



UNIVERSITY OF SARGODHA
OFFICE OF THE REGISTRAR
(ACAD BRANCH)

NOTIFICATION

The Academic Council in its 19th (4/2023) meeting held on 13.09.2023, has recommended the curricula of the following academic programs for implementation on provisional basis for affiliated colleges w.e.f Fall 2023 subject to approval by the Syndicate:-

1.	Associate Degree in Urdu	(Annex-'A')
2.	Associate Degree in Islamic Studies	(Annex-'B')
3.	Associate Degree in English (Linguistics)	(Annex-'C')
4.	Associate Degree in English (Language & Literature)	(Annex-'D')
5.	Associate Degree in Information Management	(Annex-'E')
6.	Associate Degree in Arabic	(Annex-'F')
7.	Associate Degree in Persian	(Annex-'G')
8.	Associate Degree in Punjabi	(Annex-'H')
9.	Associate Degree in Media and Communication Studies	(Annex-'I')
10.	Associate Degree in Physical Education	(Annex-'J')
11.	Associate Degree in Chemistry	(Annex-'K')
12.	Associate Degree in Bio-Chemistry	(Annex-'L')
13.	Associate Degree in Physics	(Annex-'M')
14.	Associate Degree in Statistics	(Annex-'N')
✓15.	Associate Degree in Botany	(Annex-'O')
16.	Associate Degree in Mathematics	(Annex-'P')
17.	Associate Degree in Geography	(Annex-'Q')
18.	Associate Degree in Biotechnology	(Annex-'R')
19.	Associate Degree in Zoology	(Annex-'S')
20.	Associate Degree in History	(Annex-'T')
21.	Associate Degree in Pakistan Studies	(Annex-'U')
22.	Associate Degree in Education	(Annex-'V')
23.	Associate Degree in Commerce	(Annex-'W')
24.	Associate Degree in Sociology	(Annex-'X')
25.	Associate Degree in Social Work	(Annex-'Y')
26.	Associate Degree in Economics	(Annex-'Z')
27.	Associate Degree in Psychology	(Annex-'ZA')
28.	Associate Degree in International Relations	(Annex-'ZB')
29.	Associate Degree in Political Science	(Annex-'ZC')


(WAQAR AHMAD)
Additional Registrar (General)

No. SU/Acad/23/980

Dated: 18.10.2023

Distribution:

- Controller of Examinations (with the request to upload on University Website for affiliated Colleges)

C.C:

- Director Academics
- Director, QEC
- Additional Registrar (Affiliation & Registration)
- Secretary to the Vice-Chancellor
- PA to Registrar
- Notification File

Scheme of Studies Associate Degree in Botany (For Affiliated Colleges)

1. Program Structure:

Duration	Minimum 4-Years (8-Semesters)		
Admission Requirements:	Students with Pre-Medical / Pre-Engineering combinations in HSSC / A-level with Botany/Biology as an elective subject after 12-years of education.		
Degree Completion Requirements:	General Education	GE	(31 CHs)
	Interdisciplinary	ID	(08 CHs)
	Disciplinary / Major	D	(30 CHs)
			69

2. General Education (Gen Ed) Requirements: (Mandatory/Core Courses):

The minimum requirement for Gen Ed is 31 credits hours and will be offered in first four semesters only.

Sr. No.	Semester	Course Code	Course Title	Credit Hours	Prerequisite
01	2	URCG-5112	Fables, Wisdom ^{literature} and EPICS	2(2-0)	Nil
02	4	URCG-5115	The Science of Global Challenges	3(2-1)	Nil
03	2	URCG-5116	Science of Society-I	2(2-0)	Nil
04	1	URCG-5118	Functional English	3(3-0)	Nil
05	3	URCG-5119	Expository Writing	3(3-0)	Nil
06	2	URCG-5120	Exploring Quantitative Skills	3(3-0)	Nil
07	3	URCG-5121	Tools for Quantitative Reasoning	3(3-0)	Nil
08	1	URCG-5105/ URCG-5126	Islamic Studies (OR) Religious Education/Ethics	2(2-0)	Nil
09	3	URCG-5122	Ideology and Constitution of Pakistan	2(2-0)	Nil
10	1	URCG-5123	Applications of Information and Communication Technologies (ICT)	3(2-1)	Nil
11	4	URCG-5124	Entrepreneurship	2(2-0)	Nil
12	4	URCG-5125	Civics and Community Engagement	2(2-0)	Nil
13	1-4	URCG-5111	Translation of Holy Quran	NC	Nil
14	2	URCG-5127	Seerat of the Holy Prophet (SAW)	1(1-0)	Nil
GE Courses Credit Hours Total				31	

*Courses Quran Translation and Seerat of the Holy Prophet (SAW) will be offered for Muslim students only.

3. Single Major Courses:

Sr. No.	Course Code	Course Title	Credit Hours	Prerequisite
01	BOTN-5101	Diversity of Plants	4(3+1)	FSc with Biology
02	BOTN-5102	Plant Systematics, Anatomy and Development/Embryology	4(3+1)	FSc with Biology
03	BOTN-5103	Cell Biology, Genetics and Evolution	4(3+1)	FSc with Biology
04	BOTN-5104	Plant Physiology and Ecology	4(3+1)	FSc with Biology
05	BOTN-5105	Biodiversity and Conservation	4(3+1)	BOTN-5101
06	BOTN-5106	Bacteriology and Virology	3(2+1)	BOTN-5101
07	BOTN-5107	Cell Biology	4(3+1)	BOTN-5103
08	BOTN-5108	Phycology and Bryology	3(2+1)	BOTN-5101
Major Course Credit Hours			30	

4. Interdisciplinary/Allied courses: minimum 12 credit hours:

1	ZOOL-5101	Animal Diversity-I (Invertebrates)	4(3+1)	FSc with Biology
2	CHEM-5102/ PSYC-XXX/ GEOG-XXX	Inorganic Chemistry/Psychology/Geography	4(3+1)	FSc
Interdisciplinary Courses Credit Hours Total			08	

Semester-I

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-01	URCG-5118	Functional English	3(3-0)	Nil
GE-02	URCG-5105 URCG-5126	Islamic Studies (OR) Religious Education/Ethics	2(2-0)	Nil
GE-03	URCG-5123	Applications of Information and Communication Technologies (ICT)	3(2-1)	Nil
GE-04	URCG-5111	Translation of Holy Quran- I	NC	Nil
Major-01	BOTN-5101	Diversity of Plants	4(3+1)	<i>Pre-medical with Biology</i>
Major-02	BOTN-5102	Plant Systematics, Anatomy and Development/Embryology	4(3+1)	<i>Pre-medical with Biology</i>

Semester Total Credit Hours: 16

Semester-II

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-05	URCG-5112	Fables, Wisdom and EPICS	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
Major-03	BOTN-5103	Cell Biology, Genetics and Evolution	4(3+1)	<i>FSc with Biology</i>
Major-04	BOTN-5104	Plant Physiology and Ecology	4(3+1)	--

Semester Total Credit Hours: 16

Semester-III

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-09	URCG-5119	Expository Writing	3(3-0)	Nil
GE-10	URCG-5121	Tools for Quantitative Reasoning	3(3-0)	Nil
GE-11	URCG-5122	Ideology and Constitution of Pakistan	2(2-0)	Nil
GE-4	URCG-5111	Translation of Holy Quran-II	NC	Nil
Major-05	BOTN-5105	Biodiversity and Conservation	4(3+1)	BOTN-5101
Major-06	BOTN-5106	Bacteriology and Virology	3(2+1)	BOTN-5101
ID-01	CHEM-5102/ PSYC-XXX/ GEOG-XXX	Inorganic Chemistry/ Psychology/Geography	4(3+1)	FSc

Semester Total Credit Hours: 19

Semester-IV

Category	Course Code	Course Title	Credit Hours	Pre-Requisite
GE-12	URCG-5115	The Science of Global Challenges	3(2-1)	Nil
GE-13	URCG-5124	Entrepreneurship	2(2-0)	Nil
GE-14	URCG-5125	Civics and Community Engagement	2(2-0)	Nil
Major-07	BOTN-5107	Cell Biology	4(3+1)	BOTN-5103
Major-08	BOTN-5108	Phycology and Bryology	3(2+1)	BOTN-5101
ID-02	ZOOL-5101	Animal Diversity-I (Invertebrates)	4(3+1)	<i>FSc with Biology</i>

Courses (Semester I-IV) can be rotated with subject to availability of teacher in that specialized field.

Semester Total Credit Hours: 18

Degree Total Credits: 69

ASSOCIATE DEGREE IN BOTANY

1st Year

1st Semester

URCG-5118	Functional English	3(3+0)
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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.

Course Learning Objectives:

The students would be able to logically add specific details on the topics such as facts, examples and statistical or numerical values. 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 Brief:

Islamic Studies is the academic study of Islam and Islamic culture. 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. It majorly comprises the importance of life and that after death. It is one of the best systems of education, which makes an ethically groomed person with the qualities. The basic sources of the Islamic Studies are the Holy Qur'an and Sunnah or Hadith of the Holy Prophet Muhammad (ﷺ).

Course Learning Objectives:

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 (ﷺ), Islamic philosophy, and Islamic law, culture and theology through the textual study of Qur'an and Sunnah. The learning of the Qur'an and Sunnah guides the Muslims to live peacefully.

Course Contents:

Introduction to Quranic 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 : سورة البقرہ آیات 1-5، 284-286؛ سورة الحجرات آیات 1-18؛ سورة الفرقان آیات 63-77؛ سورة المؤمنون آیات 1-11؛ سورة الاحزاب آیات 6، 21، 32-33، 40، 56-59؛ سورة الانعام آیات 151-153؛ سورة الصف آیات 1-14؛ الحشر آیات 18-20؛ آل عمران آیات 190-192؛ النحل آیات 12-14؛ لقمن آیات 20، حم السجده آیت 53)

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: [درج ذیل موضوعات پر احادیث کا مطالعہ

1. اعمال کا اجر نیت پر منحصر ہے۔ 2. بہترین انسان قرآن کا طالب علم اور اس کا معلم ہے۔ 3. کتاب و سنت گمراہی سے بچنے کا ذریعہ ہیں۔ 4. ارکان اسلام 5. اسلام، ایمان، احسان اور قیامت کی نشانیاں، 6. بچوں کی نماز کی تلقین 7. دین کا گہرا فہم اللہ کی خاص عنایت ہے 8. حصول علم، تلاوت قرآن اور عمل کی اہمیت و فضیلت، 9. روز محشر کا محاسبہ، 10. حقوق اللہ کے ساتھ ساتھ حقوق العباد کا لحاظ رکھنا بھی لازم ہے 11. حسن خلق کی عظمت اور فحش و بدگونی کی مذمت 12. دنیا و آخرت کی بھلائی کی ضمانت چار چیزیں، 13. ہلاک کر دینے والی سات چیزیں، 14. 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 النبی ﷺ) مطالعہ سیرت کی ضرورت و اہمیت، تعمیر سیرت و شخصیت کا نبوی منہاج اور عملی نمونے، اقامت دین کا نبوی طریق کار، اقامت دین بعد خلافت راشدہ، میثاق مدینہ، خطبہ حجۃ الوداع، اخلاقی تعلیمات، تشکیل اجتماعیت اور اسوہ حسنہ، قرآن مجید میں سیرت سرور عالم کا بیان، غزوات 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

4. اسلامی تہذیب و تمدن (اسلامی تہذیب کا مفہوم، اسلامی کے عوامل و عناصر، اسلامی تہذیب کی خصوصیات، اسلامی 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)

Recommend Texts:

- a. Hassan, A. (1990). *Principles of Islamic Jurisprudence*. New Dehli: Adam Publishers.
- b. Zia-ul-Haq, M. (2001). *Introduction to al-Sharia al-Islamia*. Lahore: Aziz Publication.

Suggested Readings:

1. Hameedullah, M. (1957). *Introduction to Islam*. Lahore: Sh M Ashraf Publisher.
2. Hameedullah, M. (1980). *Emergence of Islam*. New Dehli: Adam Publishers.
3. Hameedullah, M. (1942). *Muslim conduct of State*. Lahore: Sh M Ashraf Publisher.

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.
 - (d) Moral Theories:
 - (e) Hedonism (Mill)
 - (f) Intuitionism (Butler)
 - (g) Kant's Moral Theory.
4. Moral Ethics and Society.
 - (a) Freedom and Responsibility.
 - (b) Tolerance
 - (c) Justice
 - (d) Punishment (Theories of Punishment)
5. Moral Teachings of Major Religions:
 - (a) Judaism
 - (b) Christianity
 - (c) Islam
6. Professional Ethics:
 - (a) Medical Ethics
 - (b) Ethics of Students
 - (c) Ethics of Teachers
 - (d) Business Ethics

Recommend Texts:

1. William Lillie. *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*. Calcutta: 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 of

URCG-5123	Applications of Information Communication Technologies (ICT)	3(2+1)
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Course Brief:

The course introduces students to information and communication technologies and their application in the workplace

Course Learning Objectives:

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. 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 Brief:

The Quran is the exact words revealed by Allah SWT to His last Prophet Muhammad (ﷺ). It was memorized by Muhammad (ﷺ) and then dictated to his Companions, and written down by scribes, who cross-checked it during his lifetime. Not one word of the Quran has been changed over the centuries, so that the Quran is in every detail the unique and miraculous text. The Quran is the prime source of Muslim faith and practice. It deals with all the subjects which concern us as human beings: wisdom, doctrine, worship, and law, but its basic theme is the relationship between God and His creatures. At the same time it provides guidelines for proper conduct of individual, society and an equitable holistic system of human life.

Course Learning Objectives:

To familiarize the students to keys and fundamentals of recitation of the holy Quran. To develop the skill of the students of recitation the last revelation. Students will learn the basic Arabic grammar in a practical way. To develop an eagerness among the students to explore the last divine Book

Course Contents:

Course Contents:	<ul style="list-style-type: none"> • تیسواں پارہ - ناظرہ مع تجوید • بنیادی عربی گرامر اسم اور اسکے متعلقات : اسم فاعل ، مفعول ، تکضیل ، مبالغہ فعل اور اسکی اقسام : ماضی ، مضارع ، امر ، نہی حرف اور اسکی اقسام : حروف علت ، حروف جارہ ، مثنیہ بالفعل
Memorization:	تیسویں پارے کی آخری بیس سورتیں (حفظ مع ترجمہ)

Course Brief:

This course offers an evolutionary survey of the origin and diversification of land plants through geological time. The course will start with the green algae and on how plants may have transitioned from aquatic to the land environment. Land plants that will be discussed include bryophytes, lycophytes, pteridophytes, gymnosperms and angiosperms with emphasis on representative fossil and living taxa. Lectures will emphasize on life histories, anatomical and morphological adaptations, ecology and climate change, extinction, phylogenetics, economic importance, and conservation strategies of representative taxa. Plants are one of the most successful and abundant groups of organisms on earth, comprising the majority of terrestrial biomass, being integral to ecosystem structure, and providing humans with food, shelter, and materials

Course Learning Objectives:

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

Course Contents:

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

1. Viruses (RNA and DNA types) with special reference to TMV
2. Bacteria and Cyanobacteria (Nostoc, Anabaena, Oscillatoria) with specific reference to bio fertilizers, pathogenicity and industrial importance;
3. Algae (Chlamydomonas, Spirogyra, Chara, Vaucheria, Pinnularia, Ectocarpus, Polysiphonia)
4. Fungi (Mucor, Penicillium, Phyllactinia, Ustilago, Puccinia, Agaricus) their implication on crop production and industrial applications.
5. Lichens (Physcia)
6. Bryophytes (Riccia, Anthoceros, Funaria)
7. Pteridophytes: Psilopsida (Psilotum) ,Pteropsida (Marsilea), Sphenopsida (Equisetum) Lycopsida (Selaginella)
8. Gymnosperms (Cycas, Pinus, Ephedra)
9. Angiosperms: Monocot (Poaceae) , Dicot (Solanaceae)

Lab work:

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

Recommended Texts:

1. Bellinger, E. G., & Sigeo, D. C. (2015). *Freshwater Algae*. United States: Wiley Publishers.
2. Prestre, P. G. (2017). *Governing Global Biodiversity: The Evolution and Implementation of the Convention on Biological Diversity*. United Kingdom: Routledge Publishers.

Suggested Readings:

1. Şen, B., & Grillo, O. (2018). *Selected Studies in Biodiversity*. England: Intech Open Publishers.
2. Zotz, G. (2016). *Plants on Plants: The biology of vascular epiphytes*. Germany: Springer-Verlag.
3. Cronk, J. K., & Fennessy, M. S. (2016). *Wetland plants: biology and ecology*. United States: CRC Press.
4. Pullaiah T., Bahadur, B., & Murthy, K. (2015). *Plant biodiversity*. Germany: Springer-Verlag

BOTN-5102	Plant Systematics, Anatomy and Development/Embryology	4(3+1)
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Course Brief:

Plant systematics is a science that includes and encompasses traditional taxonomy; however, its primary goal is to reconstruct the evolutionary history of plant life. It divides plants into taxonomic groups, using morphological, anatomical, embryological, chromosomal and chemical data. However, the science differs from straight taxonomy in that it expects the plants to evolve, and documents that evolution. Determining phylogeny -the evolutionary history of a particular group; is the primary goal of systematics.

Course Learning Objectives:

To understand: various systems of classification, identification and nomenclature of Angiosperms. Structures and functions of tissues and organs at embryonic level.

Course Contents:

Plant Systematic

1. Introduction to Plant Systematic: aims, objectives and importance.
2. Classification: Brief history of various systems of classification with emphasis on Takhtajan.
3. Brief introduction to nomenclature, importance of Latin names and binomial system with an introduction to ICBN/ ICN for plants.
4. Morphology: A detailed account of various morphological characters root, stem, leaf, inflorescence, flower, placentation and fruit types.
5. Diagnostic characters, economic importance and distribution pattern of the following families: Ranunculaceae, Brassicaceae (Cruciferae), Fabaceae (Leguminosae), Rosaceae, Euphorbiaceae, Cucurbitaceae, Lamiaceae (Labiatae), Apiaceae (Umbelliferae), Asteraceae (Compositae), Liliaceae (Sen. Lato)

Anatomy

6. Cell wall: structure and chemical composition
7. Concept, structure and function of various tissues like: Parenchyma, Collenchyma Sclerenchyma, Xylem, Phloem, Epidermis (including stomata and trichomes)
8. Meristem: types, stem and root apices
9. Vascular cambium
10. Structure and development of root, stem and leaf.
11. Primary and secondary growth of dicot stem, periderm
12. Characteristics of wood: diffuse porous and ring porous, sap and heart wood, soft and hard wood, annual rings.
13. Development/Embryology
14. Early development of plant body: *Capsella bursa-pastoris*
15. Structure and development of Anther (microsporogenesis, microgametophyte)
16. Structure and development of Ovule (megasporogenesis, megagametophyte)
17. Endosperm formation
18. Parthenocarpy
19. Polyembryony

Lab outline:

Anatomy and Embryology

- a) Study of stomata and epidermis.

- b) Tissues of primary body of plant.
- c) Study of xylem 3-dimensional plane of wood.
- d) T. S of angiosperm stem and leaf.
- e) Anatomy of germinating seeds
- f) Study of pollens

Taxonomy

- g) Identification of families given in syllabus with the help of keys.
- h) Technical description of common flowering plants belonging to families mentioned in theory.
- i) Field trips shall be undertaken to study and collect local plants.
- j) Students shall submit 40 fully identified herbarium specimens.

Recommended Texts:

1. Steeves, T.A. and V.K. Sawhney, *Essentials of developmental plant anatomy*. (Oxford University Press, 2017).
2. Spichiger, R. E. *Systematic Botany of flowering plants: a new phylogenetic approach of the angiosperms of the temperate and tropical regions*. (CRC Press, 2019).
3. Hickey, M. and C. King, *The Cambridge Illustrated Glossary of Botanical Terms*. (Cambridge University Press, 2015).
4. Lyons-Sobaski, R.C., W. Sheila and W. Robert. *Plant anatomy*. (Springer-Verlag, 2018).

Suggested Readings:

1. Clive A., C.A. Stace and M. J. Crawley, *Alien Plants* (Harper Collins Publishers, 2015).
- Hather, J.G., *Archaeological parenchyma*. (Routledge Publishers, 2016).

BOTANY
1st Year
2nd Semester

Literature

URCG-5112	Fables, Wisdom and EPICS	2(2-0)
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Course Brief:

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. 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 Learning Objectives:

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.

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 hikāyāt 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 Kingdom: Medina Publishing, Limited.

URCG-5116	Science of Society-I	2(2+0)
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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

Course Learning Objectives:

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 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
2. Society and Community, Historical evolution of Society
 - Types of Societies
 - Foraging society, Horticultural society, Pastoralist society
 - Agrarian societies, Industrial society, Postindustrial society
3. 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
4. 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
5. 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
6. 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
7. 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
8. 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.

URCG-5120	Exploring Quantitative Skills	3(3+0)
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Course Brief:

Since ancient times, numbers, quantification, statistics and mathematics has played a central role in scientific and technological development. In the 21st century, Quantitative Reasoning (QR) skills are essential for life as they help to better understand socio-economic, political, health, education, and many other issues, an individual now faces in daily life.

Course Learning Objectives:

The skills acquired by taking this course will help the students to apply QR methods in their daily life and professional activities. This course will also change student's attitude about statistics and mathematics. It will not only polish their QR skills, but also enhance their abilities to apply these skills.

Course Contents:

1. Introduction to quantitative reasoning
2. Overview of contributions of Mathematicians and Statisticians especially Muslim scholars.
3. Types of standard numbers
4. Proportions, rates, ratio and percentages
5. Odds and odds ratio
6. Scale of measurements
7. Number sequence and series
8. Unit analysis as a problem-solving tool
9. Data handling (small and large)
10. Data errors, absolute and relative and their applications
11. Descriptive statistics
12. Rules of counting: multiplication rule, factorial, permutation and combination
13. Probability and its application in real life
14. A graphical perspective through Venn Diagram
15. Financial indicator analysis, and money management (profit, loss, simple and compound interest)
16. Practical scenarios involving algebraic expressions: linear and quadratic

Recommended Texts:

1. Akar, G. K., Zembat, İ. Ö., Arslan, S., & Thompson, P. W. (2023). Quantitative Reasoning in Mathematics and Science Education. 1st Ed., Springer, USA.
2. Peck, R., Olsen, C., & Devore, J. L. (2015). Introduction to statistics and data analysis. 5th Ed., Brooks Cole, USA.
3. Devlin, K. J. (2012). Introduction to mathematical thinking. Palo Alto, CA: Keith Devlin.

Suggested Readings:

1. Triola, M. F., Goodman, W. M., Law, R., & Labute, G. (2006). Elementary statistics. Reading, MA: Pearson/Addison-Wesley.
2. Blitzer, R., & White, J. (2005). Thinking mathematically. Pearson Prentice Hall.

Course Brief:

Seerat Un Nabi (ﷺ) is known as the acts of the Prophet according to the teachings of Islam. It contains the history, events, wars, prayers and sayings of the last messenger of Allah. It has been narrated by Hazrat Aisha (RA) that the character of the Messenger of Allah is the Quran.

Course Learning Objectives:

Objectives of the Course	<p>۱۔ طلبہ کو مطالعہ میرا طلبہ کی ضرورت و اہمیت سے آگاہ کرنا ۲۔ حقیر شخصیت میں مطالعہ میرا طلبہ کے کردار کو واضح کرنا ۳۔ بھٹ نبوی کے موقع پر اقوام عالم کی عمومی صورت حال سے آگاہ کرنا ۴۔ رسول اکرم صلی اللہ علیہ وسلم کی نبی اور مدنی زندگی کا اس طرح مطالعہ کروانا کہ طلبہ ان واقعات سے نتائج کا استفادہ کر سکیں ۵۔ طلبہ کو محمد نبوی کی معاشرت و سیاست، معیشت سے آگاہ کرنا</p>
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Course Contents:**Course Description**

S.No.	Title	Description
1	حضور صلی اللہ علیہ وسلم کے ابتدائی حالات و زندگی	۱۔ حضور صلی اللہ علیہ وسلم کا زندگی حسب دلچسپی ۲۔ سیدہ ایش اور اہل بیت ۳۔ لڑکپن اور جوانی کے حالات و زندگی
2	بھٹ نبوی کے وقت و جگہ کے حالات (۱)	۱۔ بھٹ نبوی کے وقت اہم تہذیبیں ۲۔ عرب، مصر، حبشہ، ہندوستانی، ساسانی
3	بھٹ نبوی	۱۔ نبی محمد میں دعوت اسلام
4	بھٹ نبوی	۱۔ مدنی محمد میں دعوت اسلام
5	حصانہ نبوی	آپ بظاہر عظیم الامین
6	حصانہ نبوی	بھٹ استاد و معلم
7	حصانہ نبوی	بھٹ تاجر
8	حصانہ نبوی	بھٹ سربراہ ریاست
9	حصانہ نبوی	ذہنی محاسن اور مالکیر اثرات

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

نصابی کتب

نمبر	نام مولف	نام کتاب
1	ابن ہشام	السیر النبویہ
2	مولانا فاضل نعمانی سید سلطان ممدوی	سیر النبی صلی اللہ علیہ وسلم
3	قاضی محمد سلیمان سلطان منصور چوہدری	رحمۃ اللعالمین
4	مولانا سید امجد الحسن علی ممدوی	بیرت صلی اللہ علیہ وسلم
5	ڈاکٹر حسین مظہر صدیقی	مہد نبوی کا نظام حکومت
6	ڈاکٹر خالد ملوی	انسان کا آل

حوالہ جاتی کتب

نمبر	نام مولف	نام کتاب
1	سید ابوالفتح مودودی	بیرت سرور عالم صلی اللہ علیہ وسلم
2	مولانا صفی الرحمن مہدی چوہدری	الرحیق المختوم
3	علامہ محمد کرم شاہ لاہوری	قیام النبی صلی اللہ علیہ وسلم
4	ڈاکٹر اکرم ہاشمی الممدوی	السيرة النبوية الصحيحة
5	مولانا محمد ارفان دہلوی	اصح السیر

BOTN-5103		Cell Biology, Genetics and Evolution		4(3+1)
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Course Brief:

Cell biology, genetics and evolution are fundamental to an understanding of the processes of life. In this unit, students will be able to examine the structure and function of prokaryotic and eukaryotic cells, including a discussion of the energy flow in photosynthesis, respiration and metabolism. A brief introduction to DNA structure and function from molecular to organism levels and current applications of DNA technology will be studied. This will also enlighten and introduce with classical genetic and evolutionary theory as unifying explanations of life. This course is intended for the student interested in understanding and appreciating common biological topics in the study of the smallest units within biology: molecules and cells. This course will give you a general introduction of cell organelles, cell division and enzymes which are involved in the process of metabolism. Evolution is the process of change in all forms of life over generations, and evolutionary biology is the study of how evolution occurs. Laboratory practicals will investigate enzyme function, cytogenetics and the genetic analysis of populations.

Course Learning Objectives:

To understand:

1. Structure and function of cell.
2. Nature of genetic material and hereditary process
3. Familiarization with evolutionary processes.

Course Contents:

Cell Biology

1. Structure and Function of Bio-molecules (Carbohydrates, Lipids, Proteins, Nucleic Acids)
2. Cell: Cell theory, cell types (prokaryotes, eukaryotes), basic properties of cell.
3. Brief description of structure and function of the following cell organelles (Cell wall, Cell membrane, Nucleus, Endoplasmic reticulum, Plastids, Mitochondria, Ribosomes, Dictyosomes, Vacuoles)
4. Reproduction in somatic and embryogenic cell, mitosis, meiosis and cell cycle

Genetics

5. Introduction, scope and brief history of genetics. Mendelian inheritance; Laws of segregation and independent assortment, back cross, test cross, dominance and incomplete dominance
6. Molecular genetics; DNA replication, nature of gene, genetic code, transcription, translation, protein synthesis, regulation of gene expression (e.g. lac operon).
7. Chromosomal aberrations; Changes in the number of chromosomes. Aneuploidy and Euploidy. Changes in the structure of chromosomes, deficiency, duplication, inversion and translocation.
8. Evolution: Introduction and theories.

Lab outline:

Cell Biology

1. Study of cell structure using compound microscope and elucidation of ultra structure from electron microphotographs
2. Measurement of cell size.
3. Study of mitosis and meiosis by smear/squash method and from prepared slides.
4. Study of chromosome morphology and variation in chromosome number.
5. Extraction and estimation of carbohydrate, protein, RNA and DNA from plant sources.

Genetics

6. Genetical problems related to transmission and distribution of genetic material.
7. Identification of chromosomes in plant material. Carmine/orcein staining.
8. Determination of blood groups

Recommended Texts:

1. Templeton, N.C. (2015). *Gene and cell therapy* 4th Edition. United Kingdom: Taylor and Francis Publications,
2. Sybille, M., & Shoshan, M. (2015). *Tumor cell metabolism*. United States:Springer Publications.

Suggested Readings:

1. Verma, P. S., & Agarwal, V. K. (2016). *Cell Biology (Cytology, Biomolecules and Molecular Biology)*. India: S. Chand Publishing.
2. Milo, R., & Phillips, R. (2015). *Cell biology by the numbers*. 1st edition. United Kingdom: Taylor and Francis publications.
3. Bradshaw, R., & Stahl, P. (2015). *Encyclopedia of cell biology*. Netherlands: Elsevier Publications.

BOTN-5104		Plant Physiology and Ecology	4(3+1)
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Course Brief:

This course is designed to provide students with comprehensive exposure to the subject of plant physiology and ecology and will give know how about physiological adaptation; limiting factors; resources acquisition/allocation; photosynthesis, carbon, energy balance; water use and relations; nutrient relations; linking physiology, stable isotope applications ecophysiology; stress physiology; life history, physiology; evolution of physiological performance; physiology population, community, ecosystem levels. Plant Ecology is the study of the interactions of living things with their environment. It helps to ask questions across four levels of biological organization—organismal, population, community, and ecosystem.

Course Learning Objectives:

To provide comprehensive knowledge of functioning of organs, organelles and biomolecules. To enable the students to assess the effects of various environmental factors on plant growth and development.

Course Contents:

1. Plant Physiology

- Water relations:** (water potential, osmotic potential, pressure potential, matric potential). Absorption and translocation of water. Stomatal regulation.
- Mineral nutrition:** Soil as a source of minerals. Passive and active transport of nutrients. Essential mineral elements, role and deficiency symptoms of macronutrients.
- Photosynthesis:** Introduction, oxygenic and non-oxygenic photosynthesis. Mechanism: light reactions (electron transport and photophosphorylation) and dark reactions (Calvin cycle). Differences between C₃ and C₄ plants. Factors affecting this process. Products of photosynthesis.
- Respiration:** Definition and respiratory substrates. Mechanism of Glycolysis, Krebs cycle. Electron transport and oxidative phosphorylation. Anaerobic respiration. Energy balance in aerobic and anaerobic respiration, respiratory quotients.

2. Ecology

- Introduction:** Aims and applications of ecology.
- Soil:** Physical and Chemical properties of soil (soil formation, texture, pH, EC, organism and organic matter etc.) and their relationships to plants.
- Light and Temperature:** Quality of light, diurnal and seasonal variations. Eco-physiological responses.
- Water:** Field capacity and soil water holding capacity. Characteristics of xerophytes and hydrophytes. Effect of precipitation on distribution of plants.
- Wind:** Wind as an ecological factor and its importance.
- Population Ecology:** Introduction. A brief description of seed dispersal and seed bank.
- Community Ecology.** Ecological characteristics of plant community ii. Methods of sampling vegetation (Quadrat and line intercept) iii. Major vegetation types of the local area.
- Ecosystem Ecology.** Definition, types and components of ecosystem. ii. Food chain and Food web.
- Applied Ecology:** Causes, effects and control of water logging and salinity with respect to Pakistan.

Lab Outline:

1. Plant Physiology

- Preparation of solutions of specific normality of acids/bases, salts, sugars, molal and molar solutions and their standardization.
- Determination of uptake of water by swelling seeds when placed in sodium chloride solution of different concentrations.
- Measurement of leaf water potential by the dye method.
- Determination of the temperature at which beet root cells lose their permeability.
- Determination of the effects of environmental factors on the rate of transpiration of a leafy shoot by means of a photometer/cobalt chloride paper method.
- Extraction of chlorophyll from the leaves and separation of component pigments on a

paper chromatogram. Study of absorption spectra using spectrophotometer.

g) Estimation of oxygen utilized by a respiring plant by Winkler's method.

2. **Ecology**

a) Determination of physical and chemical characteristics of soil.

b) Measurements of various population variables

c) Measurement of vegetation by Quadrat and line intercept methods.

d) Field trips to ecologically diverse habitats.

e) Measurements of wind velocity.

f) Measurement of light and temperature.

g) Effect of light and temperature on seed germination.

Recommended Texts:

1. Keddy, P.A., *Plant Ecology Origins, processes, Consequences*, 2nd Edition. (Cambridge University Press, 2017).

2. Canadell, J.G, S. Diaz, G. Heldmaier, R.B. Jackson, D.F. Levia, E.D. Schulze, U. Sommer and D.A. Wardle, *Ecological Studies*. (Springer, 2019).

3. Taiz, L. and E. Zeiger, *Plant Physiology*.7th Edition. (Sinnauers Publ. Co. Inc. 2019).

Suggested Readings:

1. Sharma, H. and P.K Singh, *Laboratory Manual for Bioinstrumentation, Biochemistry, Microbiology, Cell Biology and Enzyme Technology for PG and UG students*.(Excellent Publishing House New Delhi India, 2018).

Jugulam, M., *Biology, Physiology and Molecular Biology of Weeds*.(CRC Press, 2017).

BOTNANY
2nd Year
3rd Semester

URCG- 5119		Expository Writing		3 (3+0)
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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 self-reflection and active community engagement.

Course Learning Objectives:

The course completion will enable the students to develop communication skills as reflective and self-directed 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.

URCG-5121		Tools for Quantitative Reasoning		3(3+0)
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Course Brief:

The Quantitative Reasoning course incorporates problem solving, critical thinking, and oral and writing communication fluency. Approaches and methods used in the course include choosing and using appropriate mathematical models, the use of data, and the use of real-world applications.

Course Learning Objectives:

This course will prepare the students to apply quantitative reasoning tools more efficiently in their professional and daily life activities. This course will help them to better understand the information in form of numeric, graphs, tables, and functions.

Course Contents:

1. Types of data and its graphical representation (Histogram, Stem and Leaf display, Box Plot, Scatter diagram, Histogram, Bar chart, etc)
2. Solving practical problems using linear and exponential models
3. Population growth models
4. Analytical approach to solve simultaneous equations
5. Inequalities and their application
6. Comparing quantities using analytical tools
7. Logical reasoning and their application in modern age
8. Logical reasoning and decision making
9. Data tendencies via measure of location
10. Variability and Measure of dispersion
11. Measuring relationships via Regression analysis and correlation
12. Statistical inference: sampling techniques, estimation techniques and hypothesis testing for decision and policy making

Recommended Texts:

1. Akar, G. K., Zembat, İ. Ö., Arslan, S., & Thompson, P. W. (2023). Quantitative Reasoning in Mathematics and Science Education. 1st Ed., Springer, USA.
2. Sharma, A. K. (2005). Text book of elementary statistics. Discovery Publishing House.
3. Blitzer, R. (2014). Precalculus, 5th Ed.. Pearson Education, Limited. New York

Suggested Readings:

1. Gupta, S. C., & Kapoor, V. K. (2020). Fundamentals of mathematical statistics. 12th Ed, Sultan Chand & Sons.
2. Aufmann, R. N., Lockwood, J., Nation, R. D., & Clegg, D. K. (2007). Mathematical thinking and quantitative reasoning. Cengage Learning
3. Blitzer, R., & White, J. (2005). Thinking mathematically. Pearson Prentice Hall.

URCG-5122		Ideology and Constitution of Pakistan		2(2-0)
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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, 1935 till 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. 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 Learning Objectives:

This course 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:

1. Ideology of Pakistan Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah
2. Two Nation Theory and Factors leading to Muslim separatism
3. Constitutional Developments
4. Salient Feature of the Government of India Act 193
5. Salient Feature of Indian Independence Act 1947 Objectives Resolution
6. Salient Feature of the 1956 Constitution Developments leading to the abrogation of Constitution of 1956
7. Salient features of the 1962 Constitution Causes of failure of the Constitution of 1962
8. Comparative study of significant features of the Constitution of 1956, 1962 and 1973
9. 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:

4. Rizvi, Syed Shabbar Raza. Constitutional Law of Pakistan: Text, Case Law and Analytical Commentary. 2nd re edn. Lahore: Vanguard, 2005.
5. The Text of the Constitution of the Islamic Republic of Pakistan, 1973 (as amended).
6. Fundamental Laws of Pakistan by A.K. Brohi.

URCG-5111		Translation of Holy Quran-II		Non-credit
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Course Brief:

- The Quran is the exact words revealed by Allah SWT to His last Prophet Muhammad (ﷺ). It was memorized by Muhammad (ﷺ) and then dictated to his Companions, and written down by scribes, who cross-checked it during his lifetime. Not one word of the Quran has been changed over the centuries, so that the Quran is in every detail the unique and miraculous text. The Quran is the prime source of Muslim faith and practice. It deals with all the subjects which concern us as human beings: wisdom, doctrine, worship, and law, but its basic theme is the relationship between God and His creatures. At the same time it provides guidelines for proper conduct of individual, society and an equitable holistic system of human life.

Course Learning Objectives:

- Students will come to know about the real nature, significance and relevance of the Islamic belief in light of the text of the Holy Quran.
- Students will seek knowledge of translation and transliteration of the Holy Book Quran.
- To familiarize the students with the concept of Ibādah (Its significance, scope and relevance) and its types in Islam.
- Students will learn literal and idiomatic way of translation of the Holy Book.
- Students will learn about the polytheism and its incompatibility in Islam highlighted by the Holy Quran.
- To highlight the significance of learning through using all human faculties provided by the almighty Allah and familiarize the students about condemnation of ignorance mentioned in the Quranic text.
- To develop Awareness among the students about rights and duties of different circles of society in the light of Holy Quran.

Course Contents:

- ایمانیات اور عبادات
- اللہ پر ایمان، فرشتوں پر ایمان، رسولوں پر ایمان، آسمانی کتابوں پر ایمان
- یومِ آخرت پر ایمان، تقدیر پر ایمان
- نماز، روزہ، زکوٰۃ، حج، جہاد
- معاشرے کے حقوق
- خاندان کی تکوین
- حق سیر
- رضاعت و حمل
- اولاد کو قتل کرنے کے ضمانت
- شوہر کی نافرمانی
- طلاق
- بیوہ کی عدت کے احکام
- نکاح کا بیہام بھینچنا
- عورت کی وراثت (اس کے شوہر کی طرف سے)
- والدین کے حقوق
- بیویوں اور اولاد کے بیچ عداوت
- خاندان کے حقوق
- مہمان کی عزت
- اجازت طلب کرنے کے اصول
- مجلس کے آداب
- تماوں اور بھائی چارہ
- گروہ بندی
- محبت
- لوگوں کے درمیان صلح
- عفو و درگزر، غصہ پر قابو اور معاف کرنا
- شہوت و قہار
- لوگوں کے بیچ اختلافات
- حمايت، نگراني

BOTN-5105		Biodiversity and Conservation	4(3+1)
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Course Brief:

Over the years, the depletion of biodiversity has been quite active. This is happening as a result of habitat loss, exploitation of resources, climatic changes, diseases, pollution, poaching of animals etc. In order to correct this scenario, biodiversity conservation has been majorly stressed by governments and social organizations. It must be understood that human beings cherish almost all benefits from the biodiversity. Hence, they should focus on taking proper care associated with the preservation of biodiversity in different forms. It is important because there must be something left for the future generation to look at. We as human beings should curb the degradation as well as the destruction of the habitats, upholding the biodiversity at its prime level. Biodiversity conservation is basically aimed at protection, enhancement and scientific management of the biodiversity. To be precise, manage it at its threshold level and acquire sustainable benefits both for the present and future population. Biodiversity and conservation maintain crucial ecological processes as well as life support systems. It preserves the variety of species and make sustainable exploitation of ecosystems and species.

Course Learning Objectives:

To familiarize the students with the diversity of nature. Importance of biodiversity for survival and proper functioning of ecosystems.

Course Contents:

1. Biodiversity: Definition, types and threats.
2. Threats to Biodiversity; deforestation, over grazing, erosion, desertification, ecosystem degradation, bio invasion, pollution and climate change.
3. Biodiversity of Pakistan.
4. Measuring biodiversity: Alpha, Beta and Gamma diversity; Systematic and functional diversity.
5. Ecological services, indirect value of ecosystem by virtue of their ecological functions, direct value of ecosystem (i.e. Utility of Bio resources).
6. Sustainable and unsustainable use of biological resources.
7. Biodiversity Hot spots of Pakistan and the world.
8. International treaties/agreements regarding Biodiversity and conservation; CBD, CITES, Ramsar.
9. Conservation strategies; *in situ*, *ex situ*, *in vitro* conservation.
10. Conservation vs preservation.
11. IUCN categorized protected areas in Pakistan; red listing.
12. Environmental Impact Assessment.
13. Use of herbarium and Botanical Garden in biodiversity and conservation.
14. Concept of pastures and wild life management.
15. Global Biodiversity Information Facility (GBIF).

Lab outline:

1. Inventory of plant biodiversity in various habitats.
2. Field survey for baseline studies and Impact Assessment.
3. Identification of wild plant species used by local communities in different ecosystems.

Recommended Texts:

1. Walker, T., *Plant Conservation: Why it Matters and How it Works*. (Timber Press, 2015).
2. Pellens, P. and P. Grandcolas, *Biodiversity conservation and phylogenetic systematics*. (SIP AG Swetzerland, 2016.)
3. Blackmore, S. and S. Oldfield. *Plant Conservation Science and Practice: The Role of Botanic Gardens*. (Cambridge University press, 2017).

Suggested Readings:

1. Boenigk, A., S., Wodniok and E. Glucksman. *Biodiversity and Earth history*. (Springer, 2015).
- Scherson, R.A, *Phylogenetic Diversity*. (Springer, 2018).

BOTN-5106		Bacteriology and Virology	3(2+1)
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Course Brief:

To understand the morphology, structure and economic importance of Viruses and Bacteria. Bacteriology and Virology is a three credit hour course for BS in Botany, which covers the basic principles of Bacteriology and Virology. The course is divided into two main sections corresponding to the type of microorganism studied. The Bacteriology part includes: the historical accounts of microbiology, the bacterial structure, physiology and metabolism, the diversity and classification of bacteria, the various ways to control microorganisms, microbial ecology, food and industrial microbiology and finally an introduction to descriptive epidemiology.

Course Learning Objectives:

The main objectives of the Microbiology course is to establish the basic knowledge on microbes, mostly bacteria and viruses, and their relationships with other organisms, mainly plants and animals. Also included are the biochemical and molecular techniques and strategies used to study, but also to control, these microorganisms. After this course the students will be able to understand various biological and molecular aspects of viruses.

Course Contents:

Viruses

1. General features of viruses, viral architecture, classification, dissemination and replication of single and double - stranded DNA/RNA viruses.
2. Plant viral taxonomy.
3. Virus biology and virus transmission.
4. Molecular biology of plant virus transmission.
5. Symptomatology of virus-infected plants: (external and internal symptoms).
6. Metabolism of virus-infected plants.
7. Resistance to viral infection.
8. Methods in molecular virology.

Bacteria

1. History, characteristics and classification.
2. Evolutionary tendencies in Monera (bacteria, actinomycetes and cyanobacteria)
3. Morphology, genetic recombination, locomotion and reproduction in bacteria
4. Bacterial metabolism (respiration, fermentation, photosynthesis and nitrogen fixation)
5. Importance of bacteria with special reference to application in various modern Sciences especially agriculture, biotechnology and genetic engineering.
6. Symptoms and control of major bacterial diseases in Pakistan
7. Plant microbe interaction

Lab outline:

1. Viruses: Observation of symptoms of some viral infected plant specimens.
2. Bacteria, Actinomycetes and Cyanobacteria
3. Methods of sterilization of glassware and media etc.
4. Preparation of nutrient medium and inoculation.
5. Preparation of slides for the study of various forms, capsule/slime layer, spores, flagella and Gram-staining.
6. Growth of bacteria, subculturing and identification of bacteria on morphological and biochemical basis (using available techniques).
7. Microscopic study of representative genera of Actinomycetes and Cyanobacteria from fresh collections and prepared slides.

Recommended Texts:

1. Black J. & Black, L. (2017). *Microbiology - Principles and Exploration* (10th ed.). Arlington: John Wiley and Sons, Inc.
2. Willey, J., Sherwood, L. & Woolverton, C. (2017). *Prescott's microbiology* (10th ed.). Kent State: McGraw-Hill Companies, Inc.

Suggested Readings:

1. Mandahar, C. L., (2017). *Plant viruses: structure and replication* (1st ed.). Florida: CRC Press, Taylor & Francis Group Publishers.
 2. Arora, A., (2017). *Textbook of microbiology* (5th ed.). India: CBS Publishers and Distributors.
 3. Pommerville, J., (2018). *Fundamentals of microbiology* (11th ed.). Sudbury: Jones and Bartlet Publishers.
- Gaur, R. K, Khurana, K. & Dorokhov, Y. (2018). *Plant viruses: diversity, interaction and management* (1st ed.). Florida: CRC Press, Taylor & Francis Group Publishers.

CHEM-5102		Inorganic Chemistry		4(3+1)
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Course Brief:

This course covers a range of general topics of inorganic chemistry. It will provide a useful supplement to the advanced courses specified in the department. This course aims to enable the students to achieve the advanced knowledge about the key introductory concepts of chemical bonding, acid-base chemistry, and properties of the representative and transition elements, as well as using this knowledge for qualitative and quantitative analysis of inorganic compounds during laboratory work.

Course Learning Objectives:

Learning objectives emphasized in CHEM 5102 involve developing an understanding of basic principles of inorganic chemistry. It develops critical thinking skills enabling students to solve chemistry problems that incorporate their cumulative knowledge. Students learned in class to modern chemistry techniques which give them opportunities to upgrade their knowledge about advanced inorganic concepts. The essence of this course is to develop study skills that students need to succeed in university-level chemistry courses and preparation of students for professional positions in chemistry.

Course Contents:

1. Periodic Table and Periodicity of Properties: Modern Periodic Table, Group trends and periodic properties, Atomic & ionic radii, ionization potentials, electron affinities and electronegativities; Redox potential, electrochemical series and its applications. Corrosion and electroplating.
2. Acid Base Equilibria: Acids and bases, relative strengths of acids, pH, pKa, pKb. Hard and soft acid & Bases. SHAB Principle & its application. Buffers, types buffer, Preparation, Buffer capacity and applications of buffers. Indicators: (Acid-base, Redox, Adsorption), Solubility product, Common ion effect and its applications.
3. Chemical Bonding: Nature of a bond, hybridization, Valence Bond Theory (VBT), The Concept of Resonance, Molecular Orbital Theory (MOT), Valence Shell Electron Pair Repulsion (VSEPR) theory. Special types of bonds such as Metallic bonds, Hydrogen Bonding, Bent bond, Ion-dipole-dipole bond, ion induced-dipole bond.
4. Chemistry of p-Block Elements: Introduction to p-block elements (Group trends in p-block elements with reference to, atomic sizes & chemical reactivities). Boranes & Boride; aluminium halides, hydrides & Alums; Silicates (Structural aspects, classifications and applications); silicones (Structural aspects, classifications and applications), Germanes; phosphazenes, Phosphides, Oxoacids of Phosphorous; Oxoacids & salts of sulphur; Noble gases (compounds of Xe, Kr, Ra; bonding and applications). Production of pure silicon chips for solar energy cells.
5. Chemistry of d-Block Elements: Electronic configuration. Characteristics. Nomenclature. Nature of bonding in coordination compounds: Werner's theory, VBT, MOT and CFT for coordination compounds. Isomerism in coordination compounds. Chelates: Classification and applications. Applications of coordination compounds (Medicinal, Industrial, Agricultural).
6. Separation Techniques: General introduction and Applications (Solvent extraction and Chromatographic techniques such as paper, Ion exchange and Column).
7. Introduction to Analytical Techniques in Inorganic Chemistry: Introduction to spectroscopic Techniques: Principle, brief instrumentation, sample handling and applications (Flame emission, Atomic Absorption, IR & UV/Vis).
8. Chemical Industries: Metallurgy of Al, Cr and U, fertilizers (Urea & Phosphate fertilizers) Cement and Sugar.

Lab outline:

1. Qualitative Analysis; four radicals (cations and anions) for salt mixture.
2. Chromatographic separation of cations
3. Determination of total hardness of water using EDTA.

4. Estimation of manganese (II) using EDTA.
5. Estimation of copper (Iodometrically).
6. Determination of thiosulphate ion (Iodometrically).
7. Determination of ferricyanide using KI solution.
8. Determination of chloride by Volhard's and Mohr's methods.
9. Estimation of chloride ions using adsorption (Fluorescein) indicator.
10. Estimation of bromide ions using adsorption (Eosin) indicator.
11. Estimation of percentage of ferrous ions in the Mohr's salt using KMnO_4 .
12. Percentage determination of ferric ions in ferric alum using KMnO_4 solution.
13. Determination of purity of commercial potassium oxalate using KMnO_4 solution.
14. Estimation of ferrous ions using $\text{K}_2\text{Cr}_2\text{O}_7$ solution.

Recommended Texts:

1. Iqbal, M.Z. (2015). *Text Book of Inorganic Chemistry*. IlmiKitabKhana, Revised Edition.
2. Lee, J.D. (1996). *Concise Inorganic Chemistry*. 5th Edition, Chapman & Hall, UK.
3. Vogel, A.I. (1995). *A Text Book of Macro and Semi micro Qualitative Inorganic Analysis*. Longman Green & Co. NY.
4. Skoog, D.A., West, D.M., & Holler, F.J. (1994). *Analytical Chemistry*. 6th Edition Saunders College Publications, UK.

Suggested Readings:

1. Graham, H., & Man, H. (2000). *Chemistry in Context* 5th Edition. Thomas Nelson Ltd. U.K.
2. Philp, M. (1996). *Advance Chemistry*. Cambridge Low Price Edition, U.K.
3. David, H. (2000). *Modern Analytical Chemistry*. McGraw Hill, NY.

BOTANY
4th Semester

URCG-5115		The Science of Global Challenges		3 (2+1)
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Course Contents:

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

Lab outline:

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

Recommended Texts:

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. Obronosc. Zeszytł Naukowe. Turkey

URCG-5124		Entrepreneurship		2(2+0)
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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:

To enhance the 'entrepreneurial intentions' of the students by improving their natural willingness to start a business. 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. 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 ECommerce, 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). Small business handbook. Prentice Hall Press.

URCG-5125		Civics and Community Engagement		2(2+0)
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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.

Course Contents:

1. 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

2. Citizenship and Community Engagement

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

3. Identity, Culture, and Social Harmony

- Concept and Development of Identity, Group identities
- Components of Culture, Cultural pluralism, Multiculturalism, Cultural Ethnocentrism,

4. 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

5. 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

6. 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)

7. Human rights, constitutionalism and citizens' responsibilities

- Introduction to Human Rights
- Human rights in constitution of Pakistan

- Public duties and responsibilities
- Constitutionalism and democratic process

8.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

9.Civic Engagement Strategies

- Grassroots organizing and community mobilization
- Advocacy and lobbying for policy change
- Volunteerism and service-learning opportunities

10.Social issues/Problems of Pakistan

- Overview of major social issues of Pakistani society

11.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. Bloemraad, I. (2006). Becoming a Citizen: Incorporating Immigrants and Refugees in the United States and Canada. University of California Press.
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.

BOTN-5107		Cell Biology		4(3+1)
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Course Brief:

Cell biology is the study of cell structure and function, and it revolves around the concept that the cell is the fundamental unit of life. Focusing on the cell permits a detailed understanding of the tissues and organisms that cells compose. It is the study of cell with respect to its anatomy and physiology. It provides understanding of about cell which act as fundamental unit of life. It focusing on cell combine form tissues, organ and organism. Research in cell biology is interconnected to other fields such as genetics, molecular genetics, biochemistry, molecular biology, medical microbiology, immunology, and cytochemistry.

Course Learning Objectives:

This course aims to understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles. These can include responses to environmental or physiological changes, or alterations of cell function brought about by mutation. To know about the cell division; how and when it takes place. To know about the cancer, causes types and possible preventive measures.

Course Contents:

1. Introduction of prokaryotes and eukaryote cell, Animal and Plant cell structure.
2. Brief description of ultra-structure and functions of plant cell organelles.
3. End membranous systems.
4. Cell cycle and cell division; meiosis in sexual reproduction in plants.
5. Cellular metabolism and enzymes.
6. Cellular respiration and photosynthesis.
7. Biological information flow; transcription and translation.
8. Informational molecules; carbohydrates proteins and nucleic acids.
9. Cytoskeleton in cell cycle and mitosis.
10. Extra cellular matrix; various types of extra cellular matrix proteins; elastic fibronectin, glycoprotein, collagen, dynein and motor proteins.
11. Vesicular trafficking, cell migration, cell adhesion, cancer growth factors, disorders in cell cycle, apoptosis and gap junction.

Lab Outline:

1. Study of mitosis and meiosis in onion root tip and pollen grains
2. Study of cell organelles in plant cell by compound microscope
3. Measurement of cell size
4. Separation of different sized DNA fragments on agarose gel.
5. Study of chromosomes morphology and variation in chromosomes number.
6. Counting of prokaryotic cells (bacteria) and blood cells by using haemocytometer.
7. Extraction and estimation of carbohydrates, proteins and DNA from plant sources.

Recommended Texts:

1. Verma, P. S. & Agarwal, V.K., (2016). *Cell biology (cytology, biomolecules and molecular biology)* (1st ed.). India: S. Chand Publishing.
2. Milo, R. & Phillips, R., (2015). *Cell biology by the numbers* (1st ed.). London: Taylor and Francis publications.

Suggested Readings:

1. Templeton, N. S., (2015). *Gene and cell therapy* (4th ed.). London: Taylor and Francis publications.
2. Sybille, M. & Maria, S., (2015). *Tumor cell metabolism* (1st ed.). New York: Springer Publications.
- Bradshaw, R. & Stahl, P., (2015). *Encyclopedia of cell biology* (1st ed.). New York: Elsevier publications.

BOTN-5108		Phycology and Bryology		3(2+1)
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Course Brief:

This course provide basic knowledge about the structure and reproduction of algal and bryophytes and their evolutionary tendencies and to introduce the students with different species of algae and bryophytes, their collection methods, mounting and specimen identification and to enable the students to visualize and understand microscopic differences between algae and bryophytes and their importance. An advanced level course encompassing all the details related to evolution, types, ecology and economic importance of algae. The second half of the course will provide detail information on Introduction and general account of bryophytes, classification, and brief study of Hepaticopsida, Anthoceroopsida and Bryopsida.

Course Learning Objectives:

This course aims to understand the classification, morphology and economic importance of Algae and Bryophytes. By the completion of the course, students will be able to understand the structural difference between algae and bryophytes and their evolutionary trends. Students will also collect, identify and prepared stain slides for different specimens of algae and bryophytes. Students make use of this knowledge for the detailed study of algae, bryophytes and their economic importance.

Course Contents:

1. Phycology Introduction, general account, evolution, classification, biochemistry, ecology and economic importance of the following divisions of algae: vChlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta.
2. Bryology: Introduction and general account of bryophytes, classification, theories of origin and evolution. Brief study of the classes: Hepaticopsida, Anthoceroopsida and Bryopsida.

Lab Outline:

Phycology:

1. Collection of fresh water and marine algae.
2. Identification of benthic and planktonic algae
3. Section cutting of thalloid algae
4. Preparation of temporary slides
5. Use of camera lucida/micrographs.

Bryology

6. Study of the following genera: *Pellia*, *Porella*, *Anthoceros* and *Polytrichum*.

Recommended Texts:

1. Lee, R. E. (2019). *Phycology* (5th ed.). England: Cambridge University Press.
2. Bellinger, E., (2015). *Freshwater algae*(2nd ed.). New Jersey: John Wiley and Sons Ltd.

Suggested Readings:

1. Barsanti, L. & Gualtieri, P. (2014). *Algae: anatomy, biochemistry, and biotechnology*(1st ed.). Florida: CRC Press, Taylor and Francis Group.
2. Hussain, F. (2016) *Phycology: A text book of algae* (1st ed.). Lahore: Pak Book Empire.

ZOOL-5101	Animal Diversity-I (Invertebrates)	4(3+1)
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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.

Course Learning Objectives:

It delivers information to students about economic and ecological importance of invertebrates. Students will understand invertebrate organismal concepts in laboratory and field. 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
2. Animal-like Protists: the Protozoa
3. Multicellular and tissue levels of organization: evolutionary perspective, origins of multicellularity
4. Animal origins, Phylum Porifera, Cnidaria, Ctenophora
5. The triploblastic acoelomate body plan: Phylum Platyhelminthes, Phylum Nematode, gastrotricha
6. Pseudocoelomate body plan: Phylum Aaschelminths, Phylum Rotifera, Phylum Nematoda and Phylum kinorhyncha. Some important nematode parasites of humans
7. Phylum Mollusca, Annelida, Arthropoda,(the hexapods and myriapods), Phylum Echinodermata
8. Some lesser known invertebrates: lophorates, entoprocts, cycliophores, and cheatognaths

Lab work:

1. Study of representatives of phylum Protista, Porifera and prepared slides of spicules of sponges 2. Study of principal representatives of classes of phylum Coelenterate, Platyhelminthes, rotifer, nematode, Mollusca, Annelida, Arthropoda, Echinodermata 3. Preparation of permanent mount of obelia, hydra, proglottid, parapodia, insect mouthparts

Recommended Texts:

1. Miller, A. S., & Harley, J. B. (1999, 2002, 2007, 2009, 2012 & 2016). Zoology (4th, 5th, 6th, 7th , 8 th, 9th, 10thed.). Singapore: McGraw Hill. 2. Hickman, C. P., Roberts, L. C., & Larson, A. (2018). Integrated principles of zoology (15thed.). Singapore: McGraw-Hill.

Suggested Readings:

1. Pechenik, J. A. (2015). Biology of invertebrates (7thed.). Singapore: McGraw-Hill 2. Kent, G. C., & Miller, S. (2001). Comparative anatomy of vertebrates. New York: McGraw-Hill.

Interdisciplinary/Allied courses

PSYC-5101	Introduction to Psychology	3(3+0)
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Course Brief:

The course is designed to be an introduction to the science and profession of psychology. The course will assist the student in developing a foundation of basic knowledge to pursue further studies in specific areas of psychology—introduction to general psychology as the science of the human mind and behaviour. The course will examine the different models upon which modern psychology has been built, along with the history and origins of psychology.

Course Learning Objectives:

The course will survey introductory topics such as learning, memory, sensation and perception, personality, lifespan development, the physiological basis of behaviour, stress, health, psychological disorders, social psychology, and research methods. Students explore the key figures, diverse theoretical perspectives, and research findings that have shaped some of the major areas of contemporary psychology. This course also examines the research methods psychologists use across these areas to study the origins and variations in human behaviour.

Course Contents:

1. Introduction to Psychology: Nature and Application of Psychology with particular reference to Pakistan
2. Research Enterprise in Psychology (A brief sketch): Goals of Scientific Enterprise; Steps in Scientific Investigation; Advantages of Scientific Approach; types of research.
3. Biological Basis of Behavior: Communication in the Nervous System; Organization of the Nervous System; Brain Research Method
4. Sensation and Perception : Psychophysics: Basic Concepts and Issues: Our senses of Sight: The Visual System: Our Senses of Hearing: The Auditory System: Our Senses of Touch: Sensory Systems in the Skin: The other Senses: The Kinesthetic System & The Vestibular System
5. Motivation and Emotion. The Motivation of Hunger and Eating; Affiliation: Theories of Emotion (James Lange Theory & Cannon-Bard Theory; Schachter's Two Factor Theory & Evolutionary Theories of Emotion)
6. Learning: Definition of Learning; Types of Learning (Classical Conditioning & Operant Conditioning)
7. Human Memory: Encoding: Storage: Retrieval; Forgetting: When Memory Lapses; In Search of Memory Trace: The Physiology of Memory; Are There Multiple Memory Systems?
8. Language, Thinking & Decision making: The Cognitive revolution In Psychology; Language: Turning Thoughts into Words; Problem-Solving: In Search of Solutions; Decision Making: Choices and Chances
9. Personality: Theory, Research, and Assessment: The Nature of Personality; Psychodynamic Perspectives; Behavioral Perspectives; Humanistic Perspectives; Biological Perspectives; Contemporary Empirical Approaches to Personality Traits; Culture and Personality

Recommended Text:

- 1 Weiten, W. (2017). Psychology: Themes and variations (10th ed.). Boston: Cengage Learning.
- 2 Kalat, J. W. (2013). Introduction to psychology (10th ed.). New Delhi: Cengage Learning.
- 3 Nolen-Hoeksema, S., Hilgard, E. R. (2014). Atkinson & Hilgard's introduction to psychology (16th ed.). New Delhi: Cengage Learning.

Suggested Readings:

- 1 Plotnik, R., & Kouyoumdjian, H. (2013). Introduction to psychology (10th ed.). Boston: Cengage Learning.
- 2 Flanagan, C., Berry, D., Jarvis, M., & Liddle, R. (2015). AQA psychology. Cheltenham: Illuminate Publishing.

PSYC-5105		Experimental Psychology	3(3+0)
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Course Brief:

This course provides students with a coherent overview of classic and contemporary data on the nature of experimental psychology. Experimental psychology is an applied research course for psychology majors. Basic research methods and terminology are presented and practised in the classroom, and then the same basic research principles are practised and applied in a laboratory setting.

Course Learning Objectives:

This course Introduces research methods employed in studying the cognitive and social determinants of thinking and decision-making. Students gain experience in conducting research, including designing simple experiments, observation and preference elicitation techniques; analysing behavioural data, considering validity, reliability, and research ethics; and preparing written and oral reports. Students will learn how to plan, conduct, and analyze their experimental research and how to communicate the results of their research to others. This course will enable students to familiarise themselves with the critical evaluation of experimental data and their relations to current models of the human psyche.

Course Contents:

- 1 Introduction: Development of Experimental Psychology
- 2 Psychophysics: Importance of Psychophysics; Absolute & Differential Thresholds; Psychophysical Methods; Theory of signal detection
- 3 Learning: Simple Learning and Conditioning; Classical versus instrumental conditioning; Basic factors in learning and performance; Role of reinforcement in learning; Contemporary theories of Learning; Transfer of training
- 4 Memory: Theories of Memory; Compartments of Memory; The storage and retrieval process; Transplantation of Memory; Memory Experiments; Mnemonics: ways of improving memory (Devices Mnemonics)
- 5 Thinking and Problem-Solving: Nature of Thinking; Concept formation; Imageless thought Controversy; Set and attitude as factors in Thinking; Creative Thinking; Theories of Thinking
- 6 Practical Work: Ten experiments out of the following list shall be performed by the students:
- 7 Meaningful vs. Nonsense Learning;
- 8 Retroactive Inhibition
- 9 Simple Reaction Time; Judgment of Time
- 10 Transfer of Training: Whole vs Part Learning
- 11 Trial Position Effect under Massed and Distributed Practice
- 12 Retention for Complete and Interrupted Task
- 13 Mapping Cutaneous Sense Spot
- 14 Mental Fatigue; Negative After Image
- 15 Thermal Adaptation

Recommended Text:

- 1 Martin, D. W. (2008). Doing psychology experiments. Belmont, CA: Thomson-Wadsworth.
- 2 Postman, L., & Egan J. P. (2001). Experimental psychology. New Delhi: Kalyan Publishers.
- 3 Stevens, S. S. (2002). Handbook of experimental psychology (3rd ed.). London: John Wiley & sons.

Suggested Readings:

- 1 Galotti, K. M. (2004). Cognitive psychology in and out of laboratory (3rd ed.). Belmont, CA: Vicki Knight.
- Robert, J. S., & Karin, S. (2016). Cognitive psychology (7th ed.). Boston: Cengage Learning.

PSYC- 5106		Social Psychology		3(3+0)
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Course Brief:

This course offers to review theory and research in social psychology and to apply its major principles to situations encountered in everyday life. This course will also help familiarise you with social psychology by discussing classic topics of study and experiments that have defined the field. You will be able to recognize and evaluate social, cultural, spiritual, and other types of diversity and discuss scientific research methods commonly used to investigate social psychological phenomena. You will think critically about the merits of research findings, theories, and conclusions and gain an informed perspective on how social situations influence behaviour in everyday settings.

Course Learning Objectives:

It will discuss the relevance of social psychological research for understanding human social behavior and apply that knowledge to one's personal growth and development. It will also demonstrate the utility of applying social psychological theory and research to real-world problems and issues for the benefit of society.

Course Contents:

- 1 The Field of Social Psychology: Introduction, Current trends and future scope Conducting research in social psychology
- 2 Self-Presentation and Social Perception: Non-verbal Behaviour, Attribution, Impression Management
- 3 Social Cognition: Schemas, Heuristics, Affect and Cognition
- 4 Behaviour and Attitudes, Cognition & attitude
- 5 Aspects of Social Identity: The self: Nature of the self, Self-concept, Social diversity, Self- esteem; Self-focusing, Self Monitoring, Self Efficacy; Gender: Maleness or femaleness
- 6 Social Influence: Conformity, Compliance, Obedience
- 7 Pro-social Behavior
- 8 Aggression /hurting others,
- 9 Prejudice and Discrimination
- 10 Interacting with others: Interpersonal Attraction - need, characteristics of other situations and problems; Intimacy — Parent-child
- 11 Group Influence
- 12 Facilitation, Social loafing; Coordination in groups; Cooperation or conflict;
- 13 Leadership
- 14 Role of Media in Social Psychology: Perception, Persuasion, Propaganda, Portrayal of Role Models & Media and Agent of change
- 15 Social Psychology in action
- 16 A war against terrorism, Safety issues, and the role of media in society Note: Each student shall prepare a report on any one issue concerning humanity e. g. i) Stereotypes ii) Health, iii) Law

Recommended Text:

- 1 Branscombe, N. R., & Baron, R. A. (2017). Social psychology (14th ed.). Canada: Pearson education.
- 2 DeLamater, J. D., & Myers, D. J., & Collett, J. L. (2015). Social psychology (8th ed.). New York: Westview Press.

Suggested Readings:

- 1 Crisp, R. J. & Turner, R. N. (2014) Essential social psychology (3rd ed.). New York: SAGE Publications Ltd.
- 2 Myers, D. G. & Twenge, J. (2019). Social psychology (13th ed.). New York: McGraw- Hil

GEOG - 5102	Physical Geography	3(3-0)
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Course Brief:

This course provides an opportunity for understanding part of the complex physical and biological environment in which human beings live. It introduces basic processes that influence the characteristics and spatial relationships of climate, water cycle and vegetation. The first part of the course examines the interactions of solar energy with the Earth's atmosphere and surface, and how atmospheric circulation, precipitation, and weather systems are generated. The second part of the course covers the cycling of water and other Earth resources within the living zone - the biosphere. It focuses on how these cycles, together with the flows of energy, influence the nature and distribution of ecosystems and vegetation.

Course Learning Objectives:

Throughout the course, students look at patterns of human activity that are in response to and have an effect upon environmental processes, and are asked to observe and interpret aspects of their local environment in light of what they have learned.

Course Contents:

1. Definition, scope and major branches
2. Realms of the physical environment
3. Lithosphere
4. Internal structure of earth
5. Rocks—origin, formation and types: Igneous, Sedimentary and Metamorphic Rocks
6. Plate tectonics, mountain building forces.
7. Geomorphic processes – endogenic and exogenic processes and their resultant landforms
8. Earthquakes and volcanic activity, folding and faulting
9. Weathering, mass wasting, cycle of erosion, erosion and deposition
10. Landforms produced by running water, ground water, wind and glaciers
11. Atmosphere
12. Composition and structure of atmosphere
13. Atmospheric temperature and pressure, global circulation
14. Atmospheric moisture and precipitation
15. Air masses and fronts
16. Cyclones and other disturbances
17. Hydrosphere
18. Hydrological cycle
19. Ocean composition, temperature and salinity of ocean water
20. Movements of the ocean water; waves, currents and tides
21. Biosphere

Recommended Texts:

1. Strahler, A. (2013). *Introduction to physical geography*. New York: John Wiley & Sons.
2. Thornbury, W. D. (2004). *Principles of geomorphology*. New Jersey: John Willy & Sons.

Suggested Readings:

1. Strahlar, A. N., & Strahlar, A. H. (2004). *Physical environment*. New York: John Wiley & Sons.
2. Stringer, E. T. (2004). *Modern physical geography*. New York: John Wiley & Sons.

GEOG– 5103	Human Geography	3(3-0)
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Course Brief:

This course provides an introduction to Human Geography. The major thrust is on the study of human societies in their relation to the habitat or environment. Dealing with the spatial distribution of societies, human geography covers a very wide field or its scope is enormous. It embraces the study of human races; the growth, distribution and density of populations of the various parts of the world, their demographic attributes and migration patterns; and physical and cultural differences between human groups and economic activities. It also covers the relationship between man and his natural environment, and the way in which his activities are distributed. Human geography also takes into account the mosaic of culture, language, religion, customs and traditions; types and patterns of rural settlements, the site, size, growth and functions of urban settlements, and the functional classification of towns.

Course Learning Objectives:

The study of spatial distribution of economic activities, industries, trade, and modes of transportations and communications as influenced by the physical environment are also the important topics of human geography.

Course Contents:

1. Introduction
2. Definition, scope and branches
3. Basic approaches
4. Population and its characteristics and population distribution
5. Population structure and composition
6. Population dynamics (fertility, mortality, migration etc.)
7. Economic activities
8. Agriculture, mining, forestry, animal husbandry and poultry
9. Industries: cottage, light and heavy
10. Trade, transport and services
11. Tourism
12. Settlements
13. Theories of human settlement
14. Types of settlements

Recommended Texts:

1. Ahmed, Q. S. (2001). *Fundamentals of human geography*. Karachi: Royal Book Company.
2. Becker, A. & Secker. (2002). *Human geography: culture, society, and space*. , New Jersey: John Wiley and Sons.

Suggested Readings:

1. Benko, G. & Shorhmay. (2004). *Human geography: a history for the 21st century*. London: Hodder Arnold.
2. Blij, H. J. D. (2002). *Human geography: culture, society, and space*. New Jersey. John Wiley and Sons.
3. Cloke, P. & Crang, P. (2005). *Introducing human geographies*, (2nd ed.). London: Hodder Arnold.

Course Brief:

Surveying is the science of measuring and recording distances, angles, heights and sizes on the earth's surface to obtain data from which accurate plans and maps is made. It is the art and science of determining the position of natural and artificial features on, above the earth's surface or establishing such point and representing this information on paper plans, as figures, tables or computer based map. The basic concerns regarding a survey are spaces and locations within them. Survey essentially takes note of specific point locations for later reference. Surveying has been essential elements in the planning and execution of nearly every form of construction.

Course Learning Objectives:

One of the main functions of surveying is to acquire data on the shape and position of features on the ground, and to somehow delineate this information on maps, plans and drawings so as to make this data useful for other observers/users. These maps and plans can range from simple drawings in terms of sketches through to plans and maps, all based on some fundamentals of graphical communication

Course Contents:

1. Introduction
2. Instrumental survey and records
3. Surveying using the following instruments
4. Chain survey
5. Plane Table
6. Prismatic Compass
7. Determination of heights and slopes with Abney Level
8. Contouring by Indian Clinometer

Recommended Texts:

1. Singh, G. (2009). *Map work and practical geography*. New Delhi: Vikas Publishing House Pvt. Ltd.
2. Singh, L. & Raghu, N. S. (2000) *Map work and practical geography*. New Delhi: Kalyani publishers.

Suggested Readings:

1. Khan, M. Z. A. (1998). *Text Book of Practical Geography*. Delhi: Concept Publishing Company.
2. Bygott, J. (1952). *An introduction to mapwork and practical geography*. London: University Tutorial Press.
3. Bygott, J. (1955). *Mapwork and practical geography*. London: University Tutorial Press.