میں دعوت اسلام
5	خصائص النبیؐ	آپ بطور پیغامبر امن
6	خصائص النبیؐ	بحیثیت استاد و معلم
7	خصائص النبیؐ	بحیثیت تاجر
8	خصائص النبیؐ	بحیثیت سربراہ ریاست
9	خصائص النبیؐ	ذاتی محاسن اور عالمگیر اثرات

ناموس رسالت	خصائص النبی	10
غیر مسلموں سے تعلقات	اسوہ حسنہ اور عصر حاضر	11
اسوہ حسنہ کی روشنی میں گھریلو زندگی	اسوہ حسنہ اور عصر حاضر	12
مستشرقین اور مطالعہ سیرت	اسوہ حسنہ اور عصر حاضر	13
وطن سے محبت اور سیرت	اسوہ حسنہ اور عصر حاضر	15
مستشرقین کے اعتراضات اور ان کے جوابات	اسوہ حسنہ اور عصر حاضر	16

نصابی کتب

نمبر شمار	نام مؤلف	نام کتاب
1	ابن ہشام	السیرۃ النبویۃ
2	مولانا شبلی نعمانی، سید سلمان ندوی	سیرۃ النبی صلی اللہ علیہ وسلم
3	قاضی محمد سلیمان سلمان منصور پوری	رحمۃ للعالمین
4	مولانا سید ابوالحسن علی ندوی	نبی رحمت صلی اللہ علیہ وسلم
5	ڈاکٹر یٰسین مظہر صدیقی	عہد نبوی کا نظام حکومت
6	ڈاکٹر خالد علوی	اسلوب کامل

حوالہ جاتی کتب

نمبر شمار	نام مؤلف	نام کتاب
1	سید ابوالاعلیٰ مودودی	سیرت سرور عالم صلی اللہ علیہ وسلم
2	مولانا صفی الرحمن مبارکپوری	الرحیق المختوم
3	پیر محمد کرم شاہ الازہری	ضیاء النبی صلی اللہ علیہ وسلم
4	ڈاکٹر اکرم الضیاء العمری	السیرۃ النبویۃ الصحیحۃ
5	مولانا عبدالرؤف دانا پوری	اصح السیر

Course Code	URCG-5128	Course Title	Pakistan Studies	Credit Hours	2(2-0)

Course Brief:

The course is designed to provide students with comprehensive exploration of Pakistan's identity, spanning geographica historical, and cultural dimensions. It delves into the diverse landscapes, ancient civilizations, and rich cultural heritage th define Pakistan. Moreover, it examines the socio-cultural and political transformations in Pakistan over time includin democratic transitions and military interventions. The aim of this course is to inculcate in students a nuanced understandin of Pakistan's past, present, and potential future trajectories, enabling them to critically evaluate the complex dynamic shaping the nation's development.

COURSE LEARNING OUTCOMES

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

1. Have enhanced knowledge of the geographical, historical, and political aspects of Pakistan.
2. Understand the society and culture of Pakistan.
3. Understand and explain the socio-economic developments in Pakistan.
4. Explore contemporary issues and challenges faced by Pakistan and their implications for the future.

SYLLABUS

1. **Introduction to Pakistan:**
   - Geographical location and significance.
   - Historical background: Ancient civilizations in the region.
   - Factors leading to the creation of Pakistan.
2. **Political History of Pakistan**:
   - Formative phase.
   - Military interventions and democratic transitions.
3. **Geography of Pakistan:**
   - Physiography: Mountains, plains, plateaus, deserts, valleys and coastal areas.
   - River systems: Indus River and its tributaries.
   - Climatic regions of Pakistan.
4. **Society and Culture of Pakistan**:
   - Socio-cultural diversity.
   - Languages and literature of Pakistan.
5. **Economic Development of Pakistan**:
   - Agriculture and industrial sectors of Pakistan. Economic challenges of Pakistan.
6. **Contemporary Issues:**
   - Foreign relations of Pakistan.
   - Security challenges: terrorism, extremism, and regional conflicts. Environmental problems and sustainable development (SDGs).
   - Media and social change.

SUGGESTED INSTRUCTIONAL / READING MATERIALS

1. "Jinnah of Pakistan" by Stanley Wolpert
2. "The Sole Spokesman: Jinnah, the Muslim League, and the Demand for Pakistan" by Ayesha Jalal
3. "The struggle for Pakistan" by Ishtiaq Husain Qureshi
4. "Pakistan, the Formative Phase, 1857-1948" by Khalid B. Sayeed
5. "Pakistan Studies: A Book of Readings" by Sikandar Hayat
6. "Constitutional and Political History of Pakistan" by Hamid Khan
7. "Trek to Pakistan" by Ahmad Saeed and Kh. Mansur Sarwar
8. "Pakistan: A Modern History" by Ian Talbot
9. "Politics in Pakistan: The Nature and Direction of Change" by Khalid B. Sayeed
10. "Physical Geography of Pakistan" by Umar Jahangir
11. "A Geography of Pakistan: Environment, People, and Economy" by Fazle Karim Khan
12. "Pakistan's Foreign Policy: An Historical Analysis" by S. M. Burke
13. "Separatism in East Pakistan" by Rizwan Ullah Kokab
14. "Being Pakistani: Society, Culture and the Arts" by Raza Rumi
15. "Pakistan's Cultural Heritage: Socio-Economic and Technological Aspects" edited by Abdul Jabbar Khan
16. "Language and Politics in Pakistan" by Tariq Rahman
17. "Sociology" by Horton and Hunt
18. "Pakistan in the Twentieth Century: A Political History" by Lawrence Ziring
19. "Economic Development of Pakistan" by Ishrat Husain
20. "Issues in Pakistan's Economy" by S. Zaidi

SEMESTER III

Course Code	ZOOL-5105	Course Title	Animal Ecology	Credit Hours	3(2-1)

Course Brief:

This course will enable students to understand about habitat, ecology, ecosystems and environmental threats. Students will learn about the rehabilitation of destroyed ecosystems. They will also be capable to learn methods to protect and safe environment. The students will be literate about the biogeochemical cycles, applied ecology, population ecology, community ecology and global ecosystems. Upon successful completion of the course students will develop an appreciation of the modern scope of scientific inquiry in the field of Ecology, become familiar with the variety of ways that organisms interact with both the physical and the biological environment and develop an understanding of the differences in the structure and function of different types of ecosystems.

Course Learning Objectives:

Moreover, this subject imparts knowledge to compare the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. The students will also able to explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.

Course Contents:

1. Energy: Basic concepts of and types of ecology, laws of thermodynamics, primary and secondary productions, trophic levels and energy variation with increasing trophic levels, energy flow, food chains and food webs.
2. Biogeochemical cycle: nitrogen, phosphorus, sulphur, water, carbon and nutrient.
3. Limiting factors: basic concepts, temperature, soil, water, humidity, light and fire.
4. Global ecosystems: atmosphere, hydrosphere, lithosphere and ecosphere, an overview of ecosystem with special reference to ecological niche, basic concepts and types, major ecosystem of world, forest, grassland, desert, tundra and agricultural ecosystems. marine, estuarine, freshwater and wetlands
5. Population ecology: basic population characters, growth and growth curves, population dynamics and regulations.
6. Community ecology: basic concepts, community analysis, ecotones, inter-population interactions
7. Applied Ecology: Resources and their ecological management; mineral, agricultural desalination, weather modification, forest and range management, landscape and land use
8. Pollution: definition, types, water, air, land and noise, sources and management.
9. Radiation ecology: global environmental changes (ozone depletion, acid rain, greenhouse effect and global warming, koyota protocol, radioactivity leakage, environmental laws).
10. Exotic and Invasive Species: desertification, deforestation, exotic and invasive species

Practical

1. Population Sampling Techniques (quadrate, line transact, point count, focal scan and capture and recapture method).
2. Study of different Ecosystems (fresh water, terrestrial, marine/mountain/ desert).
3. Ecological notes.
4. Measurements of physical factors of different ecosystems.
5. Adaptive features of animals in relation to food and environment.
6. Food chain studies through analysis of gut contents.

7. Analysis of polluted and fresh water for biotic and abiotic variations.
8. Field visits for study of selected terrestrial habitat and writing notes.
9. Experimental design and approaches in ecological research; writing a research project
10. Development of an ecological management plan of some selected area

Recommended Texts:

1. Molles, M. C. (2005). *Ecology: concepts and applications* (6th ed.). New York: McGraw Hill.
2. Cox, C. B., & Morre, D. (2000). *Biogeography: an ecological and evolutionary approach* (6th ed.). London: Life Sciences King's College.
3. Morrison, M.L., Brennan, L.A., Marcot, B.G., Block, W.M., & McKelvey, K.S. (2020). *Foundations for advancing animal ecology (wildlife management and conservation). Maryland:* John Hopkins University Press.

Suggested Readings:

2. Dondson, S. I., Allen, T. F. N., Carpenter, S. R., Ives, A., Jeanne, R. L., Kitchell, J. F., Langston, N. E., & Turner, M. G. (1998). *Ecology*. Oxford: Oxford Univ. Press.
3. Chapman, J. L., & Reiss, M. J. (1997). *Ecology: principles and applications*. Cambridge:
4. Cambridge University Press.
5. Odum, E. P. (2005). *Fundamentals of ecology* (5th ed.) Philadelphia: W.B. Saunders

Course Code	ZOOL-5106	Course Title	Animal Behavior	Credit Hours	3(3-0)

Course Brief:

This course will give the baseline information about animal behavior and associate the likely role of external and internal stimuli on various animals during the day, season and year. It also relates daily behavioral rhythms in diurnal and nocturnal periodicities and predicts and anticipates variety of animal actions (costs and benefits) as assessed by innate and learned behavioral displays. The unifying theme of this course will be evolution by means of natural and sexual selection

Course Learning Objectives:

It includes the scientific study of the mechanistic and evolutionary causes of animal behavior, including communication, foraging and anti- predator behavior, spatial behavior, mating behavior, parental care, and social behaviors. After successful completion of this course, students should be capable of understand and identify behaviors in a variety of taxa, can competently discuss the evolutionary origins of various behaviors and can design and implementing experiments to test hypotheses relating to animal behavior.

Course Contents:

1. Introduction: behavior and its types, proximate and ultimate causes of behavior.
2. Development of behavior: Impact of neural and physiological mechanisms; role of external and internal stimuli and animal responses, physiology of behavior in changed environments.
3. Hormones and behavior in animals. Innate behavior and innate releasing mechanisms; built in programmed performance by offspring to that of parents. Innate behavior of three spines stickle back fish. Learned behavior and its mechanisms: quick learners' vs. slow learners.
4. Concept of animal cognition: key to understand and develop multiple behavioral choices, Ecological and genetics to maintain animal behavior, concept of territoriality and defense in animals.
5. Circadian rhythms and concept of bio-rhythmicity in animals.
6. Maintenance of internal biological clock to perform various diurnal and nocturnal periodicities.
7. Costs and benefit ratios in behavior; successful foragers and winners of predator-prey relationships. Altruism and parental sacrifice to nurture the young.
8. Competition for resources; survival of the most suitable individuals; evolutionary arms races in behavior.
9. Social organization in animals and concept of group living; benefits and losses, Aggression, appeasement and selfish individuals. Social organization in insects and mammals.
10. Communication in animals: visual, bioacoustic, electrical, chemical and tactile.
11. Various types of chemical signals in animal's behavior and their importance in ecosystems.

Recommended Texts:

1. Dugatkin, L. A. (2020). *Principles of animal behavior* (4th ed.). University of Chicago Press.
2. Rubenstein, D. (2022). *Animal Behavior* (12th ed.) Oxford University Press

Suggested Readings:

1. Rubenstein, D., & Alcock, J. (2019). *Animal behavior, an evolutionary approach* (11th ed.). New York, Oxford, Oxford University Press.
2. Goodenough, J., McGuire, B., & Wallace, R.A. (2009). *Perspective on animal behavior*. New York: John Wiley & Sons.
3. Scott, G. (2009). *Essential Animal Behavior*. Wiley-Blackwell publishers

Course Code	AIDE-5205	Course Title	Applied Artificial Intelligence	Credit Hours	3(3-0)

Course Title: Applied Artificial Intelligence

Level: Undergraduate (Non-Computing Disciplines)
Credit Hours: 3 (2 theory + 1 lab/tutorial/project)
AIDE-5205

Introduction

Artificial Intelligence (AI) is rapidly transforming industries and reshaping the way people work, think, and make decisions. This course introduces non-computing students to the practical applications of AI in their respective fields. Without requiring prior programming knowledge, the course emphasizes conceptual understanding, societal impact, and hands-on exposure to user-friendly AI tools. It builds AI literacy for responsible use and critical thinking in AI-driven environments.

Course Objectives

This course aims to provide students with a foundational understanding of artificial intelligence and its transformative potential across various disciplines. Students will learn about real-world AI applications, ethical considerations, and how to leverage basic AI tools and techniques relevant to their domains. The course encourages interdisciplinary exploration and empowers students to become informed participants in AI-driven decision-making processes.

Learning Outcomes

Upon successful completion of the course, students will be able to:

- Explain the basic concepts and history of AI and distinguish it from related technologies.
- Identify and interpret AI applications relevant to their disciplines.
- Evaluate the ethical, social, and economic implications of AI systems.
- Use simple AI-based tools and platforms to solve discipline-specific problems.
- Propose AI-based enhancements or solutions to real-world scenarios related to their fields.

Course Syllabus (Week-wise Breakdown)

Weeks 1–2: Introduction to AI

- What is Artificial Intelligence?
- History, evolution, and key milestones
- Types of AI (Narrow, General, Super AI)
- AI vs. Machine Learning vs. Deep Learning

Weeks 3–4: Foundations of AI and Machine Learning

- Supervised, Unsupervised, and Reinforcement Learning
- Common algorithms (basic intuition only: regression, classification, clustering)
- Concept of training/testing data
- AI vs. data analytics: connections and differences

Weeks 5–6: AI Tools & Platforms (No Code or Low Code)

- Hands-on with tools like:
  - Google Teachable Machine
  - Microsoft Lobe
  - ChatGPT & other LLMs
  - Canva AI, Grammarly AI, etc.
- Data visualization and interpretation

Weeks 7–8: AI Ethics and Social Impacts

- AI bias and fairness
- Data privacy concerns
- Legal, moral, and social dimensions
- Case studies of AI misuse and responsible AI

Weeks 9–10: Natural Language Processing & Generative AI

- What is NLP? Where is it used?
- Introduction to ChatGPT, translation tools, and text summarizers
- Content generation: Images, text, videos (DALL·E, RunwayML, etc.)

Weeks 11–12: AI in Society & Interdisciplinary Projects

- How AI is transforming jobs and education
- AI and creativity: human-AI collaboration
- Interdisciplinary group projects: ideation & planning

Weeks 13–15: Discipline-Specific AI Applications

(Breakout sessions or tailored lectures per group)

Discipline-Specific Applications

Discipline	Sample Applications
Business & Economics	AI in customer insights, predictive analytics, fraud detection, marketing automation
Education	Intelligent tutoring systems, personalized learning platforms, automated grading
Engineering	Predictive maintenance, smart systems, optimization, AI in CAD and robotics
Health Sciences	Diagnostic tools, symptom checkers, AI in medical imaging, public health forecasting
Social Sciences & Humanities	AI in social media analysis, digital humanities, ethics, linguistics
Arts & Design	Generative art, AI-assisted design, music generation, creative writing tools
Psychology/Sociology	AI in behavioral prediction, sentiment analysis, social media Analytics
Agricultural Sciences	AI in weather prediction, yield estimation, disease detection

Recommended Books (Latest Editions & Recent Releases)

1. Ng, A. (2024). *AI for everyone*. San Francisco, CA: deeplearning.ai Press.A non-technical, accessible introduction to AI concepts and their implications in various domains.
2. Mitchell, M. (2023). *Artificial intelligence: A guide for thinking humans* (Updated ed.). New York, NY: Pinedor.
3. Offers a critical overview of AI's current capabilities and limitations, accessible for general audiences.
4. Shane, J. (2020). *You look like a thing and I love you: How AI works and why it's making the world a weirder place*. New York, NY: Voracious/Little, Brown and Company.A humorous yet insightful look at AI through real-world experiments and examples.
5. Smith, P. D. (2022). *Hands-on artificial intelligence for beginners: Build intelligent systems using Python and open-source tools*. Birmingham, UK: Packt Publishing.A beginner-friendly guide that introduces core AI techniques and applications using practical tools.
6. Buddington, P. (2023). *Editor of artificial intelligence and robotics* (2nd ed.). Cham, Switzerland: Springer.A comprehensive and interdisciplinary exploration of the ethical concerns in AI development and deployment.
7. Yao, M., Zhou, A., & Jia, M. (2022). *Applied artificial intelligence: A handbook for business leaders*. Sebastopol, CA: O'Reilly Media.A strategic guide for applying AI in real business environments with case studies and actionable advice.

Course Code	URCG- 5119	Course Title	Expository Writing	Credit Hours	3 (3-0)

Course Brief:

This course prepares undergraduates to become successful writers and readers of English. The course helps students develop their fundamental language skills with a focus on writing so that they can gain the confidence to communicate in oral and written English outside the classroom. The course is divided into five units and takes a Project-based Learning approach. Unit themes target the development of 21st century skills and focus on selfreflection and active community engagement.

Course Learning Objectives:

The course completion will enable the students to develop communication skills as reflective and selfdirected learners. They will be able to intellectually engage with different stages of writing process, and develop analytical and problem-solving skills to address various community-specific challenges.

Course Contents:

1. Self-Reflection
   - Introduction to the basics of the writing process
   - Introduction to the steps of essay writing
   - Prewriting activities: Brainstorming, listing, clustering and freewriting
   - Practicing Outlining of the essay
2. Personalized Learning
   - Learning Process, Learning Styles, Goal Setting and Learning Plan
3. Oral Presentation
   - Structure and Significance, Content Selection and Slide Presentation, Peer Review
4. Critical Reading Skills
   - Introducing Authentic Reading (Dawn and non-specialist academic books/texts)
   - Reading Strategies and Practice: Skimming, scanning, SQW3R, Annotating, Detailed reading and note-taking, Standard Test Practice: TOEFL and IELTS, Model Review Reports and Annotated Bibliographies
5. Community Engagement
   - Student-led brainstorming on local versus global issues, Identifying research problems
   - Drafting research questions, Drafting interview/survey questions for community research (in English or L1)
   - Engaging students in Critical reading, Presenting interview/ survey information, Field work
   - Writing Community Engagement Project
6. Letter to the Editor
   - Types of letters, Format and purpose of letter to the editor, Steps in writing letter-to-editor

Recommended Texts:

1. Bailey, S. (2011). Academic writing: A handbook for international students (3rd ed.). New York: Routledge.
2. Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3rd ed.). Ann Arbor: The University of Michigan Press.

Suggested Readings:

1. Cresswell, G. (2004). *Writing for academic success*. London: SAGE.
2. Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
3. Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing*. Washington: American Psychological Association.

General Education Cluster: Quantitative Reasoning

URCG-5121 **Tools for Quantitative Reasoning** **3(3-0)**

This is a sequential undergraduate course that focuses on logical reasoning supported with mathematical and statistical concepts and modeling / analysis techniques to equip students with analytical skills and critical thinking abilities necessary to navigate the complexities of modern world. The course is designed to familiarize students with the quantitative concepts and techniques required to interpret and analyze numerical data and to inculcate ability in students the logical reasoning to construct and evaluate arguments, identify fallacies, and think systematically. Keeping the pre-requisite course of Quantitative reasoning (I) as its base, this course will enable students further their quantitative, logical and critical reasoning abilities to complement their specific major field of study

Course Learning Outcomes

By the end of the course, student shall have

1. Understanding of logic and logical reasoning
2. Understanding the basic quantitative Modeling and Analyses.
3. Logical reasoning skills and abilities to apply them to solve quantitative problems and evaluate arguments;
4. Ability to critically evaluate quantitative information to make evidence based decisions through appropriate computational tools.

Contents

1. Logic, Logical and Critical Reasoning:
    i. Introduction and importance of logic,
    ii. Introductive, deductive and abductive approaches of reasoning,
    iii. Propositions, arguments (valid; invalid), logical connectives, truth tables and propositional equivalences,
    iv. Logical fallacies,
    v. Venn Diagrams,
    vi. Predicates and quantifiers,
    vii. Quantitative reasoning exercises using logical reasoning concepts and techniques.
2. Mathematical Modeling and Analyses:
    i. Introduction to deterministic models,
    ii. Use of linear function for modeling in real-world situations,
    iii. Modeling with the system of linear equation and linear solutions,
    iv. Elementary introduction to derivatives in mathematical modeling,
    v. Linear and exponential growth and decay models,
    vi. Quantitative reasoning exercises using mathematical modeling.
3. Statistical Modeling and Analyses:
    i. Introduction to probabilistic models,
    ii. Bivariate analysis, scatter plots,
    iii. Simple linear regression model and correlation analysis,
    iv. Basics of estimation and confidence interval,

    v. Testing of hypothesis (z-test; t-test),
    vi. Statistical inference in decision making,
    vii. Quantitative reasoning exercise using statistical modeling.

Recommended Texts

1. Bennett, J., & Briggs, W. (2019). *Using & understanding mathematics: a quantitative reasoning approach*. Pearson.
2. Rosen, K. H., & Krithivasan, K. (2012). *Discrete mathematics and its applications* (Vol. 6). New York: McGraw-Hill.

Suggested Readings

1. Epp, S. S. (1990). *Discrete mathematics with applications*. Wadsworth Publ. Co.
2. Budnick, F. S., Quinn, S., Bowser, K., & Flaherty, E. H. (1993). *Applied mathematics for business, economics, and the social sciences*. New York: McGraw-Hill
3. Bluman, A. (2014). *Elementary Statistics: A step by step approach* 9e. McGraw Hill.
4. Mann, P. S. (2007). *Introductory statistics*. John Wiley & Sons
5. Babones, S. (2013). Applied statistical modeling. *(No Title)*.
6. Green, S. W., Wolf, I.K., Stewrat, B. W. (2022). SAT Study Guide Premium. Barrons

.Course Code	URCG-5122	Course Title	Ideology and Constitution of Pakistan	Credit Hours	2(2-0)

Course Brief:

This course focuses on ideological background of Pakistan. The course is designed to give a comprehensive insight about the constitutional developments of Pakistan. Starting from the Government of India Act, 1935till to date, all important events leading to constitutional developments in Pakistan will be the focus of course. Failure of the constitutional machinery and leading constitutional cases on the subject. Moreover, students will study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Learning Objectives:

It will also cover the entire Constitution of Pakistan 1973. However, emphasis would be on the fundamental rights, the nature of federalism under the constitution, distribution of powers, the rights and various remedies, the supremacy of parliament and the independence of judiciary.

Course Contents:

- **Ideology of Pakistan**
  - Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
  - Two Nation Theory and Factors leading to Muslim separatism.
- **Constitutional Developments**
  - Salient Feature of the Government of India Act 1935 Salient Feature of Indian Independence Act 1947
  - Objectives Resolution
  - Salient Feature of the 1956 Constitution
  - Developments leading to the abrogation of Constitution of 1956 Salient features of the 1962 Constitution
  - Causes of failure of the Constitution of 1962
  - Comparative study of significant features of the Constitution of 1956, 1962 and 1973
- **Fundamental rights**
- **Principles of policy**
- **Federation of Pakistan** President Parliament The Federal Government
- **Provinces**
  - Governors
  - Provincial Assemblies
  - The Provincial Government
- **The Judicature**
  - Supreme Court High Courts
  - Federal Shariat Courts Supreme Judicial Council
  - Administrative Courts and tribunals
- **Islamic Provisions in Constitution**
- **Significant Amendments of Constitution of Pakistan 1973**

Recommended Texts:

1. Constitutional and Political History of Pakistan by Hamid Khan
2. Mahmood, Shaukat and Shaukat, Nadeem. Constitution of the Islamic Republic of Pakistan, 3rd re edn. Lahore: Legal Research Centre, 1996.
3. Munir, Muhammad. Constitution of the Islamic Republic of Pakistan: Being a Commentary on the Constitution of Pakistan, 1973. Lahore, Law Pub., 1975

Suggested Readings:

1. Rizvi, Syed Shabbar Raza. Constitutional Law of Pakistan: Text, Case Law and Analytical Commentary. 2nd re edn. Lahore: Vanguard, 2005.
2. The Text of the Constitution of the Islamic Republic of Pakistan, 1973 (as amended).

Model Course Outline
for the Course Understanding of Quran – II

Course Title: Understanding of Quran – II
Course Book: Muallim ul Quran (Volume 3, 4 & 5) by Dr Ubaid ur Rahman
Credit Hours: 1 (0-1)
Contact Hours: 3 per week
Weeks: 15-16 (45-48 hours)

Course Learning Outcomes:

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

1. Directly comprehend hundreds of Quranic sentences & verses.
2. Understand at least 80 to 85 % of each page of the holy Quran.
3. Understand common verses across different Quranic topics.
4. Achieve proficiency in the basic and advance linguistic aspects of the Arabic language.
5. Understand the difference between Quranic verbs in various forms, such as present, past and imperative.
6. Develop the ability to understand long verses of the holy Quran independently and then comprehend their interpretation.

Provision of material, content and books:

- **Paper book:** All volumes are available in printed book form.
- **Tutorial videos:** Teaching video of each lesson available on YouTube.
- **Confirmation Videos:** A complete series of confirmation videos of all lessons is available in which the student can confirm his answers.
- **A flipbook:** A flipbook edition is also accessible.
- **Helping material:** Helping material for the teachers like quizzes, question papers and images is available on website.

Course Outline:

Weeks	Lectures	Units	Lessons	Assignments/Home Task	
1.	1.	6	6	Understanding & Translation of Verses	Present Tense صیغۃ جمع مذکر غائب مثل یعبدون
	2.	6	7-8	Understanding & Translation of Verses	Present Tense صیغۃ جمع مذکر غائب مثل یعبدون
2.	1.	6	9-10	Understanding & Translation of Verses	Present Tense صیغۃ مفرد مذکر مخاطب (تعبد) وجمع مذکر مخاطب (تعبدون)
	2.	6	11-12	Understanding & Translation of Verses	Present Tense صیغۃ جمع مذکر مخاطب (تعبدون)

					صيغة المتكلم (أعبد)
3.	1.	6	13	Understanding & Translation of Verses	Present Tense صيغة جمع المتكلم (نعبد)
	2.	6	14-15	Understanding & Translation of Verses	Negative Imperative صيغة المفرد وصيغة الجمع , لا تعبد، لا تعبدوا
4.	1.	6	16-17	Understanding & Translation of Verses	Conditional Sentences & masdar moawal (مصدر مؤول)
	2.	6	18-19	Understanding & Translation of Verses	Laam ut'taleel (لام التعليل) & Laam ul jhood(لام الجحود)
5.	1.	6	20-21	Understanding & Translation of Verses	Present with object pronouns & Passive Voice
	2.	6	Revision (Unit 6)	Quiz	
6.	1.	Unit 7	1 (sec 1-3)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
	2.	6	1 (Sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
7.	1.	6	1 (Sec 5-6)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
	2.	6	1 (Sec 7-9)	Understanding & Translation of Verses	Past Tense صيغة المفرد الغائب
8.	1.	7	Revision	Understanding & Translation of Verses QUIZ	Past Tense صيغة المفرد الغائب
	2.	MID TERM			
9.	1.	7	2 (sec 1-2)	Understanding & Translation of Verses	Past Tense صيغة الجمع الغائب هدوا
	2.	7	2 (sec 3)	Understanding & Translation of Verses	Past Tense صيغة الجمع الغائب هدوا
10.	1.	7	2 (sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة الجمع الغائب هدوا
	2.	7	2 (sec 6-7)	Understanding & Translation of Verses	Past Tense صيغة الجمع الغائب هدوا
11.	1.	7	3 (sec 1-2)	Understanding & Translation of Verses	Past Tense صيغة الجمع المتكلم هدنا

	2.	7	3 (sec 2-3)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم مبنا
12.	1.	7	3 (sec 3-4)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم مبنا
	2.	7	3 (sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمتكلم مبنا
13.	1.	7	4 (sec 1-2-3)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمخاطب مبنم
	2.	7	4 (sec 4-5)	Understanding & Translation of Verses	Past Tense صيغة الجمع للمخاطب مبنم
14.	1.	7	5-6	Understanding & Translation of Verses Quiz	Past Tense صيغة للمتكلم و المخاطب مبنث ، مبنث
	2.	7	7	Understanding & Translation of Verses	Past Tense صيغة المؤنث الغائب مبنث
15.	1.	7	8	Understanding & Translation of Verses	Passive Voice (Past Tense) فعل مجهول المفرد
	2.	7	9	Understanding & Translation of Verses	Passive Voice (Past Tense) فعل مجهول الجمع
16.	1.	8	1-4	Understanding & Translation of Verses	Imperative Verb for singular فعل الأمر المفرد
	2.	7	5-8	Understanding & Translation of Verses	Imperative Verb for plural فعل الأمر الجمع

Ethics-II

1-Course Description **URCG-5132** **1 (0-1)**

The course *Ethics-II* is designed to provide students with a deeper understanding of ethical principles and practices from both Semitic and non-Semitic religions, as well as their application in professional and social contexts. Students will engage with Jewish, Christian, Islamic, Hindu, Buddhist, Sikh, Confucian, and Jain ethical traditions. The course emphasizes moral reasoning, decision-making, tolerance, and peacebuilding. It aims to cultivate an inclusive, humanistic, and holistic approach towards ethical living and interfaith engagement.

2- Learning Objectives

The course objectives are to:

1. Understand the fundamental principles and theories of ethics.
2. Introduce the ethical and moral teachings of Judaism, Christianity, Islam, and Hinduism.
3. Explore the ethical teachings of non-Semitic religions such as Buddhism, Sikhism, Confucianism, and Jainism.
4. Develop critical thinking skills to evaluate ethical arguments and theories.
5. Promote ethical leadership and interfaith harmony.

3- Learning Outcomes

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

1. Identify and analyze major ethical theories and teachings from world religions.
2. Understand the role of religions in improving moral values and social behavior.
3. Demonstrate ethical decision-making in various personal and professional contexts.
4. Recognize the impact of ethical decisions on individuals, communities, and society.
5. Apply skills of ethical leadership, including communication, conflict resolution, and inclusive engagement.

4-Course Structure

1. Interactive lectures, Group discussions and debates
2. Reflection papers and presentations
3. Assignments and Quiz

~~Course Title: Ethics-II (For Non-Muslim Students) Course Code: URCG-5130~~

Course Contents

Unit 1: Ethical Teachings of Semitic Religions

- Judaism and its ethical teachings
- Christianity and its ethical teachings
- Islam and its ethical teachings

Unit 2: Ethical Teachings of Non-Semitic Religions

- Hinduism and its ethical teachings
- Sikhism and Buddhism: ethical values and practices
- Confucian and Jain ethical traditions

Unit 3: Professional Ethics

- Ethics for students and teachers
- Ethics in doctor–patient relationships
- Ethics in trader–customer interactions

Unit 4: Concept and Significance of Tolerance

- Definition, need, and importance of tolerance
- Teachings of Semitic religions on tolerance and their contemporary relevance
- Teachings of non-Semitic religions on tolerance and their contemporary relevance

Unit 5: Foundational Values and Ethics for Peacebuilding in Society

- Respect for sacred scriptures, personalities, places of worship, and religious symbols
- Promotion of tolerance and broadmindedness
- Encouragement of dialogue and harmony
- Benevolence towards humanity
- Establishment of justice and fairness
- Patience, forbearance, and forgiveness

Textbook

- Kidder, R. M. (2009). *How Good People Make Tough Choices: Resolving the Dilemmas of Ethical Living*. Harper.

Suggested Readings

1. Barash, D. P., & Webel, C. P. (2014). *Peace and Conflict Studies*. Sage.
2. Smart, N. (1998). *The World's Religions*. Cambridge University Press.
3. Nasr, S. H. (2003). *The Heart of Islam: Enduring Values for Humanity*. HarperOne.
4. Sharma, A. (2006). *Hindu Ethics: Purity, Abortion, and Euthanasia*. SUNY Press.
5. Harvey, P. (2000). *An Introduction to Buddhist Ethics: Foundations, Values and Issues*. Cambridge University Press.
6. Coward, H., & Perkinson, J. (2013). *A Cross-Cultural Dialogue on Ethical Leadership*. Wilfrid Laurier University Press.

SEMESTER IV

Course Code	ZOOL-5107	Course Title	Evolution	Credit Hours	3(3-0)

Course Brief:

The course aims to provide extensive knowledge about origin of life and concepts about forces responsible for evolutionary changes. This course will also provide information about origin, classification and evolution of fauna. The students will be able to understand classification, philosophy of nomenclature, species concepts, phylogenetic inference and evolutionary perspectives of biodiversity.

Course Learning Objectives:

The students will be able to understand the basic principles of evolution and systematics, and the inference of evolutionary patterns in the major animal groups. Students will be able to demonstrate evolutionary implications of animal diversity, nature and origin to life, Systematic Zoology, microtaxonomy and taxonomic categories. The practical section will enable the students to preserve invertebrate species and classify them up to class level, how to identify animal by the help of key and how to make keys of different types for identification of animals

Course Contents:

1. Theories of Evolution: theories to explain diversity of life– modern synthetic theory, Factors initiating elementary evolutionary changes (micro-evolution) and change of gene frequencies. Mutation pressure, selection pressure, immigration and crossbreeding, genetic drift.

2.Role of isolation in evolution: factors of large evolutionary changes (macroevolution). Concepts of allometry, orthogenesis, adaptive radiation.

3.Modern concept of Natural Selection: levels of selection, selection patterns, some examples of Natural Selection.
4.Impacts of Natural Selection leading to convergence, radiation, regression and extinction, Batesian mimicry, Mullerian mimicry, sexual selection: Darwin's concept, Fisher's view, Zahavi's handicap theory and recapitulation theory

Recommended Texts:

1. Strickberger's Evolution Hall, B.K. & Hallgrímsson, B. (2013). *Jones & Barrett Publishers.*
2. Ridley, M. (2004). Evolution. Blackwell Scientific Publications.
3. Freeman, S.& Herron, J. C. (2014). Evolutionary analysis, 5th ed. Pearson Prentice Hall.

Suggested Readings:

1. Moody, P.A. (1989). Introduction to Evolution, Harper and Row, Publishers, New York Systematics

Course Code	ZOOL-5108	Course Title	Animal Form and Function-II (*Comparative Physiology)*	Credit Hours	3(2-1)

Course Brief:

This course will enable students to understand the diversity in animal form and function adapted according to the modified environmental conditions. Students will also be provided understanding about the need of emergence of diversity of forms for the performance of similar function in variable conditions. It also demonstrates that a form is successfully adapted to perform a function like temperature regulation adequately and successfully according to its own environment.

Course Learning Objectives:

Upon successful completion of course students will have knowledge about nutrition and digestion process among animal groups, temperature regulation strategies adapted by animals and different modes of reproduction adapted by several groups for their successful stay on planet. The practical section will let them to study the excretory system in invertebrate and vertebrate model animals, can study nutritive canal in invertebrate and vertebrate animals through dissection and will be able to study the male and female reproductive system of an invertebrate and a vertebrate animal model with familiarity of major differences in them.

Course Contents:

1. Nutrition and Digestion: Evolution of nutrition; the metabolic fates of nutrients in heterotrophs; digestion, Animal strategies for getting and using food, diversity in digestive structures of invertebrates., The mammalian digestive system: gastrointestinal motility and its control, Oral cavity, pharynx and esophagus, stomach, small intestine: main site of digestion; large intestine; role of the pancreas in digestion; and role of the liver and gallbladder in digestion.
2. Temperature and body fluid regulation: homeostasis and temperature regulation; the impact of temperature on animal life; heat gains and losses; some solutions to temperature fluctuations;
3. Temperature regulation in invertebrates, fishes, amphibians, reptiles, birds and mammals; heat production in birds and mammals, control of water and solutes (osmoregulation and excretion); invertebrate and vertebrate
4. Excretory systems; how vertebrates achieve osmoregulation; vertebrate kidney variations; mechanism in metanephric kidney functions.
5. Reproduction and development: asexual reproduction in invertebrates; advantages and disadvantages of asexual reproduction, sexual reproduction in invertebrates; advantages and disadvantages of sexual reproduction; sexual reproduction in vertebrates; reproductive strategies; examples of reproduction among various vertebrate classes; the human male reproductive system: spermatogenesis, transport and hormonal control, reproductive function; the human female reproductive system: folliculogenesis, transport and hormonal control, reproductive function; hormonal regulation in gestation; prenatal development and birth: the placenta; milk production and lactation.

Practical

1. Study of excretory system in an invertebrate and a vertebrate representative (Model).
2. Study of dissection system in invertebrate and a vertebrate representative (Dissection). 3. Dissection and study of male and female reproductive system in vertebrates and invertebrates.

Note: Prepared slides and preserved specimen and/or projection slides and/or CD ROM computer projections may be used to develop better understanding among students.

Recommended Texts:

1. Miller, A. S., & Harley, J. P. (2016 & 2019). *Zoology (*10 & 11 ed.). Singapore: McGraw Hill.
2. Hickman, C., Jr., Keen, S., Eisenhour, D., Larson, A., I'Anson, H., (2019). *Integrated principles of zoology* (18 ed.). Singapore: McGraw-Hill.

Suggested Readings:

1. Campbell, N. A. (2002). *Biology* (6th ed.). California: Benjamin Cummings.
2. Kent, G. C., & Miller, S. (2001). *Comparative anatomy of vertebrates*. New York: McGraw-Hill.
3. Pechenik, J. A. (2015). *Biology of invertebrates* (7th ed.). Singapore: McGraw-Hill

Course Code	ZOOL-6109	Course Title	Entomology	Credit Hours	3(2-1)

Course Brief:

The course is designed to impart knowledge to students about morphology and body parts of the insects. The objective of the entomology undergraduate is to provide students with a broadly-based education in the science and practice of entomology. After this course, students can demonstrate an understanding of insect identification, structure, and function. It includes general characteristics of insects, relationship with other arthropods and evolutionary study of insects splitting up into different evolutionary lines.

Course Learning Objectives:

This subject also imparts knowledge about ecology of insects by learning carrying capacity, food chains, predation and competition, diapause insect population and community studies and insect communication. The practical section will enable the students to prepare permanent slides, distinguish the several body parts (antennae, mouth parts, wings, legs, terminal segments and genitalia) of insects; can study the different systems, especially digestive, reproductive of the insect and be able to address complex problems facing entomology.

Course Contents:

1. General characteristics of insects and their classification
2. Hard parts: general segmentation, tagmatosis and organization.
3. Cuticle: colors of insects, cuticular outgrowths and appendages sclerotization.
4. Head: cephalization, sclerites, modifications.
5. Antennae: different modes of ingestion and types of mouth parts.
6. Neck: sclerites, thorax: sclerites: legs, their different modifications and functions.
7. Wings: origin; development and basal attachments, main veins and their branches 8. Abdomen: secondary appendages and external genitalia, 9. Flight; types of flight.
10. Soft parts: muscular system; basic structure, types of muscles
11. Sense organs: sound and light producing organs.
12. Nutritive requirements: fat body, exocrine and endocrine glands
13. Reproduction: reproductive organs and different types of reproduction in insects,
14. Development: embryology up to dorsal closure, different types of metamorphosis, apolysis and ecdysis and the role of endocrine secretions.
15. Ecology: insect population and community studies, insect communication.

Practical

1. Preparation of permanent slides.
2. All the hard parts (antennae, mouth parts, wings, legs, terminal segments and genitalia).
3. Different systems, especially digestive, reproductive of the following insects.
4. American cockroach, gryllus, grasshopper, housefly, butterfly, mosquito, any common beetle.
5. Red cotton bug.
6. Wasp and honey bee.
7. Sympathetic nervous system of cockroach and gryllus.
8. Salivary glands of cockroach, red cotton bug and honey bee.

Recommended Texts:

1. Richards, O. W., & Davies, R. G. (1977). *Imm's general textbook of entomology* (Vol. 1; 10 ed.).

London: Chapman & hall.
2. Chapman, R. F. (2013). *The insects: structure and function* (5th ed.). Cambridge: Cambridge University Press.
3. Wigglesworth, V. B. (2012). *The principles of insect physiology*. London: Springer Science & Business Media.

Suggested Readings:

1. Tembhare, D. B. (2002). *Modern entomology.* Dehli: Himalaya Publishing House.
2. Henderson, P. A., & Southhood, T. R. E. (2016). *Ecological methods*. London: Wiley Blackwell.
3. Peterson, P. G. (2018). *Elements of insect ecology.* London: Ed- Tech Press.

Course Code	ZOOL-6110	Course Title	Developmental Biology	Credit Hours	3(2-1)

Course Brief:

The course aims to provide information on transmission of traits from the parents in their gametes, the formation of zygote and its development; impart detailed knowledge about cellular basis of morphogenesis, mechanisms of cellular differentiation and induction. It provides understanding of the mechanisms of organogenesis, factors controlling growth and oncogenesis. Students will learn how developmental biology is having a significant impact on our understanding of evolution and modern medicine, including the treatment of birth defects, infertility and cancer in humans.

Course Learning Objectives:

The students will be able to understand and compare basic principles of embryology through understanding the developmental patterns with help of morphology and anatomy of embryos of different vertebrates. The practical section will enable them to go through the structure of gametes of animals (like. frog, fish and mammal), to study of fertilization, early development of frog/fish through induced spawning under laboratory conditions and to know about the dactylography and its uses in developmental biology.

Course Contents:

1. Introduction: History and Basic Conceptsof developmental biology, Principal features of developmental biology and embryology with special emphasis on vertebrate models, origin of sexual reproduction, developmental patterns
2. Spermatogenesis: Mammalian spermatogenesis as model for all vertebrates, Spermiogenesis or (spermateliosis), The role of Sertoli and Leydig cells in spermatogenesis, Hormonal control of spermatogenesis
3. Primates menstrual cycle
4. Oogenesis: mechanism of oogenesis among various classes of vertebrates, vitellogenesishormonal control of vitellogenesis and oogenesis
5. Fertilization: external & internal fertilization, species-specific recognition of sperm and egg, fusion of male and female gametes
6. Polyspermy: slow and fast blocks to polyspermy, activation of egg metabolism
7. *IN VITRO* Fertilization (IVF): history, steps and advantages of IVF, disadvantages and risk factors
8. Cleavage &blastulation, patterns of embryonic cleavage and blastulation among different vertebrate classes, mechanism of cleavage
9. Gastrulation: fate maps, gastrulation in amphibians, birds and mammals 10. Early vertebrate development
11. Neurulation, ectoderm, mesoderm and endoderm formation
12. Placenta and extraembryonic membranes
13. Cellular basis of morphogenesis: differential cell affinity, cell adhesion molecules,
14. Organogenesis, Mechanism of teratogenesis
15. Aging and regeneration in vertebrates

Practical

1. Study of the structure of gametes in some representative cases, i.e. frog, fish and mammal.
2. Hen's egg internal and external structural details.
3. Microscopic analysis of hen's egg yolk, albumin and shell membranes.
4. Study of cleavage and subsequent development from prepared slides and/or models in various animals i.e., frog,

mammals and chick etc.

5. Study of fertilization, early development of frog/fish through induced spawning under laboratory conditions.
6. Study of developmental stages of nematodes through microscopic analysis of animal dung.
7. Semen analysis.
8. Dactylography and its uses in developmental biology.

Recommended Texts:

1. Gilbert, S. F., & Barresi, M. J. F. (2020). Developmental Biology (11th ed.). Oxford: Oxford University Press, Incorporated.
2. Dale, L., & Slack, J. M. W. (2021). *Essential Developmental Biology*. Wiley: United Kingdom.

Suggested Readings:

1. Carlson, B. M. (2023). Human Embryology and Developmental Biology. Elsevier Health Sciences: United States.
2. Micheal, J. F., & Scott, F.G. (2019). *Developmental Biology*. United States: MJP Publisher.
3. Carlson B. M. (2014). *Human Embryology and Developmental Biology* (5th ed.). Elsevier/Saunders: United States.

Course Code	URCG-5125	Course Title	Civics and Community Engagement	Credit Hours	2(2-0)

Course Brief:

The Civics and Community Engagement course is designed to provide students with an understanding of the importance of civic participation, culture and cultural diversity, basic foundations of citizenship, group identities and the role of individuals in creating positive change within their communities. The course aims at developing students' knowledge, skills and attitudes necessary for active and responsible citizenship

Course Learning Objectives:

After completing this course, students will be able to

- Understand the concepts of civic engagement, community development, and social responsibility.
- Understand rights and responsibilities of citizenship
- Understand cultural diversity in local and global context
- Analyze the significance of civic participation in promoting social justice, equity, and • democracy.
- Examine the historical and contemporary examples of successful civic and community engagement initiatives.
- Identify and assess community needs, assets, and challenges to develop effective strategies for community improvement.
- Explore the ethical implications and dilemmas associated with civic and community engagement.
- Develop practical skills for effective community organizing, advocacy, and leadership.
- Foster intercultural competence and respect for diversity in community engagement efforts.
- Collaborate with community organizations, stakeholders, and fellow students to design and implement community-based projects.

Course Contents:

Introduction to Civics & Community Engagement

- Overview of the course: Civics & Community Engagement□
- Definition and importance of civics□
- Key concepts in civics: citizenship, democracy, governance, and the rule of law□
- Rights and responsibilities of citizens□

Citizenship and Community Engagement

- Introduction to Active Citizenship: Overview of the Ideas, Concepts, Philosophy and Skills□
- Approaches and Methodology for Active Citizenship□

Identity, Culture, and Social Harmony

- Concept and Development of Identity, Group identities□
- Components of Culture, Cultural pluralism, Multiculturalism, Cultural Ethnocentrism, Cultural relativism, Understanding cultural diversity, Globalization and Culture, Social Harmony,□
- Religious Diversity (Understanding and affirmation of similarities & differences)□
- Understanding Socio-Political Polarization□
- Minorities, Social Inclusion, Affirmative actions□

Multi-cultural society and inter-cultural dialogue

- Inter-cultural dialogue (bridging the differences, promoting harmony)□
- Promoting intergroup contact/ Dialogue□
- Significance of diversity and its impact□
- Importance and domains of Inter-cultural dialogue□

Active Citizen: Locally Active, Globally Connected

- Importance of active citizenship at national and global level□

- Understanding community□
- Identification of resources (human, natural and others)□
- Utilization of resources for development (community participation)□
- Strategic planning, for development (community linkages and mobilization)□

Human rights, constitutionalism and citizens' responsibilities

- Introduction to Human Rights□
- Human rights in constitution of Pakistan□
- Public duties and responsibilities□
- Constitutionalism and democratic process□

Social Institutions, Social Groups, Formal Organizations and Bureaucracy

- Types of Groups, Group identities, Organizations□
- Bureaucracy, Weber's model of Bureaucracy□
- Role of political parties, interest groups, and non-governmental organizations□

Civic Engagement Strategies

- Grassroots organizing and community mobilization
- Advocacy and lobbying for policy change
- Volunteerism and service-learning opportunities **Social issues/Problems of Pakistan**

□ Overview of major social issues of Pakistani society□

Social Action Project

Recommended Texts:

1. Kennedy. J. K., & Brunold, A. (2016). Regional context and Citizenship education in Asia and Europe. New Yourk: Routledge, Falmer.
2. Henslin, James M. (2018). Essentials of Sociology: A Down to Earth Approach (13th ed.). New York: Pearson Education
3. Macionis, J. J., & Gerber, M.L. (2020). Sociology. New York: Pearson Education

Suggested Readings:

1. Glencoe McGraw-Hill. (n.d.). Civics Today: Citizenship, Economics, and Youth.
2. Magleby, D. B., Light, P. C., & Nemacheck, C. L. (2020). Government by the People (16th ed.). Pearson.
3. Sirianni, C., & Friedland, L. (2005). The Civic Renewal Movement: Community-Building and Democracy in the United States. Kettering Foundation Press.
4. Bloemraad, I. (2006). Becoming a Citizen: Incorporating Immigrants and Refugees in the United States and Canada. University of California Press.
5. Kuyek, J. (2007). Community Organizing: Theory and Practice. Fernwood Publishing.
6. DeKieffer, D. E. (2010). The Citizen's Guide to Lobbying Congress. TheCapitol.Net. 7. Rybacki, K. C., & Rybacki, D. J. (2021). Advocacy and Opposition: An Introduction to Argumentation (8th ed.). Routledge.
8. Kretzmann, J. P., & McKnight, J. L. (1993). Building Communities from the Inside Out: A Path Towards Finding and Mobilizing a Community's Assets. ACTA Publications.
9. Patterson, T. E. (2005). Engaging the Public: How Government and the Media Can ReinvigorateAmerican Democracy. Oxford University Press.
10. Love, N. S., & Mattern, M. (2005). Doing Democracy: Activist Art and Cultural Politics.

Course Code	URCG-5115	Course Title	The Science of Global Challenges	Credit Hours	3(2-1)

Course Brief:

Natural sciences enable an understanding and appreciation of the physical and the natural world through observation and experimentation. The program of studies introduces students to theoretical analyses, experimental methods, and problem solving. The study of physics, chemistry, geology, biology, and ecology helps develop critical faculties for evaluating natural phenomena and expert opinion.

Course Learning Objectives:

The course shall enable the students to practice application of Scientific Method in the natural sciences. It will also teach the students to appreciate the beauty of the natural and physical worlds often hidden from casual observation but which, once revealed, lends richness to everyday life.

Course Contents:

1. **Climate Change** i.e., Global Warming, Natural and Anthropogenic Activities and their impact
2. **Energy** i.e., Renewable and non-renewable energy resources
3. **Water Security** i.e., water scarcity andwaste water treatment
4. **Land Degradation** i.e., salinity, water logging, deforestation, land erosion; **Food Security** and roll of Biotechnology in food production
5. **Global Health Pandemics** i.e., Infectious diseases, vaccine, development of drug discovery for newly explored diseases

Practical

1. Preparation of standard solution and their standardizations
2. Soil and Water Analysis

Recommended Texts:

1. Usman, M. (2022). *Science of Global Challenges*. Ilmi Kitab Khana, Lahore

Suggested Readings:

1. Thieman, W.J. & Palladino, M.A. (2014). *Introduction to biotechnology*. Edinburgh Gate UK: Pearson Education Limited.
2. Daugherty, E. (2012). *Biotechnology: Science for the New Millennium*, 1st Edition, Revised, USA: Paradigm Publication.
3. Karaduman, I. C. (Ed.) (2014) *Global Challenges for the world.* Obronnosc. Zeszytl Naukowe.Turkey

Course Code	URCG-5124	Course Title	Entrepreneurship	Credit Hours	2(2-0)

Course Brief:

This course addresses the unique entrepreneurial experience of conceiving, evaluating, creating, managing, and potentially selling a business idea. The goal is to provide a solid background with practical application of important concepts applicable to the entrepreneurial environment. Entrepreneurial discussions regarding the key business areas of finance, accounting, marketing and management include the creative aspects of entrepreneurship. The course relies on classroom discussion, participation, the creation of a feasibility plan, and building a business plan to develop a comprehensive strategy for launching and managing a new venture.

Course Learning Objectives:

1. To enhance the 'entrepreneurial intentions' of the students by improving their natural willingness to start a business.
2. To understand the process of entrepreneurship and learn the ways to manage it by working individually in the class and in the form of groups outside the class to conduct field assignments.
3. To educate the students about the practical underpinnings of the entrepreneurship with the aid of practical assignments and idea pitching

Course Contents:

1. **Background:** What is an Organization, Organizational Resources, Management Functions, Kinds of Managers, Mintzberg's Managerial Roles.
2. **Forms of Business Ownership:** The Sole proprietorship, Partnership, Joint Stock Company
3. **Entrepreneurship:** The World of the Entrepreneur, what is an entrepreneur? The Benefits of Entrepreneurship, The Potential Drawbacks of Entrepreneurship, Behind the Boom: Feeding the Entrepreneurial Fire.
4. **The Challenges of Entrepreneurship:** The Cultural Diversity in Entrepreneurship, The Power of "Small" Business, Putting Failure into Perspective, The Ten Deadly Mistakes of Entrepreneurship, how to Avoid the Pitfalls, Idea Discussions & Selection of student Projects, Islamic Ethics of Entrepreneurship.
5. **Inside the Entrepreneurial Mind:** From Ideas to Reality: Creativity, Innovation, and Entrepreneurship, Creativity – Essential to Survival, Creative Thinking, Barriers to Creativity, how to Enhance Creativity, The Creative Process, Techniques for Improving the Creative Process, Protecting Your Ideas, Idea Discussions & Selection of student Projects.
6. **Products and technology, identification opportunities**
7. **Designing a Competitive Business Model and Building a Solid Strategic Plan:** Building a strategic plan, building a Competitive Advantage, The Strategic Management Process, formulate strategic options and select the appropriate strategies, Discussion about execution of Students' Project.
8. **Conducting a Feasibility Analysis and Crafting a Winning Business Plan:** Conducting a Feasibility Analysis, Industry and market feasibility, Porter's five forces model, Financial feasibility analysis. Why Develop a Business Plan, The Elements of a Business Plan, What Lenders and Investors Look for in a Business Plan, Making the Business Plan Presentation.
9. **Building a Powerful Marketing Plan:** Building a Guerrilla Marketing Plan, Pinpointing the Target Market, Determining Customer Needs and Wants Through Market Research. Plotting a Guerrilla Marketing Strategy: How to Build a Competitive Edge, Feed Back & Suggestions on Student Project, Islamic Ethics for Entrepreneurial Marketing
10. **E-Commerce and the Entrepreneur:** Factors to Consider Before Launching into E- Commerce, Ten Myths of E-Commerce, Strategies for E-Success, designing a Killer Web Site, Tracking Web Results, Ensuring Web Privacy and Security, Feed Back & Suggestions on Student Project.
11. **Pricing Strategies:** Three Potent Forces: Image, Competition, and Value, Pricing Strategies and Tactics, Pricing Strategies and Methods for Retailers, The Impact of Credit on Pricing

12. **Attracting Venture Capitalist:** Projected Financial Statements, Basic Financial Statements, Ratio Analysis, Interpreting Business Ratios, Breakeven Analysis, Feed Back &Suggestions on Student Project,
13. **Idea Pitching:** Formal presentation, 5-minutes pitch, funding negotiation and launching.

Recommended Texts:

1. Scarborough, N. M. (2011). *Essentials of entrepreneurship and small business management.* Publishing as Prentice Hall, One Lake Street, Upper Saddle River, New Jersey 07458.

Suggested Readings:

1. Burstiner, I. (1989). S*mall business handbook.* Prentice Hall Press.