Ist Semester AD Chemistry 2025				
Semester	**Course Code**	**Course Title**	**Credit Hrs.**	**Category**
1st	CHM-3101	Fundamentals of Chemistry	3(2-1)	Major
	CHM-3102	Principles of Biochemistry	3(2-1)	Interdisciplinary
	GEN-3103	Quantitative Reasoning –I	3(3-0)	General
	GEN-3104	Natural Science	3(2-1)	General
	GEN-3105	Functional English	3(3-0)	General
	GEN-3106	Applications of Information & Communication Technologies	3(2-1)	General

CHM-3101 Fundamentals of Chemistry Credit Hrs. 3(2-1)

1. Introduction to Inorganic Chemistry

History and development of Inorganic chemistry

2. The Periodic Law and Periodicity

Modern Periodic Table; Classification of elements based on s, p, d and f orbitals; group trends, and periodic properties in s, p, d and f block elements, i.e. atomic radii, ionic radii, ionization potential, electron affinities, electronegativities and redox potential; anomalies in group trends and periodic properties, the uniqueness principle, the diagonal effect and the inert pair effect

3. Introduction to Classes and Nomenclature of Organic Compounds

Classification of organic compounds; development of systematic nomenclature; IUPAC nomenclature of hydrocarbons and heteroatom functional groups up to bi functional compounds.

4. Chemical Bond

Localized and delocalized chemical bonding; concept of hybridization leading to bond angles, bond lengths, bond energies and shapes of organic molecules.

5. Introduction to Biochemistry

Applications of Biochemistry, disciplines related to Biochemistry, biochemistry of the cell. Introduction to biomolecules, classification, composition and biological roles of nucleic

acids, proteins, carbohydrates, lipids, vitamins and minerals

6. Introduction to Physical Chemistry

Introduction; physical states of matter.

Practicals:

1. Determine the concentration of unknown solution by titration.

2. Identify laboratory glass wares and apparatus and its uses and understand various scientific techniques in organic chemistry.

3. Perform experiments based on physical aspects and calculate parameters.

Recommended Books

1. Mingos D. M. P. "Essential Trends in Inorganic Chemistry" Oxford University

Press, First Indian Edition, 2004.

2. Madan R. D. "Satya Prakash's Modern Inorganic Chemistry" S. Chand and

Company Limited, 2011.

3. Rodgers G. E. "Introduction to Coordination, Solid State and Descriptive Inorganic

Chemistry" McGraw-Hill, Inc

CHM-3102 Principles of Biochemistry Credit Hrs. 3(2-1)

Course Objectives

The course, Principles of Biochemistry covers different areas of biochemistry. It introduces a number of features that are intended to promote students understanding about all those principles which are common to various biological systems.

Course Outlines

Hydrogen bonding in water, solvent properties of water, chemical equilibrium, pH, acids and bases, buffers, the Handerson-Hesselbalch equation, bicarbonate buffer system of blood. Enzymes. The ATP cycle and bio-energetics. Structures and biological functions of carbohydrates, lipids, proteins and nucleic acids. Electron transport, oxidative phosphorylation and regulation of ATP Production. Detoxification and human system, acid base balance, electrolyte and water balance. Acid base reactions, redox reactions.

Practicals:

Normal solutions; Various qualitative tests for Monosaccharides, oligosaccharides, and polysaccharides; Study of hydrolysis of starch by using mineral acids; Detection of reducing sugars in the presence of non-reducing sugars; Qualitative tests for different lipids; Paper and thin-layer chromatography of sugars; Paper chromatography of various amino acids; Determination of pK values of amino acids (Glycine, Alanine) by preparation of titration curves. Estimation of glucose from unknown samples through UV spectrophotometry. Extraction and salting out of proteins; Quantitative analysis of proteins by UV spectrophotometry; Extraction and quantitative analysis of amino acids. Determination of acid value of fats.

Suggested Readings

1. D. Voet, J. G. Voet, C. W. Pratt, "Biochemistry", John Wiley & Sons, New York, 1999.

2. A. L. Lehninger, D. L. Nelson, M. M. Cox, "Principles of Biochemistry", 3rd Ed., Worth Publishers, New York, 2000.

3. G. Zubay, "Biochemistry", W. C. B. Publishers, Toronto, 1998.

4. L. Stryer, "Biochemistry" 5th Ed., W. H. Freeman & Co., 2002.

5. R. K. Murray, D. K. Granner, P. A. Mayes, "Harper's Biochemistry", Rodwell, 2000.

CHM-3103 Quantitative Reasoning-1 3(3-0)

Course Objectives:

Introduction, understanding of the basic mathematical and statistical tools, and real-life applications of quantitative reasoning.

Course Outlines:

Numerical Literacy: Number 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.

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.

Fundamental Statistical Concepts: 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 Books:

1. Quantitative Reasoning: Tools for Today's Informed Citizen by Bernard L. Madison, Lynn and Arthur Steen.
2. Quantitative Reasoning for the Information Age by Bernard L. Madison and David M. Bressoud.
3. Fundamentals of Mathematics by Wade Ellis.
4. Quantitative Reasoning: Thinking in Numbers by Eric Zaslow.
5. Thinking Clearly with Data: A Guide to Quantitative Reasoning and Analysis by Ethan Bueno de Mesquita and Anthony Fowler.
6. Using and Understanding Mathematics: A Quantitative Reasoning Approach by Bennett, J. O., Briggs, W. L., & Badalamenti, A.
7. Discrete Mathematics and its Applications by Kenneth H. Rosen.
8. Statistics for Technology: A Course in Applied Statistics by Chatfield, C.
9. Statistics: Unlocking the Power of Data by Robin H. Lock, Patti Frazer Lock, Kari Lock Morgan, and Eric F. Lock.

CHM-3104 **Natural Science** **Credit Hrs. 3(2-1)**

Course Outline

1. Introduction

Nature of Science; Brief History of Science with special reference to contribution of Muslims in the evolution and development of science:Impact of science on society.

2. The Physical Sciences

a. Constituents and Structure: "Universe, Galaxy. Solar system, Sun, Earth. Minerals;

b. Processes of Nature -Solar and Lunar Eclipses Day and Night and their variation:

c. Energy :- sources and resources of Energy conservation

i. Ceramics, Plastics. Semiconductors.

ii. Radio. Television, Telephones. Camera. Laser. Microscope.

iii. Computers, Satellites.

iv. Antibiotics, Vaccines, Fertilizers, Pesticides.

3. Biological Sciences

The basis of life - the cell, chromosomes, genes, nucleic acids.

The building blocks - Proteins. Hormones and other nutrients Concept of balanced diet. Metabolism.

Survey of Plant and Animal Kingdom - a brief survey of plant and animal kingdom to pinpoint similarities and diversities in nature.

The Human body - a brief account of human Physiology, Human behavior.

Practicals:

Finding pH of samples by pH paper.

Studying the properties of acid bases on the basis of their reaction with metals and nonmetals

Experimentally show that carbon dioxide is given out during respiration

Tracing the path of ray with prism

Tracing the path of a ray light through a slab. Measure angle of incidence and reflection

Onion peel experiment

Books Recommended

1. Kashmiri, M.A. (2023). Everyday Science. A.H. Publishers

2. Kilburn, R.E. and Howell, P.S. (1980). Exploring Life Sciences, Allyn and Bacon.

3. Kilburn, R.E. and Howell, P.S. (1981). Exploring Physical Sciences, Allyn and Bacon.

GEN-3105 Functional English Credit Hrs: 3(3-0)

Course Objectives: The course is developed to enhance the language skills and critical thinking of students by

- Enabling them to correct use of grammar and language structures
- Enabling them to communicate effectively
- Helping them improve their presentation skills by systematic drilling and

activities in the areas of reading and speaking

- Guiding them well organized writing

Course Contents:

Grammar:

- Basics of grammar
- Parts of speech and their use in communication
- Sentence structure
- Correct use of Tenses
- Active and passive voice
- Practice in unified sentences (unity and coherence)
- Analysis of Phrase, Clause and sentence structures
- Transitive and Intransitive Verbs
- Punctuation and Spellings

Reading skills:

- Comprehension skills
- Literal understanding of text, reading between lines (interpret text), reading beyond lines (to assimilate, integrate knowledge)
- Answers to the questions on a given text

Discussion:

- General topics and everyday conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of the students)
- Introducing ourselves, describing things, recounting past events, agreeing and disagreeing, compare and contrast

Listening:

- To be improved by showing documentaries/ films carefully selected by subject teacher
- Listening and note taking

Translation Skills:

- Urdu to English

Writing Skills:

- Paragraph Writing

  Basic structure of paragraph and guidelines for writing an effective paragraph Speaking Skills:

- Presentation Skills
- Introduction (types of presentation, structure of presentation)
- Prepared and unprepared talks

Note: Extensive reading is required for vocabulary building

Recommended Books:

1. **Functional English**

a) Grammar

1. Practical English Grammar by A. J. Thomson and A. V. Martinet.

Exercises 1. Third edition. Oxford University Press. 1997. ISBN 0194313492

2. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2. Third edition. Oxford University Press. 1997. ISBN 0194313506

b) Writing

1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Francoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.

c) Reading/Comprehension

1. Reading. Upper Intermediate. Brain Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.

d) Speaking

1) Ellen, K. 2002. Maximize Your Presentation Skills: How to Speak, Look and Act on Your Way to the Top
2) Hargie, O. (ed.) Hand book of Communications Skills
3) Mandel, S. 2000. Effective Presentation Skills: A Practical Guide Better Speaking
4) Mark, P. 1996. Presenting in English. Language Teaching Publications

CHM-3106 Applications of Information and Communication Technologies Credit Hrs. 3(2-1)

Objective

1. Explain the fundamental concepts, components, and scope of Information and Communication Technologies (ICT).
2. Identify uses of various ICT platforms and tools for different purposes.

Course Contents:

1. Introduction to Information and Communication Technologies:

- Components of Information and Communication Technologies (basics of hardware, software, ICT platforms, networks, local and cloud data storage etc.).
- Scope of Information and Communication Technologies (use of ICT ineducation, business, governance, healthcare, digital media and entertainment, etc.).
- Emerging technologies and future trends.

2. Basic ICT Productivity Tools:

- Effective use of popular search engines (e.g., **Google,** Bing, etc.) to explore World Wide Web.
- Formal communication tools and etiquettes (Gmail, Microsoft Outlook, etc.).
- Microsoft Office Suites (Word, Excel, PowerPoint).
- Google Workspace (Google Does, Sheets, Slides).
- Dropbox (Cloud storage and file sharing), Google Drive (Cloud storage with Google Docs integration) and Microsoft OneDrive (Cloud storage with Microsoft Office integration).
- Evernote (Note-taking and organization applications) and OneNote (Microsoft's digital notebook for capturing and organizing ideas).

  Video conferencing (Google Meet, Microsoft Teams, Zoom, etc.).
- Social media applications (LinkedIn, Facebook, Instagram, etc .).

3. ICT in Education:

- Working with learning management systems (Moodie, Canvas, Google Classrooms, etc.).
- Sources of online education courses (Coursera, edX , Udemy, Khan Academy, etc.).
- Interactive multimedia and virtual classrooms.

4. ICT in Health and Well-being:

- Health and fitness tracking devices and applications (Google Fit, Samsung Health, Apple Health, Xiaomi Mi Band, Runkeeper, etc.).
- Telemedicine and online health consultations (OLADOC, Sehat Kahani, Marham, etc.).

5. ICT in Personal Finance and Shopping:

- Online banking and financial management tools (JazzCash, Easypaisa, Zong PayMax, I LINK and MNET, Keenu Wallet, etc.).
- E-commerce platforms (Daraz.pk, Telemart, Shophive, etc.)

6. Digital Citizenship and Online Etiquette:

- Digital identity and online reputation.
- Netiquette and respectful online communication.
- Cyberbullying and online harassment.

7. Ethical Considerations in Use of ICT Platforms and Tools:

- Intellectual property and copyright issues.
- Ensuring originality in content creation by avoiding plagiarism and

unauthorized use of information sources.

- Content accuracy and integrity (ensuring that the content shared through ICT platforms is free from misinformation, fake news, and manipulation).

Practical Requirement

As part of the overall learning requirements, the course will include:

1. Guided tutorials and exercises to ensure that students are proficient in commonly used software applications such as word processing software (e.g., Microsoft Word), presentation software (e.g., Microsoft PowerPoint), spreadsheet software (e.g., Microsoft Excel) among such other tools. Students may be assigned practical tasks that require them to create documents, presentations, and spreadsheets etc.
2. Assigning of tasks that involve creating, managing, and organizing files and folders on both local and cloud storage systems. Students will practice file naming conventions, creating directories, and using cloud storage solutions (e.g., Google Drive, OneDrive).
3. The use of online learning management systems (LMS) where students can access course materials, submit assignments, participate in discussion forums, and take quizzes or tests. This will provide students with the practical experience with online platforms commonly used in education and the workplace.

Reading Materials

I."Discovering Computers" by Vermaat, Shaffer, and Freund.

2."GO! with Microsoft Office" Series by Gaskin, Vargas, and McLellan.

3. "Exploring Microsoft Office" Series by Grauer and Poatsy.

4. "Computing Essentials" by Morley and Parker.

5. "Technology in Action" by Evans, Martin, and Poatsy.