

**ASSOCIATE DEGREE IN SCIENCE BIOTECHNOLOGY PROGRAM
CURRICULUM AS PER HEC UNDERGRADUATE EDUCATION POLICY 2020**

TWO YEARS ASSOCIATE DEGREE PROGRAM

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➤	Total numbers of Credit hours	72
➤	Duration	02 years
➤	Semester duration	16-18 weeks
➤	Semesters	04
➤	Course Load Per Semester	18 Cr hrs
➤	Number of Courses Per Semester	06

BACHA KHAN UNIVERSITY CHARSADDA
SCHEME OF STUDIES FOR ASSOCIATE DEGREE IN SCIENCE
BIOTECHNOLOGY PROGRAM
FIRST YEAR: FIRST SEMESTER

COURSE CODE	COURSE TITLE	Course Type	CREDIT HOURS
ELL-311	English I: Functional English	Gen Ed	03
PS-321	Pakistan Studies	Gen Ed	03
CS-311	QR-1 (ICT)	Gen Ed	03
	NS-I*	Gen Ed	03
BIOTECH -311	Introduction to Biotechnology	Subject-Specific	03
BIOTECH -312	Cell Biology	Subject-Specific	03
	Total Credit Hours		18

FIRST YEAR: SECOND SEMESTER

COURSE CODE	COURSE TITLE	Course Type	CREDIT HOURS
ELL-321	English II: Composition Writing	Gen Ed	03
IS-312	Islamic Studies	Gen Ed	03
	Arts and Humanities-I (Languages)	Gen Ed	03
SOC -313	SS-1 (Citizenship Education and community Engagement)	Gen Ed	03
BIOTECH-321	Animal Diversity	Subject-Specific	2+1
BIOTECH-322	Genetics	Subject-Specific	2+1
	Total Credit Hours		18

SECOND YEAR: THIRD SEMESTER

COURSE CODE	COURSE TITLE	Course Type	CREDIT HOURS
ELL-411	English III: Academic Reading and Writing	Gen Ed	03
	NS-II *	Gen Ed	03
	QR-II (Logic and Quantitative Reasoning)	Gen Ed	03
BIOTECH-411	Ecosystem & Environment	Subject-Specific	2+1
BIOTECH-412	Biochemistry-I	Subject-Specific	2+1
BIOTECH-413	Microbiology	Subject-Specific	2+1
Total Credit Hours			18

SECOND YEAR: FOURTH SEMESTER

COURSE CODE	COURSE TITLE	Course Type	CREDIT HOURS
	Arts and Humanities-II	Gen Ed	03
	Social Sciences - II	Gen Ed	03
BIOTECH-421	Health Biotechnology	Subject-Specific	03
BIOTECH-422	Molecular Biology-I	Subject-Specific	2+1
BIOTECH-423	Biochemistry-II	Subject-Specific	2+1
BIOTECH-424	Techniques in Biotechnology	Subject-Specific	2+1
	Internship	PLL	Non-Credit Hour
	Entrepreneurship/Youth Club/ Sports	PLL	Non-Credit Hour
Total Credit Hours			18

Arts and Humanities

I. Pashto,Urdu, Arabic, Turkish, Chinese or any other language

II. Islamic History and Culture, Philosophy, History, Education, Home Economics or any other approved course of BKUC

Social science II

Political Science, Sociology, Psychology, Economics, Law , or any other approved Basic course of BKUC

Natural Sciences (any two subjects may be selected from the following disciplines)

Mathematics, Statistics , Botany, Zoology, Chemistry, Physics, Geography, GIS, Geology, Electronics, Geophysics, computer, (or any other approved Basic Course of BKUC)

Total Credit Hours 72 for the award of ADP (Biotechnology)

ASSOCIATE DEGREE IN SCIENCE BIOTECHNOLOGY YEAR-1 SEMESTER-1

COURSE TITLE: ENGLISH -I (FUNCTIONAL ENGLISH)

COURSE CODE: ELL 311

CREDITS HOURS: 03

Course Description

The subject aims to enhance the students' ability in the meaningful use of grammatical structures. Students will be able to use the targeted grammatical structures meaningfully and appropriately both in oral and written production.

Course Objectives

1. To enable students to identify main/topic sentences.
2. To teach them to use effective strategies while reading texts.
3. To acquaint them with cohesive devices and their function in the text.

Course Contents

- Vocabulary (Frequently confused / misused words, Phrases, synonyms, antonyms, idioms & General vocabulary),
- Practical Use of Grammar (Nouns, Pronouns, Verbs, Adjectives, Adverbs, Prepositions, Conjunctions, Articles, Interjections & Tenses),
- Transitive and Intransitive verbs
- Punctuations, 14 American English Punctuations.
- Sentences (Types of sentences, Parts of sentences, Direct and Indirect Speech, Active & Passive Voice & Conditional Sentences),
- Composition + Summarization (Describing, Narrating, Argumentation, Short / long Composition)
- Comprehension + Precise writing.
- Phrase, Types of Phrase
- Clause, Types of Clause

Recommended Books

- High School English Grammar & Composition by Wren and Martin.
- Practical English Grammar by A.J. Thomson & A.V. Martinet. Exercises 1 & 2. 3rd edition. Oxford University Press.
- Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand & Françoise Grellet. Oxford Supplementary Skills. 4th Impression 1993.
- Reading. Upper Intermediate. Brian Tomilson & Rod Ellis. Oxford Supplementary Skills. 3rd Impression 1992.

COURSE TITLE: PAKISTAN STUDIES

COURSE CODE: PS-321

CREDIT HOURS: 03

COURSE OBJECTIVES:

Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan and to Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

COURSE CONTENTS:

Historical Perspective

- Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-i-Azam Muhammad Ali Jinnah.
- Factors leading to Muslim separatism
- People and Land
 - i. Indus Civilization
 - ii. Muslim advent
 - iii. Location and geo-physical features.

Government and Politics in Pakistan

- Political and constitutional phases:
 - 1947-58
 - 1958-71
 - 1971-77
 - 1977-88
 - 1988-99
 - 1999 onward

Contemporary Pakistan

- Economic institutions and issues
- Society and social structure
- Ethnicity
- Foreign policy of Pakistan and challenges
- Futuristic outlook of Pakistan

COURSE RECOMMENDED BOOKS:

1. Amin, Tahir. (1999). Ethno-National Movement in Pakistan. Islamabad: Institute of Policy Studies, Islamabad.
2. Burke,S.M and Ziring,Lawrence. (1993). Pakistan's Foreign policy: An Historical analysis. Karachi: Oxford University Press,
3. Mehmood, Safdar. (2001). Pakistan Kayyuntoota. Lahore: Idara-e-Saqafat-e-Islamia. Club Road Press.
4. Mehmood, Safdar. (1994). Pakistan Political Roots & Development. Lahore.

5. Waseem, Muhammad. (1987). Pakistan under Martial Law. Lahore: Vanguard.

COURSE CODE: CS-311

COURSE TITLE: INTRODUCTION TO INFORMATION AND COMMUNICATION TECHNOLOGIES

Introduction to Information and Communication Technologies			
Credit Hours:	3 (2+1)	Prerequisites:	None
Course Learning Outcomes (CLOs):			
At the end of the course the students will be able to:		Domain	BT Level*
Understand basics of computing technology (Knowledge)		C	1
Have knowledge of types of software (Understand)		C	2
Have knowledge of computing related technologies		C	2
Have practical knowledge of use of computer and MS office.		C	3
* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain			

Course Content:

<u>Introduction:</u>	Brief history of Computer, Basic Computer Elements and computer types (Super, Mainframe, Mini and Micro), Digital and Analogue Computer
<u>Computer Hardware:</u>	(Input Devices, processor, Output Devices)
<u>Storage Devices:</u>	(Register, Cache, RAM, ROM, HDD, optical Storage devices (CD, DVD, Blue rays), Cloud)
<u>Computer Software:</u>	System Software (Operating System, Device Drivers and Language processor) Application software
<u>Computer Network:</u>	Types of Computer Network (LAN, MAN, WAN), Topologies (Bus, Star, Ring Mesh), Client, Server, Hub, Switch, Router
<u>Internet and WWW:</u>	Basic Structure of Internet, Web page, Website, Web application, Web Browser,

Search engine, email, cyber security

MS Word

MS Power Point

MS Excel

Basics of program relevant tools

Teaching Methodology:

Lectures, Written Assignments, Practical labs, Semester Project, Presentations

Course Assessment:

Sessional Exam, Home Assignments, Quizzes, Project, Presentations, Final Exam

Reference Materials:

1. Charles S. Parker, Understanding Computers: Today and Tomorrow, Course Technology, 25 Thomson Place, Boston, Massachusetts 02210, USA
2. Livesley, Robert Kenneth. An introduction to automatic digital computers. Cambridge University Press, 2017.
3. Zawacki-Richter, Olaf, and Colin Latchem. "Exploring four decades of research in Computers & Education." Computers & Education 122 (2018): 136-152.
4. Sinha, Pradeep K., and Priti Sinha. Computer fundamentals. BPB publications, 2010.
5. Goel, Anita. Computer fundamentals. Pearson Education India, 2010

NS-I*

Gen Ed

(3+0)

Natural Sciences (one subjects to be selected from the following disciplines)

Mathematics, Statistics, Botany, Zoology, Chemistry, Physics, Geography, GIS, Geology, Electronics, Geophysics, computer, (or any other approved Basic Course of BKUC)

BIOTECH -311

INTRODUCTIONS TO BIOTECHNOLOGY

(3+0)

Course Objective:

To acquaint students with the basic concepts and significance of biotechnology as it stands today.

Course Contents:

Biotechnology- definition and history; Foundations of Biotechnology and Interdisciplinary pursuit; Branches and/or Applications of Biotechnology in Interdisciplinary, Agriculture (Food, livestock, fisheries, algae, fungi, etc.); Protection of Biotechnological products, Safety in Biotechnology; Public Perception of Biotechnology; Biotechnology and Ethics; Biotechnology and the Developing world.

Recommendation Books:

1. Daugherty E, 2012. Biotechnology; Science for the New Millennium. 1st Edition. Revised; paradigm Publication.
2. Smith JE, 2009. Biotechnology. 5th Edition; Cambridge University Press.
3. Nicholl TSD, 2004. An Introduction to Genetic Engineering. 2nd Edition. Cambridge University Press UK.
4. Purohit SS. 2005. Biotechnology Fundamentals & Application. 4th Edition; Agro Bios. India.
5. Ratlegde C and Kristiansen B, 2006. Basic Biotechnology. 2nd Edition; Cambridge University Press, UK.
6. Thomas JA and Funchs RL, 2002. Biotechnology and Safety Assessment. 3rd Edition; Academic Press, UK.

Course Objectives: To acquaint students with cell structure, function and visualization of cell and its components.

COURSE CONTENTS:

Introduction to cell theory, structure, chemical constituents of cell and cell organelles and their functions, separation of cell organelles, Cell membrane, its molecular organization and functional role, The concept of the unit membrane, the fluid mosaic model, membrane receptors and transport mechanisms. Endoplasmic Reticulum, Lysosome, Micro-bodies, Mitochondrial ultra structure and function, Chloroplast ultra structure and the mechanism of photosynthesis, Cell movements, structure and function of cytoskeleton, centriole, cilia and flagella, the mitotic apparatus, The nucleus, structure and function of chromosomes, the cell cycle, mitosis, meiosis.

Practical:

Microscopy and staining techniques, Study of prokaryotic and eukaryotic cells, Study of plant and animals cell, Cell structure in the staminal hair of *Tradescantia*, Study of different types of plastids, Cellular reproduction, Mitosis: smear/squash preparation of onion roots.

Recommended text books:

1. Molecular Biology of the Cell, Bruce Alberts, Alexander Johnson, 4th Edition, 2006. Garland Sciences. Published by Academic Internet Publishers.
2. Molecular Cell Biology, Lodish, Berk, Zipursky, 4th Edition. 2000. W.H. Freeman.
3. Cell and Molecular Biology, Karp, 3rd Edition. 2002. John Wiley and Sons.

ASSOCIATE DEGREE IN SCIENCE BIOTECHNOLOGY YEAR-1 SEMESTER-1I

COURSE TITLE: ENGLISH II: COMPOSITION WRITING

COURSE CODE: ELL 321

CREDIT HOURS: 03

Course Description:

The course focuses on the basic strategies of composition and writing skills. Good writing skills not only help students obtain good grades but also optimize their chances to excel in professional life. The course includes modes of collecting information and arranging it in appropriate manner such as chronological order, cause and effect, compares and contrast, general to specific etc. It enables the students to write, edit, rewrite, redraft and proofread their own document for writing effective compositions. Because of the use of a significant amount of written communication on daily basis, sharp writing skills have always been valued highly in academic as well as professional spheres.

Course Objectives:

This course aims to:

1. Assist students identify the audience, message, and the purpose of writing
2. Develop rhetorical knowledge and critical thinking
3. Enable them express themselves in a variety of writing styles
4. Help students write well organized academic texts including examination answers with topic/thesis statement and supporting details.
5. Make students write argumentative essays and course assignments
6. Use different mechanics of writing to produce various types of compositions effectively keeping in view the purpose and the audience
7. Demonstrate rhetorical knowledge
8. Demonstrate critical thinking in well-organized forms of academic texts

Course Contents:

- Writing Process,
- Invention in writing Process or brainstorming
- Generating Ideas (collecting information in various forms such as mind maps, tables, lists, charts etc)
- Identifying Audience, Purpose, and Message,
- Ordering Information,
- Chronology for a narrative,
- Stages of a process,

- Deductive vs. Inductive approach in writing
- Comparison and contrast,
- Problem solution pattern,
- Drafting,
- Free Writing,
- Revising, Editing, Paraphrasing,
- Cohesion and Coherence, Cohesive Devices,
- Paragraph unity, Summary and Precise Writing,
- Creative Writing, Essay Writing,
- Developing a thesis, writing effective introduction and conclusion
- Organizing an essay, different types of essays, use of various rhetorical modes including exposition, argumentation and analysis

Recommended Books

Critical Reading and Writing: An Introductory Course by Goatly, A. 2000. London: Taylor & Francis

A Writer's Reference by Hacker, D. 1992. 2nd ed. Boston: St. Martin's

Study writing: A course in written English for academic and professional purposes. by Hamp-Lyons, L. & Heasley, B. 1987. Cambridge: Cambridge University Press.

Oxford English for Undergraduates by Howe, D. H, Kirkpatrick, T. A. & Kirkpatrick, D. L. 2004. Karachi: Oxford University Press.

- Patterns for College Writing: Fourth Edition. Kirszner, L.G & Mandell, S.R. 1989 USA: St. Martin's Press, Inc.
- Write to be Read: Reading, Reflection and Writing by Smazler, W. R. 1996. Cambridge: Cambridge University Press.

COURSE TITLE: ISLAMIC STUDIES

COURSE CODE: IS-312

CREDIT HOURS: 03

Course Objectives:

This course is aimed at:

- 1 To provide Basic information about Islamic Studies
- 2 To enhance understanding of the students regarding Islamic Civilization
- 3 To improve Students skill to perform prayers and other worships
- 4 To enhance the skill of the students for understanding of issues related to faith and religious life.

Course Contents:

Introduction to Quranic Studies

- Basic Concepts of Quran
- History of Quran
- Uloom-ul -Quran

Study of Selected Text of Holly Quran

- Verses of Surah Al-Baqra Related to Faith (Verse No-284-286)
- Verses of Surah Al-Hujrat Related to Adab Al-Nabi (Verse No-1-18)
- Verses of Surah Al-Mumanoon Related to Characteristics of faithful (Verse No-1-11)
- Verses of Surah al-Furqan Related to Social Ethics (Verse No.63-77)
- Verses of Surah Al-Inam Related to Ihkam (Verse No-152-154)

Study of Selected Text of Holly Quran

- Verses of Surah Al-Ihzab Related to Adab al-Nabi (Verse No.6,21,40,56,57,58.)
- Verses of Surah Al-Hashar (18,19,20) Related to thinking, Day of Judgment
- Verses of Surah Al-Saf Related to Tafakar, Tadabar (Verse No-1,14)

Seerat of Holy Prophet (S.A.W) I

- Life of Muhammad Bin Abdullah (Before Prophet Hood)
- Life of Holy Prophet (S.A.W) in Makkah
- Important Lessons Derived from the life of Holy Prophet in Makkah

Seerat of Holy Prophet (S.A.W) II

- Life of Holy Prophet (S.A.W) in Madina
- Important Events of Life Holy Prophet in Madina
- Important Lessons Derived from the life of Holy Prophet in Madina

Introduction To Sunnah

- Basic Concepts of Hadith
- History of Hadith
- Kinds of Hadith
- Uloom –ul-Hadith
- Sunnah & Hadith
- Legal Position of Sunnah

Introduction To Islamic Law & Jurisprudence

- Basic Concepts of Islamic Law & Jurisprudence
- History & Importance of Islamic Law & Jurisprudence
- Sources of Islamic Law & Jurisprudence
- Nature of Differences in Islamic Law
- Islam and Sectarianism

Islamic Culture & Civilization

- Basic Concepts of Islamic Culture & Civilization
- Historical Development of Islamic Culture & Civilization
- Characteristics of Islamic Culture & Civilization
- Islamic Culture & Civilization and Contemporary Issues

Islam & Science

- Basic Concepts of Islam & Science
- Contributions of Muslims in the Development of Science
- Quranic & Science

Islamic Economic System

- Basic Concepts of Islamic Economic System
- Means of Distribution of wealth in Islamic Economics
- Islamic Concept of Riba
- Islamic Ways of Trade & Commerce

Political System of Islam

- Basic Concepts of Islamic Political System
- Islamic Concept of Sovereignty
- Basic Institutions of Govt. in Islam

Islamic History

- Period of Khlaft-E-Rashida
- Period of Ummayyads
- Period of Abbasids

Social System of Islam

- Basic Concepts of Social System of Islam
- Elements of Family
- Ethical Values of Islam

COURSE RECOMMENDED BOOKS:

1. Bhatia, H.S. (1989). Studies in Islamic Law, Religion and Society. New Delhi: Deep & Deep Publications.
2. Hasan, Ahmad. (1993) .Principles of Islamic Jurisprudence. Islamabad: Islamic Research Institute, IIU.
3. Waliullah, Mir. (1982). Muslim Jrisprudence and the Quranic Law of Crimes. Lahore: Islamic Book Service.
4. Zia-ul-Haq, Muhammad. (2001). Introduction to Al Sharia Al Islamia. Islamabad: Allama Iqbal Open University.

ARTS AND HUMANITIES-I (LANGUAGES)

(3+0)

One subject to be selected from the list of disciplines below:

Arts and Humanities

I. Pashto, Urdu, Arabic, Turkish, Chinese or any other language

II. Islamic History and Culture, Philosophy, History, Education, Home Economics or any other approved course of BKUC

SOC-313 CITIZENSHIP EDUCATION AND COMMUNITY ENGAGEMENT (3+0)

Course Objectives: The overall objectives of this course are to:

- Teach students the importance and role of active citizenship in promoting a productive, harmonious and developed society/world
- Educate students about the importance of concepts, skills and philosophy of community linkages in developing a sustainable society
- Inculcate the importance of community involvement for ensuring an improved, tolerant and generative society/world
- Provide an opportunity to the students to develop their relationship with the community

Learning Outcomes:

The primary outcome is inclusive development through active citizenship locally and globally, Moreover, the following are the detailed outcomes of the course based on the three domains of Bloom's Taxonomy i.e Affective, Psychomotor and Cognitive. The students will be able to:

- Understand the overall organization of the society
- Recognize and exercise their rights, responsibilities and the significance of active citizenship in positive societal development
- Identify and critically evaluate social issues and implement practicable community based solutions
- Understand the concept of human rights and its significance
- Appreciate diverse viewpoints and inter-cultural harmony

Course Outline:

Introduction to Citizenship Education and Community Engagement

- Meaning & History
- Attributes of Active Citizenship
- Different Approach
 - i. Republican Approach
 - ii. Liberal Approach
 - iii. Cosmopolitan Approach
- Dimensions of Active Citizenship
- Rights
- Membership
- Participation
- Identity

Identity, Culture, and Social Harmony

- Sociological Theories of Self Formation
 - i. Sigmund Freud Theory
 - ii. George Herbert Mead Theory
 - iii. Charles Horton Cooley Theory
- Cultural & Religious Harmony
- Pluralism & Diversity
- Democracy & Democratic Norms
- Concept and Development of Identity
- Components of Cultural and Social Harmony

Inter-Cultural Dialogue (me versus you)

- Principles & Purpose
- Ability to Support, learn and share through dialogue
- Policy Dialogue (encourage young people to share their opinion and perspective with policy makers and opinion makers.)

Local & Global Communities

- Concept of Community
- Needs, Issues & Conflicts
- Conflict Resolution
- Communication & Networking
- Social Cohesion
- Social Capital
- Social Networking
- Advocacy
- Social Entrepreneurship & Partnership

Social Action Planning

- Skills in project Planning & Management
- Project Cycle
- Stakeholder Analysis
- Problem Identification
- Writing Project Plan
- Monitoring & Evaluation
- Risk Analysis

Population Dynamics in Pakistan

- Population Growth Pakistan
- Factors Behind High Fertility Rate
 - i. Legislative Actions
 - ii. Dearth of Medical Facilities
 - iii. Delayed VS Early Age Marriages
 - iv. Poverty
 - v. Women Empowerment
 - vi. Spreading Awareness
 - vii. Providing Incentives
- Population Theory
- How to Control Population Growth

Text and Reference Books:

Core Readings:

1. Larsen A. K. Sewpaul, V., & Hole, G. O. (Eds.). (2013). Participation in community work: International Perspectives, Rutledge
2. Alan, T. (2008). Community work, London: Palgrave Macmillan
3. British Council, (2017) Active Citizen's social Action Projects Guide (Scotland: British Council)
4. Kaye, C. B. (2004). The complete guide to service learning: Proven, practical ways to engage students in civic responsibility, academic curriculum, & social action. Free spirit publishing.
5. Hans, R. (1993). Population Studies, Indian Council of Social Sciences Research, New Delhi.
6. Peterson, W. (1975). Population, New York, Macmillan.
7. United Nations Economic Commission for Europe-official web site.
8. Weeks, J. R. (1992). Population: An Introduction to Concepts and Issues, Belmont California, Wadsworth Publishing Company

BIOTECH-321**ANIMAL DIVERSITY****3 (2+1)****COURSE OBJECTIVES:**

To acquaint students with major phyla of invertebrates and different classes of chordates for understanding diverse nature of animals.

COURSE CONTENTS:

Introduction to animal kingdom. Protozoa: Diagnostic features of protozoa, classification up to classes with examples, economic importance of Protozoa. Porifera: Diagnostic features of Porifera, classification up to classes with examples, canal system in Porifera. Coelenterates: Diagnostic features, classification up to classes with examples (Coral reefs and polymorphism). Platyhelminthes: Diagnostic features of Platyhelminthes, classification up to classes with examples, parasitic adaptation in Platyhelminthes. Nematoda: Diagnostic features, classification up to classes with examples, biological importance of Nematoda. Annelida: Diagnostic features, classification up to classes with examples, segmentation and economic importance of annelids. Mollusca: Diagnostic features, classification up to classes with examples, foot and shell in Mollusca. Arthropoda: Diagnostic features of the phylum, classification up to classes with examples, economic importance of Arthropoda. Echinodermata: Diagnostic features of echinodermates, classification up to classes, economic importance of Echinodermata. Vertebrata/chordates: Three basic characteristics of chordates, basic characteristics of 5 classes of chordata (Pisces, Aves, Reptilia, Amphibia, Mammalia), brief account about integumentary, digestive, circulatory, respiratory, excretory, nervous, endocrine and reproductive systems.

Practical:

General survey of each phylum and group from invertebrata to vertebrata, collection and identification of importance local fauna. Dissection of cockroach, pigeon, rabbit and rat. Brief introduction of evolution, zoogeography and wild life of Pakistan.

Recommended Books

1. E.L. Jordan, P.S. Verma. 2003. Invertebrate zoology. S Chand & Co Ltd.
2. E.L. Jordan, P.S. Verma. (New Edition). Chordates zoology. S Chand & Co Ltd.

Biotech-322**GENETICS****(2 +1)**

COURSE OBJECTIVES: To acquaint the student with the Mendelian inheritance, gene interaction and gene mapping.

COURSE CONTENTS:

Mendelian Genetics, principle of segregation, symbols and Terminology, Monohybrid crosses, Dominance, Recessiveness, codominance, Semidominance, Principle of independent Assortment, Dihybrid Ratios, Trihybrid Ratios, Gene interaction, Epistasis, Multiple Alleles, ABO blood Type Alleles in Humans, Rh factor Alleles in humans, Probability in Mendelian inheritance, chi-square, structure of chromosomes and Genes, Function of DNA and RNA, classes of RNA, Nucleotide units of DNA and RNA, DNA as storage of Genetic information, Friedrich Miescher Experiment, Avery, Macleod and McCarty Experiment, Hershey and chase experiment, Watson and crick DNA model, physical and chemical structure of DNA, Difference between Prokaryotic and Eukaryotic Genetic material, sex determination, identification of sex chromosomes, Environmental factors and sex determination, Linkage and crossing over.

Practicals:

Introduction to Fast plants and Drosophila. Set up a Drosophila opened-ended cross, Pollinate Fast Plants, ABO blood group, Isolation of DNA from Drosophila.

RECOMMENDED TEXT BOOKS:

1. Principal of Genetics by D.Peter Snustad and Michael J. Simons
2. Principles of Genetics by Eldon John Gardner, Michael J. Simons, and D. Peter Snustad

ASSOCIATE DEGREE IN SCIENCE BIOTECHNOLOGY YEAR-2 SEMESTER-3

COURSE TITLE: ACADEMIC READING & WRITING (ENGLISH III)

LEVEL: BS 3RD

COURSE CODE: ELL 411

CREDIT HOURSS: 03

Course Description

This course aims at inculcating proficiency in academic writing through research. It guides students to develop a well-argued and well documented academic paper with a clear thesis statement, critical thinking, argumentation and synthesis of information. This course also teaches students how to use different systems of citations and bibliography. It allows students to become independent and efficient readers armed with appropriate skills and strategies for reading and

Comprehending texts at undergraduate level

Course Objectives

To enable the students to:

1. Improve literal understanding, interpretation & general assimilation, and integration of knowledge
2. Write well organized academic texts including examination answers with topic/thesis statement and supporting details.
3. Write argumentative essays and course assignments

Course Contents:

Reading and Critical Thinking

- Read academic texts effectively by
- Using appropriate strategies for extracting information and salient points according to a given purpose
- Identifying the main points supporting details, conclusions in a text of intermediate level
- Identifying the writer's intent such as cause and effect, reasons, comparison and contrast, and exemplification
- Interpreting charts and diagrams
- Making appropriate notes using strategies such as mind maps, tables, lists, graphs.
- Reading and carrying out instructions for tasks, assignments and examination questions
- Enhance academic vocabulary using skills learnt in Compulsory English I course
- Acquire efficient dictionary skills such as locating guide words, entry words, choosing appropriate definition, and identifying pronunciation through pronunciation key, identifying part of speech, identifying syllable division and stress patterns
- Writing Academic Texts

Organization and development of effective compositions

- employ appropriate strategies for prewriting, drafting, revising, and editing as part of the writing process
- compose coherent paragraphs, supporting central ideas with specific details
- Compose organized essays with genre-specific structure including thesis, introduction, body, and conclusion.
- demonstrate control of key conventions of standard written English
- summarize a text objectively
- respond to a text subjectively
- analyze, synthesize, interpret, and evaluate information from multiple texts
- apply active reading strategies such as skimming, scanning, questioning, and annotating
- develop vocabulary; choose correctly among different forms of related words; evaluate differences in diction

Recommended Books:

- English Practice Grammar (New edition with tests and answers) by Eastwood, J. 2004.. Karachi: Oxford University Press.
- Fisher, A. 2001. Critical Thinking. C UP
- Critical Reading and Writing: An Introductory Course. By Goatly, A. 2000. London: Taylor & Francis
- A Writer's Reference. 2nd Ed. By Hacker, D. 1992. Boston: St. Martin's
- Study writing: A course in written English for academic and professional purposes. By Hamp-Lyons, L. & Heasley, B. 1987. Cambridge: Cambridge University Press.
- Oxford English for Undergraduates. By Howe, D. H, Kirkpatrick, T. A., & Kirkpatrick, D. L. 2004. Karachi: Oxford University Press.
- Grammar in Use. By Murphy, R. 2003. Cambridge: Cambridge University Press.
- Write to be Read: Reading, Reflection and Writing. By Smazler, W. R. 1996. Cambridge: Cambridge University Press.
- Study Skills. By Wallace, M. 1992. Cambridge: Cambridge University Press.
Primary Texts: The Norton Field Guide to Writing, by Richard Bullock; or the St. Martin's Guide to Writing, by Rise Axelrod and Charles Cooper; or The Allyn and Bacon Guide to Writing, by John Ramage and John Bean; or The Call to write, by John Trimbu

NS-II *

(3+0)

Natural Sciences (One subjects may be selected from the following disciplines)

Mathematics, Statistics, Botany, Zoology, Chemistry, Physics, Geography, GIS, Geology, Electronics, Geophysics, computer, (or any other approved Basic Course of BKUC)

QR-II` (LOGIC AND QUANTITATIVE REASONING) (3+0)

BIOTECH-411 ECOSYSTEM AND ENVIRONMENT (2 + 1)

Course Objectives: To acquaint the students with the knowledge of ecosystems and the environment.

Course Contents:

Concept, overall structure and components of Ecosystem, Energy flow and Biogeochemical cycling, Energy transfer (Food chain, Food webs, Food cycle, Trophic levels), Ecological pyramids, Productivity of ecosystems, Factors influencing environments and habitats, Impact of man on ecosystem, Fundamental of population ecology and community ecology, Human impacts on ecosystems, The Atmosphere (Composition, Minor and major gases, Water in atmosphere, Aerosols, Global circulation pattern), Pollution (Air, Water, Land, Thermal, Radiation and Noise), Climate Change (Green House Effect and Global Warming), Ozone Depletion (Ozone-structure, Properties/Significances, Ozone destroying catalysts, Natural, Anthropogenic, Antarctic ozone hole, Changing ozone Level, Impact on biosphere), Waste Type, Disposal and Management, Environmental Ethics.

Practicals:

Study of pond freshwater ecosystem, Study of vegetation profile, Study of grassland, rangeland and forest, Study of some biotic and abiotic factors of grassland, rangeland and aquatic ecosystem, methods of sampling. Measurements and description of plant communities by different methods. Study of decomposition of leaf litter by organisms.

RECOMMENDED TEXT BOOKS:

1. Davet, P. 2004. Microbial ecology of soil and plant growth. Science Publishers.
2. Nico, M., Straalen, V., and Roelofs, D., 2006. An Introduction to Ecological Genomics. Oxford University Press.
3. Aston, A., Harris, S., Lowe, A., 2004. Ecological Genetics: Planning and Application. Blackwell Science (UK).
4. Costa, L. G., and Eaton, D. L., 2006. Gene-Environment Interactions: Fundamentals of Ecogenetics. John-Wiley and Son Limited.
5. Freeland, J. R., 2005. Molecular Ecology. John-Wiley and Son Limited.
6. Light. A and Rolston III.H. 2003. Environmental Ethics. Blackwell Publishers Ltd. U.S.A.
7. Wenz, P. S., 2001. Environmental Ethics Today, Oxford University Press.
8. Louis P. and Pojman, L. P., 2004. Environmental Ethics: Readings in Theory and Application, 4th edition. Wadsworth Publishing.
9. Light, A., and Rolston, III. H., 2005. Environmental Ethics. Blacwell Publishing Incorporated.
10. Raven, P. H., and Berg, L. R., 2005. Environment, 5 Editionth. John-Wiley and Son Limited

COURSE OBJECTIVES:

To acquaint the student with the chemistry and biology of biomolecules.

COURSE CONTENTS:

Introduction to biochemistry, amino acids and proteins, general functions, classification, primary, secondary, tertiary and quaternary structure, Fibrous and globular proteins, Protein stability, Protein folding. Enzyme nomenclature and classification, co-factors and co-enzymes, general characteristics of enzymatic reactions. Enzyme kinetics. Classification of carbohydrates, structure and functions of mono, oligo and polysaccharides, sugar derivatives, Structural polysaccharides, storage polysaccharides, Structure and function of bacterial cell-walls. Classification, structure, properties and functions of different types of lipids, fatty acids, triglycerides, glycerophospholipids, sphingolipids, cholesterol, Micelles, bilayers and liposomes. Properties and functions of lipoproteins, Fat and water soluble vitamins, Structural and functional aspects of nucleic acids, Chemical structures of nucleotides, nucleosides and bases.

Practicals:

Qualitative tests for amino acids, Amino acid titration, Hydrolysis of proteins and chromatographic separation of amino acids, Isolation and solubilization of proteins from plant and animal tissues, Estimation of proteins using different methods, Estimation of glucose in a mixture of monosaccharides, estimation of sucrose by polarimeter, chromatographic separation of sugars. Estimation of acid, saponification and iodine values of fat, Enzymes assay, effect of pH, temperature and substrate concentration on the properties of enzymes, Kinetic analysis of enzymes. Isolation of nucleic acids.

RECOMMENDED TEXT BOOKS:

1. Principles of Biochemistry, A. L. Lehninger, D.L. Nelson, 3rd edition (2000), Worth Publishers.
2. Biochemistry, L. Stryer, 6th Edition (2006), W.H. Freeman and Co.
3. Biochemistry, D. Voet, T. G. Voet, 3rd edition (2004), John Wiley and Sons, New York.
4. Harper's Illustrated Biochemistry, 27th edition (2006), McGraw-Hill Medical.
5. Lippincott's Biochemistry, P.C. Champe, R.A. Harvey, D.R. Ferrier, 4th edition (2008), J.B. Lippincott Company.
6. An Introduction to Practical Biochemistry, D. T. Plummer, 3rd edition (1987), McGraw-Hill.
7. Handbook of Molecular and Cellular Methods in Biology and Medicines, P.B. Kaufmann, W.Wu, L.J. Creke (1995), CRC Press.

Course Objectives: To acquaint student with the knowledge of Microbiology and its applications.

Course Contents:

Introduction and scope of Microbiology, Historical foundations of Microbiology, General characteristics of Microbes, methods of Microbiology, bacterial forms and ultrastructure, microbial nutrition, cultivation, reproduction and growth, Metabolic characteristics, symbiotic relationships, taxonomy, classification, nomenclature of microorganism/bacteria. Physical and chemical control of microbes. Role of microbes in industry, agriculture, health, basic research and environment.

Practicals:

Sterilization techniques, culturing, staining (Gram, simple, negative, capsule and spore), colony and cell morphology, bacterial cell count and growth curve, biochemical tests (Oxidation Fermentation (OF), urease, oxidase and catalase) of bacteria.

RECOMMENDED TEXT BOOKS:

1. Talaro, K. P., 2006. Foundations in Microbiology: Basic Principles. Mcgraw Hill. Publisher.
2. Black, J. G., 2005. Microbiology: principles and explorations, *by* 6th Edition, J. Wiley & Sons, USA.
3. Cappuccino, J. G. and Sherman, N. 2004, Microbiology: a laboratory manual. Pearson Education, USA.
4. Pollack, R. A. Findlay, L., Mondschein, W. Modesto R. R., 2004. Laboratory Exercises in Microbiology *by* 2nd Edition, J. Wiley and Sons, USA.
5. Tortora, G. J., Funke, B. R. and Case, C. L. 2008. Microbiology: an introduction 9th Edition, Pearson Education, USA.
6. Kathleen P. T., and Arthur, T. 2001. Foundations in Microbiology: Basic Principles McGraw-Hill Companies/
7. Tortora, G. J., Funke, B. R., Case, C. L. 2000. Microbiology: An Introduction, Study Guide. Benjamin-Cummings Publishing Company.
8. Tortora, G. J., Funke, B. R. and Case, C. L. 2004. Microbiology: an introduction 8th Edition, Pearson Education, USA.
9. Tortora, G. J., Christine, L. Case, C. L., Funke, B. R., Funke, B., Case, C., 2006. Microbiology: An Introduction, Publisher: Pearson Education.
10. Alcamo, I. E., 2001. Fundamentals of Microbiology *published by* Jones and Bartlett Publishers, USA.

ASSOCIATE DEGREE IN SCIENCE BIOTECHNOLOGY YEAR-1I SEMESTER-4

ARTS AND HUMANITIES-II

(3+0)

One subject to be selected from the list of disciplines below:

Arts and Humanities

I. Pashto, Urdu, Arabic, Turkish, Chinese or any other language

II. Islamic History and Culture, Philosophy, History, Education, Home Economics or any other approved course of BKUC

SOCIAL SCIENCES - II

3+0

One subject to be selected from the list of disciplines below:

Social science II

Political Science, Sociology, Psychology, Economics, Law, or any other approved Basic course of BKUC

Course Objectives: To acquaint the student with diagnostic tools, immunization and therapeutics.

COURSE OUTLINES:

Introduction to Health biotechnology, Social acceptance of medical biotechnology, The molecular basis of disease, Molecular and genetic markers, Detection of mutations, Detection of infectious agents, Active and passive immunization, vaccines (live, killed, recombinant DNA vaccines, subunit vaccines, DNA vaccines, edible vaccines), Organ transplantation, transplant rejection, Applications of transgenic animals (animal models of diseases, pharming, farm animals improvement), Drug delivery systems, Blood transfusion, Grafting techniques, Pharmacogenetics, Strategies of gene therapy, gene delivery vehicles, genetic disorders and gene therapy, Biopharmaceuticals from plants, Uses of stem cell technology.

RECOMMENDED TEXT BOOKS:

1. "Medical Biotechnology" by Judit Pongracz, Mary Keen "(2009). Published by Elsevier Health Sciences.
2. "Biotechnology and Your Health: Pharmaceutical Applications" by Bernice Zeldin Schacter, Bernice Schacter (2005). Published by Chelsea House Publishers,
3. "Health and Pharmaceutical Biotechnology" by D.M. Chetan, K.P. Dinesh, D.M. Chetan (2006). Published by Firewall Media.

Course Objectives: To acquaint the student with the chemistry and biology of macromolecules.

Course Contents:

Overview of Molecular Biology, Logic of Molecular Biology, Prokaryotes and Eukaryotes, bacteria, Bacteriophage, yeasts, Animal cell, Animal & plant viruses, Genetic Analysis of Molecular Biology, Macromolecules, chemical structures of the major classes of Macromolecules: Proteins, Nucleic Acids, Polysaccharides, Nucleic Acids, DNA Helix, Form of DNA Helix, Factor that determine structure of DNA, properties of Genetic Material (storage and Transmission of Genetic information by DNA). Transmission of information from parent to progeny, chemical stability of DNA, Ability of DNA to change, DNA Replication, Enzymology of DNA Replication. Events in the Replication Fork, Initiation of synthesis of Leading and lagging strands, Okazaki fragments, importance of 3 → 5 and 5 → 3 Exonuclease activities of DNA polymerase, Rolling circular Replication, Loop Rolling circular Replication, Difference between Prokaryotic and Eukaryotic Replication, DNA Repair.

Practicals:

Isolation & Purification of DNA, Determination of Concentration of DNA using spectrophotometer. Hypochromicity determination of DNA,

RECOMMENDED TEXT BOOKS:

1. Molecular Biology by David Freifelder, Jones & Barlet Publisher, Boston

2. Molecular Biology of the cell by B. Alberts, D. Brag, J. Lewis, M. Raff, K. Roberts and J. D. Watson, Garland Publishers. Jones & Barlet Publisher, Boston

BIOTECH-423

BIOCHEMISTRY-II

(2 + 1)

Course Objectives: To acquaint the student with the key concepts of intermediary metabolism of proteins, nucleic acids, carbohydrates and lipids.

Course Contents:

Amino acid deamination mechanisms, urea cycle and its regulation, biosynthesis and degradation of essential and non-essential amino acids, RNAs and their role in protein synthesis, transcription and translational processes, Chemical nature, synthesis and degradation of purine and pyrimidine nucleotides, Glycolytic pathway and its significance, fermentation, Glycogen breakdown and synthesis pathways. Citric acid cycle, mechanism of electron transport chain, oxidative phosphorylation and regulation of ATP production, gluconeogenesis, pentose phosphate pathway, Properties and functions of lipoproteins, fatty acid oxidation, fatty acid and triglyceride synthesis, Ketone bodies, utilization of cholesterol, Prostaglandins, prostacyclines, thromboxanes and leukotrienes.

Practicals:

Iodine test for polysaccharides, Formation of sugar derivatives, Fermentation of sugars by Baker's yeast. Isolation of amylose and amylopectin from starch, extraction of glycogen from liver, acid and enzymatic hydrolysis of glycogen. Extraction and estimation of Lipids from wheat grain, Lipid separation from brain tissue and fractionation by TLC. Effect of UV light on vitamin A. Preparation of mitochondrial fraction from heart muscles and measurement of enzyme activities like malate dehydrogenase and monoamine oxidase.

RECOMMENDED TEXT BOOKS:

1. Biochemistry, D. Voet, J.G. Voet, 3rd (2004), John Wiley and Sons Inc.
2. Principles of Biochemistry, A.L. Lehninger, D.L. Nelson, 3rd edition (2000), Worth Publishers.
3. Lippincott's Biochemistry, P.C. Champe, R.A. Harvey, D.R. Ferrier, 4th edition (2008), J.B. Lippincott Company.
4. An Introduction to Practical Biochemistry, D. T. Plummer, 3rd edition (1987), McGraw-Hill.
5. Modern Experimental Biochemistry, R.F. Boyer, 3rd edition (2000), Pearson Education Inc.

Course Objectives: To acquaint the student with key analytical concepts of identification and analysis at molecular levels.

Course Contents: Ultra centrifugation, Sedimentation, density gradient and differential centrifugation, Introduction to Chromatography, types of chromatography, HPLC instrumentation and applications., Electrophoresis, paper and gel Electrophoresis, Capillary and two dimensional electrophoresis, PCR, blotting techniques. DNA Sequencing RNAi, ELISA, RFLPs and Microarray.

Recommended Books:

Practicals:

Experiments in chromatography (TLC, column and paper), Dialysis, ultrafiltration, fractionation of proteins using gel filtration, ion-exchange chromatography, chromatofocussing and other chromatographic techniques. Fractionation of proteins using native and SDS gel electrophoresis, Molecular weight determination of proteins using UVP gel based computer software program, Isoelectric focusing, Preservation of biological samples by lyophilization.

RECOMMENDED TEXT BOOKS:

1. Methods for protein analysis, R.A. Copeland, (1994), Chapman and Hall.
2. Campbell L, Durek, Braun B (1987) 1st edition, "Introduction to instrumental Analysis" Mc Graw Hill International editions, chemistry series Liss.
3. A Biological Guide to Principles and Techniques of Practical Biochemistry, K.Wilson, K.H. Goulding, 3rd edition (1991), ELBS.
4. Protein Methods, D.M. Bollag, M.D. Rozycki, S.J. Edelstein, 2nd Edition (1996), Wiley- Liss.
5. A Biological Guide to Principles and Techniques of Practical Biochemistry, K.Wilson, K.H. Goulding, 3rd edition (1991), ELBS.
6. Methods for Protein Analysis, R.A. Copeland, (1994), Chapman and Hall.
7. Protein Methods, D.M. Bollag, M. D. Rozycki, S.J. Edelstein, 2nd Edition (1996), Wiley- Liss.
8. Analytical Chemistry, A. Skoog, M. Donald (2000), Saunder Publishers Kenkel J (1994) 2nd edition, "Analytical Chemistry for Technicians" Lewis Publishers, BocaRaton.
9. Wilson K, Walker J (1994) 3rd edition, "Principles and Techniques of Practical Biochemistry" Cambridge University Press. Cambridge.
10. Basic Biochemical Methods, R.R. Alexander, J. M. Griffiths, 2nd edition (1993), Wiley