




NOTIFICATION

On the recommendations of Academic Council made in its 22nd (3/2024) meeting held on 30.09.2024, the Vice Chancellor is pleased to approve the revised curricula of the following programs for implementation w.e.f. Fall 2024 provisionally subject to approval by the Syndicate.

- | | |
|-------------------------------|-----------|
| i. Associate Degree in Botany | Annex-'A' |
| ii. BS in Botany | Annex-'B' |


(WAQAR AHMAD)
Additional/Registrar (General)

No. SU/Acad/25/18

Dated: 09.01.2025

Distribution:

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

C.C:

- Dean, Faculty of Sciences
- Director, QEC
- Additional Registrar (Affiliation & Registration)
- Secretary to the Vice-Chancellor
- PA to Registrar
- Notification File

SCHEME OF STUDIES
ASSOCIATE DEGREE
IN BOTANY
(2024 & onwards)



DEPARTMENT OF BOTANY
UNIVERSITY OF SARGODHA
SARGODHA

Associate Degree Program
SCHEME OF STUDIES
Associate Degree in Botany (For Affiliated Colleges)

1. Program Structure:

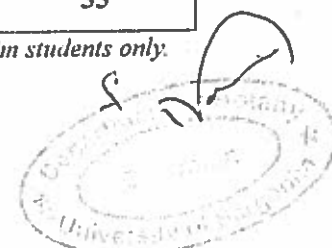
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| Duration | Minimum 2-Years (4-Semesters) | |
| Admission Requirements: | Students with Pre-Medical / Pre-Engineering combinations in HSSC / A-level with Botany/Biology as an elective subject after 12-years of education. | |
| Degree Completion Requirements: | General Education | 33 Cr. Hrs |
| | Discipline Related Courses / Major | 30 Cr. Hrs |
| | Interdisciplinary / Allied Courses | 06 Cr. Hrs |
| | Total | 69 |

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

The minimum requirement for Gen Ed is 33 credits hours and will be offered in first four semesters only.

| Sr. No. | Course Code | Course Title | Credit Hours |
|--------------------------------------|--------------------------|--|--------------|
| 1. | URCG-5105 / URCG-5126 | Islamic Studies / Ethics | 2 (2-0) |
| 2. | URCG-5111 | Translation of the Holy Quran | NC |
| 3. | URCG-5112 / URCG-5113 | Fables, Wisdom Literature and Epic / Space, Place & Experiences | 2 (2-0) |
| 4. | URCG-5116 / URCG-5117 | Science of Society-I / Science of Society-II | 2 (2-0) |
| 5. | URCG-5118 | Functional English | 3 (3-0) |
| 6. | URCG-5119 | Expository Writing | 3 (3-0) |
| 7. | URCG-5120 | Exploring Quantitative Skills | 3 (3-0) |
| 8. | URCG-5121 | Tools for Quantitative Reasoning | 3 (3-0) |
| 9. | URCG-5122 | Ideology and Constitution of Pakistan | 2 (2-0) |
| 10. | URCG-5123 | Applications of Information Communication Technologies (ICT) | 3 (2-1) |
| 11. | URCG-5124 | Entrepreneurship | 2 (2-0) |
| 12. | URCG-5125 | Civics & Community Engagement | 2 (2-0) |
| 13. | URCG-5127 | Seerat of the Holy Prophet (SAW)* | 1(1-0) |
| 14. | URCG-5128 | Pakistan Studies | 2 (2-0) |
| 15. | URCG-5115 | The Science of Global Challenges | 3 (2-1) |
| GE Courses Credit Hours Total | | | 33 |

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

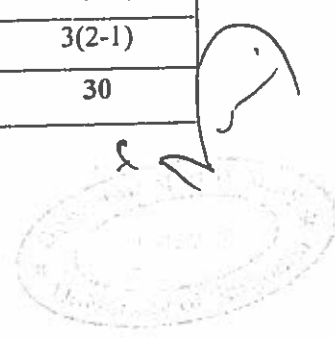


3. Single Major Courses:

| Sr. No. | Course Code | Course Title | Credit Hours |
|----------------------------------|-------------|----------------------------------|--------------|
| 1. | BOTN-5101 | Cell Biology | 3 (2-1) |
| 2. | BOTN-5102 | Diversity of Plants | 3 (2-1) |
| 3. | BOTN-5103 | Fundamentals of Plant Taxonomy | 3 (2-1) |
| 4. | BOTN-5106 | Phycology & Bryology | 3 (2-1) |
| 5. | BOTN-5107 | Mycology | 3 (2-1) |
| 6. | BOTN-5108 | Plant Anatomy & Embryology | 3 (2-1) |
| 7. | BOTN-5109 | Phytogeography | 3 (2-1) |
| 8. | BOTN-5110 | Principles of Plant Ecology | 3 (2-1) |
| 9. | BOTN-5111 | Principles of Plant Biochemistry | 3 (2-1) |
| 10. | BOTN-5112 | Fundamentals of Plant Physiology | 3 (2-1) |
| Major Course Credit Hours | | | 30 |

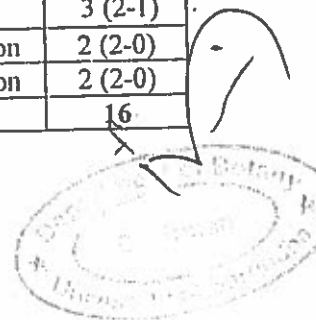
4. Interdisciplinary/Allied Courses:

| | | | |
|--|-----------|-------------------------------------|-----------|
| 1. | BOTN-5104 | Biodiversity & Conservation | 3 (3-0) |
| 2. | BOTN-5105 | Fundamental of Genetics & Evolution | 3(2-1) |
| Interdisciplinary Course Credit Hours | | | 30 |



Scheme of Studies
Associate Degree in Botany

| Sr # | Code | Course Title | Course Type | Credit Hours |
|---------------------------|--------------------------|--|-------------------|--------------|
| Semester-I | | | | |
| 1. | BOTN-5101 | Cell Biology | Major | 3 (2-1) |
| 2. | BOTN-5102 | Diversity of Plants | Major | 3 (2-1) |
| 3. | URCG-5111 | Translation of the Holy Quran – I | General Education | NC |
| 4. | URCG-5118 | Functional English | General Education | 3 (3-0) |
| 5. | URCG-5120 | Exploring Quantitative Skills | General Education | 3 (3-0) |
| 6. | URCG-5123 | Applications of Information Communication Technologies (ICT) | General Education | 3 (2-1) |
| 7. | URCG-5115 | The Science of Global Challenges | General Education | 3 (2-1) |
| Total Credit Hours | | | | 18 |
| Semester-II | | | | |
| 1. | BOTN-5104 | Biodiversity & Conservation | Interdisciplinary | 3 (3-0) |
| 2. | BOTN-5105 | Fundamental of Genetics & Evolution | Interdisciplinary | 3 (2-1) |
| 3. | URCG-5116 / URCG-5117 | Science of Society-I / Science of Society-II | General Education | 2 (2-0) |
| 4. | URCG-5121 | Tools for Quantitative Reasoning | General Education | 3 (3-0) |
| 5. | URCG-5119 | Expository Writing | General Education | 3 (3-0) |
| 6. | URCG-5127 | Seerat of the Holy Prophet (SAW) | General Education | 1(1-0) |
| 7. | URCG-5128 | Pakistan Studies | General Education | 2 (2-0) |
| Total Credit Hours | | | | 17 |
| Semester-III | | | | |
| 1. | BOTN-5103 | Fundamentals of Plant Taxonomy | Major | 3 (2-1) |
| 2. | BOTN-5106 | Phycology & Bryology | Major | 3 (2-1) |
| 3. | BOTN-5107 | Mycology | Major | 3 (2-1) |
| 4. | BOTN-5108 | Plant Anatomy & Embryology | Major | 3 (2-1) |
| 5. | URCG-5112 / URCG-5113 | Fables, Wisdom Literature and Epic / Space, Place & Experiences | General Education | 2 (2-0) |
| 6. | URCG-5105 / URCG-5126 | Islamic Studies / Ethics | General Education | 2 (2-0) |
| 7. | URCG-5122 | Ideology and Constitution of Pakistan | General Education | 2 (2-0) |
| 8. | URCG-5111 | Translation of Holy Quran-II | General Education | NC |
| Total Credit Hours | | | | 18 |
| Semester-IV | | | | |
| 1. | BOTN-5109 | Phytogeography | Major | 3 (2-1) |
| 2. | BOTN-5110 | Principles of Plant Ecology | Major | 3 (2-1) |
| 3. | BOTN-5111 | Principles of Plant Biochemistry | Major | 3 (2-1) |
| 4. | BOTN-5112 | Fundamentals of Plant Physiology | Major | 3 (2-1) |
| 5. | URCG-5124 | Entrepreneurship | General Education | 2 (2-0) |
| 6. | URCG-5125 | Civics and Community Engagement | General Education | 2 (2-0) |
| Total Credit Hours | | | | 16 |



Semester I

| BOTN-5101 | Cell Biology | 3(2-1) |
|--|--------------|--------|
| <p>Course Brief: This course covers fundamental cell biology concepts, including microscopy, cell fractionation, and organelle functions, while also exploring membrane physiology, the cell cycle, stem cells, and cancer. It evaluates current issues in cell biology and their impacts on medicine, agriculture, and biotechnology.</p> <p>Course Learning Objectives: The course aims to provide a comprehensive understanding of cell biology, including the fundamental concepts and various microscopy techniques used to visualize cellular structures. Students will learn about cell fractionation and the analysis of biological molecules, focusing on their structures and roles in bioenergetics. The course covers the organization and function of cellular organelles, membrane structure, and cytoplasmic physiology. Key topics include intercellular interactions, the cell cycle, stem cell biology, and cancer mechanisms. Additionally, students will evaluate current issues in cell biology and their impacts on medicine, agriculture, biotechnology, and society.</p> <p>Course Content:</p> <ol style="list-style-type: none">1. Introduction: the discovery of cells, its basic properties, different types of cells.2. Structure and function of biological molecules/ Chemical components of cells: Acids, Bases and Buffers, Nature of Biological molecules, four types of biological molecules, carbohydrates, lipids, proteins, Nucleic Acids3. Cell wall: Cell Wall Structure and Chemical Composition4. Cell membrane: Membrane functions, history, chemical composition of membranes, structure and function of membranes, membrane lipids and membrane fluidity, movement of substances across cell membrane.5. Cellular organelles: structure and function of endoplasmic reticulum, Golgi complex, Vacuole, Lysosomes, Ribosomes, Microbodies6. Cytoskeleton and Cytoplasm: Chemical composition, structure and function. Microtubules, Microfilaments.7. Mitochondria: structure and function, mitochondrial membranes, mitochondrial matrix, function of mitochondria, Peroxisomes.8. Chloroplast structure and Function: structure and function, membranes, photosynthetic units and reaction centres, function of chloroplast.9. Nucleus: Nuclear membrane, nucleolus, ultrastructure and morphology of chromosomes, karyotype analysis.10. Cell signaling Pathways: the basic elements of cell signaling system, G protein coupled Receptors and their second messengers, the role of calcium as an intracellular messenger.11. DNA and Chromatin: Chemical structure, different types of Chromatins, Euchromatin and Heterochromatin and their function.12. Extracellular Matrix. Extracellular space, interactions of cells with extracellular materials, interaction of cells with other cells.13. Cell Division: Cell cycle, Mitosis and Cytokinesis, Meiosis.14. Chromosomal Aberrations; Changes in the number of chromosomes, aneuploidy and euploidy; Changes in the structure of chromosomes, deletion, duplication, inversion and translocation, special types of chromosomes.15. Trends in cell Biology: the light microscope, Transmission electron microscope, Scanning electron microscope, use of radioisotopes, cell culture, DNA sequencing, DNA libraries, use of Antibodies. <p>Lab Outline:</p> <ol style="list-style-type: none">1. Study of cell structure using compound microscope.2. Identification of general Biomolecules.3. Extraction and estimation of Biomolecules4. Extraction and estimation of RNA and DNA from plant material.5. Elucidation of ultrastructure of cell through electron microphotographs6. Measurement of cell size | | |

7. Slide preparation of Cell wall and its layers.
8. Study of Nucleus and its staining in different cells.
9. Study of mitosis from prepared slides and by smear/squash method with onion root tip
10. Study of meiosis from prepared slides
11. Study of chromosome morphology
12. Study of variation in chromosome number
13. Study of variation in chromosome structure

Recommended Texts:

1. Urry, L. A., Cain, M., Wasserman, S. A., & Jane, R. (2020). Campbell Biology, (13th Ed.), Pearson Education, New York.
2. Alberts, B. (2022). Molecular Biology of Cell. (7th Ed.). W. W. Norton & Company.

Suggested Readings:

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.
3. Templeton, N. S., (2015). Gene and cell therapy (4th Ed.). London: Taylor and Francis publications.
4. Sybille, M. & Maria, S., (2015). Tumor cell metabolism (1st Ed.). New York: Springer Publications.

| BOTN-5102 | Diversity of Plant | 3(2-1) |
|--|--------------------|--------|
| <p><u>Course Brief:</u> This course provides a comprehensive study of diverse biological systems, including viruses, bacteria, algae, fungi, bryophytes, Pteridophytes, and Gymnosperms. Students will explore their structures, reproductive strategies, and ecological significance, with a focus on their economic importance and practical applications. The course integrates theoretical knowledge with practical insights to address real-world issues in agriculture and environmental management.</p> <p><u>Course Learning Objectives:</u> The purpose of this course is to understand the discovery and general characteristics of viruses, including their unique structure and diverse replication mechanisms, and evaluate their economic significance. They will gain comprehensive knowledge of the structure and replication cycles of DNA viruses (T-phages) and RNA viruses (Tobacco Mosaic Virus), and their economic impact on crops, livestock, and human health. The course will enable students to examine the discovery and characteristics of bacteria, focusing on their cell structure and reproductive methods, including conjugation, transformation, and transduction, and analyze their roles in ecosystems and industry. Students will also study the characteristics, classification, and economic importance of algae, fungi, bryophytes, pteridophytes, gymnosperms, and angiosperms, understanding their morphology, life cycles, and ecological significance, with detailed examinations of specific representatives within each group.</p> <p><u>Course Content:</u></p> <ol style="list-style-type: none"> 1. Comparative study of life form, structure, reproduction and economic significance of: 2. Viruses (RNA and DNA types) with special reference to TMV 3. Bacteria and Cyanobacteria (Nostoc, Anabaena, Oscillatoria) with specific reference to bio fertilizers, pathogenicity and industrial importance. 4. Algae (Chlamydomonas, Spirogyra, Chara, Vaucheria, Pinnularia, Ectocarpus, Polysiphonia) 5. Fungi (Mucor, Penicillium, Phyllactinia, Ustilago, Puccinia, Agaricus) their implication on crop production and industrial applications. 6. Lichens (Physcia) | | |

7. Bryophytes (Riccia, Anthoceros, Funaria)
8. Pteridophytes: Psilopsida (Psilotum), Pteropsida (Marsilea), Sphenopsida (Equisetum)
Lycopsida (Selaginella)
9. Gymnosperms (Cycas, Pinus, Ephedra)
10. Angiosperms: Monocot (Poaceae) , Dicot (Solanaceae)

Lab Outline:

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.

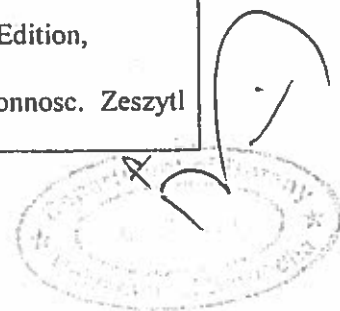
Recommended Texts:

1. Ali, S. I. and Nasir, Y. (1995-to date). Flora of Pakistan. Karachi Univ. Press, Karachi.
2. Davis, P.H. and Heywood, V. H. (1963). Principles of Angiosperm Taxonomy. Oliver & Boyd, London.
3. Greuter, W., McNeill, J. Barrie, F.R., Burdet, H. M., Demoulin, V., Filguerras, T.S., Nicolson, D.H., Silva, P.C., Skog, J.E., Trehane, P., Turland, N. J. and Hawksworth, D. L. (2000). International code of botanical nomenclature (Saint Louis Code) adopted by the Sixteenth International botanical congress St. Louis Missouri, July –August 1999. Koeltz, Konigstein. (Regnum Veg.138.)
4. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F. and Donoghue, M. J. (2015). Plant Systematics; A phylogenetic Approach, Sinauer, USA.
5. Levine, D. A. (2000). The Origin, Expansion and Demise of Plant Species. Oxford University Press.

Suggested Readings:

1. Simpson, M. G. (2018). Plant Systematics (3rd edition). Elsevier Academic Press, UK. (Latest edition)
2. Singh, G. (2016). Plant Systematics; An Integrated Approach (3rd edition), University of Dehli, India (Latest edition).
3. Briggs, D.J. and Walters, S.M.. (2016) Plant Variation and Evolution, Cambridge University Press & Assessment
4. Journal Articles/ Reports: Pakistan journal of Botany, Mycotaxon, Plant systematics and Evolution, etc.

| URCG-5115 | The Science of Global Challenges | 3(2-1) |
|---|----------------------------------|--------|
| <p>Course Content: Climate Change i.e., Global Warming, Natural and Anthropogenic Activities and their impact; Energy i.e., Renewable and non-renewable energy resources; Water Security i.e., water scarcity and waste water treatment; Land Degradation i.e., salinity, water logging, deforestation, land erosion; 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</p> <p>Practical:</p> <ol style="list-style-type: none"> 1. Preparation of standard solution and their standardizations 2. Soil and Water Analysis <p>Recommended Texts:</p> <ol style="list-style-type: none"> 1. Usman, M. (2022). Science of Global Challenges. Ilmi Kitab Khana, Lahore. <p>Suggested Readings:</p> <ol style="list-style-type: none"> 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. Zeszyt Naukowe. Turkey | | |



Course Brief:

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

Course Learning Objectives:

By the end of this course, students shall have:

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

Course Contents:

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

Recommended Texts

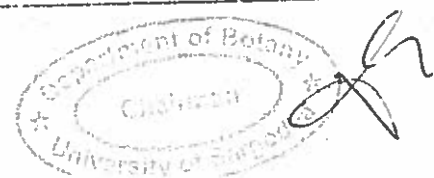
1. Sevilla, A., & Somers, K. (2012). Quantitative reasoning: tools for today's informed citizen. New Jersey, John Wiley & Sons.
2. Burzynski, D., & Ellis, W. (2008). Fundamentals of mathematics. USA, Saunders College Publishing.

Suggested Readings :

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

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|---|--------------------|--------|
| URCG-5118 | Functional English | 3(3-0) |
| <p>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.</p> <p>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.</p> <p>Course Content:</p> <ol style="list-style-type: none"> 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 <p>Recommended Texts:</p> <ol style="list-style-type: none"> 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. <p>Suggested Readings:</p> <ol style="list-style-type: none"> 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 | | |

| | | |
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| URCG-5123 | Applications of Information Communication Technologies (ICT) | 3(2-1) |
| <p>Course Brief: The course introduces students to information and communication technologies and their application in the workplace. Objectives include basic understanding of computer software, hardware, and associated technologies. How computers can be used in the workplace, how communications systems can help boost productivity, and how the Internet technologies can influence the workplace. 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.</p> | | |



Course Content:

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.

| URCG-5111 | Translation of Holy Quran-I | Non-Credit |
|---|-----------------------------|------------|
| Semester / Level: In some discipline 1st semester and in some discipline 2nd Semester/ ADP Program 1st Year | | |
| Course Learning Objectives: <ul style="list-style-type: none">• 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 Content: <ul style="list-style-type: none">• تیسواں پارہ - ناظرہ مع تجوید• بنیادی عربی گرامر• اسم اور اسکے متعلقات: اسم ناعل، مفعول، تفضیل، مبالغہ• فعل اور اسکی اقسام: ماضی، مضارع، امر، نہی• حرف اور اسکی اقسام: حروف علت، حروف جار، مشبہ بالفعل | | |
| Memorization: تیسویں پارے کی آخری میں سور تیس (حفظ مع ترجمہ) | | |



Semester II

| | | |
|-----------|--------------------------------|--------|
| BOTN-5103 | Fundamentals of Plant Taxonomy | 3(2-1) |
|-----------|--------------------------------|--------|

Course Brief:

The "Plant Classification and Identification" course aims to provide a comprehensive understanding of plant taxonomy, focusing on systematic analysis of plant characteristics for classification and identification. Students will learn about botanical nomenclature, plant parts, and taxonomic techniques essential for distinguishing and categorizing plants. The course also explores various plant families and the application of molecular data in modern taxonomy.

Course Learning Objectives:

The Plant Taxonomy course provides an in-depth understanding of plant classification and identification. It covers the basics of scientific and vernacular names, Linnaeus's binomial system, and classification ranks. Students will learn about plant parts and their descriptions, taxonomic techniques, and the use of molecular data in taxonomy. The course includes practical work, such as collecting and preserving specimens, using and creating keys, and analyzing plant reproductive strategies. Students will also engage in outdoor lab sessions and herbarium preparation, with a focus on identifying and documenting plant families and evolutionary relationships.

Course Content:

1. Introduction to Taxonomy
Definition, scope, objectives, basic components, types and phases
2. History of Taxonomy
Pre-Linnaean Taxonomy, Linnaean Era, Post Linnaean Taxonomy
3. Systems of Classification
Artificial-Carl Linnaeus system, Natural-George Bentham & Joseph Dalton Hooker system, Mechanical system, Phylogenetic-Adolf Engler & Karl Prantl, John Hutchinson systems, Current Systems-Robert F. Thorne, Phycocode.
4. Branches of Taxonomy
Numerical taxonomy, Chemotaxonomy, cytotaxonomy, molecular taxonomy
5. PLANT NOMENCLATURE
Common names, Binomial nomenclature, International Code of Botanical Nomenclature (ICBN)
6. Plant Nomenclature
Problems with Common names, Binomial nomenclature, International Code of Botanical Nomenclature (ICBN)
7. Plant Characters and their value in Taxonomy
Habit, Stems, Hairs, Leaves, Compound and Simple Leaves, Leaf Shapes, Leaf Margins, Leaf Structure, Leaf Arrangements, Leaf Venation, Leaf Modifications, Roots, Root modifications, Flowers, The Inflorescence, Fruits, placentation.
8. Plant Collection and Preservation Techniques
HERBARIA - Collecting and Preserving a Plant, Fresh Material, Arranging Plants for Pressing, Pressing Difficult Specimens, The Drying Process, Herbarium Specimens, Photographs, The Problem of Colour, Describing a Plant on Paper, Botanical illustration, Floral Diagrams, Floral Formulae
9. Plant Identification Diagnostic characters, basic aids for plant identification, family wise key identification tools

Lab Outline:

1. Technical description of some plants of the local flora and their identification up to species level with the help of a regional/Flora of Pakistan
2. Preparation of indented and bracketed types of keys
3. Preparation of permanent slides of pollen grains by acetolysis method and study of different pollen characters.
4. Study of variation pattern in different taxa.
5. Submission of properly mounted and fully identified hundred herbarium specimens at the time of examination
6. Field trips shall be undertaken to study and collect plants from different ecological zones of Pakistan.



Recommended Texts:

1. Thomson, S. A., Pyle, R. L., Ah Yong, S. T., Alonso-Zarazaga, M., Ammirati, J., Araya, J. F., & Segers, H. (2018). Taxonomy based on science is necessary for global conservation. PLoS biology, 16(3), e2005075.
2. Simpson, M. G. (2019). Plant systematics. Academic press.
3. Pawara, P., Okafor, E., Schomaker, L., & Wiering, M. (2017, September). Data augmentation for plant classification. In International conference on advanced concepts for intelligent vision systems (pp. 615-626). Springer, Cham.

Suggested Readings:

1. Thomson, S. A., Pyle, R. L., Ah Yong, S. T., Alonso-Zarazaga, M., Ammirati, J., Araya, J.F., & Segers, H. (2018). Taxonomy based on science is necessary for global conservation. PLoS Biology, 16(3), e2005075.
2. Elhariri, E., El-Bendary, N., & Hassanien, A. E. (2014, December). Plant classification system based on leaf features. In 2014 9th International Conference on Computer Engineering & Systems (ICCES) (pp. 271-276). IEEE.
3. Louhaichi, M. (2018). Group Training Course on Rangelands Plant Terminology & Basic Plant Identification.

| BOTN-5104 | Biodiversity & Conservation | (3-0) |
|---|-----------------------------|-------|
| <p>Course Brief: The depletion of biodiversity is driven by habitat loss, resource overexploitation, climate change, diseases, pollution, and poaching. To address this, governments and organizations emphasize biodiversity conservation, recognizing that humans benefit from biodiversity and must preserve it for future generations. Conservation efforts focus on protection, enhancement, and scientific management of biodiversity to maintain ecological processes and life support systems. The goal is to sustain species variety and ensure ecosystems are used sustainably for both current and future populations.</p> <p>Course Learning Objectives: The Biodiversity and Conservation course explores biodiversity definitions, types, and threats like deforestation and pollution. It covers measuring biodiversity through alpha, beta, and gamma diversity, and examines conservation strategies, including in situ and ex situ methods. Students will study biodiversity hotspots, international treaties, and the role of herbariums and botanical gardens. The course also addresses sustainable resource use, ecological services, and the Global Biodiversity Information Facility (GBIF).</p> <p>Course Content:</p> <ol style="list-style-type: none">1. Basic concepts<ul style="list-style-type: none">• Introduction to biodiversity and its tangible and intangible value• Biodiversity hotspots (tropical and coral reef ecosystems)• Introduction and levels of biodiversity (Alpha, Beta and Gamma)• Biodiversity distribution, importance and Reduction.• Major and Current threats to biodiversity• Inventorying and monitoring of Biodiversity: baseline data (study)• Policies and legislation related to biodiversity loss and conservation• Different types of protected areas for biodiversity conservation• Understanding opportunities and challenges of biodiversity conservation2. Cause and depletion of biodiversity<ul style="list-style-type: none">• Concept of habitat and niche• Habitat loss• Habitat fragmentation• Concept of speciation• Loss of existing species• Origin of new species3. Species inventory and its utilization | | |



- Baseline data of biodiversity
 - Use of species inventory in EIA (Environmental Impact Assessment)
 - Preparing species inventory at first level
 - Monitoring of biodiversity
 - Red data books and lists
4. Species extinction
 - How do species become endangered?
 - How species become threatened?
 - Criteria for recognizing different categories of threatened species
 - IUCN threatened species categories
 - Concept of extinct and extant species
 - Extinction of species
 - Theory of mass extinction
 5. Species invasion and its impacts on local biodiversity
 - Concept of invasive, alien and native species
 - Species invasion and its major types
 - Intensively invasive species and its out-competing potential for native species
 - Concept of direct and indirect competition of local resources
 6. Biodiversity conservation
 - Introduction to conservation, its history, guiding principles, and characteristics
 - In situ conservation – conservation at species and population level
 - Ex situ conservation – conservation in man-made ecosystems, croplands, cities.
 - Reconfirmation assays of existing biodiversity
 - Museums, arboretums, herbarium, zoos
 - Natural parks, sanctuaries, and biosphere reserves
 - Gene bank management and operation
 7. Biodiversity conservation – role of masses
 - Public awareness strategies
 - Population explosion role of herbaria and botanical gardens in conservation
 - Legal protection of species and habitats
 - National and international laws and agreements for species and habitat Protection
 - National conservation strategy of Pakistan
 - Major prioritized sites for conservation
 - Priorities in conservation and conservation planning (case studies & exercises)
 - National Conservation Strategy of Pakistan
 - Major protected areas and national parks of Pakistan

Recommended Texts:

1. Baldauf, C. (2020). *Participatory Biodiversity Conservation: Concepts, Experiences, and Perspectives*. Springer Publishers. ISBN: 978-3-030-41686-7.
2. Dar, G.H., Khuroo, A.A. (2020). *Biodiversity of the Himalaya: Jammu and Kashmir State*. Springer Publishers. ISBN 978-981-329-174-4.

Suggested Readings:

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



Course Brief:

This course provides a comprehensive introduction to genetics and evolution, covering fundamental concepts in Mendelian genetics, molecular genetics, and evolutionary biology. Students will explore the principles of inheritance, the molecular mechanisms underlying gene expression, and the evolutionary processes that shape genetic diversity in populations. Through laboratory exercises and hands-on activities, students will gain practical experience in genetic analysis and bioinformatics tools.

Course Learning Objectives:

The course on Introduction to Genetics and Evolution provides a comprehensive understanding of key genetic and evolutionary concepts. Students will gain insights into Mendelian genetics, including the laws of inheritance and different types of genetic crosses, as well as sex-linked inheritance. The course covers chromosomal biology and cell division, emphasizing mitosis, meiosis, and chromosomal mutations. Molecular genetics topics include DNA structure, replication, gene expression, and repair mechanisms. Evolutionary principles are explored through natural selection, phylogenetics, and systematics, while population genetics focuses on genetic variation, drift, gene flow, and adaptation. The course concludes with a study of evolutionary processes such as speciation and co-evolution, along with genomics and its role in understanding genome evolution and comparative genomics.

Course Content:

- 1 Introduction to Genetics and Evolution
- 2 Mendelian Genetics, Laws of inheritance, Monohybrid and dihybrid crosses, Sex-linked inheritance
- 3 Chromosomes and Cell Division, Mitosis and meiosis, Chromosomal mutations
- 4 DNA structure and replication, DNA synthesis and amplification, Transcription and translation, Mutation and repair
- 5 Evolutionary Principles, Introduction to evolution, Natural selection, Phylogenetics and systematics
- 6 Population Genetics, Genetic variation and drift, Gene flow and migration, Selection and adaptation
- 7 Evolutionary Processes, Speciation, Co-evolution, Evolutionary developmental biology (evo-devo)
- 8 Genomics and Evolution, Genome evolution, Comparative genomics, Evolutionary genomics

Lab Outline:

- 1 Perform monohybrid and dihybrid crosses in model organisms and
- 2 Use PCR to amplify DNA sequences and perform DNA sequencing to identify genetic variations.
- 3 Utilize bioinformatics software to analyze genomic data and compare genomic sequences across species.
- 4 Conduct phylogenetic analysis using genetic data to construct evolutionary trees and study population genetics through simulation models.

Recommended Texts:

- 1 Futuyma, D. J., & Kirkpatrick, M. (2017). Evolution (4th ed.). Sinauer Associates.
- 2 Alberts, B., Johnson, A., Lewis, J., Morgan, D., Raff, M., Roberts, K., & Walter, P. (2015). Molecular biology of the cell (6th ed.). Garland Science.

Suggested Readings

1. Wilson, R. K. (2008). Genomics and evolution. Elsevier.



Course Description:

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

Learning Outcomes:

The course has following outcomes: It will

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

Course Outlines:

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 Books and Reading Material:

1. Giddens, A. (2018). Sociology (11th Ed.). UK: Polity Press.
2. Henslin, J. M. (2018). Essentials of Sociology: A Down-to-Earth Approach. (18th Ed) 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.
6. Systems of Stratification | Boundless Sociology (no date). Available at: <https://courses.lumenlearning.com/boundless-sociology/chapter/systems-of-stratification/>
7. 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)
8. Zaidi, S. A. (2015) Issues in Pakistan's Economy: A Political Economy Perspective. Oxford University Press. Chapter 26
9. Akhtar, A. S. (2017) The Politics of Common Sense: State, Society and Culture in Pakistan. Cambridge: Cambridge University Press.

| | | |
|---|------------------------------|----------------|
| URCG-5117 | Science of Society-II | 2 (2-0) |
| <p><u>Course Description:</u> This course extends our study of modern societies, their structures, their institution and their functions in global era. It will introduce the participants with processes of social change in Pakistan from the time of formal independence to the present day. It will enhance our understanding of the evolution of Pakistani culture, society and its social institutions including role of religion in society/polity, democracy, urbanization and individuation, ending with important questions and challenges facing by Pakistan in the twenty first century. From a social science perspective participants will learn analytically about the issues and challenges faced by states and societies of today's world with special focus on local context.</p> | | |



Course Learning Outcomes:

The course has outcomes. It will:

- Cultivate critical thinking, the ability to ask questions, engage in reasoned debate and tolerance of opposing points of view
- Introduce student with modern day social organization, institutions, groups and group identities
- Make student aware with the concept of growth and development and endogenous and exogenous factors of development
- Make students familiar with religious and political institution of our society from a sociological perspective
- Introduce students with the socio-economic prospects and challenges faced by Pakistan as a developing and transforming state
- Help students to understand the implications of modernity including digital/technological revolution, global warming, income inequality, global terrorism and polarization
- Develop an in-depth and critical understanding of the socio-economic problems faced by Pakistan

Course Content:

1. Groups, Organizations and Bureaucracies
 - Primary and secondary groups
 - Group identities, In group, Out group
 - Traditional vs Modern organizations, Organizational leadership
 - Formal organizations, Bureaucracy, Weber's model of Bureaucracy
 - Military and Civil Bureaucracy in Pakistan
2. Development, Economic Growth, Human development and Globalization
 - Understanding development
 - Modernization and Development
 - Globalization and Development, Global economic systems and local economic Growth
 - Sustainable development
 - Development in Pakistan: Challenges and Prospects
3. Politics and Religion in Pakistan
 - Rationality vs Traditionalism in Religion and Politics
 - Religion: Integration and divide
 - Politics and Democracy, Challenges faced by Pakistan in becoming a democratic state
 - Political Development, Theoretical understanding of political development
4. Human Development, Youth Bulge in Pakistan
 - Demographic transition
 - Population and Resource mobilization
 - Engaging youth, Youth policy
 - Migration, Urbanization, Socio-cultural identities
5. Digital technology and a changing life/world
 - Technology and Modern world Challenges
 - Technology and Globalization
 - Technology and Ethical issues
 - Technology and Crime, Future of technology
6. Eco-systems, Environment and Sustainable development
 - Ecology and human society
 - Global environment
 - Cost of development, Alternative models, Sustainable development
 - Global warming, Causes and remedies
 - Environmental challenges and adaptation strategies
7. Pakistan in 21st century
 - Colonialism, colonial legacy, National identity
 - Transformation in Pakistani society: Traditionalism vs Modernism
 - Economy, Informality of Economy, Modern global economic systems and Pakistan



- Political Economy, Sociology of Economy, Women in Pakistan
8. Social Issues of Pakistan
- Population
 - Crime and Terrorism
 - Illiteracy
 - Environmental challenges
 - Political Instability

Recommended Texts:

1. Barnett, T. (2003). Sociology and development. Routledge.
2. Giddens, A. (2018). Sociology (11th Ed.). UK: Polity Press.
3. Henslin, J. M. (2018). Essentials of Sociology: A Down-to-Earth Approach. (18th Edition) Pearson Publisher.
4. Macionis, J. J. (2016). Sociology (16th Ed.). New Jersey: Prentice-Hall.
5. Clapham, C. (2002). The challenge to the state in a globalized world. Development and change, 33(5), 775-795.
6. Class dynamics of Agrarian Change by Henry Bernstein: Chapter 3 Colonialism and Capitalism. Page 47-50.
7. A.s, H. and F, K. (1974) 'Land tenure and rural development in Pakistan.' Land Reform, Land Settlement and Cooperatives. Available at: <https://agris.fao.org/agris-search/search.do?recordID=XF19760074297>
8. Kennedy, C. H. (1987) Bureaucracy in Pakistan. Oxford University Press. Chapters 2, 3 & 9.
9. Introduction to the Sociology of "Developing Societies". London: Macmillan Education UK, pp. 289-307.
10. Akhtar, A. S. (2017) The Politics of Common Sense: State, Society and Culture in Pakistan. Cambridge: Cambridge University Press.
- 11.
12. Craggs, R. (2014) 'Development in a global-historical context', in The Companion to Development Studies. 3rd Edn. Routledge, 5-10 (Chapter 1.1)
13. Addleton, J. S. (1992) Undermining the Centre: The Gulf Migration and Pakistan. 1st edition. Karachi: Oxford University Press, 51-63 (Chapter 5).
14. S. Zaidi, S. A. (2015) Issues in Pakistan's Economy: A Political Economy Perspective. Oxford University Press. (Chapter 3: The Green Revolution and Land Reforms).
15. West, C. and Zimmerman, D. H. (1987) 'Doing Gender', Gender and Society, 1(2), pp. 125-151.
16. Lorber, J. and Farrell, S. A. (1990) The Social Construction of Gender. SAGE Publications.
17. Ahmad, S. (2018) Unleashing the potential of a young Pakistan | Human Development Reports. Available at: <http://hdr.undp.org/en/content/unleashing-potential-young-pakistan>
18. White, B. (2012) 'Agriculture and the Generation Problem: Rural Youth, Employment and the Future of Farming', IDS Bulletin, 43(6), pp. 9-19
20. Jason W. Moore (2017) The Capitalocene, Part I: on the nature and origins of our ecological crisis, The Journal of Peasant Studies, 44:3, 594-630.
21. Ali, N. (2019) Delusional States: Feeling Rule and Development in Pakistan's Northern Frontier. Cambridge: Cambridge University Press. 195-230 (Chapter 5).
22. Majed Akhter (2015) Dams as a Climate Change Adaptation Strategy: Geopolitical Implications for Pakistan, Strategic Analysis, 39:6, 744-748.
23. Woodcock, J. and Johnson, M. (2019) 'Live Streamers on Twitch.tv as Social Media Influencers: Chances and Challenges for Strategic Communication', International Journal of Strategic Communication, 13, pp. 321-335.
24. Qadeer, M. (2006) Pakistan - Social and Cultural Transformation in a Muslim Nation.
25. Smelser, N.J. and Swedburg, R., The Handbook of Economic Sociology, Chapter 1 'Introducing Economic Sociology', Princeton University Press, Princeton.



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

Course Brief:

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

Course Learning Outcomes:

By the end of the course, student shall have:

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

Course Content:

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

Recommended Texts :

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

Suggested Readings :

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



| URCG- 5119 | Expository Writing | 3(3-0) |
|--|--------------------|--------|
| Course Brief: This course prepares undergraduates to become successful writers and readers of English. The course helps students develop their fundamental language skills with a focus on writing so that they can gain the confidence to communicate in oral and written English outside the classroom. The course is divided into five units and takes a Project-based Learning approach. Unit themes target the development of 21st century skills and focus on self-reflection and active community engagement. 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 Content: 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-5127 | Seerat of the Holy Prophet (مطالعہ سیرت النبی صلی اللہ علیہ وسلم) | 1(1-0) |
|---|---|--------|
| 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: <ul style="list-style-type: none">• طلباء کو مطالعہ سیرۃ طیبہ کی ضرورت و اہمیت سے آگاہ کرنا• تعمیر شخصیت میں مطالعہ سیرۃ طیبہ کے کردار کو واضح کرنا• بہشت نبوی کے موقع پر اقوام عالم کی عمومی صورت حال سے آگاہ کرنا | | |



- رسول اکرم صلی اللہ علیہ وسلم کی اور مدنی زندگی کا اس طرح مطالعہ کرانا کہ طلباء ان واقعات سے نتائج کا استنباط کر سکیں
- طلباء کو عہد نبوی کی معاشرت، سیاست، معیشت سے آگاہ کرنا

Course Content:

| S. No. | Title | Description |
|--------|--|---|
| 1. | حضور صلی اللہ علیہ وسلم کے ابتدائی حالات زندگی | ۱۔ حضور صلی اللہ علیہ وسلم کا خاندانی حسب و نسب ۲۔ پیدائش اور ابتدائی تربیت ۳۔ لڑکپن اور جوانی کے حالات زندگی |
| 2. | بعثت نبوی کے وقت دنیا کے حالات (۱) | ۱۔ بعثت نبوی کے وقت اہم تہذیبیں ۲۔ عرب، مصر، حبشہ، بازنطینی، ساسانی |
| 3. | بعثت نبوی | ۱۔ مکہ میں دعوت اسلام |
| 4. | بعثت نبوی | ۱۔ مدنی عہد میں دعوت اسلام |
| 5. | خصائص النبیؐ | آپؐ بطور پیغمبر امن |
| 6. | خصائص النبیؐ | بعثت استاد معلم |
| 7. | خصائص النبیؐ | بعثت تاجر |
| 8. | خصائص النبیؐ | بعثت سربراہ ریاست |
| 9. | خصائص النبیؐ | ذاتی محاسن اور عالمگیر اثرات |
| 10. | خصائص النبیؐ | ناموس رسالت |
| 11. | اسوہ حسنہ اور عصر حاضر | غیر مسلموں سے تعلقات |
| 12. | اسوہ حسنہ اور عصر حاضر | اسوہ حسنہ کی روشنی میں گھریلو زندگی |
| 13. | اسوہ حسنہ اور عصر حاضر | مستشرقین اور مطالعہ ہجرت |
| 14. | اسوہ حسنہ اور عصر حاضر | وطن سے محبت اور ہجرت |
| 15. | اسوہ حسنہ اور عصر حاضر | مستشرقین کے اعتراضات اور ان کے جوابات |

نصابی کتب

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

حوالہ جاتی کتب

| نمبر شمار | نام مؤلف | نام کتاب |
|-----------|-----------------------------|-----------------------------------|
| 1 | سید ابوالاعلیٰ مودودی | سیرت سرور عالم صلی اللہ علیہ وسلم |
| 2 | مولانا صفی الرحمن مبارکپوری | الرحیق المختوم |
| 3 | پیر محمد کرم شاہ الازہری | ضیاء النبی صلی اللہ علیہ وسلم |
| 4 | ڈاکٹر اکرم الضیاء، الحمیری | السیرۃ النبویۃ الصحیحة |



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|-----|----------------------------|---|
| اسم | مولانا عبدالرزاق دانا پوری | 5 |
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|---|------------------|---------|
| URCG-5128 | Pakistan Studies | 2 (2-0) |
| <p>Course Brief: This course is designed to provide students with a comprehensive exploration of Pakistan's identity, spanning geographical, historical and cultural dimensions. It delves into the diverse landscape, ancient civilizations, and rich cultural heritage that define Pakistan. Moreover, it examines the socio-cultural and political transformations in Pakistan over time including democratic transitions and military interventions. The aim of this course is to inculcate in students a nuanced understanding of Pakistan's past, present, and potential future trajectories, enabling them to critically evaluate the complex dynamics shaping the nation's development.</p> <p>Course Learning Outcomes: By the end of this course, student will be able to:</p> <ol style="list-style-type: none"> 1. Have enhanced knowledge of the geographical, historical and political aspects of Pakistan. 2. Understand the society and cultural of Pakistan. 3. Understand and explain the scio-economics developments in Pakistan. 4. Explore contemporary issues and challenges faced by Pakistan and their implications for the future. <p>Content:</p> <ol style="list-style-type: none"> 1. Introduction to Pakistan: <ul style="list-style-type: none"> • Geographical location and significance. • Historical background: Ancient civilizations in the region. • Factors leading to the creation of Pakistan 2. Political History of Pakistan: <ul style="list-style-type: none"> • Formative phase • Military interventions and democratic transitions. 3. Geography of Pakistan: <ul style="list-style-type: none"> • Physiography: Mountains, plains, plateaus, deserts, valleys and coastal areas. • River system: Indus river and its tributaries; • Climatic regions of Pakistan. 4. Society and Culture of Pakistan: <ul style="list-style-type: none"> • Socio- cultural diversity. • Language and literature of Pakistan. 5. Economics Development of Pakistan: <ul style="list-style-type: none"> • Agriculture and industrial sectors of Pakistan. • Economic challenges of Pakistan. 6. Contemporary Issues: <ul style="list-style-type: none"> • Foreign relations of Pakistan. • Security challenges: terrorism, extremism, regional conflicts. • Environmental problems and sustainable development (SDGs). • Media and social change. <p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. "Jinnah of Pakistan" by Stanley Wolpert 2. "The sole Spokesman: Jinnah, the Muslim League, and the Demand for Pakistan" by Ayesha Jalal 3. "The struggle for Pakistan" by Ishtiaq Hussain Qureshi 4. "Pakistan, the Formative Phase, 1857-1948" by Khalid B. Sayeed 5. "Pakistan Studies: A Book of Readings" by Sikandar Hayat 6. "Constitutional and Political History of Pakistan" by Hamid Khan 7. "Trek to Pakistan" by Ahmad Saeed and Kh. Mansur Sarwar 8. "Pakistan: A Modern History" by Ian Talbot | | |



9. "Politics in Pakistan: The Nature and Direction of Change" by Khalid B. Sayeed
10. "Physical Geography of Pakistan" by Umar Jahangir
11. "A Geography of Pakistan: Environment, people, and Economy" by Fazle Karim Khan
12. "Pakistan's Foreign Policy: An Historical Analysis" by S.M. Burke
13. "Separatism in East Pakistan" by Rizwan Ullah Kokab
14. "Being Pakistani: Society, Culture and the Arts" by Raza Rumi
15. "Pakistani's Culture Heritage: Socio-Economic and Technological Aspects" edited by Abdul Jabbar Khan
16. "Language and Politics in Pakistan" by Tariq Rahman
17. "Sociology" by Horton and Hunt
18. "Pakistan in the Twentieth Century: A Political History" by Lawrence Ziring
19. "Economic Development of Pakistan" by Ishrat Husain
20. "Issues in Pakistan's Economy" by S. Zaidi

| BOTN-5106 | Phycology & Bryology | 3(2-1) |
|--|----------------------|--------|
| <p>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, Anthocerosida and Bryopsida.</p> <p>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.</p> <p>Course Content:</p> <ol style="list-style-type: none"> 1 Phycology Introduction, general account, evolution, classification, biochemistry, ecology and economic importance of the following divisions of algae: Chlorophyta, 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, Anthocerosida and Bryopsida. <p>Lab Outline:</p> <p>Phycology:</p> <ol style="list-style-type: none"> 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. <p>Bryology</p> <ol style="list-style-type: none"> 1. Study of the following genera: <i>Pellia</i>, <i>Porella</i>, <i>Anthoceros</i> and <i>Polytrichum</i>. <p>Recommended Texts:</p> <ol style="list-style-type: none"> 1. Lee, R. E. (2019). <i>Phycology</i> (5th Ed.). England: Cambridge University Press. 2. Bellinger, E., (2015). <i>Freshwater algae</i> (2nd Ed.). New Jersey: John Wiley and Sons Ltd. <p>Suggested Readings:</p> <ol style="list-style-type: none"> 21. Barsanti, L. & Gualtieri, P. (2014). <i>Algae: anatomy, Biochemistry and Biotechnology</i> (1st Ed.). Florida: CRC Press, Taylor and Francis Group. 22. Hussain, F. (2016) <i>Phycology: A text book of algae</i> (1st Ed.). Lahore: Pak Book Empire | | |



Course Brief:

This course will provide students with basic concepts and identification of fungi, plant pathogens and diseases caused to various important crops. Students will be able to: identify major fungal groups based on morphology; understand and explain the ecological roles and trophic modes of major fungal groups; use fungal biology resources to understand fungal nomenclature and systematic; demonstrate a broad knowledge of core concepts in Plant Pathology; disease diagnosis and management.

Course Learning Objectives:

The aim of the course is to introduce the students to Mycology and diseases caused by Fungi, to develop an understanding of the diversity of organisms in the Kingdom Fungi. Upon completion of the course the student will be able to: describe the concepts of what constitutes disease in plants. Identify major principles of plant pathology; recognize the etiological agents of disease.

Course Content:

1. Introduction: General characters of fungi, Thallus, cell structure and ultra structure of fungi.
2. Reproduction: Asexual and sexual reproduction and reproduction structures, life cycle, haploid, heterokaryotic and diploid states.
3. Fungal Systematics: Classification of fungi into phyla with suitable examples to illustrate somatic structures, life cycle and reproduction of Myxomycota, Chytridiomycota, Zygomycota (Mucorales) Oomycota (Peronosporales), Ascomycota (Erysiphales, Pezizales), Basidiomycota (Agaricales, Polyporales, Uredinales, Ustilaginales) and Deuteromycetes.
4. Symbiotic relationships of fungi with other organisms (lichens and mycorrhiza) and their significance.
5. Importance of fungi in human affairs with special reference to Industry and Agriculture.
6. Field Guides for Mushroom Identification, Mushrooms Demystified, Comprehensive guide to mushroom identification, Visual identification techniques, Common species and their distributions, The Complete Mushroom Hunter
7. Foraging techniques and safety, Seasonal variations and regional differences.

Lab Outline:

1. Basic mycological techniques.
2. Isolation of fungi from soil, water and air using different techniques.
3. Processing and staining of roots for Arbuscular mycorrhizal assessment in roots of crop plants
4. Isolation and identification of endogonaceous fungi from soil by wet sieving and decanting techniques.
5. Collection, preservation, culturing and identification of mycological specimens with special reference to taxa of agricultural importance; use of keys for their identification.
6. Examination of prepared slides of selected taxa.
7. Field study of Ascomycetous macrofungi, mushrooms, toadstools, rusts, smuts and other pathogenic fungi.
8. Isolation of pathogenic fungi from diseased tissues.
9. Anatomical and microscopic study of lichens.
10. Anatomical study and hyphal systems of Polypores and Agaricales.
11. Identification of various types of Ectomycorrhizae.
12. Study of interaction of fungi in culture.
13. Macroscopic and microscopic examination of common locally available types representing various taxonomic groups.

Recommended Texts:

1. Phillips, M., (2017). Mycorrhizal planet: how symbiotic fungi work with roots to support plant health and build soil fertility (1st Ed.). United States: Chelsea Green Publishing Co.
2. Piepenbring, M., (2015). Introduction to mycology in the tropics (1st Ed.). America: APS Press, The American Phyto pathological Society.

Suggested Readings:

1. Molecular Markers in Mycology: Diagnostics and Marker Developments by Bhim Pratap Singh (Editor); Vijai Kumar Gupta (Editor) : Publication in 2017.



Course Brief:

This course provides an in-depth study of the structure and chemical composition of plant cell walls, the organization and function of various plant tissues, and the primary and secondary growth processes in plants. Students will gain practical skills in plant tissue analysis, anatomical studies of plant organs, and the identification of plant families through lab work and field trips.

Course Learning Objectives:

The aim of this course is to understand of plant cell wall structure and chemical composition, including the organization and roles of key components. They will explore the concept, structure, and function of various plant tissues, such as parenchyma, collenchyma, sclerenchyma, epidermis, xylem, and phloem, as well as different types of meristems. The course will cover the structure and development of plant organs, focusing on root, stem, and leaf development, including primary and secondary growth in dicots and periderm formation.

Course Content:

1. Plant Anatomy
 - The Plant Body and its development- Internal Organization, Different Tissue Systems of Primary and Secondary Plant Body. Dermal Tissue System and Modifications, Ground Tissue System and Vascular Tissues System (Origin, Structure, Development, Functional and Evolutionary Specialization).
 - Meristematic Tissues: Classification, Cytological Characteristics, Shoot and Root Apices.
 - Leaf, Stem and Roots: Types, Internal Organization, Functions and Development of various Tissues. Anatomical Adaptations of Plants to various Climatic Regimes.
 - Vascular Cambium: Origin, Structure, Seasonal activity and its role in the Secondary Growth of Root and Stem. Wood Anatomy, Abnormal Secondary Growth.
 - Anatomy of Reproductive Parts (Flower, Seed and Fruit).
2. Embryology/Development
 - Flower Morphology and Development, Structure and Development of Anther-Microsporogenesis and Micro gametogenesis, Structure and Development of Ovule-Megasporogenesis and Mega gametogenesis, Embryo Sac Structure, Endosperm Formation, Parthenocarpy, Polyembryony.

Lab Outline:

1. Study of Organization of Shoot and Root Meristem,
2. Different Primary and Secondary tissues (Dermal, Ground and Vascular Tissues) of the Plants
3. Study of Parenchyma, Collenchyma, Sclerenchyma, Stomata, Trichomes and Laticifers.
4. Transverse Section of Root, Stem and Leaf of Angiosperms.
5. Study of Primary and Secondary xylem
6. Comparative study of wood structure of Gymnosperms and Angiosperms with the help of prepared slides.
7. Anatomy of Germinating Seeds.
8. Studies of developmental phases of Pollen and Ovule of various Plants

Recommended Texts:

1. Bojwani, S.S., Bhatnagar, S.P. and Dantu, P.K. (2015). *The Embryology of Angiosperms*. Vikas Publishing House.
2. Carrillo-López, A. and Yahia, E.M. (2019). Morphology and Anatomy. In: Postharvest Physiology and Biochemistry of Fruits and Vegetables. Woodhead Publishing.
3. Crang, R., Lyons-Sobaski, S. and Wise, R. (2018). *Plant Anatomy: A Concept-Based Approach to the Structure of Seed Plants*. Springer.

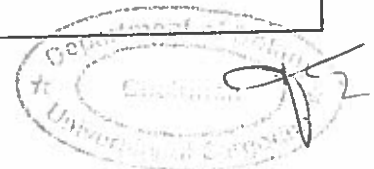
Suggested Readings:

1. Gupta, R. and Shukla, K. (2012). Plant Anatomy in relation to Taxonomy. In: *Plant Taxonomy: Past, Present, and Future*. New Delhi, The Energy and Resources Institute, pp. 211-229.
2. Johri, B.M. (2012). *Embryology of Angiosperms*. Springer Science & Business Media.
3. Lopez, F.B., Barclay, G.F. and Badal, S. (2024). *Plant Anatomy and Physiology*. In: Pharmacognosy. Academic Press.



| URCG-5112 | Fables, Wisdom Literature and Epic | 2(2-0) |
|--|------------------------------------|--------|
| <p>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.</p> <p>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.</p> <p>Course Content:</p> <ol style="list-style-type: none"> 1. Fables <ul style="list-style-type: none"> • 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 <ul style="list-style-type: none"> • Ten hikāyāt from John T. Platts, The Gulistan 3. Epic <ul style="list-style-type: none"> • THE SHĀHNĀMA OF FIRDAUSI <p>Recommended Texts:</p> <ol style="list-style-type: none"> 1. John T. P. (1876). The Gulistan; or, Rose Garden of Shaikh Muslihu'd- Dīn Sa'dī of Shīrāz. London: Wm. II. Allen. 1 Chishti, Y.S. (1991). Sharah-i bāng-i darā. Lāhaur: Maktaba-i ta'mīr-i insāniyat <p>Suggested Readings:</p> <ol style="list-style-type: none"> 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-5113 | Space, Place & Experiences | 2(2-0) |
|--|----------------------------|--------|
| <p>Course Learning Objectives: Architectural structures host the most mundane and ordinary activities as well as elaborate ceremonies to honor religious sentiments or to propitiate political deities. Some structures built for one purpose sometimes end up serving the other in subsequent times. The purpose of this course is to familiarize the learners with the concepts of reading a building to understand human life that existed in and around it during certain historical moments of its existence. Some of the approaches to study a monument could be the socio-cultural, religious, economic, and political situations of the area where it stands. These angles will not only acquaint you with the different phases of the monument's life but also with the people who commissioned it, occupied or altered it, or tried to destroy it.</p> <p>Course Content:</p> <ol style="list-style-type: none"> 1. Learning to engage with a building Case Study: Mughal-period mosque, the Begum Shahi/Maryam Zamani 2. Reading a building: History, decorative techniques, location, symbolic significance of motifs, plan/layout 3. Bays and isles, arches, minarets and domes 4. Muqarnas | | |



5. Traditional decorative techniques: munabbat-kārī, parchīn-kārī, kāsha- kārī, āyina- kārī, tāza-kārī
6. Wet-plaster painting known as fresco-buono and dry-plaster painting or fresco-secco
7. Geometric patterns, Islīmī or arabesque (stylized vegetal designs) and naturalistic vegetal designs for decorative purposes
 - Project: Working on historical and anecdotal material of a selected monument

Recommended Texts:

1. Lāl, K. (1884), Tārīkh-i lāhaur (Lāhaur: Būk ṭāk, 2006 [1884]), 127-128.
2. Latif, S.M. (1892), Lahore: Its Historical, Architectural Remains and Antiquities, with an Account of its Modern Institutions, Inhabitants, their Trade, Customs &c. (Lahore: New Imperial Press, 1892), 131-132.
3. Baqir, M. Lahore: Past and Present (Delhi: Low price Publications, 1993 [1952]), 358-359.
4. Quraishī M. A. (1962), "Masājīd: 'ahd-i ghaznavī se zamāna-yi ḥāl tak," in Muḥammad Ṭufail ed., Nuqūsh lāhaur nambar: ahd-i ghaznavi se daur-i ḥāzīr tak kī tārīkh, 1014 se 1961 tak, Vol. 92 (Special issue 1962), 545-546.
5. Peck, L. (2015), Lahore: The Architectural Heritage (Lahore: Ferozsons, 2015), 80-81.

| URCG-5105 | Islamic Studies | 2(2-0) |
|--|-----------------|--------|
| <p>Course Brief: Islamic Studies engages in the study of Islam as a textual tradition inscribed in the fundamental sources of Islam: Qur'aan and Hadith, history-and particular cultural contexts. The area seeks to provide an introduction to and a specialization in Islam through a large variety of expressions (literary, poetic, social and anthropology). It offers opportunities to get fully introductory foundational basis of Islam in fields that include Qur'aanic studies, Hadith and Seerah of Prophet Muhammad (PBUH), Islamic philosophy and Islamic law, culture and theology through the textual study of Qur'aan and Sunnah.</p> <ul style="list-style-type: none"> • To make students understand the relevance and pragmatic significance of Islam in their lives. • To make learners comprehend the true spirit of Islam with reference to modern world. • To generate a sense of Islamic principles as a code of living that guarantee the effective solutions to the current challenges of being. • To provide basic information about Islamic Studies. • To enhance understanding of the students regarding Islamic Civilization • To improve students skills to perform prayers and other worships • To enhance the skill of the students for understanding the issues related to faith and religious life. | | |
| <p>Content:</p> <ol style="list-style-type: none"> 1. Introduction to Qur'anic Studies <ol style="list-style-type: none"> i. Basic Concepts of Qur'an ii. History of the compilation of Qur'aan iii. Uloom-ul-Qur'aan | | |
| <p>تعارف قرآن مجید قرآن مجید کا بنیادی تعارف تاریخ تصنیف و تدوین قرآن مجید علوم القرآن</p> <p>مطالعہ قرآن (تعارف قرآن مجید، منتخب آیات کا ترجمہ و تفسیر: سورۃ البقرہ آیات 1-5، 284-286؛ سورۃ الحجرات آیات 1-18؛ سورۃ الفرقان آیات 63-77؛ سورۃ المؤمنون آیات 1-11؛ سورۃ الاحزاب آیات 6، 21، 32، 33، 40، 56-59؛ سورۃ الانعام آیات 151-153؛ سورۃ الصافات آیات 1-14؛ سورۃ الحشر آیات 20-18؛ سورۃ آل عمران آیات 190-192؛ سورۃ النحل آیات 12-14؛ سورۃ لقمن آیت 20؛ سورۃ تم السجدہ آیت 53</p> | | |

2. Introduction to Hadith

تعارف حدیث

i. Legal Status of Hadith

حدیث کی قانونی حیثیت

ii. History of the compilation of Hadith

تاریخ جمع و تدوین حدیث

iii. Classifications of Hadith

حدیث کی اقسام

متن، حدیث: 1 درج ذیل موضوعات پر احادیث کا مطالعہ

- 1۔ اعمال کا اجریت پر منحصر ہے۔ 2۔ بہترین انسان قرآن کا طالب علم اور اس کا معلم ہے۔ 3۔ کتاب و سنت گراہی سے بچنے کا ذریعہ ہیں۔ 4۔ ارکان اسلام۔ 5۔ اسلام، ایمان، احسان اور قیامت کی نشانیاں۔ 6۔ بیچوں کو نماز کی تلقین۔ 7۔ دین کا گہرا فہم اللہ کی خاص عنایت ہے۔ 8۔ حصول علم، عبادت قرآن اور عمل کی اہمیت و فضیلت۔ 9۔ روز محشر میں ہونے والا حسابہ۔ 10۔ حقوق اللہ کے ساتھ ساتھ حقوق العباد کا لحاظ رکھنا بھی لازم ہے۔ 11۔ حسن خلق کی عظمت اور بخشش و بزرگوئی کی مذمت۔ 12۔ دنیا و آخرت کی بھلائی کی ضامن 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 سیرت النبی ﷺ

3. Sirah of the Prophet (PBUH)

سیرت النبی ﷺ

i. Significance of Seerah Studies

مطالعہ سیرت کی ضرورت و اہمیت

ii. Prophetic principles of Character building

تفسیر سیرت و شخصیت کا نبوی ﷺ منہاج

اقامت دین کا نبوی طریق کار، اقامت دین بجمہد خلافت راشدہ 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

4. Islamic Culture & Civilization

اسلامی تہذیب و تمدن

i. Basic Concepts of Islamic Civilization

اسلامی تہذیب کا مفہوم

ii. Historical evaluation of Islamic Civilization

اسلامی تہذیب کا تاریخی ارتقاء

iii. Salient feature of Islamic Civilization

اسلامی تہذیب کی نمایاں خصوصیات

iv. Islamic Civilization and Contemporary Issues

اسلامی تہذیب و تمدن اور معاصر مسائل

اسلامی تہذیب کے عوامل و عناصر، اسلامی تہذیب کے 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، نامور مسلمان سائنسدان

Recommended Books:

1. Hameed Ullah Muhammad, —Emergence of Islaml , IRI, Islamabad
2. Hameed Ullah Muhammad, —Muslim Conduct of State
3. Hameed Ullah Muhammad, _Introduction to Islam
4. Ahmad Hasan, —Principles of Islamic Jurisprudencel Islamic Research, Institute, International Islamic University, Islamabad (1993).
5. Dr. Muhammad Zia-ul-Haq, —Introduction to Al Sharia Al Islamial, Allama Iqbal Open University, Islamabad (2001)
6. Dr. Muhammad Shahbaz Manj, Teleemat-e- Islam

| URCG-5126 | ETHICS | 2(2-0) |
|--|--------|--------|
| Course Content: <ol style="list-style-type: none">1. Meaning and Scope of Ethics.2. Relation of Ethics with:<ul style="list-style-type: none">• Religion• Science• Law3. Historical Development of Morality:<ul style="list-style-type: none">• Instinctive Moral Life.• Customary Morality. | | |

- Reflective Morality.
- 4. Moral Theories:
 - Hedonism (Mill)
 - Intuitionism (Butler)
 - Kant's Moral Theory.
- 5. Moral Ethics and Society.
 - Freedom and Responsibility.
 - Tolerance
 - Justice
 - Punishment (Theories of Punishment)
- 6. Moral Teachings of Major Religions:
 - Judaism
 - Christianity
 - Islam
- 7. Professional Ethics:
 - Medical Ethics
 - Ethics of Students
 - Ethics of Teachers
 - Business Ethics

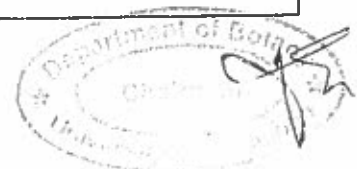
Recommended Texts:

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 Reading:

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.
3. Sayeed, S.M.A.(Tr.) Ta'aruf-e-Akhlaqiat. Karachi: BCC&T, Karachi University of Karachi.

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|---|--|---------------|
| URCG-5122 | Ideology & Constitution of Pakistan | 2(2=0) |
| <p><u>Course Brief:</u> 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</p> <p><u>Course Content:</u></p> <ol style="list-style-type: none"> 1. Ideology of Pakistan Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah. Two Nation Theory and Factors leading to Muslim separatism 2. Constitutional Developments Salient Feature of the Government of India Act 1935 Salient Feature of Indian Independence Act 1947 Objectives Resolution Salient Feature of the 1956 Constitution Developments leading to the abrogation of Constitution of 1956 Salient features of the 1962 Constitution | | |

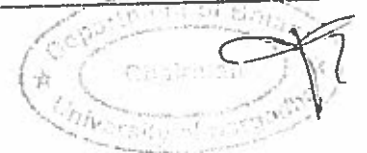


- Causes of failure of the Constitution of 1962
Comparative study of significant features of the Constitution of 1956, 1962 and 1973
3. Fundamental rights
 4. Principles of policy
 5. Federation of Pakistan
President; Parliament; the Federal Government
 6. Provinces
Governors; Provincial Assemblies; the Provincial Government
 7. The Judiciary
 8. Supreme Court; High Courts; Federal Shariat Courts; Supreme Judicial Council;
Administrative Courts and tribunals
 9. Islamic Provisions in Constitution
 10. Significant Amendments of Constitution of Pakistan 1973

Recommended Books:

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.
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

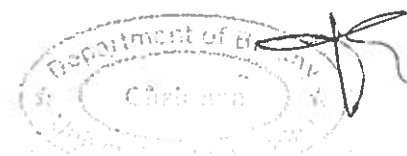
| URCG-5111 | Translation of Holy Quran-II | Non-Credit |
|---|------------------------------|------------|
| <p>Semester / Level: In some discipline 3rd semester and in some discipline 4th Semester/ ADP Program 2nd Year</p> | | |
| <p>Course Learning Objectives:</p> <ul style="list-style-type: none"> • Students will come to know about the real nature, significance and relevance of the Islamic beliefs 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. • To introduce the students to Quranic Arabic grammar in practical manner. | | |
| <p>Course Content:</p> <p style="text-align: right;">ایمانیات اور عبادات •</p> <p style="text-align: right;">اللہ پر ایمان، فرشتوں پر ایمان، رسولوں پر ایمان، آسمانی کتابوں پر ایمان، یوم آخرت پر ایمان، تقدیر پر ایمان، نماز، روزہ، زکوٰۃ، حج، جہاد •</p> <p style="text-align: right;">معاشرے کے حقوق •</p> <p style="text-align: right;">خاندان کی نگین •</p> | | |



| |
|----------------------------|
| • الزمر (٦) |
| • الور (٢٩،٦٠،٢٤،٥٢،٢٨،٥٣) |
| • مجر (٣٣) |
| • انفال (٢٠،٨٢) |
| • الرعد (٣) |
| • الطلاق (٣) |
| • الحج (٥) |
| • ابراهيم (٣٣،٢٣) |
| • الاسراء (٢٣،٢٣) |
| • الاحقاف (١٥) |
| • المؤمنون (٢٤) |
| • التكبوت (٨،٣٨،٢٥) |
| • النحل (٢٢) |
| • لقمان (١٣،٣،١٥) |
| • الاحزاب (٣٩،٣٨،٥٠،٣٥) |
| • اشراء (٤) |
| • الروم (٢١) |
| • مریم (٢٦،١٣) |
| • المجادلہ (١١،١٢) |

Semester IV

| BOTN-5109 | Phytogeography | 3(2-1) |
|---|----------------|--------|
| <p>Course Brief: This course explores the geographical distribution of plants and the environmental factors influencing their distribution patterns. It covers the principles of phytogeography, including biogeographical regions, plant ecology, and the impact of climate and human activities on plant distribution. The course provides insights into the historical and contemporary aspects of plant distribution, including the role of evolutionary processes and ecological interactions. Practical laboratory work complements the theoretical aspects, focusing on plant distribution mapping, vegetation analysis, and field surveys.</p> <p>Course Learning Objectives: Students will explore the definition, scope, and significance of phytogeography, including its historical development and key concepts. They will study the principles of phytogeography, including biogeographical regions, classification, and factors influencing plant distribution such as climate, soil, and topography. The course will cover global plant distribution patterns, endemism, diversity hotspots, and historical and evolutionary aspects of plant distribution. Students will examine major phytogeographical regions (temperate, tropical, arid, and alpine), their characteristics, plant species, and the impact of climate change. Additionally, they will learn methods and techniques for mapping plant distribution, conducting vegetation analysis, and performing field surveys. The course will</p> | | |



address human impacts on plant distribution and biodiversity, emphasizing conservation strategies and sustainable management.

Course Content:

1. Introduction to Phytogeography, Definition, scope, and importance of phytogeography, Historical development and key concepts in phytogeography
2. Principles of Phytogeography, Biogeographical regions and their classification, Factors influencing plant distribution: climate, soil, topography, and human activities, Ecological interactions and their impact on plant distribution
3. Plant Distribution Patterns, Global plant distribution patterns and major biomes, Endemism and plant diversity hotspots, Historical and evolutionary aspects of plant distribution
4. Phytogeographical Regions, Major phytogeographical regions: temperate, tropical, arid, and alpine regions, Characteristics and plant species of each region, Impact of climate change on plant distribution
5. Methods and Techniques in Phytogeography, Mapping plant distribution: techniques and tools, Vegetation analysis and classification, Field surveys and data collection
6. Human Impact and Conservation, Effects of human activities on plant distribution and biodiversity, Conservation strategies and sustainable management of plant resources

Lab Outline:

- 1 Create distribution maps using Q-GIS, Arc GIS and other tools; analyze patterns and their environmental correlations.
- 2 Study of Global components of living environment.
- 3 Study of different climatic regions of the world.
- 4 Measurement of light intensity, temperature, and relative humidity under different climatic conditions.
- 5 Study of climatic conditions and vegetation of coniferous forest,
- 6 Vegetation and climatic conditions of Heathlands; Grasslands & Deserts.
- 7 Mangrove and seashore vegetation.
- 8 Fresh water Plankton, Benthos, Bog & Saline water communities.
- 9 Marine environment Vegetation.
- 10 Field work: to study Phytosociology and Impact of climatic factors on plants.

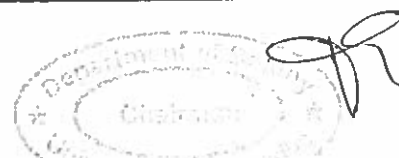
Recommended Texts:

- 1 Cox, C.B., Moore, P.D. and Ladle, R.J. (2016). *Biogeography: An Ecological and Evolutionary Approach*. John Wiley & Sons.
- 2 Taylor, E.L., Taylor, T.N. and Krings, M. (2009). *Paleobotany: the biology and evolution of fossil plants*. Academic Press.

Suggested Reading:

1. Seward, A.C. (2011). *Fossil plants: a text-book for students of botany and geology* (Vol. 4). Cambridge University Press.
2. Von Humboldt, A. and Bonpland, A. (2010). *Essay on the Geography of Plants*. University of Chicago Press.
3. Willis, K.J. and McElwain, J.C. (2014). *The Evolution of Plants*. Oxford University Press, USA.

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|---|------------------------------------|---------------|
| BOTN-5110 | Principles of Plant Ecology | 3(2-1) |
| <p>Course Brief: This course examines the role of plants within ecosystems, including their interactions with other organisms and abiotic factors. Students will explore plant life history, functional traits, and demography, alongside ecosystem processes that sustain and regulate environments. Emphasis is placed on understanding plant-to-plant, plant-animal, and broader ecosystem interactions. By the end, students will develop skills in analyzing current theories and applying practical solutions to ecological problems.</p> <p>Course Learning Objectives:</p> | | |



The aim of the course is to understand the role and interaction of plants with their environment. Plant Ecology is the study of organisms, populations, and communities as they relate to one another and interact in the ecosystems they comprise. In plant ecology, ecosystems are composed of organisms, the communities they comprise, and the non-living aspects of their environment. Ecosystem processes are those that sustain and regulate the environment. Ecological areas of study include topics ranging from the interactions and adaptations of organisms within an ecosystem to the abiotic processes that drive the development of those ecosystems. The course deals with plants life history and functional traits, demography, and interactions between plants, between plants and animals and between plants and the remaining ecosystem. The student can analyze the current theories, methods and interpretations within the field plant ecology, and work independently with practical and theoretical problem solving.

Course Content:

1. Introduction: The seven major autecological factors and their detail. Adaptations in plants in response to ecological factors.
2. The Soil Factor: Definition and importance of soil: Concept of texture and structure; Physical and chemical properties of soil; Soil formation and parent materials; Soil porosity; Organic and inorganic components; Living inhabitants of soil.
3. The Water Factor: Importance of water to plants; Forms of atmospheric moisture; Forms of precipitation and their ecological effects. Soil moisture constants.
4. Light and Temperature Factors: Introduction; Comparison of tropical, temperate and polar regions; Temporal and spatial variations in light and temperature; Role of light and temperature in plant distribution and diversity; Responses and adaptations of plants to light and temperature; Differences in Heliophytes and Sciophytes; Ecological response of plants to warm, chilling and freezing temperatures. Hardening; Ecophysiological responses in plants: Photoperiodism; Thermoperiodism; Cardinal temperatures; Light compensation point; Dormancy; Stratification; Vernalization.
5. The Wind Factor: Formation of wind; Influences of wind on plants; Cushion plants; Shelterbelts.
6. The Fire Factor: Kinds of fire; Plant adaptations related to fire. Fire climax; Practical value of vegetation burning.
7. The Biotic Factor: Biotic influences; Local vegetation; Vegetation of Pakistan; Major Biomes of the world

Lab Outline:

1. Determination of Soil Texture of given soil sample by Hydrometer method
2. Find out the percentage and types of Water Stable Aggregates in a given soil sample by
3. Wet Sieving Technique
4. Determination of Capillary Rise of water in soil of different textures
5. Study the Infiltration and Permeability in soils of different textures
6. Determination of soil moisture constants of given soil sample
7. Determination of Oxidizable Organic Matter Content of soil by Wet Digestion Method
8. Determination of soil water holding capacity of given soil sample
9. Determination of Air Temperature and Relative Humidity in open sunlight/shade at
10. ground level and different heights with a Whirling Psychrometer
11. Determination of Light Intensity in various habitats by using a Lux-Meter
12. Study the different adaptations in Hydrophytes. Xerophytes and Cacti.
13. Study of Heliophytes and Sciophytes
14. Study of Impact of Wind on plants- Cushion plants
15. Preliminary survey to gain information about different local Plant Communities

Recommended Texts:

1. Keddy, P. A., (2017). Plant ecology origins, processes, consequences (2nd Ed.). England: Cambridge University Press.
2. Canadell, J. G., Diaz, S. Heldmaier, G., Jackson, R.B., Levia, D.F., Schulze, E.D., Sommer, U. & Wardle, D. A., (2019). Ecological studies (1st Ed.). New York: Springer.

Suggested Readings:

1. Fath, B., (2018). Encyclopedia of ecology (2nd Ed.). New York: Elsevier.
2. Keddy, P. A., (2018). Wetland ecology: principles and conservation, (2nd Ed.). England:



| BOTN-5111 | Principles of Plant Biochemistry | 3(2-1) |
|--|----------------------------------|--------|
| Course Brief: | | |
| <p>Biochemistry is the study of the chemical processes that drive biological systems. Because the field of biochemistry is continually evolving and touches many areas of cell biology, this course also includes an elementary introduction to the study of molecular biology. Biochemistry is both life science and a chemical science - it explores the chemistry of living organisms and the molecular basis for the changes occurring in living cells. It uses the methods of chemistry, "Biochemistry has become the foundation for understanding all biological processes.</p> | | |
| Course Learning Objectives: | | |
| <p>The course aims to provide an advanced understanding of the core principles and topics of Biochemistry and their experimental basis, and to enable students to acquire a specialized knowledge and understanding of selected aspects. This course gives information to understand the fundamental chemical principles that govern complex biological systems. Biochemistry is the study of the chemical processes that drive biological systems. Biochemistry is both life science and a chemical science - it explores the chemistry of living organisms and the molecular basis for the changes occurring in living cells. At the end of the course students will be unable to get an understanding of fundamental biochemical principles.</p> | | |
| Course Content: | | |
| <ol style="list-style-type: none"> 1. Introduction to Plant Biochemistry, Definition and scope of plant biochemistry. Importance of structural biochemistry in plant science. Overview of plant cell structure with a focus on biochemical components 2. Introduction to carbohydrates: Occurrence and classification, sugar structures, synthesis of polysaccharides, carbon metabolism in the chloroplast, starch synthesis, Pentose phosphate pathway, carbon export, sucrose synthesis and transport in vascular plants, cellulose synthesis and composition of primary cell walls 3. Introduction to lipids: Occurrence, classification, structure and chemical properties of fatty acids, fatty acid biosynthesis in plants, di and triglycerides, phospholipids, glycolipids, lipids, waxes and sterols. 4. Introduction to Proteins: Aminoacids and their structure. Electrochemical properties and reactions of amino acids. Classification of proteins, primary, secondary, tertiary and quaternary structure of proteins. Protein targeting, protein folding and unfolding. Transport, storage, regulatory and receptor proteins. Protein purification, proteinsequencing. Biological role, plant defense proteins and peptides, defensins and related proteins. Synthesis and functions of non-ribosomal peptides 5. Introduction to Nucleic Acids: General introduction. Purine and pyrimidine bases, nucleosides, nucleotides. Structure and properties of DNA and RNA, types and functions of RNA, nucleic acid metabolism. 6. Introduction to Enzymes: Nature and functions, I.U.E. classification with examples of typical groups, isozymes, ribozymes, abzymes, enzyme specificity, enzyme kinetics, nature of active site and mode of action, allosteric enzymes and feedback mechanism, enzymes with multiple functions mechanisms and evolution. Isoprenoid metabolism, biosynthetic pathways, monoterpenes, sesquiterpenes, phytosterols, diterpenes, Enzymes with multiple functions, mechanisms and evolution. | | |
| Lab Outline: | | |
| <ol style="list-style-type: none"> 1. Solutions, acids and bases, electrolytes, non-electrolytes, buffers, pH and chemical bonds. 2. To determine the R_f value of monosaccharide's on a paper Chromatogram. 3. To estimate the amount of reducing and non-reducing sugars in plant material titrimetrically/spectrophotometrically. 4. To determine the saponification number of fats. 5. To extract and estimate oil from plant material using soxhlet apparatus. | | |



6. Analysis of various lipids by TLC methods.
7. To estimate soluble proteins by Biuret or Lowry or Dye-binding method.
8. To estimate the amount of total Nitrogen in plant material by Kjeldahl's method.
9. To determine R_f value of amino acids on a paper chromatogram.
10. Extraction of Nucleic acids from plant material and their estimation by UV absorption or color reactions.
11. To estimate the catalytic property of enzyme catalase or peroxidase extracted from a plant source.
12. To determine the PKa and isoelectric point of an amino acid.

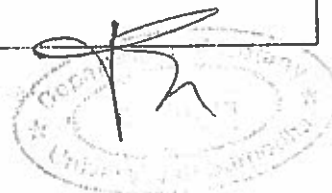
Recommended Texts:

1. Nelson, D. & Cox, M., (2017). *Lehninger: principles of biochemistry* (7th Ed). New York: W.H. Freeman.
2. Heldt, H. & Piechulla, B., (2016). *Plant biochemistry* (1st Ed.). London: Academic Press.

Suggested Readings:

1. Voet, D., Voet, J. G. & Pratt, C.W., (2015). *Fundamentals of biochemistry* (5th Ed.). New Jersey: John Wiley and Sons.
2. Mitra, G. N., (2015). *Plants: A biochemical and molecular approach* (1st Ed.). India: Springer.
3. Buchanan, B.B., Gruissem, & W., Jones, R. L., (2015). *Biochemistry and molecular biology of plants*, (2nd ed.). New Jersey: Wiley.
4. Conn E. E. & Stump, P.K., (2017). *Outlines of biochemistry* (4th Ed.). New Jersey: John Wiley and Sons Inc.

| BOTN-5112 | Fundamentals of Plant Physiology | 3(2-1) |
|---|----------------------------------|--------|
| <p>Course Brief: This course provides an introduction to basic principles of plant functions including physical processes occurring in plants, Photosynthesis, Respiration, Pathway of translocation, Gaseous exchange, Mechanism of stomatal regulation and growth and development. The subject here to describe plant physiology-I comprises on harvesting of light by plants and its conversion into a chemical energy, mechanism of oxygen evolution by plants, cyclic and non-cyclic electron transport chain. This also gives information about dark reaction, C3, C4 cycle, mechanisms of photosynthesis in CAM plants and phloem transport.</p> <p>Course Learning Objectives: This course aims to develop understanding of the relationship of complementary metabolic pathways such as photosynthesis and respiration in energy acquisition and use during plant development and to develop understanding of the environmental influences upon carbon metabolism in plants (e.g. with respect to alternative fixation pathways, photoinhibition, and photorespiration). Plant physiology deals with all the internal activities of plants.</p> <p>Course Content:</p> <ol style="list-style-type: none"> 1. Photosynthesis: General Concepts, Organization of the photosynthetic apparatus, Ultra structure and composition of photosystem-I and II, ATP synthase, Mechanism of photosynthesis, light absorption, charge separation and oxidation of water (water oxidizing clock), electron and proton transport, thylakoid protein-pigment complexes. CO₂ fixation mechanism (C3, C4 and CAM plants). 2. Respiration: Glycolysis, Anaerobic and aerobic respiration, The Citric Acid Cycle, Mitochondrial Electron Transport and ATP synthesis, Energetics of Respiration, Glyoxylate cycle. 3. Translocation of photosynthates: Pathway of Translocation, Mechanism of phloem transport; materials translocated through phloem, Phloem loading and unloading, Photosynthate allocation and partitioning. <p>Lab Outline:</p> | | |



1. To determine the volume of CO₂ evolved during respiration by plant material.
2. To determine the amount of O₂ used by respiring water plant by Winkler Method.
3. Separation of chloroplast pigments on column chromatogram and their quantification by spectrophotometer.
4. To extract and separate anthocyanins and other phenolic pigments from plant material and study their light absorption properties.
5. To categorize C₃ and C₄ plants through their anatomical and physiological characters. To regulate stomatal opening by light of different colours and pH.

Recommended Texts:

1. Taiz, L. & Zeiger, E., (2019). Plant physiology (7th Ed.). England: Sinauer's Publ. Co. Inc.
2. Dennis, D. T., Turpin, D. H., Lefebvre, D. D. & Layzell, D. B., (2016). Plant metabolism (6th Ed.). London: Longman Group.

Suggested Readings:

1. Mitra, G. N., (2015). Plants: a biochemical and molecular approach (1st Ed.). India: Springer.
2. Buchanan, B., Gruissem, W. & Russell, L., (2015). Biochemistry and molecular biology of Plants (2nd Ed.). New Jersey: John Wiley & Sons.

| URCG-5125 | Civics and Community Engagement | 2(2-0) |
|--|---------------------------------|--------|
| <p>Course Description: 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.</p> <p>Learning Outcomes: After completing this course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the concepts of civic engagement, community development, and social responsibility. • Understand rights and responsibilities of citizenship • Understand cultural diversity in local and global context • Analyze the significance of civic participation in promoting social justice, equity and democracy. • Examine the historical and contemporary examples of successful civic and community engagement initiatives. • Identify and assess community needs, assets, and challenges to develop effective strategies for community improvement. • Explore the ethical implications and dilemmas associated with civic and community engagement. • Develop practical skills for effective community organizing, advocacy, and leadership. • Foster intercultural competence and respect for diversity in community engagement efforts. • Collaborate with community organizations, stakeholders, and fellow students to design and implement community-based projects. • Reflect on personal growth and learning through self-assessment and critical analysis of community engagement experiences. <p>Course Content:</p> <ol style="list-style-type: none"> 1. Introduction to Civics & Community Engagement , <ul style="list-style-type: none"> • 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, 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
- 4. 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
- 5. 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)
- 6. Human rights, constitutionalism and citizens' responsibilities
 - Introduction to Human Rights
 - Human rights in constitution of Pakistan
 - Public duties and responsibilities
 - Constitutionalism and democratic process
- 7. 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
- 8. Civic Engagement Strategies
 - Grassroots organizing and community mobilization
 - Advocacy and lobbying for policy change
 - Volunteerism and service-learning opportunities
- 9. Social issues/Problems of Pakistan
 - Overview of major social issues of Pakistani society
- 10. Social Action Project

Recommended Texts:

1. Kennedy, J. K., & Brunold, A. (2016). Regional context and Citizenship education in Asia and Europe. New York: 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

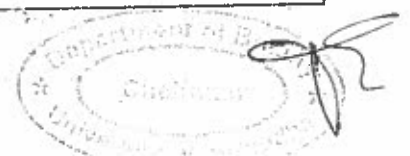
Reference Books:

1. Glencoe McGraw-Hill. (n.d.). Civics Today: Citizenship, Economics, and Youth.
2. Magleby, D. B., Light, P. C., & Nemacheck, C. L. (2020). Government by the People (16th Ed.). Pearson.
3. Sirianni, C., & Friedland, L. (2005). The Civic Renewal Movement: Community-Building and Democracy in the United States. Kettering Foundation Press.
4. Bloemraad, I. (2006). Becoming a Citizen: Incorporating Immigrants and Refugees in the United States and Canada. University of California Press.
5. Kuyek, J. (2007). Community Organizing: Theory and Practice. Fernwood Publishing.



6. DeKieffer, D. E. (2010). The Citizen's Guide to Lobbying Congress. TheCapitol.Net.
7. Rybacki, K. C., & Rybacki, D. J. (2021). Advocacy and Opposition: An Introduction to Argumentation (8th ed.). Routledge.
8. Kretzmann, J. P., & McKnight, J. L. (1993). Building Communities from the Inside Out: A Path Towards Finding and Mobilizing a Community's Assets. ACTA Publications.
9. Patterson, T. E. (2005). Engaging the Public: How Government and the Media Can Reinvent American Democracy. Oxford University Press.
10. Love, N. S., & Mattern, M. (2005). Doing Democracy: Activist Art and Cultural Politics. SUNY Press.

| URCG-5124 | Entrepreneurship | 2(2-0) |
|---|------------------|--------|
| <p>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.</p> <p>Course Learning Objectives:</p> <ol style="list-style-type: none"> 1. To enhance the 'entrepreneurial intentions' of the students by improving their natural willingness to start a business. 2. To understand the process of entrepreneurship and learn the ways to manage it by working individually in the class and in the form of groups outside the class to conduct field assignments. 3. To educate the students about the practical underpinnings of the entrepreneurship with the aid of practical assignments and idea pitching. <p>Course Content:</p> <ol style="list-style-type: none"> 1. Background: What is an Organization, Organizational Resources, Management Functions, Kinds of Managers, Mintzberg's Managerial Roles 2. Forms of Business Ownership: The Sole proprietorship, Partnership, Joint Stock Company 3. Entrepreneurship: The World of the Entrepreneur, what is an entrepreneur? The Benefits of Entrepreneurship, the Potential Drawbacks of Entrepreneurship, Behind the Boom: Feeding the Entrepreneurial Fire. 4. The Challenges of Entrepreneurship: The Cultural Diversity in Entrepreneurship, The Power of "Small" Business, Putting Failure into Perspective, The Ten Deadly Mistakes of Entrepreneurship, How to Avoid the Pitfalls, Idea Discussions & Selection of student Projects, Islamic Ethics of Entrepreneurship. 5. Inside the Entrepreneurial Mind: From Ideas to Reality: Creativity, Innovation, and Entrepreneurship, Creativity – Essential to Survival, Creative Thinking, Barriers to Creativity, How to Enhance Creativity, The Creative Process, Techniques for Improving the Creative Process, Protecting Your Ideas, Idea Discussions & Selection of student Projects. 6. Products and technology, identification opportunities 7. Designing a Competitive Business Model and Building a Solid Strategic Plan: Building a strategic plan, Building a Competitive Advantage, The Strategic Management Process, Formulate strategic options and select the appropriate strategies, Discussion about execution of Students' Project. | | |



8. **Conducting a Feasibility Analysis and Crafting a Winning Business Plan:**
Conducting a Feasibility Analysis, Industry and market feasibility, Porter's five forces model, financial feasibility analysis. Why Develop a Business Plan, The Elements of a Business Plan, What Lenders and Investors Look for in a Business Plan, Making the Business Plan Presentation.
9. **Building a Powerful Marketing Plan:**
Building a Guerrilla Marketing Plan, Pinpointing the Target Market, Determining Customer Needs and Wants through Market Research. Plotting a Guerrilla Marketing Strategy: How to Build a Competitive Edge, Feed Back & Suggestions on Student Project, Islamic Ethics for Entrepreneurial Marketing
10. **E-Commerce and the Entrepreneur:**
Factors to Consider before Launching into E-commerce, Ten Myths of E-Commerce, Strategies for E-Success, Designing a Killer Web Site, Tracking Web Results, Ensuring Web Privacy and Security, Feed Back & Suggestions on Student Project.
11. **Pricing Strategies:**
Three Potent Forces: Image, Competition, and Value, Pricing Strategies and Tactics, Pricing Strategies and Methods for Retailers, The Impact of Credit on Pricing
12. **Attracting Venture Capitalist:**
Projected Financial Statements, Basic Financial Statements, Ratio Analysis, Interpreting Business Ratios, Breakeven Analysis, Feed Back & Suggestions on Student Project,
13. **Idea Pitching:**
Formal presentation, 5-minutes pitch, funding negotiation and launching.

Recommended Texts:

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

Suggested Readings:

1. Burstiner, I. (1989). Small business handbook. Prentice Hall Press.

