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UNIVERSITY OF SARGODHA, SARGODHA

NOTIFICATION

No. UOS/Acad/7/7

Dated: 09.08.2017

On the recommendation of the Academic Council made in its meeting dated 23.08.2016, the Syndicate in its 1/2017 meeting held on 15-16.05.2017 has approved the revised curricula of BS & M.Sc Chemistry program (Semester System) for implementation at main campus w.e.f 2016-17. The same will be applicable at sub-campuses and Affiliated Colleges w.e.f session 2017-18. Approved curricula is annexed at 'A' & 'B' respectively.

[Handwritten signatures and dates: 10/8/17, 11/8/17, 11/8/17]

[Handwritten signature: Amjad Hussain Janjua]
(AMJAD HUSSAIN JANJUA)
Deputy Registrar (Acad)
for Registrar
[Handwritten date: 9/8/17]

Distribution:

- Chairman, Department of Chemistry
- Controller of Examinations
- Director, Sub-Campuses
- Principal of Affiliated Colleges concerned
- Web-Developer *(for uploading on university web-site)*

C.C:

- Dean, Faculty of Science
- Secretary to the Vice-Chancellor
- P.A to Registrar
- Notification file

[Handwritten notes: 1. DEES, 2. ACE(SS), 7/10/18]

[Handwritten note: UOS/KE/NO. 3/38, 10-8-17]

**Scheme of studies for BS-4 Years Program in Chemistry (Semester wise)
w.e.f. 2016 & onwards sessions**

Summary:

BS-4 Years Chemistry program comprises of 8 semesters with 136 credit hours.
Outline of the courses is as under.

Semester-I:

Course Code	Course Title	Credits
*CHEM-181	Physical Chemistry	4(3-1)
*BOT:101	Botany -I	4(3-1)
*ZOO:101	Zoology -I	4(3-1)
ENG:101	English-I	3(3-0)
ISL:101	Islamiat	2(2-0)
Total Credits		17

Semester-II:

Course Code	Course Title	Credits
*CHEM-161	Inorganic Chemistry	4(3-1)
*BOT:102	Botany -II	4(3-1)
*ZOO:102	Zoology -II	4(3-1)
ENG:102	English-II	3(3-0)
PAK:101	Pak. Studies	2(2-0)
Total Credits		17

Semester-III:

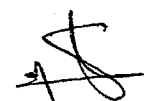
Course Code	Course Title	Credits
*CHEM-271	Organic Chemistry	4(3-1)
*BOT:203	Botany -III	4(3-1)
*ZOO:203	Zoology -III	4(3-1)
ENG:203	English-III	3(3-0)
CS:203	Computer Application	3(3-0)
Total Credits		18

Semester-IV:

Course Code	Course Title	Credits
*CHEM-291	Chemistry Special Topics	4(3-1)
*BOT:204	Botany -IV	4(3-1)
*ZOO:204	Zoology -IV	4(3-1)
ENG:204	English-IV	3(3-0)
MNT:204	Introduction to Management	3(3-0)
Total Credits		18

* Mathematics and Physics courses will be offered for the students who have entered in the program with Pre-Engineering combination in F. Sc. or equivalent.

* Chemistry courses (semester I-IV) can be rotated with subject to availability of teacher in that specialized field.


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Annexture-1

Course Codes and Course Titles for Mathematics and Physics
Pre-Engineering Combination

Semester-I

Course Code	Course Title	Credit Hours
PhyG-101 ✓	Mechanics-I, Waves & Oscillations	04
MATHS-311 ✓	Calculus-I	04

Semester-II

Course Code	Course Title	Credit Hours
PhyG-201	Electricity & Magnetism-I, Electronics	04
MATHS-321	Calculus-II	04

Semester-III

Course Code	Course Title	Credit Hours
PhyG-102	Mechanics-II, Electricity & Magnetism-II	04
MATHS-431	Analytical Geometry and Complex Numbers	04

Semester-IV

Course Code	Course Title	Credit Hours
PhyG-402 ✓	Thermodynamics & Statistical Mechanics, Modern Physics	04 ✓
MATHS-441 ✓	Linear Algebra & Differential Equations	04 ✓

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Semester-V:

Course Code	Course Title	Credits
MATH-300	Basic Mathematics for Chemists	2(2-0)
CHEM-311	Analytical Chemistry	4(3-1)
CHEM-362	Inorganic Chemistry-I	4(3-1)
CHEM-372	Organic Chemistry-I	4(3-1)
CHEM-382	Physical Chemistry-I	4(3-1)
Total Credits		18

Semester-VI:

Course Code	Course Title	Credits
STAT-300	Basic Statistics	2(2-0)
CHEM-322	Biochemistry	4(3-1)
CHEM-363	Inorganic Chemistry-II	4(3-1)
CHEM-373	Organic Chemistry-II	4(3-1)
CHEM-383	Physical Chemistry-II	4(3-1)
Total Credits		18

VII SEMESTER

Every student will be offered two compulsory theory courses of five credits (3 and 2) in Semester VII. Moreover at the beginning of VII Semester every student shall opt one field of specialization (11 credits). Some of the students will be offered research on the basis of merit while others will be offered a theory course (3 - 1 Credit) from field other than specialization in lieu of research.

List of compulsory courses

Course Code	Title of the Course	Credits
CHEM-441	Forensic Chemistry	2(2-0)
CHEM-461	Industrial Chemistry	3(3-0)

With Research

Two theory courses (compulsory) of (2+3) credits
 One theory course of specialization (Major)
 One theory course of specialization (Minor)
 Research

Credit**Th - Pr**

5 (5-0)

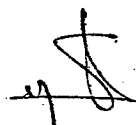
3(3-0)

4 (3-1)

4 (4-0)

Total

16


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CHEM-477 Organometalics

3(3-0)

v) Physical Chemistry

Course Code	Title of Course	Credits
CHEM-484	Surface Phenomena (Minor).	4(3-1)
CHEM-485	Molecular Spectroscopy (Major).	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member.

CHEM-486 Statistical and Quantum Mechanics

3(3-0)

VIII SEMESTER

Every student will be offered one compulsory theory course of three credits in Semester VIII. Moreover the scheme of studies on behalf of VII semester will be carried over to semester VIII accordingly.

Compulsory course


Course Code	Title of the Course	Credits
CHEM-431	Environmental Chemistry	3(3-0)

With Research**Research**

- One theory course (compulsory)
- One theory course of specialization (Major)
- One theory course of specialization (Minor)

Credits
Th - Pr
4(4)
3(3-0)
3(3-0)
4(3-1)
14

Total


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Field of Specialization

Field of specialization will remain same as opted in semester VII

i) Analytical Chemistry

Course Code	Title of Course	Credits
CHEM-400	Research	4(4)
CHEM-415	Advanced Spectroscopy – II (Minor)	4(3-1)
CHEM-417	FTIR, Raman Spectroscopy, ESR and Surface Analysis (Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-418 Instrumental Methods of Analysis-II 3(3-0)

ii) Biochemistry

Course Code	Title of Course	Credits
CHEM-400	Research	4(4)
CHEM-426	Chemotherapy & Immunology (Major)	3(3-0)
CHEM-427	Molecular Biology & Physical Techniques (Minor)	4(3-1)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-428 Endocrine System 3(3-0)

iii) Inorganic Chemistry

Course Code	Title of Course	Credits
CHEM-400	Research	4(4)
CHEM-467	Homogeneous Catalysis by Transition Metal Complexes (Minor)	4(3-1)
CHEM-468	Inorganic Reaction Mechanism (Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-469 Physical Methods in Inorganic Chemistry 3(3-0)

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iv) Organic Chemistry

Course Code	Title of Course	Credits
CHEM-400	Research	4(4)
CHEM-479	Chemistry of Natural Products (Minor)	4(3-1)
CHEM-478	Organic Synthesis (Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member.

CHEM-480 Chemistry of Protective Groups & Reactive Intermediates

3(3-0)

v) Physical Chemistry

Course Code	Title of Course	Credits
CHEM-400	Research	4(4)
CHEM-487	Advanced Approaches of Homogeneous and Heterogeneous Kinetics (Minor)	4(3-1)
CHEM-488	Polymers and Photochemistry (Major)	3(3-0)


The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-489 Elementary Group Theory

3(3-0)

Without Research

	Credits
One theory course (compulsory)	Th - Pr
One theory course of specialization (Major)	3(3-0)
One theory course of specialization (Minor)	3(3-0)
One theory course (Minor) from field other than specialization	4(3-1)
	4(3-1)
Total	14


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Field of Specialization

Field of specialization will remain same as opted in semester 3rd.

i) Analytical Chemistry

Course Code	Title of Course	Credits
CHEM-415	Advanced Spectroscopy – II (Minor)	4(3-1)
CHEM-417	Advanced Spectroscopy – III(Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-418 Instrumental Methods of Analysis-II

3(3-0)

ii) Biochemistry

Course Code	Title of Course	Credits
CHEM-426	Chemotherapy & Immunology (Major)	3(3-0)
CHEM-427	Molecular Biology & Physical Techniques (Minor)	4(3-1)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-428 Endocrine System 03**iii) Inorganic Chemistry**

Course Code	Title of Course	Credits
CHEM-467	Homogeneous Catalysis by Transition Metal Complexes (Minor)	4(3-1)
CHEM-468	Inorganic Reaction Mechanisms (Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-469 Physical Methods in Inorganic Chemistry

3(3-0)

iv) Organic Chemistry

Course Code	Title of Course	Credits
CHEM-479	Chemistry of Natural Products (Minor)	4(3-1)
CHEM478	Organic Synthesis (Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-480 Chemistry of Protective Groups & Reactive Intermediates 3(3-0)

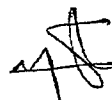
v) Physical Chemistry

Course Code	Title of Course	Credits
CHEM-487	Advanced Approaches of Homogeneous and Heterogeneous Kinetics (Minor)	4(3-1)
CHEM-488	Polymers and Photochemistry (Major)	3(3-0)

The following major course may also be substituted with the 3 credits Course (Major) subject to the interest & availability of the faculty member

CHEM-489 Elementary Group Theory 3(3-0)

Note: Order of the courses in semesters may be changed depending upon the available resources.


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BOTANY-1
I SEMESTER
DIVERSITY OF PLANTS

BOT-101

4 (3+1)

Theory

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

- a) Viruses (RNA and DNA types) with special reference to TMV;
- b) Bacteria and Cyanobacteria (Nostoc, Anabaena, Oscillatoria) with specific reference to biofertilizers, pathogenicity and industrial importance;
- c) Algae (Chlamydomonas, Spirogyra, Chara, Vaucheria, Pinnularia, Ectocarpus, Polysiphonia)
- d) Fungi (Mucor, Penicillium, Phyllactinia, Ustilago, Puccinia, Agaricus), their implication on crop production and industrial applications.
- e) Lichens (Physcia)
- f) Bryophytes
 - i. Riccia
 - ii. Anthoceros
 - iii. Funaria
- g). Pteridophytes.
 - i. Fossils and fossilization
 - ii. Psilopsida (Psilotum)
 - iii. Lycopsida (Selaginella)
 - iv. Sphenopsida (Equisetum)
 - v. Pteropsida (Marsilea)
 - vi. Seed Habit
- h). Gymnosperms Cycas, Pinus, Ephedra.

Practical

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

Books recommended:

1. Lee, R.E. 1999. Phycology. Cambridge University Press, UK
2. Prescott, L.M., Harley, J.P. and Klein, A.D. 2004. Microbiology, 3rd ed. WM. C. Brown Publishers.
3. Alexopoulos, C.J., Mims, C.W. and Blackwell, M. 1996. Introductory Mycology. 4th ed. John Wiley and Sons Publishers.
4. Agrios, G.N. 2004. Plant pathology. 8th ed. Academic press London.
5. Vashishta, B.R. 1991. Botany for degree students (all volumes). S. Chand and Company. Ltd. New Delhi.
6. Andrew, H. N. 1961. Studies in Paleobotany. John Willey and Sons.
7. Ingrouille, M. 1992. Diversity and Evolution of Land Plants. Chapman & Hall.
8. Mauseth, J.D. 2003. Botany: An Introduction to Plant Biology 3rd ed., Jones and Bartlett Pub. UK

ZOOLOGY - 1

I SEMESTER

PRINCIPLES IN ANIMAL LIFE

ZOL-101

4 (3+1)

AIMS & OBJECTIVES:

The course aims to impart knowledge and understanding of:

- a. The concept and status of Zoology in life sciences.
- b. The common processes of life through its chemistry, biochemical and molecular processes.
- c. The structure and function of cell organelle and how common animal cell diversified in various tissues, organs and organ systems.
- d. Biochemical mechanisms eventually generating energy for animal work.
- e. Animals and their relationship with their environment.

COURSE CONTENTS

1. Place of Zoology in Science

One-world view: genetic unity, the fundamental unit of life, evolutionary oneness and the diversity of life, environment and world resources: what is zoology? The classification of animals; the scientific method.

2. The Chemical Bases of Animal Life

Atoms and elements: building blocks of all matter; compounds and molecules: aggregates of atoms; acids, bases, and buffers; the molecules of animals: fractional account of carbohydrates, lipids, proteins, nucleotides and nucleic acids based on their structural aspects.

3. Cells, Tissues, Organs, and Organ System of Animals

Structure and functions of cell membranes; various movements across membranes: cytoplasm, organelles, and cellular components: functional account of ribosomes, endoplasmic reticulum, golgi apparatus, lysosomes, mitochondria, cytoskeleton, cilia and flagella, centrioles and microtubules, and vacuoles based on their structural aspects. The nucleus: nuclear envelope, chromosomes and nucleolus. Tissues: diversity in epithelial tissue, connective tissue, muscle tissue and nervous tissue to perform various functions. Structural integrations for functions in organs and organ systems.

4. Energy and Enzymes: Life's Driving and Controlling Forces

Energy and the laws of energy transformation; activation energy; enzymes: structure, function and factors affecting their activity; cofactors and coenzymes; ATP: how cells convert energy? An overview.

5. How Animals Harvest Energy Stored in Nutrients

Glycolysis: the first phase of nutrient metabolism; fermentation: "life without oxygen"; aerobic respiration: the major source of ATP; metabolism of fats and proteins; control of metabolism: the metabolic pool.

6. Ecology I: Individuals and Populations

Animals and their abiotic environment; populations: interspecific interactions.

7. Ecology II: Communities and Ecosystems

Community structure and diversity; ecosystems: ecosystems of the earth; ecological problems: human population growth, pollution, resource depletion and biodiversity.

8. Cell Division

Mitosis, cytokinesis, and the cell cycle: an overview; control of the cell cycle; meiosis: the basis of sexual reproduction; gamete formation.

9. Inheritance Patterns

The birth of modern genetics; mendelian inheritance patterns; other inheritance patterns; environmental effects and gene expression.

10. Chromosomes and Gene Linkage

Eukaryotic chromosomes; linkage relationships; changes in chromosome number and structure.

11. Molecular Genetics: Ultimate Cellular Control

DNA: the genetic material; DNA replication in eukaryotes; genes in action; control of gene expression in eukaryotes; mutations; applications of genetic technologies; recombinant DNA.

12. Animal Behavior

Four approaches to animal behavior; proximate and ultimate causes; anthropomorphism; development of behavior; learning; control of behavior; communication; behavioral ecology; social behavior.

13. Evolution: A Historical Perspective

Pre-Darwinian theories of change; Lamarck: an early proponent of evolution; early development of Darwin's ideas of evolution and evidences; the theory of evolution by natural selection; evolutionary thought after Darwin; biogeography.

14. Evolution and Gene Frequencies

The modern synthesis: a closer look; the Hardy-Weinberg theorem; evolutionary mechanisms: population size, genetic drift, natural selection, gene flow, mutation, and balanced polymorphism; species and speciation; rates of evolution; molecular evolution; mosaic evolution.

PRACTICALS

1. Tests for different carbohydrates, proteins and lipids.

Note: Emphasis on the concept that tests materials have been ultimately obtained from living organisms and constituted their body.

2. Study of the prepared slides of squamous, cuboidal, columnar epithelial tissues, adipose, connective, cartilage, bone, blood, nervous, skeletal muscle, smooth muscle and cardiac muscle tissues.

Note: Prepared microscopic and/or projection slides and/or CD ROM computer projections must be used.

3. Plasmolysis and deplasmolysis in blood.

4. Protein digestion by pepsin.

5. Ecological notes on animals of a few model habitats.

6. Field observation and report writing on animals in their ecosystem (a terrestrial and an aquatic ecosystem study).

7. Study of mitosis in onion root tip.

8. Study of meiosis in grasshopper testis (students should prepare the slide).
(Note for 1-2: Prepared microscopic and/or projection slides and/or CD ROM computer projections must be used).

9. Problem based study of Mendelian ratio in animals.

10. Multiple alleles study in blood groups.

11. Survey study of a genetic factor in population and its frequency.

12. Study of karyotypes of *Drosophila*. Mosquito.

13. Study of cytochemical detection of DNA in protozoa and avian blood cell.

14. Study of stages in the development of an Echinoderm.

15. Study of early stages in the development of a frog, chick and a mammal.

(Note for 8-9: Prepared slides and preserved specimen and/or projection slides and/or CD ROM computer projections may be used).

16. Study to demonstrate nervous or endocrine basis of behaviour (conditioned reflex or aggression or parental behavior).

17. Study to demonstrate social behaviour (documentary film be shown, honey bee, monkey group in a zoo).

BOOKS RECOMMENDED

1. Miller, S.A. and Harley, J.B., 1999, 2002 and 2005. ZOOLOGY, 4th, 5th & 6th Edition (International). Singapore: McGraw Hill.
2. Hickman, C.P., Roberts, L.S. and Larson, A., 2004. INTEGRATED PRINCIPLES OF ZOOLOGY, 11th and 12th Edition (International). Singapore: McGraw Hill.
3. Pechenik, J.A., 2000. BIOLOGY OF INTERVEBRATES, 4th and 5th Edition (International). Singapore: McGraw Hill.
4. Kent, G.C. and Miller, S., 2001. COMPARATIVE ANATOMY OF VERTEBRATES, New York: McGraw Hill.
5. Campbell, N.A., 2002. BIOLOGY. Sixth Edition. Menlo Park, California: Benjamin/Cummings Publishing Company, Inc.
6. Miller, S.A., 2002. GENERAL ZOOLOGY LABORATORY MANUAL. 5th Edition (International) Singapore: McGraw Hill.
7. Hickman, C.P. and Kats, H.L., 2000. LABORATORY STUDIES IN INTEGRATED PRINCIPLES OF ZOOLOGY. Singapore: McGraw Hill.

Annexure-I

Course Codes and Course Titles for Mathematics and Physics

14

Pre Engineering Group

Semester-I

Course Code	Course Title	Credit Hours
PhyG-101	Mechanics-I, Waves & Oscillations	04
MATHS-311	Calculus-I	04

COURSE OUTLINE

Semester-I

~~PHYS-101~~ Mechanics-I

Vector Algebra in three dimension. Co-ordinate system. Vector calculus. Vector identities. Stokes Divergence theorem and its applications. Particle dynamics and second law of motion. Dynamics of the uniform circular motion. Projectile motion in with and without air resistance. Force of friction. Work done by a constant and variable force in one and two dimension. Work energy theorem in variable and constant force. Power and energy. Conservation of energy in one, two and three dimensions. Law of conservation of energy in isolated system. Two particle system and its generalization to many particle system. Center of mass of different solid objects. Momentum and Momentum changes in a system of variable mass. Elastic and inelastic collision in one and two dimension and its applications.

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc. (2008).
3. University Physics by Young, Freedman and Ford, Scers and Zemansky's Pearson Education Inc. (2008).
4. Physics for Scientist and Engineers by Giancoli, Prentice Hall Inc., 4th Ed. (2007).

~~Waves and Oscillations~~

S.H.M & its applications, Energy consideration in SHM, SHM & uniform circular motion, combinations of Harmonic motion, Damped harmonic motion, Forced Oscillation & Resonance, Mechanical Waves, Traveling waves, wave speed, wave equation, Power & intensity in wave motion, principle of superposition, standing waves, Interference of waves, Beats, Doppler effect. Nature of visible light and its physical characteristics, light as an electromagnetic wave, speed of light in matter, coherence of sources. double slit interference and its analytical treatment by using trigonometric and phasors method, intensity in Double slit interference, interference from thin film, Single slit diffraction, Intensity in single slit diffraction using phasors method, diffraction at circular aperture, diffraction grating, x-ray Diffraction, Holography. Polarization by Reflection & Double Refraction, Polarization states, Rotation of Plane Polarization.

Recommended Books:

1. Physics by D. Halliday, R. Resnick and K. S. Krane, John Wiley & Sons Inc., 5th Ed. (2003).
2. Fundamental of Physics by D. Halliday, R. Resnick and J. Walker, Extended. John Wiley & Sons Inc. (2008).
3. University Physics by Young, Freedman and Ford, Scers and Zemansky's Pearson Education Inc. (2008).
4. Physics by M. Alonso and E. J. Finn: Addison-Wesley, USA, (1999).

SEMESTER-I

Course code: MATH-311

Title: Calculus-I

Credit Hours: 3

Recommended Book: Calculus and Analytic Geometry by S.M Yusuf (Ilmi Kitab Khana, Lahore)

Reference books: I) Calculus and Analytic Geometry (9th Edition) by Thomas and Finney (National Book Foundation Pakistan)

II) James Stewart: Calculus, 3rd Edition 1995, (Brooks& Cole)

Contents: Real Number System. Absolute values and inequalities. Limits and Continuity. Derivatives of algebraic and transcendental functions. Differentiation of Implicit function. Higher order derivatives, Leibniz's theorem. Newton Raphson formula.

Differentials. Related rates. Increasing and decreasing functions. Extrema and applied problems of extrema.

Details of BS Courses (Chemistry)
(Session 2016 Onwards)

SEMESTER-I

CHEM-181 Physical Chemistry (Cr. 03)

(3+1)

Elementary Mathematics: Logarithmic, exponential and trigonometric functions, differentiation of elementary functions, methods of differentiation & integration, significance of differentiation & integration.

Physical States of Matter: Gases (van der Waal's equation, critical Phenomena, Critical values of T, P & V., liquification of gases, molecular collisions, collision diameter, mean free path) **Liquids** (viscosity, Parachor value, Refractive index, molar refraction and its applications. Dipole moment, **Solids** (Unit cells. Bragg crystal analysis, crystal structure of NaCl, powder method of crystal structure analysis).

Atomic Structure: De Broglie equation. Schrodinger wave equation, solution for particle in 1D box, quantization concept, Heisenberg Uncertainty Principle, Pauli Exclusion Principle, Hund's Rule.

Chemical Thermodynamics: First law of thermodynamics, state functions, isothermal and adiabatic processes in ideal gases, heat capacity, reversible and irreversible processes. Spontaneous and non-spontaneous processes, second law of thermodynamics, change of entropy with change in T, P & V.

Chemical Equilibrium: Law of Mass Action, equilibrium constant, relationship between K_c , K_p , K_x and K_a and LeChaterlier's Principle.


Solutions: composition, ideal and non-ideal solutions. Raoult's law. Colligative properties, ebullioscopy, cryoscopy, osmotic pressure, distillation and concept of azeotrops.

Chemical Kinetics: Zero, first and second order reaction, Arrhenius equation, activation energy, Lindermmann's mechanism, collision theory and transition state theory.

Electrochemistry: Conductance, dependence of conductance on the nature of solvent and temperature, Kohlrausch's law and its applications, measurement of conductance strong and weak electrolytes, degree of dissociation.

Physical Chemistry Lab (Cr. 01)

1. Determination of surface tension and Parachor value by stalagmometer.
2. Determination of percent composition of liquid solutions from surface tension measurement.
3. Determination of viscosity and Rhechor value of liquids from viscosity measurement.
4. Determination of percent composition of liquid solutions viscometrically.
5. Determination of refractive index and molar refractivity by refractometer.
6. Determination of percent composition of liquid solutions by refractive index measurements.
7. Determination of heat of solution by solubility method.
8. Determination of heat of neutralization of an acid with a base.
9. A kinetic study of acid hydrolysis of ethyl acetate.
10. Kinetic study of saponification of ethyl acetate.
11. Determination of molecular weight of a compound by elevation in boiling point. (Ebullioscopic method).


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12. Determination of molecular weight of a compound by lowering of freezing point (The Cryoscopic methods).
13. Determination of equilibrium constant of KI - I₂ - KI₃.
14. Conductometric titration of strong acid and strong base.

Recommended Books (Physical Chemistry)

1. Chaudhry. G.R., Text Book of Physical Chemistry, 2nd Edition, New Kitab Markaz, Aminpur Bazar, Faisalabad, Pakistan, (2001).
2. Maron S. H. and Jerome, B. "Fundamentals of Physical Chemistry" Macruthan Publishing co. Inc. New York, (1995).
3. Atkins P.W. and Clugston. M.J. "Principles of Physical Chemistry" Pitam Publishing Company. NY (1998).
4. Moore, W.J., "Physical Chemistry", 5th Ed. Longmans Publishers, NY (1972).
5. Jones, M., "Elements of Physical Chemistry" 3rd Ed. Benjamin Cummings Publishing Company Inc., NY (1993).
6. Adamson, A. W., "Understanding Physical Chemistry" 3rd Ed. Benjamin Cummings Publishing Company Inc. NY (1973).
7. Heald, C. and Smith, A.C.K. Applied Physical Chemistry. MacMillan UK (1973).
8. Akhtar, M.N. & Ghulam Nabi, "Text Book of Physical Chemistry" Ilmi Kitab Khawna, Lahore (2006).
9. Bhatti, H.N. and K. Hussain, "Principles of Physical Chemistry"; Carwan Book House, Lahore (2005).
10. Levitt, B.P., "Findlay's Practical Physical Chemistry". 9th Ed. Longman, London (1973).
11. Das, R.C. and B. Behera, "Experimental Physical Chemistry", Tata McGraw Hill, Delhi (2003).
12. Crocleford, H.D., H.W. Biard, F.W. Getzen & J.W. Nowell, "Laboratory Manual of Physical Chemistry", 2nd Ed., John Wiley & Sons, London (1975).

OK

Signature

Semester I

Course:

English-I

Credit Hrs 3

ENG-101

Course Aims:

The aim of this course is to groom the students linguistically in such a manner that they can read and understand different texts written in English (academic or non academic) by applying different strategies of reading. A particular care has been taken to gratify the aesthetic needs of the learners. The basic aim of this course is to develop critical reading and critical thinking among the students. This course also aims to train students to meet the demands of other subjects written in the English language which need to be dealt with at optimal level of efficiency. The course shall enable the learners to develop vocabulary in English by reading dynamic texts and understand different composition patterns in the English language.

1: An introduction to:

- a: Language
- b: Communication
- c: Grammar

2: Sentence

Definition , Parts : Subject , Predicate , Phrase , Clause,
Types---simple, compound , complex, multiple, declarative,
Interrogative, Imperative, Exclamatory, optative .

3: Parts of Speech:

Noun , Pronoun, Adjective, Verb, Adverb,
Preposition, Conjunction, Interjection.
Error Analysis.

4: Tenses : Active Voice & Passive Voice.

5: Clause Analysis & Synthesis.

6: Use of Dictionary & Vocabulary Building.

Poems:

- | | | |
|----|-------------------------------|-------------------|
| 1: | New Year Resolutions | Elizabeth Sewell |
| 2: | Tartary | Walter De La Mare |
| 3: | The Huntsman | Edward Lowbury |
| 4: | The Character of A Happy Life | Sir Henry Wotton |
| 5: | One Art | Elizabeth Bishop |
| 6: | Death The Leveller | James Shirley |

Short Stories:

- | | | |
|----|------------------------------|------------------|
| 1: | The Duchess And The Jeweller | Virginia Woolf |
| 2: | The Voice | S.V. Pritchett |
| 3: | Passion In The Desert | Honore De Balzac |

Essays:

- | | | |
|----|---------------------------|-------------------|
| 1: | Spoon Feeding | W.R. Inge |
| 2: | Nagasaki, August 9, 1945. | Michaito Ichimaru |
| 3: | My Tailor | Stephen Leacock |
| 4: | The Damned Human Race | Mark Twain |

یونیورسٹی آف سرگودھا

نصاب برائے اسلامیات لازمی کلاس BS 4 Years

ISL - 101 /

باب اول: مطالعہ قرآن وحدیث

باب دوم: مطالعہ سیرت

باب سوم: مطالعہ تہذیب و تمدن

باب اول: مطالعہ قرآن وحدیث (Topical Study of Quran & Hadith)

موضوعات

۱- توحید (دلائل کا عقلی و نقلی مطالعہ، تفکر و تدبیر)

آیات

۱. اللہ مافی السموات وما فی الارض وان تبدوا ما فی انفسکم او تخفوه یحاسبکم بہ اللہ فیغفر لمن یشاء ویعذب من یشاء واللہ علی کل

شیء قدیدر (البقرة: ۲۸۳)

۲. الم تر وان اللہ سخر لکم مافی السموات وما فی الارض واسغ علیکم نعمہ ظاہرۃ و باطنۃ ومن الناس من یجادل فی اللہ بغير علم ر

ہدی ولا کتاب منیر (لقمان: ۲۰)

۳. ربنا لانواخذنا ان نسینا و اخطانا ربنا ولا تحمل علینا اصرا کما حملتہ علی الذین من قبلنا ربنا ولا تحملنا مالا طاقة لنا بہ واعف عنا

واغفر لنا وارحمنا انت مولانا فانصرنا علی القوم الکافرین (البقرة: ۲۸۶)

۴. سنریہم آياتنا فی الآفاق و فی انفسہم حتی یبین لہم انه الحق اولم یکف بربک انه علی کل شیء شہید (حم السجدة: ۴۱)

ان فی خلق السموات والارض و اختلاف اللیل والنهار لایت الالیاب (آل عمران: ۱۹۰)

۵. الذین یدکرون اللہ قیاما و قعودا و علی جنوبہم و یتفکرون فی خلق السموات والارض ربنا ما خلقت هذا باطلا ، سبحانک فقنا

عذاب النار (آل عمران: ۱۹۲)

احادیث

عن عمر بن الخطاب قال: قال رسول اللہ ﷺ حين سئل عن الايمان ان تؤمن بالله و ملائکته و کتبہ و رسلہ و الیوم الآخر و تؤمن

بالقدر خیرہ و شرہ (متفق علیہ)

۲: رسالت (الہامی کتب، و ملائکہ پر ایمان، آداب نبوی، اطاعت رسول اور ختم نبوت)

آیات:

۱. امن الرسول ما انزل الیہ من ربه والمؤمنون کل امن بالله و ملائکته و رسلہ لا نفرق بین احد من رسلہ وقالوا سمعنا و اطعنا غفرانک

ربنا والیک المصیر (البقرة: ۲۳۵)

۲. یا ایہا الذین امنوا لا تقدموا بین یدی اللہ و رسولہ و اتقوا اللہ ان اللہ سميع علیم (الحجرات: ۱)

یونیورسٹی آف سرگودھا
شعبہ علوم اسلامیہ
یونیورسٹی آف سرگودھا

٢. يا ايها الذين امنوا لا ترفعوا اصواتكم فوق صوت النبي ولا تجهروا له بالقول كجهر بعضكم لبعض ان تحبط اعمالكم وانتم لا تشعرون
(الحجرات: ٢)
٣. ان الذين يغضون اصوتهم عند رسول الله اولئك الذين امتحن الله قلوبهم للتقوى لهم مغفرة واجر عظيم. (الحجرات: ٣)
٤. ولوانهم صبروا حتى تخرج اليهم لكان خيرا لهم والله غفور رحيم. (الحجرات: ٤)
٥. ان الذين ينادونك من وراء الحجرات اكثرهم لا يعقلون. (الحجرات: ٥)
٦. يا ايها الذين امنوا ان جاءكم فاسق بنبأ فتبينوا ان تصيبوا قوما بجهالة فتصبحوا على ما فعلتم نادمين. (الحجرات: ٦)
٧. واعلموا ان فيكم رسول الله لو يطيعكم في كثير من الامر لعنتم ولكن الله حبب اليكم الايمان وزينه في قلوبكم وكره اليكم الكفر والفسوق والعصيان اولئك هم الراشدون. (الحجرات: ٧)
٨. فضلا من الله وبعمة ولله عليم حكيم. (الحجرات: ٨)
٩. النبي اولى بالمؤمنين من انفسهم وازواجه امهاتهم واولوالارحام بعضهم اولى ببعض في كتاب الله من المؤمنين المهاجرين الا ان تفعلوا الى اولياءكم معروفاً، كان ذلك في الكتاب مستظوراً. (الاحزاب: ٦)
١٠. ان الله وملائكته يصلون على النبي يا ايها الذين امنوا صلوا عليه وسلموا تسليماً. (الاحزاب: ٥٦)
١١. ان الذين يوذون الله ورسوله لعنهم الله في الدنيا والاخرة واعد لهم عذاباً مهيناً. (الاحزاب: ٥٧)
١٢. لقد كان لكم في رسول الله اسوة حسنة لمن كان يرجو الله واليوم الآخر وذكر الله كثيراً. (الاحزاب: ٢١)
١٣. ما كان محمد اباً احد من رجالكم ولكن رسول الله وخاتم النبيين وكان الله بكل شيء عليماً. (الاحزاب: ٤٠)

احاديث

عن العباس بن عبد المطلب قال: قال رسول الله ﷺ ذاق طعم الايمان من رضى باللذير بابو الاسلام ديناً وبمحمد رسولا

آخرة

آيات

١. يا ايها الذين امنوا اتقوا الله ولتنظر نفس ما قدمت لغد واتقوا الله ان الله خبير بما تعملون. (الحشر: ١٨)
٢. ولا تكونوا كالذين نسوا الله فانسهم انفسهم اولئك هم الفاسقون (الحشر: ١٩)

حديث

عن ابن مسعود عن النبي ﷺ لاتزول قدما ابن آدم حتى يسئل عن خمس عن عمره فيما افناه وعن شبابه فيما ابلاه وعن ماله من اين اكسبه وفيما انفقته وما ذا عمل فيم علم (جامع ترمذى)

٣. عبادات (نماز، زكوة، زه، حج، جهاد)

١. قد افلح المؤمنون الذين هم في صلاتهم خاشعون. (المؤمنون: ١)
٢. والذين هم عن اللغو معرضون. (المؤمنون: ٢)
٣. والذين هم للزكوة فاعون. (المؤمنون: ٣)
٤. يا ايها الذين امنوا بدل ادلكم على تجارة تنجيكم من عذاب اليم. (الصف: ١٠)
٥. تؤمنون بالله ورسوله وجاهدون في سبيل الله باموالكم و انفسكم ذلكم خير لكم ان كنتم تعلمون. (الصف: ١١)
٦. يصفر لكم ذنوبكم ويدخلكم جنات تجري من تحتها الانهر ومساكن طيبة في جنت عدن ذلك الفوز العظيم. (الصف: ١٢)

واخرى تحببها نصر من الله وفتح قريب وبشر المؤمنين. (الصف: ١٣)

احاديث

١. عن ابن عمر قال: قال رسول الله ﷺ بنى الاسلام على خمس شهادة ان لا اله الا الله وان محمدا عبده ورسوله واقام الصلوة وابتداء الزكوة والحج وصوم رمضان (متفق عليه)
٢. عن شيراز بن عبد قال: قال رسول الله ﷺ مروا الصبي الصلوة اذا بلغ سبع سنين وادا بلغ عشر سنين فاضربوه عليها. (سنن ابو داود، جامع ترمذى)
٣. عن ابي هريرة قال: قال رسول الله ﷺ من اتاه الله مالا فلم يود زكوة مثل له ماله يوم القيامة شجاعا اقرع له زبيبتان يطوقه يوم القيامة ثم ياخذ بلهزمته (يعنى شدائيه) ثم يقول انا مالك وانا كنزك ثم تلا ولا يحسن الذين يبخلون بما آتاهم الله من فضله هو خير لهم بل هو شر لهم سيطوقون ما بخلوا به يوم القيامة..... الخ (بخارى)
٤. عن علي قال: قال رسول الله ﷺ من ملك زاد راحلته تبلغه الى بيت الله ولم يحج فلا عليه ان يموت يهوديا او نصرانيا وذلك ان الا تبارك وتعالى يقول وللا على الناس حج البيت من استطاع اليه سبيلا (جامع ترمذى)

٥. صفات المؤمنين

آيات

١. وعباد الرحمن الذين يمشون على الارض هوناً و اذا خاطبهم الجاهلون قالوا سلماً. (الفرقان: ١)
٢. والذين يبيتون لربهم سجداً وقياماً. (الفرقان: ٢)
٣. والذين يقولون ربنا اصرف عنا عذاب جهنم ان عذابها كان غراماً. (الفرقان: ٣)
٤. انها ساءت مستقراً ومقاماً. (الفرقان: ٤)
٥. والذين اذا انفقوا لم يسرفوا ولم يقتروا وكان بين ذلك قواماً. (الفرقان: ٥)
٦. والذين لا يدعون مع الله الهاً ائرو ولا يقتلون النفس التي حرم الله الا بالحق ولا يزنون ومن يفعل ذلك يلق اثمًا. (الفرقان: ٦)
٧. يضعف له العذاب يوم القيمة ويخلد فيه مهاناً. (الفرقان: ٧)
٨. الا من تاب وامن وعمل صالحاً فأولئك يبدل الله سيئاتهم حسنت وكان الله غفوراً رحيمًا. (الفرقان: ٨)
٩. ومن تاب وعمل صالحاً فإنه يتوب الى الله متاباً. (الفرقان: ٩)
١٠. والذين لا يشهدون الزور و اذا مروا باللغو مروا كراماً. (الفرقان: ١٠)
١١. والذين اذا ذكروا بايت ربهم لم يخروا عليها صماً وعمياناً. (الفرقان: ١١)
١٢. والذين يقولون ربنا هب لنا من ازواجنا وذرياتنا قرّة أعين واجعلنا للمتقين اماماً. (الفرقان: ١٢)
١٣. ان لك يجزون الغرفة بما صبروا و يلقون فيها تحية وسلاماً. (الفرقان: ١٣)
١٤. خلدين فيها حسنت مستقراً ومقاماً. (الفرقان: ١٤)
١٥. ل ما يعبوا بكم ربى لو لاد عاؤكم فقد كذبتم فسوف يكون لزاماً. (الفرقان: ١٥)
١٦. والذين هم لفرو جهنم حافظون. (المؤمنون: ٣)
١٧. الاعلى ازواجهم او ما ملكت ايماهم فانهم غير ملومين. (المؤمنون: ٥)



٦. والذين هم على صلواتهم يحافظون. (المؤمنون: ٦)

٧. اولئك هم البرار ثون. (المؤمنون: ٧)

٨. الذين يرثون الفردوس. (المؤمنون: ٨)

٩. هم فيها خالدون. (المؤمنون: ٩)

احاديث

١. عن انس قال: قال رسول الله ﷺ والذي نفسي بيده لا يؤمن عبد حتى يحب لا خيه ما يحب لنفسه. (متفق عليه)

٢. عن النعمان بن بشير قال: قال رسول الله ﷺ ترى المؤمنين في تراحمهم وتوادهم وتعاطفهم كمثل الجسد اذا اشتكى عضو تداعى له سائر الجسد بالسهر والحمى. (متفق عليه)

آداب معاشرت

١. وان طائفتان من المؤمنين اقبلوا فاصلحوا بينهما فان بغت احدهما على الاخرى فقاتلوا التي تبغى حتى تفيء الى امر الله فان قامت فاصلحوا بينهما بالعدل واقسطوا ان الله يحب المقسطين. (الحجرات: ٩)

٢. انما المؤمنون اخوة فاصلحوا بين اخويكم واتقوا الله لعلكم ترحمون. (الحجرات: ١٠)

٣. يا ايها الذين امنوا لا يستخرق قوم من قوم عسى ان يكونوا خيرا منهم ولا نساء من نساء عسى ان يكن خيرا منهن ولا تلمزوا انفسكم ولا تتنازروا بالالقباب بنس الاثم الفسوق بعد الايمان ومن لم يتب فاولئك هم الظالمون. (الحجرات: ١١)

٤. يا ايها الذين امنوا اجنبوا كثير من الظن ان بعض الظن اثم ولا تجسسوا ولا يغتب بعضكم بعضا. ائحب احدكم ان ياكل لحم اخيه ميتا فكرهته واتوا الله ان اله تواب رحيم. (الحجرات: ١٢)

٥. يا ايها الذين اناخفناكم من ذكر وانثى وجعلناكم شعوبا وقبائل لتعارفوا ان اكرمكم عند الله اتقاكم ان الله عليم خبير. (الحجرات: ١٣)

احاديث

١. عن ابي هريرة ان رسول الله ﷺ قال: ان المفلس من امتي من ياتي يوم القيامة بصلاة و صيام و زكوة، وياتي قد شتم هذا، وقذف هذا، و اكل مال هذا، وسفك دم هذا، وضرب هذا، فيعطى هذا من حسناته، وهذا من حسناته، وهذا من حسناته، فان فئت حسناته قبل ان يقضى ما عليه اخذ من خطاياهم فطرح عليه ثم طرح في النار.

٤. دعوت واقامت دين

١. ومن اظلم ممن افترى على الله الكذب وهو يدعى الى الاسلام والله لا يهدي القوم الظالمين. (الصف: ٦١)

٢. يريدون ليطفنوا نور الله بافواههم، والله متم نوره ولو كره الكافرون. (الصف: ٦٢)

٣. هو الذي ارسل رسوله بالهدى ودين الحق ليظهره على الدين كله ولو كره المشركون. (الصف: ٦٣)

احاديث

١. عن ابي سعيد بن الخدري عن رسول الله ﷺ قال من راي منكم منكرا فليغيره بيده فان لم يستطع فبلسانه فان لم يستطع فقلبه و ذلك اضعف الايمان (مسلم)

٢. عن عبد الله بن عمر قال قال رسول الله ﷺ الا كلكم راع و كلكم مسؤول عن رعيته فالامام الذي على الناس راع وهو مسؤول عن رعيته و الرجل راع على اهل بيته وهو مسؤول عن رعيته و المرأة راعية على بيت زوجها وولده وهي مسؤلة عنهم و عبد الرجل راع على

ماں سیدہ وهو رسول عنہ الا فکلکم راع و کلکم مسؤل عن رعیتہ (متفق علیہ)

۳. قال رسول الله ﷺ: جاء الرجل يوم القيامة في النار فيطحن فيها كطحن الحمار برحاه فيجتمع اذنه في النار عليه فيقولون، اي المان ماشانك، اليس كنت تأمرنا بالمعروف وتنهانا عن المنكر؟ قال كنت امركم ولا اتبه ونهاكم عن المنكر و اتبه

احاديث

۱. عن عبدالله قال: قال رسول الله ﷺ: طلب كسب الحلال فريضة بعد الفريضة (بيهقي: شعب الايمان)

۲. عن ابي سعيد قال: قال رسول الله ﷺ: التاجر الصدوق الامين مع النبيين والصديقين والشهداء (جامع ترمذی)

باب دوم: مطالعہ سیرت (Seerah Study)

۱. مطالعہ سیرت کی اہمیت

۲. تزکیہ نفس اور تعمیر شخصیت کا نبوی منہاج

۳. تشکیلی معاشرت اور اسوۂ حسنہ

۴. ہجرت مدینہ، مواخات اور یناق مدینہ

۵. غزوات النبی، مقاصد و حکمت

۶. خطبہ حجۃ الوداع

باب سوم: مطالعہ تہذیب و تمدن (Study of Culture)

۱. تہذیب کا مفہوم، اسلامی تہذیب کی خصوصیات

۲. بنیادی انسانی حقوق

۳. تہذیب انسانی کے ارتقاء میں مسلمانوں کا کردار

۴. اسلام کا تصور علم

۵. طبیعی علوم، یاتمیاتی علوم اور معاشرتی علوم میں مسلمانوں کا کردار

۶. مکالمہ بین المذاہب

پرچہ میں نمبروں کی تقسیم درج ذیل ہوگی

قرآن وحدیث، موضوعاتی مطالعہ : ۶۰

مطالعہ سیرت : ۲۰

مطالعہ تہذیب و تمدن : ۲۰

چترس
شعبہ علوم اسلامیہ
یونیورسٹی آف سرگودھا

SMESER-II

CHEM-161 Inorganic Chemistry (Cr. 03)

(3+1)

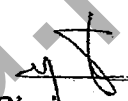
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Periodic Table and Periodicity of Properties: Modern Periodic Table, Group trends and periodic properties, Atomic & ionic radii, ionization potentials, electron affinities and electronegativities; Redox potential, electrochemical series and its applications. Corrosion and electroplating.

Acid Base Equilibria: Acids and bases, relative strengths of acids, pH, pKa, pKb. Hard and soft acid & Bases. SHAB Principle & its application. Buffers, types buffer. Preparation, Buffer capacity and applications of buffers. Indicators: (Acid-base, Redox, Adsorption), Solubility product, Common ion effect and its applications.

Chemical Bonding: Nature of a bond, hybridization, Valence Bond Theory (VBT), The Concept of Resonance, Molecular Orbital Theory (MOT), Valence Shell Electron Pair Repulsion (VSEPR) theory. Special types of bonds such as Metallic bonds, Hydrogen Bonding, Bent bond, Ion-dipole-dipole bond, ion induced-dipole bond.

Chemistry of p-Block Elements: Introduction to p-block elements (Group trends in p-block elements with reference to, atomic sizes & chemical reactivities). Boranes & Boride;


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aluminium halides, hydrides & Alums; Silicates (Structural aspects, classifications and applications); silicones (Structural aspects, classifications and applications), Germanes; phosphazenes, Phosphides, Oxoacids of Phosphorous; Oxoacids & salts of sulphur; Noble gases (compounds of Xe, Kr, Ra: bonding and applications). Production of pure silicon chips for solar energy cells.

Chemistry of d-Block Elements: Electronic configuration. Characteristics. Nomenclature. Nature of bonding in coordination compounds: Werner's theory. VBT, MOT and CFT for coordination compounds. Isomerism in coordination compounds. Chelates: Classification and applications. Applications of coordination compounds (Medicinal, Industrial, Agricultural).

Separation Techniques: General introduction and Applications (Solvent extraction and Chromatographic techniques such as paper, Ion exchange and Column).

Introduction to Analytical Techniques in Inorganic Chemistry: Introduction to spectroscopic Techniques: Principle, brief instrumentation, sample handling and applications (Flame emission, Atomic Absorption, IR & UV/Vis).


Chemical Industries: Metallurgy of Al, Cr and U, fertilizers (Urea & Phosphate fertilizers) Cement and Sugar.

Inorganic Chemistry Lab (Cr. 01)

1. Qualitative Analysis; four radicals (cations and anions) for salt mixture.
2. Chromatographic separation of cations
3. Determination of total hardness of water using EDTA.
4. Estimation of manganese (II) using EDTA.
5. Estimation of copper (iodometrically).
6. Determination of thiosulphate ion (Iodometrically).
7. Determination of ferricyanide using KI solution.
8. Determination of chloride by Volhard's and Mohr's methods.
9. Estimation of chloride ions using adsorption (Fluorescein) indicator.
10. Estimation of bromide ions using adsorption (Eosin) indicator.
11. Estimation of percentage of ferrous ions in the Mohr's salt using KMnO4.
12. Percentage determination of ferric ions in ferric alum using KMnO4 solution.
13. Determination of purity of commercial potassium oxalate using KMnO4 solution.
14. Estimation of ferrous ions using K2Cr2O7 solution.

Recommended Books (Inorganic Chemistry)

1. Iqbal, M.Z., 'Text Book of Inorganic Chemistry', Ilmi Kitab Khana, Revised Edition (1998).
2. Chaudhry, G. R., 'Text Book of Inorganic Chemistry, 2nd Edition; New Kitab Markaz, Faisalabad, Pakistan (2001).
3. Bhatti, H.N. and Nasir, B.A. Modern Inorganic Chemistry, 1st Edition, The Carvan Book House, Lahore. (2000).
4. Albert, C.F., Wilkinson G. and Gaus, P.L. Basic Inorganic Chemistry, 3rd Edition, John Wiley & Sons, Inc. NY (1995).
5. Lee, J.D., 'Concise Inorganic Chemistry'. 5th Edition, Chapman & Hall, UK (1996).
6. Jolly, W.L., 'Modern Inorganic Chemistry'. Chemistry, 2nd Edition McGraw Hill, NY (1991).


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7. Shriver, D.F., Atkins P.W. and Langford, C.H. 'Inorganic Chemistry', 2nd Edition, Oxford Press, UK (1994).
8. Housecroft, C.E. and Sharpe, A.G., 'Inorganic Chemistry', 3rd Edition, Longman, NY (1992).
9. Rayner-Canham, G. 'Descriptive Inorganic Chemistry', W.H. Freeman & Co. UK (1995).
10. Jeffery, G.H., Bassett, J., Mendham, J. and Denney, R.C. 'Vogel's Textbooks of Quantitative Chemical Analysis', 5th Edition, Benjamin-Cummings, NY (1989).
11. Vogel, A.I., 'A Text Book of Macro and Semimicro Qualitative Inorganic Analysis', Longman Green & Co. NY (1995).
12. Skoog, D.A., West, D.M and Holler, F.J. Analytical Chemistry, 6th Edition Saunders College Publications, UK (1994).
13. Graham, H and Man, H. Chemistry in Context 5th Edition, Thomas Nelson Ltd. U.K. (2000).
14. Philp M. Advance Chemistry, Cambridge Low Price Edition, U.K. (1996).
15. David H. Modern Analytical Chemistry, McGraw Hill, NY (2000).

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BOT-102 / **Botany - II** / **4(3 + 1)**
Plant Systematic, Anatomy and Development

Specific objectives of course:

To understand 1- various systems of classification, identification and nomenclature of higher plants, 2- Structures and functions of tissues and organs at embryonic level.

Course outline:

a) Plant systematics

1. Introduction to Plant Systematics: aims, objectives and importance.
2. Classification: brief history of various systems of classification with emphasis on Takhtajan.
3. Brief introduction to nomenclature, importance of Latin names and binomial system with an introduction to International Code of Botanical Nomenclature (ICBN). Vienna code.
4. Morphology: a detailed account of various, orphological characters root, stem, leaf, inflorescence, flower, placentation and fruit types.
5. Diagnostic characters, economic importance and distribution pattern of the following families:

- i. Ranunculaceae
- ii. Brassicaceae (Cruciferae)
- iii. Fabaceae (Leguminosae)
- iv. Rosaceae
- v. Euphorbiaceae
- vii. Cucurbitaceae
- viii. Solanaceae
- viii. Lamiaceae (Labiatae)
- ix. Apiaceae (Umbelliferae)
- x. Asteraceae (Compositae)
- xi. Liliaceae (Ser. Lato)
- xii. Poaceae (Gramineae)

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b) Anatomy

1. Cell wall: structure and chemical composition
2. Concept, structure and function of various tissues like:
 - i. Parenchyma
 - ii. Collenchyma
 - iii. Sclerenchyma
 - iv. Epidermis (including stomata and trichomes)
 - v. Xylem
 - vi. Phloem
3. Meristem: types, stem and root apices
4. Vascular cambium
5. Structure and development of root, stem and leaf.
Primary and secondary growth of dicot stem, periderm
6. Characteristics of wood: diffuse porous and ring-porous, sap and heart wood, soft and hard wood, annual rings.

c) Development / Embryology

Early development of plant body:

1. Capsella bursa-pastoris
2. Structure and development of Anther Microsporogenesis
Microgametophyte
3. Structure of Ovule Megasporogenesis
Megagametophyte
4. Endosperm formation
5. Parthenocarpy
6. Polyembryony

Lab Outline:

Anatomy

1. Study of stomata, epidermis,
2. Tissues of primary body of plant
3. Study of xylem 3-dimensional plane of wood.
4. T.S of angiosperm stem and leaf.

Taxonomy

1. Identification of families given in syllabus with the help of keys.

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2. Technical description of common flowering plants belonging to families mentioned in theory syllabus.
3. Field trips shall be undertaken to study and collect local plants.
4. Students shall submit 40 fully identified herbarium specimens.

Recommended Books:

1. Mauseth, J.D. 1998. An Introduction to Plant Biology: Multimedia Enhanced. Jones and Bartlett Pub. UK
2. Moore, R.C., W.D. Clarke and Vodopich, D.S. 1998. Botany. McGraw Hill Company, U.S.A.
3. Raven, P.H., Evert. R.E. and Eichhorn, S.E. 1999: Biology of Plants. W.H. Freeman and Company Worth Publishers.
5. Stuessy, T.F. 1990. Plant Taxonomy. Columbia University Press, USA.
6. Lawrence, G.H.M. 1951 Taxonomy of Vascular Plants. MacMillan & Co. New York.
7. Panday, B.P. 2004. A textbook of Botany (Angiosperms). S. Chand and Co. New Delhi.
8. Raymond E, S. E. Eichhorn. 2005. Esau's Plant Anatomy. Meristems cells and tissues of the plant body, 3rd ed. John Wiley & Sons. Inc.
9. Fahn, A. 1990. Plant Anatomy. Pergamon Press, Oxford.
10. Esau, K. 1960. Anatomy of Seed Plants. John Wiley, New York.
11. Maheshwari, P.1971. Embryology of Angiosperms, McGraw Hill. New York.
12. Eames A.J. and L.H Mac Daniels. 2002. An Introduction to Plant Anatomy. Tata-Mac Graw-Hill Publishing Company, Limited New Delhi.
13. Pullaiah, T. 2007. Taxonomy of Angiosperms. 3rd Edition Regency Publications, New Delhi.
14. Naik, V.N. 2005 Taxonomy of Angiosperms. 20th Reprint. Tata-Mac Graw-Hill Publishing Company, Limited New Delhi.

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ZOOLOGY - II

ZOL-102	Diversity in Animal in Vertebrates	4(3 + 1)
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Aims and Objectives:

The course is designed to provide students with:

- a. concepts of evolutionary relationship of animal kingdom.
- b. knowledge about animal kingdom, emphasizing their phylogenetic relationships and simple to complex mode of animal life.

Course Contents

1. **Introduction**
Classification of organisms; evolutionary relationships and tree diagrams; patterns of organization.
2. **Animal-Like Protists: The Protozoa**
Evolutionary perspective; life within a single plasma membrane; symbiotic life-styles. Protozoan taxonomy: (up to phyla, subphyla and super classes, wherever applicable). Pseudopodia and amoeboid locomotion; cilia and other pellicular structures; nutrition; genetic control and reproduction; symbiotic ciliates; further phylogenetic considerations.
3. **Multicellular and Tissue Levels of Organization**
Evolutionary perspective; origins of multicellularity; animal origins. Phylum porifera: cell types, body wall, and skeletons; water currents and body forms; maintenance functions; reproduction. Phylum cnidaria (coelenterata) the body wall and nematocysts; alternation of generations; maintenance functions; reproduction and classification up to class. Phylum ctenophora; further phylogenetic considerations.
4. **Triploblastics and Acoelomate Body Plan**
Evolutionary perspective; phylum platyhelminthes: classification up to class; the free-living flatworms and the tapeworms; phylum nemertea; phylum gastrotricha; further phylogenetic considerations.
5. **Pseudocoelomate Body Plan: Aschelminths**
Evolutionary perspective; general characteristics; classification up to phyla with external features; feeding and the digestive system; other organ systems; reproduction and development of phylum rotifera and phylum nematoda; phylum kinorhyncha. Some important nematode parasites of humans; further phylogenetic considerations.

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- 6. **Molluscan Success**
Evolutionary perspective: relationships to other animals; origin of the coelom; molluscan characteristics; classification up to class. The characteristics of shell and associated structures, feeding, digestion, gas exchange, locomotion, reproduction and development, other maintenance functions and diversity in gastropods, bivalves and cephalopods; further phylogenetic considerations.
- 7. **Annelida: The Metameric Body Form**
Evolutionary perspective: relationship to other animals, metamerism and tagmatization; classification up to class. External structure and locomotion, feeding and the digestive system, gas exchange and circulation, nervous and sensory functions, excretion, regeneration, reproduction and development, in polychaeta, oligochaeta and hirudinea; further phylogenetic considerations.
- 8. **Arthropods: Blueprint for Success**
Evolutionary perspective: classification and relationships to other animals; metamerism and tagmatization; the exoskeleton; metamorphosis; classification up to class; further phylogenetic considerations.
- 9. **Hexapods and Myriapods: Terrestrial Triumphs**
Evolutionary perspective; classification up to class. External structure and locomotion, nutrition and the digestive system, gas exchange, circulation and temperature regulation, nervous and sensory functions, excretion, chemical regulation, reproduction and development in hexapoda; insect behavior; insects and humans; further phylogenetic considerations.

Books Recommended

- 1. Hickman, C.P., Roberts, L.S. and Larson, A. INTEGRATED PRINCIPLES OF ZOOLOGY, 11th Edition (International), 2004. Singapore: McGraw Hill.
- 2. Miller, S.A. and Harley, J.B. ZOOLOGY, 5th Edition (International), 2002. Singapore: McGraw Hill.
- 3. Pechenik, J.A. BIOLOGY OF INVERTEBRATES, 4th Edition (International), 2000. Singapore: McGraw Hill.
- 4. Kent, G.C. and Miller, S. COMPARATIVE ANATOMY OF VERTEBRATES. 2001. New York: McGraw Hill.
- 5. Campbell, N.A. BIOLOGY, 6th Edition. 2002. Menlo Park, California: Benjamin/Cummings Publishing Company, Inc.

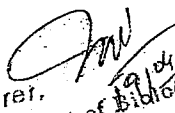
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Lecturer,
Department of Biological Sciences
University of Sargodha

Practicals

1. Study of *Euglena*, *Amoeba*, *Entamoeba*, *Plasmodium*, *Trypanosoma*, *Paramecium* as representative of animal like protists. (Prepared slides).
2. Study of sponges and their various body forms.
3. Study of principal representative classes of phylum Coelenterata.
4. Study of principal representative classes of phylum Platyhelminthes.
5. Study of representative of phylum Rotifera, phylum Nematoda.
6. Study of principal representative classes of phylum Mollusca.
7. Study of principal representative classes of phylum Annelida.
8. Study of principal representative classes of groups of phylum Arthropoda.
9. Brief notes on medical/economic importance of the following:
Plasmodium, *Entamoeba histolytica*, *Leishmania*, Liverfluke, Tapeworm, Earthworm, Silkworm, Citrus butterfly.
10. Preparation of permanent stained slides of the following:
Obelia, *Daphnia*, Cestode, Parapodia of *Nereis*.

Books Recommended

1. Hickman, C.P. and Kats, H.L. LABORATORY STUDIES IN INTEGRATED PRINCIPLES OF ZOOLOGY. 2000. Singapore: McGraw Hill.
2. Miller, S.A., GENERAL ZOOLOGY LABORATORY MANUAL, 5th Edition (International), 2002. Singapore: McGraw Hill.


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Semester-II

(Pre-Engineering Group)

Course Code	Course Title	Credit Hours
PhyG-201	Electricity & Magnetism-I, Electronics	04
MATHS-321	Calculus-II	04

Course Code: ~~PHYG-201~~
Electricity and Magnetism
Prerequisites: Mechanics-I
Cr. Hours 3+1

Course Contents

Electric Field, Electric Potential, Capacitors and dielectrics, DC Circuits, Magnetic Field Effects and Magnetic Properties of Matter, Electronics.

Lab-II

1. To determine Horizontal/Vertical distance by Sextant
2. The determination of wavelength of Sodium -D lines by Newton's ring.
3. The determination of wavelength of light/laser by diffraction grating.
4. To study the laws of vibration of stretched string-using sonometer.
5. To determine the stopping potential by photocell.

Recommended Books:

1. Beiser A. 1987 Concepts of Modern Physics. 4th ed. McGraw-Hill Book Co.
2. Grobe. 1993 Basic Electronics. 7th ed. McGraw Hill Book Co.
3. Reitz, John R. and Milford Fredrick, J., 1970. Foundations to Electromagnetic Theory 2nd ed. Addison-Wesley Publishing Co.
4. Sear and Zemansky. 2008. University Physics with Modern Physics. 12th ed. Pearson.

SEMESTER-II

Course code: MATH-321

Title: Calculus-II

Credit Hours: 3

Recommended Books: I) Calculus and Analytic Geometry by S.M Yusuf (Illmi Kitab Khana, Lahore)

II) Mathematical Methods by S.M Yusuf (Illmi Kitab Khana, Lahore)

Reference books: I) Calculus and Analytic Geometry (9th Edition) by Thomas and Finney (National Book Foundation Pakistan)

II) James Stewart: Calculus, 3rd Edition 1995, (Brooks & Cole)

Contents: Anti derivative and indefinite integral. Techniques of evaluating indefinite integrals. Fundamental theorem of integral calculus. Properties of definite integral. Walli's Sine and Cosine formulas. Quadrature and Rectification (cartesian and polar curves). Double and triple integrals with application. Numerical integration - trapezoidal and simpson's rule. Improper Integrals.

Sequences. Infinite series and their convergence. Comparison tests. Cauchy's root test. Integral test. Ratio test.

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Semester - II

Course: English-II Credit Hrs 3

ENG-102**Course Aims:**

The aim of this course is to groom the students linguistically in such a manner that they can read and understand different texts written in English (academic or non academic) by applying different strategies of reading. A particular care has been taken to gratify the aesthetic needs of the learners. The basic aim of this course is to develop critical reading and critical thinking among the students. This course also aims to train students to meet the demands of other subjects written in the English language which need to be dealt with at optimal level of efficiency. The course shall enable the learners to develop vocabulary in English by reading dynamic texts and understand different composition patterns in the English language.

- Narration
- Punctuation
- Note-Taking
- Oral Presentation Skills
- Paragraph Writing

Poems:

- | | |
|--|--------------------|
| 1: The Divine Image | William Blake |
| 2: Sonnet Composed Upon Westminster Bridge | William Wordsworth |
| 3. Youth and Age | S.T. Coleridge |
| 4. To Wordsworth | P.B. Shelley |
| 5. Patriot into Traitor | Robert Browning |
| 6. When You Are Old | W. B. Yeats. |

Short Stories:

- | | |
|-------------------------|----------------|
| 1. Mayhew | S. Maugham |
| 2. The New Constitution | S. H. Manto |
| 3. Breakfast | John Steinbeck |

One Act Plays:

- | | |
|------------------|------------------|
| 1. The Bear | Anton Chekhov |
| 2. Smoke Screens | Harold Brighouse |

Essays:

- | | |
|---|----------------|
| 1. Quid-e-Azam's Address to the Constituent Assembly. | |
| 2. Seeing Life | Arnold Bennet |
| 3. The Last Lesson | Alphonse Daude |

Course Outline for Pakistan Studies

Marks: 80

(PAK. 101)

Objectives: The objectives of this course are to acquaint the students with:

1. Two Nation Theory and Ideology of Pakistan

- a. Historical background of creation of Pakistan
- b. Two Nation Theory in its historical context, definition and interpretations
- c. Quaid-i-Azam and his political ideas.

2. Political Dynamics of Pakistan

- a. Constitutional development in Pakistan. (1947-73)
- b. Salient features of constitution of Pakistan 1973.
- c. Institutions of Pakistan: political parties, bureaucracy, army, judiciary and media.
- d. Problems of Pakistan as a Federal State.

3. Socio-Economic Issues of Pakistan.

- a. Economical Problem.
- b. Social and demographic issues.

4. Diplomatic Dynamics of Pakistan.

- a. Determinants and objectives of Pakistan's foreign policy.
- b. Pakistan's relations with its neighboring countries.
- c. Pakistan and the Muslim World (A comprehensive review of foreign policy of Pakistan)

Recommended Books:

1. Javed Ahmad Sheikh, Pakistan's Political, Economic and Diplomatic Dynamics, Lahore: Kitabistan Paper Products.
2. Other relevant readings for the individual subjects shall be recommended by the teacher during the course.

2nd Year
3rd Semester

Botany - III

2/19/11

Title of the course: BOT-203 Cell Biology, Genetics and Evolution

Credit hours: 4(3+1)

Specific objectives of course: To understand 1- structure and functions of cell, 2-nature of genetic material and hereditary process 3- familiarization with evolutionary processes.

Course outline:

a) Cell biology

Structures and Functions of Bio-molecules

- i. Carbohydrates
- ii. Lipids
- iii. Proteins
- iv. Nucleic Acids

2. Cell: Physico-chemical nature of plasma membrane and cytoplasm.

3. Ultra structure of plant cell with a brief description and functions of the

following organelles

- i. Cell wall
- ii. Endoplasmic reticulum
- iii. Plastids
- iv. Mitochondria
- v. Ribosomes
- vi. Dictyosomes
- vii. Vacuole
- viii. Microbodies (Glyoxysomes and Peroxisomes)

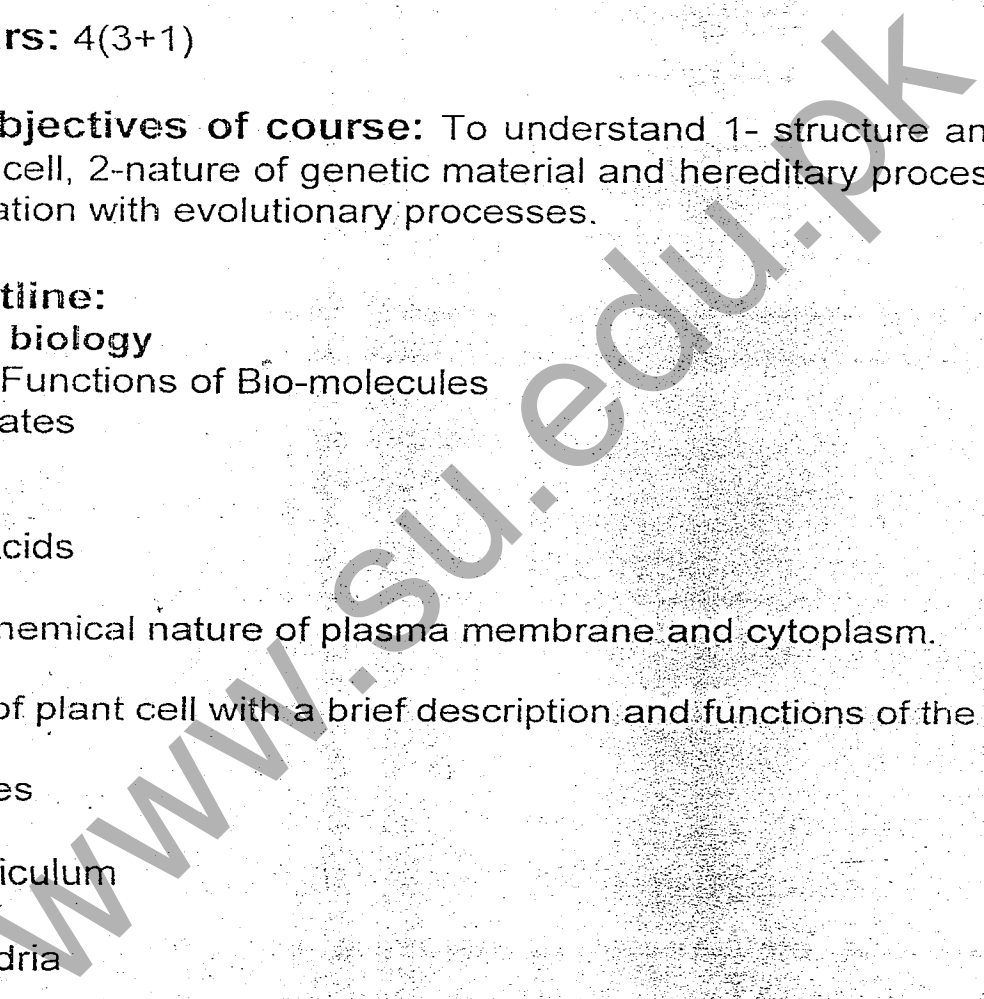
4. Nucleus: Nuclear membrane, nucleolus, ultrastructure and morphology of chromosomes, karyotype analysis

5. Reproduction in somatic and embryonic cell, mitosis and meiosis, cell cycle

6. Chromosomal aberrations; Changes in the number of chromosomes. Aneuploidy and euploidy. Changes in the structure of chromosomes, deficiency, duplication, inversion and translocation.

b) Genetics 1. Introduction, scope and brief history of genetics. Mendelian inheritance; Laws of segregation and independent

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assortment, back cross, test cross, dominance and incomplete dominance.

2. Sex linked inheritance, sex linkage in *Drosophila* and man (colour blindness), XO, XY, WZ mechanisms, sex limited and sex linked characters, sex determination.
3. Linkage and crossing over: definition, linkage groups, construction of linkage maps, detection of linkage.
4. Molecular genetics; DNA replication. Nature of gene, genetic code, transcription, translation, protein synthesis, regulation of gene expression (e.g. *lac* operon).
5. Transmission of genetic material in Bacteria: Conjugation and gene recombination in *E.coli*, transduction and transformation.
6. Principles of genetic engineering / biotechnology; Basic genetic engineering techniques.
7. Application of genetics in plant improvement: Induction of genetic variability (gene mutation, recombination), physical and chemical mutagens, selection, hybridization and plant breeding techniques. Development and release of new varieties.
8. Introduction to germplasm conservation.

c) Evolution

The nature of evolutionary forces, adaptive radiations, differential reproductive potential, first plant cell, origin of organized structures, early aquatic and terrestrial ecosystem, first vascular plant.

Lab Outline:

Cell Biology

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

Genetics

1. Genetical problems related to transmission and distribution of genetic material.
2. Identification of DNA in plant material. Carmine/orcein staining.
3. Study of salivary gland chromosomes of *Drosophila*.

Recommended Books:

1. Hoelzel, A. R. 2001. Conservation Genetics. Kluwer Academic Publishers.
2. Dyonsager, V.R. (1986). Cytology and Genetics. Tata and McGraw Hill Publication Co. Ltd., New Delhi.

3. Lodish, H. 2001. Molecular Cell Biology. W. H. Freeman and Co.
4. Sinha, U. and Sinha, S. (1988). Cytogenesis Plant Breeding and Evolution, Vini Educational Books, New Delhi.
5. Strickberger, M.V. (1988), Genetics, MacMillan Press Ltd., London.
6. Carroll, S.B., Grenier, J.K. and Welnerbee, S.d. 2001. From DNA to Diversity - Molecular Genetics and the Evolution of Animal Design. Blackwell Science.
7. Lewin, R, 1997. Principles of Human Evolution. Blackwell Science.
8. Strickberger, M. W. 2000 Evolution. Jones & Bartlet Publishers Canada
9. Ingrouille M. J. & B. Eddie. 2006. Plant Diversity and Evolution. Cambridge University Press.

Journals / Periodicals: Theoretical & Applied Genetics, The Cell, Heredity.

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Zoology - III

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DIVERSITY IN ANIMALS (CHORDATES) Code-ZOL-203

21/9/11

Course Contents

1. Echinoderms

Evolutionary perspective: relationships to other animals; echinoderm characteristics; classification up to class. Maintenance functions, regeneration, reproduction, and development in asterozoa, ophiurozoa, echinozoa, holothurozoa and crinozoa; further phylogenetic considerations; some lesser-known invertebrates: the lophophorates, entoprocts, cycliophores, and chaetognaths.

2. Hemichordates and Invertebrate Chordates

Evolutionary Perspective: Phylogenetic Relationships; Classification up to subphylum or class where applicable; Further Phylogenetic Considerations.

3. Fishes: Vertebrate Success in Water

Evolutionary perspective: phylogenetic relationships; survey of super class agnatha and gnathostomata; evolutionary pressures: adaptations in locomotion, nutrition and the digestive system, circulation, gas exchange, nervous and sensory functions, excretion and osmoregulation, reproduction and development; further phylogenetic considerations.

4. Amphibians: The First Terrestrial Vertebrates

Evolutionary perspective: phylogenetic relationships; survey of order caudata, gymnophiona, and anura. Evolutionary pressures: adaptations in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, temperature regulation, nervous and sensory functions, excretion and osmoregulation, reproduction, development, and metamorphosis; further phylogenetic considerations.

5. Reptiles: The First Amniotes

Evolutionary perspective: cladistic interpretation of the amniotic lineage; survey of order testudines or chelonina, rhynchocephalia, squamata, and crocodilia; evolutionary pressures: adaptations in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, and temperature regulation, nervous and sensory functions, excretion and osmoregulation, reproduction and development, further phylogenetic considerations.

6. Birds: Feathers, Flight, and Endothermy

Evolutionary perspective: phylogenetic relationships; ancient birds and the evolution of flight; diversity of modern birds; evolutionary pressures: adaptation in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, and

temperature regulation, nervous and sensory systems, excretion and osmoregulation, reproduction and development; migration and navigation.

7. Mammals: Specialized Teeth, Endothermy, Hair, and Viviparity

Evolutionary perspective: diversity of mammals; evolutionary pressures: adaptations in external structure and locomotion, nutrition and the digestive system, circulation, gas exchange, and temperature regulation, nervous and sensory functions, excretion and osmoregulation, behavior, reproduction and development.

Books Recommended

1. Hickman, C.P., Roberts, L.S. and Larson, A. INTEGRATED PRINCIPLES OF ZOOLOGY, 11th Edition (International), 2004. Singapore: McGraw Hill.
2. Miller, S.A. and Harley, J.B. ZOOLOGY, 5th Edition (International), 2002. Singapore: McGraw Hill.

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3. Pechenik, J.A. BIOLOGY OF INVERTEBRATES. 4th Edition (International). 2000. Singapore: McGraw Hill.
4. Kent, G.C. and Miller, S. COMPARATIVE ANATOMY OF VERTEBRATES. 2001. New York. McGraw Hill.
5. Campbell, N.A. BIOLOGY, 5th Edition. 2002. Menlo Park, California. Benjamin/Cummings Publishing Company, inc.

Practicals

1. Study of a representative of Hemichordate and Invertebrate Chordate.
2. Study of representative groups of class Fishes.
3. Study of representative groups of class Amphibia.
4. Study of representative groups of class Reptilia.
5. Study of representative groups of class Aves.
6. Study of representative groups of class Mammalia.
7. Field trips to study animal diversity in an ecosystem.

Note: Preserved specimen and/or colored projection slide and/or CD ROM projection of computer must be used.

Books Recommended

1. Hickman, C.P. and Kats, H.L. LABORATORY STUDIES IN INTEGRATED PRINCIPLES OF ZOOLOGY. 2000. Singapore: McGraw Hill.
2. Miller, S.A. GENERAL ZOOLOGY LABORATORY MANUAL. 5th Edition (International), 2002. Singapore: McGraw Hill.

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SEMESTER-III

CHEM-271 Organic Chemistry (Cr. 03)

40

Basic Concepts: Atomic, molecular and hybrid orbitals: multiple localized and delocalized bonds; properties of bonds; inductive effect dipole moment. The concept of resonance, rules for resonance; resonance energy; steric inhibition of resonance; hyper conjugation; resonance effect; hydrogen bonding; tautomerism. Introduction to spectroscopy with special reference to ultraviolet / visible and infrared spectroscopy.

Hydrocarbons: Classification of hydrocarbons. Nomenclature, methods of preparations, physical characteristics and chemical reactions of alkanes, cycloalkanes, alkenes and alkynes. Source of aromatic hydrocarbons. Structure of benzene and the concept of aromaticity Aromatic electrophilic substitution.


Stereoisomerism: Conformational Analysis of ethane and butane. Optical Isomerism. Optical activity, chiral carbon atom and optical isomerism; relative and absolute configuration, creation of chiral carbon and racemization, optical isomerism in compounds containing two chiral carbon atoms; diastereoisomers; elements of symmetry; resolution of racemic mixture. Geometrical Isomerism, *cis/trans* isomerism, designation of configuration, Determination of configuration.

Alkyl Halides: Nomenclature, methods of preparation and chemical reactions with special reference to nucleophilic substitution and elimination reaction of alkyl halides. Preparations, structure and synthetic applications of Grignard's reagents.

The Hydroxyl group and Ethers: Nature of hydroxyl group in alcohols and phenols.

Alcohols: Classification and nomenclature of alcohols; methods of preparation and chemical reactions of alcohols; distinction between primary, secondary and tertiary alcohols. Polyhydric alcohols.

Phenols: Methods of preparation of phenols; acidity of phenols; chemical reactions of phenols. **Ethers:** Methods of preparation and reactions of ethers.


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The Carbonyl Group: Nature of carbonyl group and its reactivity; nomenclature of aldehydes and ketones; methods of preparation of aldehydes and ketones; chemical reactions of aldehydes and ketones; distinction between aldehydes and ketones.

Carboxylic Acids and their Derivatives: Nomenclature of carboxylic acids; methods of preparation and chemical reactions of carboxylic acids, strength of carboxylic acids and the factors affecting it. Formation and hydrolysis of acid anhydrides, acid amides, acid halides and esters including glycerides. Introduction to amino acids.

Nitrogen Compounds: Amines: Classification and nomenclature of amines; methods of preparation and chemical reactions of amines; distinction between primary, secondary and tertiary amines. Preparation and reactions of aniline. Basicity of aliphatic and aromatic amines and factors affecting it. Diazonium Salts and their synthetic applications.

Recommended Books (Organic Chemistry)

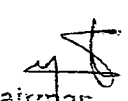
1. Younas, M., Text Book of Organic Chemistry, Ilmi Kutab Khana, Lahore. (2006).
2. Rehman, A., Text Book of Organic Chemistry, Caravan Book House, Lahore. (2006).
3. March, J., Advanced Organic Chemistry, Wiley, New York. (1992).
4. Pine, S. H., Organic Chemistry, McGraw-Hill, New York. (1987).
5. Sykes, P., A Guide Book to Mechanism in Organic Chemistry, Prentice Hall. (1999).
6. Younas, M., Organic Spectroscopy, A. H. Publisher, Lahore. (2006).
7. Solomons, T. W. G., Fundamentals of Organic Chemistry, Wiley, New York. (1999).
8. Kemp, W., Organic Spectroscopy, Macmillan, London. (1990).
9. Chughtai, F. A., Organic Reactions, Majid Book Depot, Lahore/Faisalabad. (1995).
10. Vogel, A. I., A Text Book of Practical Organic Chemistry, Prentice Hall. (1996).
11. Clarke, H. T. and D. Haynes. A Hand Book of Organic Analysis, Edward Arnold, London. (1947).
12. Mann, F. G and B. C. Saunders. Practical Organic Chemistry, Longman, London. (1978).
13. Shriner, R. L., D.Y. Curtin, R.C. Fuson, and T.C. Morrill, The Systematic Identification of Organic Compounds, Wiley, New York. (1997).
14. Rehman, A., Experimental Organic Chemistry, The Caravan Book House, Lahore. (2006).
15. Morrison R. T. and R.N. Boyd. Organic Chemistry, Allyn and Bacon, London. (1987).

Organic Chemistry Lab (Cr. 01)

1. Qualitative Organic Analysis: Systematic identification of organic compounds containing groups containing groups like COOH, OH, NH₂ and C=O.
2. Purification techniques viz solvent extraction distillation and Recrystallization, etc.
3. Preparation of simple organic compounds viz. Ethyl benzoate, benzoic acid, tribromophenol, aspirin and nitrobenzene.

Recommended Books (Organic Chemistry)

1. Younas, M. Text Book of Organic Chemistry, Ilmi Kutab Khana, Lahore (2006).
2. Rehman, A. Text Book of Organic Chemistry, Caravan Book House Lahore (2006).
3. Smith M.B. and March, J. March's Advanced Organic Chemistry, 5th Edition, John Wiley, NY. (2001).
4. Pine, S. H. Organic Chemistry, (5th Edition) McGraw-Hill, NY. (1987).


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5. Sykes, P., A Guide Book to Mechanism in Organic Chemistry, Longman, London (1999).
6. Younas, M. Organic Spectroscopy, A. H. Publisher, Lahore (2006).
7. Solomons, T.W.G., Fundamentals of Organic Chemistry, Wiley, NY (2003).
8. Kemp, W., Organic Spectroscopy, Macmillan, London (1990).
9. Vogel, A.I. A Text Book of Practical Organic Chemistry, Longman, London (1968).
10. Mann, F.G and Saunders B.C. Practical Organic Chemistry, Longman, London (1978).
11. Shriner, R.L., Curtin, D.Y. Fuson, R.C. and Morrill, T.C. The Systematic Identification of Organic Compounds, Wiley, NY (1997).
12. Rehman, A. Experimental Organic Chemistry, The Caravan Book House, Lahore (2006).
13. Morrison, R.T. and Boyd, R.N. Organic Chemistry, Allyn & Bacon, Boston (1987).

Semester-III **Pre-Engineering Group**

Course Code	Course Title	Credit Hours
PhyG-102	Mechanics-II, Electricity & Magnetism-II	04
MATHS-431	Analytical Geometry and Complex Numbers	04

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Course Code: PHY-102

Mechanics-II

Prerequisites: Electricity and Magnetism

Cr. Hours 3+1

Course Contents:

Rotational Dynamics. Angular Momentum, Gravitation, Bulk Properties of Matters, Special Theory of Relativity, Inductance, Alternating Current Circuits, Electro-Magnetic Waves (Maxwell's Equations).

Lab-III

1. Measurement of resistance using a Neon flash bulb and condenser
2. Conversion of a galvanometer into voltmeter & an ammeter.
3. Measurement of low resistance coil by a Carey Foster Bridge.
4. Resonance frequency of an acceptor circuit
5. Resonance frequency of a Rejector Circuit.
6. Study of the parameter of wave i.e. amplitude, phase and time period of a complex signal by CRO.

Recommended Books:

1. A. Beiser, 1987. Concepts of Modern Physics, 4th ed. McGraw-Hill Book Co.s
2. Giancoli, Douglas, C., 1988. Physics for Scientist and Engineers with Modern Physics 2nd ed. Prentice Hall Inc
3. Sear and Zemansky, 2008. University Physics with Modern Physics, 12th ed Pearson.

SEMESTER-III

Course code: MATH-431

Title: Analytic Geometry & Complex Numbers

Credit Hours: 3

Recommended Books: I) Calculus and Analytic Geometry by S.M Yusuf (Ilmi Kitab Khana, Lahore)

II) Mathematical Methods by S.M Yusuf (Ilmi Kitab Khana, Lahore)

III) Vector Analysis By Dr. Munawar Hussain (Carvan Book House, Lahore)

Reference books: I) Calculus and Analytic Geometry (9th Edition) by Thomas and Finney (National Book Foundation Pakistan)

II) James Stewart: Calculus, 3rd Edition 1995, (Brooks & Cole)

Contents: Vectors in space. Dot, cross and triple products. Differentiation of vectors. Complex numbers and their properties. De, Moivre's theorem and its application. Circular, logarithmic and hyperbolic functions. Separation into real and imaginary parts.

Translation and rotation of rectangular axes. General equation of 2nd degree. Properties of parabola, ellipse and hyperbola. Tangents and normals. Parametric representation.

Distance between two points in space. Direction angles. Direction numbers. Direction cosines. Lines and Planes. Skew lines. Cylindrical and spherical coordinates.


UNIVERSITY OF SARGODHA, SARGODHA

NOTIFICATION

No. UOS/Acad/604

Dated: 02/05/2008

The Syndicate in its 1/2008 meeting held on 23.04.2008 has approved the course outlines for Basic Computer Applications for teaching in BS Programs (Science Disciplines) with the amendment that course assessment and evaluation be done as per evaluation weightage prescribed in the University Semester Regulations, 2007. Approved course outlines are annexed.


(MUDASSAR KAMRAN)
Assistant Registrar (Acad)
for Registrar

Distribution:

1. All Deans of Faculties
2. All Heads of the Teaching Departments
3. Director Academics
4. Controller of Examinations
5. Coordinator, BS Science Programs
6. Secretary to the Vice-Chancellor
7. P.A to Registrar
8. Notification File

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University of Sargodha
Faculty of Science & Technology
Department of Computer Science &
Information Technology

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Course Syllabus for Introduction to Computers
CS-111 - Credit Hours 3

Required Pre-requisites (NONE)
1st Semester - Academic Year 2006-07

(CS.203)

Course Description:

The areas covered in this course include: Concept of Computer, its different types, input and output devices, Software concept along with importance of Operating system and its types, Introduction of networks and communication devices. All features of MS Word, MS Excel, and MS PowerPoint are also covered in this course. For specific specialization, relevant topics are covered.

Prerequisites by Topics: None

Required Text(s) (TB):

Introduction to Computers by Peter Norton's, Sixth Edition

Reference Text(s) (RB):

Laurie Ann Ulrich, How to Do Everything with Microsoft Office 2003, McGraw-Hill/Irwin, 2003, ISBN:0-07-2229373-3

Course Objective(s):

The goal of this course is to make the students to understand the effect of computers in different areas of life and they will be able to select a computer for particular application. This course also gives understanding of networks and different type of communication devices. The course will develop useful skills in word processing, spreadsheets, and multimedia presentation. This course covers the specific contents for each specialization.

Topics Covered:

For all programs:

- Computer Hardware
- Computer Software
- MS Word
- MS PowerPoint
- MS Excel
- MS Outlook
- Internet

For Specializations:

- a. Physics and Mathematics - Scientific Word, MATLAB (Numerical Computation Tool)
- b. Statistics - SPSS (Analytical Software)
- c. Botany, Zoology, and Chemistry - Advance MS Excel

Lecture/Laboratory Schedule:

	HOUR(S)	VENUES
Lecture / Week	2	To be allocated
Lab. / Week	3	Computer Lab.

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Instructional Tools and Evaluation Methods:

Lectures, Lab, Exercises, Homework, Quizzes, Assignment, Lab, Work - Mini Project, Lab, Quizzes, Lab, Assignments, Lab, Exams & Class Project

Course Assessment and Evaluation:

• Homework & Participation	}	20 %
• Quizzes		
• Mid Term Examination	}	30 %
• Lab (Exam 1)		
• Final Exam		
		50 %

Final Grades:

An overall grade will be assigned on the following grading scale.

INTERVAL	80 - 100	65 - 79	50 - 64	0 - 49
POINTS				
LETTER GRADE		B	C	F

*As per approved
Semester Regulations 2007.*

Learning Outcomes of the Course:

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

1. Understand Computer and its different parts (Input and Output Devices)
2. Compare and contrast Different Types of Computers, Information Processing, and Information Processing Cycle
3. Use Internet applications such as the World Wide Web and File Transfer Protocols
4. Create Word, Excel, Power Point Documents and Apply Formatting
5. Understand Networks Concepts and Different types of Networks along with Communication Devices

Relationship of the Course to Professional Components:

This course will provide the base for all advance CS courses.

Course/Class Policies:

- **Class Attendance and Absenteeism**
Students are required to attend all classes and lab meetings. Regular attendance in their class/laboratory sessions will be very helpful to maintain a satisfactory progress throughout their course. Attendance will be strictly enforced and evaluated according to the Student Attendance Control Criteria announced by the DOCSIT and UoS. Any student who exceeds the maximum allowable absence limit during the course will not be allowed to sit in the exams. The maximum allowed limit for this course is 25% which include both excused and unexcused absences.
- **Policy on Late Lab. / Project Report and Written Work**
Assignments are due at the beginning of the class on the date indicated in the course schedule or on the assignment. If the due date is extended, you will be informed of this through notice board. Assignments will not be accepted after the classroom discussion occurs. Such discussion would provide an unfair advantage to those who are preparing/submitting the assignment after the fact. At the instructor's option, late

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assignments may be evaluated to provide feedback, but WILL NOT BE GRADED. Late assignments will receive a grade of zero.

- **Academic Integrity**

Cheating in any form will not be tolerated and could lead to severe consequences. Academic work submitted by the students in the form of homework, assignment, or a project must be the result of their own effort.

- **Make-Up Exam Policy**

A student who has missed an exam will be allowed to sit in a make-up exam only if he or she provides a medical report from a government hospital/clinic.

- **General Behavior**

Students must maintain a good behavior both in and outside their classes. They are required to keep their mobile phones switched off while attending their class/laboratory sessions or writing their exams. Any student who engages in a behavior that disrupts the learning environment may face disciplinary action under the UoS code. Students must also maintain a smoke free environment in all college facilities.

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University of Sargodha
 Faculty of Science & Technology
 Department of Computer Science &
 Information Technology

Course Outline for Introduction to Computers
 CS-111 - Credit Hours 3
 Required Pre-requisites (NONE)
 First Semester - Academic Year 2006-07

Course Delivery and Lecture Schedule (CS-111 - First Semester - Academic Year 2006-07)

WEEK	TOPICS	Reference to the Chapter/Section of the Book or Other Material Given to Students	Homework / Assignment / Quiz / Exam etc. Date
1.	<p>Course Overview What is Computer? Computer for Individual Users</p> <ul style="list-style-type: none"> • Desktop Computers • Workstations Computers • Notebook Computers • Tablet PCs • Handheld PCs • Smart Phones. <p>Computer for Organizations</p> <ul style="list-style-type: none"> • Network Computers • Mainframe Computers • Minicomputers • Supercomputers <p>Computer's Applications</p> <ul style="list-style-type: none"> • Home • Education • Small Business • Industry • Government and • Healthcare <p>Part of Computer System</p> <ul style="list-style-type: none"> • Hardware • Software • Data • Users <p>Information Processing Cycle Memory Devices Types of Software</p> <ul style="list-style-type: none"> • System Software • Application Software 		
2.	<p>Purpose of Operating Systems Types of Operating Systems</p> <ul style="list-style-type: none"> • Real-Time Operating system • Single-User / Single-Tasking Operating system • Single-User / Multitasking Operating system • Multi-User / Multitasking Operating system <p>Input and Output Devices</p> <ul style="list-style-type: none"> • Keyboard, Mouse, Pens, Touch Screen, Game Collectors, Optical Input Devices, Microphones, Digital Camera 		

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	<ul style="list-style-type: none"> • Monitors (CRT Monitors, Flat-Panel Monitors), Data Projection, Scanners, Headphones and Headsets, Printers (Impact and Non-Impact), Plotters <p>Storage Devices</p> <ul style="list-style-type: none"> • Magnetic Storage Devices • Optical Storage Devices • Solid-State Storage Devices 		
3.	<p>The Windows Environment</p> <ul style="list-style-type: none"> • The Windows Desktop • Orientation to Keyboard and Mouse • The Taskbar and Start Menu • Working with an Open Window • Using Help and Support <p>Working with the Windows Hierarchy</p> <ul style="list-style-type: none"> • My Computer 		
4.	<p>Using Windows Explorer</p> <ul style="list-style-type: none"> • Creating Folders • Copying and Moving Objects • Using the Recycle Bin <p>Working with Windows Programs</p> <ul style="list-style-type: none"> • Running Several Programs • Moving Between Programs • Saving Files <p>Customizing the Windows Desktop</p> <ul style="list-style-type: none"> • Working with Shortcuts • Working with Control Panel Settings 		
5.	<p>Overview of Internet</p> <ul style="list-style-type: none"> • WWW • Protocol <p>Applications of Internet</p> <p>Introduction to Internet Explorer</p> <ul style="list-style-type: none"> • Connecting to the Internet • Using Internet Explorer • Using a Search Engine • Visiting Different Websites 		
6.	<p>Getting Started With Outlook</p> <ul style="list-style-type: none"> • Composing and Sending Messages • Opening a Message • Replying to a Message • Printing a Message • Deleting a Message <p>Composing Messages</p> <ul style="list-style-type: none"> • Addressing a Message • Formatting a Message • Checking Spelling and Grammar • Attaching a File • Forwarding a Message <p>Managing Mail</p> <ul style="list-style-type: none"> • Opening and Saving an Attachment • Flagging a Message • Moving and Copying Messages to a Folder • Deleting a Folder <p>Setting Message Options</p> <ul style="list-style-type: none"> • Modifying Message Options • Modifying Delivery Options • Modifying Message Formats 		
7.	MID TERM EXAMINATION		

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8.	<p>MS Word</p> <ul style="list-style-type: none"> • Features of MS Word • Interface of MS Word • Creating New Document • Saving, Deleting, Renaming, Closing Document and Opening Existing Document • Using Different View Option in MS Word • Typing and Inserting Text • Selecting Text with Mouse and Keyboard • Deleting Text • Cut and Paste Text • Copy and Paste Text • Past Special • Undo and Redo • Inserting Symbol and Special Characters • Find, Go To and Replace Text • Inserting Footnote • Use of Ruler • Inserting Comments • Formatting Document <ul style="list-style-type: none"> ○ Changing the Font, Font Size, Font Color, Font Style ○ Changing Character Case ○ Adjusting Character Spacing ○ Applying Text Effects ○ Copying Formatting with Format Painter 		
9.	<p>MS Word</p> <ul style="list-style-type: none"> • Paragraph Formatting <ul style="list-style-type: none"> ○ Indenting Paragraph ○ Paragraph Alignment ○ Adjusting Line Spacing ○ Adjusting Tab ○ Removing Paragraph Formats ○ Bullets and Numbering ○ Using Columns ○ Drop Caps • Formatting Pages <ul style="list-style-type: none"> ○ Set Page Margins ○ Change Page Orientation and Paper Size ○ Page Breaks ○ Inserting Header and Footer ○ Inserting Page Number 		
10.	<ul style="list-style-type: none"> • Spelling and Grammar <ul style="list-style-type: none"> ○ Replace and Replace All ○ Ignore and Ignore All • AutoCorrect • Synonyms • Working With Tables <ul style="list-style-type: none"> ○ Creating Table ○ Inserting Text and Moving with in Table ○ Selecting Table, Row and Column ○ Resizing Tables ○ Adding and Deleting Rows and Columns ○ Using Table Properties ○ Sorting Data in Table • Creating Document Summery • Print Document • Counting Words • Merging Documents • Hyperlink Two Documents 		

11.	<p>MS Excel</p> <ul style="list-style-type: none"> • Features of MS Excel • Interface of MS Excel • Creating New Sheet • Saving, Deleting, Renaming, Moving and Copying Existing Document • Moving and Copying Sheets • Using Different View Option in MS Excel • Auto filling Cells • Find and Replace Data • Inserting and Deleting Rows or Columns <p>Formatting</p> <ul style="list-style-type: none"> • Changing Font and Font Size • Changing Font Style • Align and Orient Cell Contents • Merging Cells • Rotating Text • Wrapping Text • Fit to Cell • Borders • Protecting Cells and Objects • Clearing Formats • Resizing Column or Rows • Hiding and Un-hiding Rows and Columns • AutoFormat • Conditional Formatting 		
12.	<p>MS Power Point</p> <ul style="list-style-type: none"> • Features of MS Power Point • Interface of MS Power Point • Creating, Deleting Slides • Formatting Slides <ul style="list-style-type: none"> ◦ Applying Back Ground Color on Slides ◦ Apply Design Template and Slide Layout • Inserting Object / Image on Slide • Sorting Slides • Applying Animation Effects on Slides • Using Slid Show 		
BS Physics Specialization			
13.	<p>Microsoft Word Equation Editor</p> <ul style="list-style-type: none"> • Inserting the Equation Icon into the Tool Bar • Writing Equations <p>MATLAB</p> <ul style="list-style-type: none"> • Accessing MATLAB • Entering Matrices • Matrix and array operations 		
14.	<p>MATLAB (Cont'd)</p> <ul style="list-style-type: none"> • Statements, expressions, variables; saving a session • Matrix building functions • For, while, if, and relations 		
15.	<p>MATLAB (Cont'd)</p> <ul style="list-style-type: none"> • Scalar functions • Vector functions • Matrix functions • Command line editing and recall • Sub matrices and colon notation 		

A.D.

Statistics Specialization

13.	<p>SPSS</p> <p>SPSS Windows</p> <ul style="list-style-type: none"> • Data View • Variable View • Output Window with Navigation Frame <p>Data Entry</p> <ul style="list-style-type: none"> • Defining the Variable Properties • Entering the Data Itself 		
14.	<p>SPSS (Cont'd)</p> <p>Data Manipulation</p> <ul style="list-style-type: none"> • Select • Split File • Weight Cases • Transform/Compute New Variable • Recode (into Same or into Different) 		
15.	<p>SPSS (Cont'd)</p> <p>The (all powerful) Analyze Menu</p> <ul style="list-style-type: none"> • Frequencies • Descriptive <p>Compare Means</p> <p>Graphs Menu</p> <ul style="list-style-type: none"> • Histograms • Line Graphs 		

BS Botany, Zoology, and Chemistry Specialization

13.	<p>Advance MS Excel</p> <ul style="list-style-type: none"> • Building a List • Sorting by a Single Field • Sorting by Multiple Fields • Counting Functions • What - If Analysis 		
14.	<p>Advance MS Excel (Cont'd)</p> <ul style="list-style-type: none"> • Create a Link Between Cells in the Same Worksheet or Workbook and Different Worksheet or Workbooks • Create a Reference Between Cells on the Same or Different Worksheets • Break a Link to a Source • Enter the Same Data into Several Cells at Once • Enter or Edit the Same Data on Multiple Worksheets 		
15.	<p>Advance MS Excel (Cont'd)</p> <p>Charts</p> <ul style="list-style-type: none"> • Selecting data • Formatting your chart • Combination charts • Picture charts • Custom chart types 		
16.	FINAL EXAMINATION		

Semester- III

Course: English-III Credit Hrs 3

ENG-203

Course Aims:

The aim of this course is to train the students in such a manner that they can comprehend and understand different English text patterns by applying different analytical strategies. A particular care has been taken to gratify the aesthetic needs of the learners. The basic aim of this course is to develop critical reading and critical thinking among the students. The course shall enable the learners to develop vocabulary in English by reading dynamic texts and understand different composition patterns in the English language. It shall also give them orientation to different literary genres so that they could themselves be able to compose variety of texts independently.

- Letter Writing: (Official / Formal and must discuss some problem)
- Essay writing
- Reading Skills
- Listening Skills

Poetry:

- | | |
|----------------------------|---------------------|
| 1. All The World's A Stage | William Shakespeare |
| 2. On His Blindness | John Milton |
| 3. Ode To Autumn | John Keats |
| 4. No Buyers | Thomas Hardy |
| 5. Prayer Before Birth | Louis MacNiece |
| 6. The Owl Critic | J.T. Field |

Essays:

- | | |
|-------------------------------------|------------------|
| 1. One Vote For This Age of Anxiety | Margaret Mead |
| 2. On Babies | Jerome K. Jerome |
| 3. Islamic Culture | M. M. Pickthal |

Short Stories:

- | | |
|---------------------|-----------------|
| 1. Take Pity | Bernard Malamud |
| 2. The Necklace | G.D. Maupassant |
| 3. The Happy Prince | Oscar Wilde |

One Act Plays:

- | | |
|----------------------------|--------------|
| 1. Even Exchange | Paul S McCoy |
| 2. The Master of The House | W.S. Houston |

SEMESTER-IV

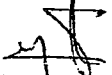
CHEM-291 Chemistry Special Topics (Cr. 03)

(3+1)

- Bio-molecules and Simple Heterocycles:** (carbohydrates, proteins, lipids, nucleic acids, their importance, nomenclature, properties, synthesis and reactions of simple heterocycles).
- Introduction to Spectroscopy:** (IR & UV/Vis).
- Surface Phenomena and Colloids:** (Physisorption and chemisorption, isotherms, types, properties, preparation and applications of colloids).
- Nuclear Chemistry:** (radioactivity; stability of nuclei, nuclear transformation, measurement of nuclear radiation, nuclear reactions, fission and fusion, nuclear reactor, uses of radioisotopes, nuclear hazards and safety measures).
- Modern Materials:** (introduction to liquid crystals, Inorganic polymers, Ceramics, Fiber glass, Thin films, Semiconductors and Composite materials).
- Chemical Industries:** (Metallurgy of Al, Manufacturing of sulphuric acid, nitric acid, fertilizers, cement and glass).

Chemistry Special Topics Lab (Cr. 01)

1. Percentage determination of barium in barium nitrate by gravimetric method.
2. Gravimetric determination of nickel.
3. Estimate the glucose content in the sample by titration method
4. Determination of adsorption parameters using Langmuir adsorption isotherm of acetic acid on charcoal.
5. To determine the wavelength of maximum absorption of compounds using spectrophotometer.
6. To determine the concentration of Cr in water sample by using spectrophotometer.
7. To determine the concentration of Mn in water sample by using spectrophotometer.
8. To determine the concentration of the Sucrose, glucose and dextrose in samples by using polarimeter.
9. To determine the Iodine value of the oil and fat
10. Estimate the glucose content in the sample by titration method
11. Identification Al^{3+} , Cr^{3+} and F^{3+} in samples by TLC
12. Determine the partition coefficient of iodine between water and carbon tetrachloride


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Qualitative Analysis of Lipids, Proteins, Carbohydrates

Recommended Books (Chemistry Special Topics)

1. Voet, D. R and Voet, J. G. Biochemistry. John Wiley & Sons, NY (2001).
2. Kent, J.A. Riegel's Handbook of Industrial Chemistry, CBS Publishers and Distributors, New Delhi, (1997).
3. Arnikar, H.J. Nuclear Chemistry. Krishna Prakashan Media (P) Ltd. (1998).
4. Gurdeep R. "Advanced Physical Chemistry". Krishna Prakashan Media (P) Ltd. Delhi (2002).
5. Younas, M., Organic Spectroscopy, A. H. Publisher, Lahore (2005).

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BOTANY-IV

IV SEMESTER

BOT. 204

PLANT PHYSIOLOGY & ECOLOGY

4 (3+1)

A. Plant Physiology

1. Water relations (water potential, osmotic potential, pressure potential, matric potential). Absorption and translocation of water. Stomatal regulation.
2. Mineral nutrition: Soil as a source of minerals. Passive and active transport of nutrients. Essential mineral elements, role and deficiency symptoms of macronutrients.
3. Photosynthesis: Introduction. Oxygenic and non-oxygenic photosynthesis. Mechanism: light reactions (electron transport and photophosphorylation) and dark reactions (Calvin cycle). Differences between C₃ and C₄ plants. Factors affecting this process. Products of photosynthesis.
4. Respiration: Definition and respiratory substrates. Mechanism- Glycolysis, Krebs cycle. Electron transport and oxidative phosphorylation. Anaerobic respiration. Energy balance in aerobic and anaerobic respiration. Respiratory quotients.
5. Growth: Definition; role of auxins, gibberellins, cytokinins, abscisic acid and ethylene in controlling growth. Introduction to plant tissue culture.
6. Photoperiodism: Definition, historical background. Classification of plants based on photoperiodic response. Role of phytochromes, and hormones and metabolites in photoperiodism.
7. Dormancy: Definition and causes of seed and bud dormancy; methods of breaking seed dormancy. Physiological processes during seed germination.
8. Plant Movements: Classification. Tropic movements- phototropism, gravitropism and their mechanisms. Nastic movements.

b) Ecology

1. Introduction, aims and applications of ecology.
2. Soil: Physical and Chemical properties of soil (soil formation, texture, pH, EC, organism and organic matter etc) and their relationships to plants.
3. Light and Temperature. Quality of light, diurnal and seasonal variations. Ecophysiological responses.
4. Water: Field capacity and soil water holding capacity. Characteristics of xerophytes and hydrophytes. Effect of precipitation on distribution of plants.
5. Wind: Wind as an ecological factor and its importance.
6. Population Ecology: Introduction. A brief description of seed dispersal, seed bank, demography, density effects and reproductive strategy.
7. Community Ecology
8. Ecological characteristics of plant community

II. Methods of sampling vegetation (Quadrat and line intercept)

III. Succession.

IV. Major vegetation types of the local area.

8. Ecosystem Ecology

I. Definition, types and components of ecosystem.

II. Food chain and Food web.

III. Biogeochemical cycles, definition, types with emphasis on nitrogen and Hydrological cycles.

9. Applied Ecology

I. Causes, effects and control of water logging and salinity with respect to Pakistan

II. Soil erosion, types, causes and effects (wind and water)

III. Brief concept of pollution types and effects (air, sediments and water pollution)

IV. Brief introduction to biodiversity and conservation with emphasis on Pakistan.

Practicals

A. Plant Physiology

1. Preparation of solutions of specific normality of acids/bases, salts, sugars, molal and molar solutions and their standardization.

2. Determination of uptake of water by swelling seeds when placed in sodium chloride solution of different concentrations.

3. Measurement of leaf water potential by the dye method.

4. Determination of the temperature at which beet root cells lose their permeability.

5. Determination of the effects of environmental factors on the rate of transpiration of a leafy shoot by means of a porometer/by cobalt chloride paper method.

6. Chemical tests for the following cell constituents:

i. Starch

ii. Cellulose

iii. Lignin

iv. Proteins

7. Extraction of chlorophyll from the leaves and separation of component pigments on a paper chromatogram. Study of absorption spectra using spectrophotometer.

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

9. Extraction of amylase from germinating wheat seeds and study of its effect on starch breakdown.

10. Measurement of carbon dioxide evolution during respiration of germinating seeds by the titration method.

11. Measurement of light and temperature.

12. Effect of light and temperature on seed germination.

h) Ecology

13. Determination of physical and Chemical characteristics of soil.
14. Measurements of various population variables
15. Measurement of vegetation by Quadrat and line intercept methods.
16. Field trips to ecologically diverse habitats.
17. Measurements of wind velocity.

Books Recommended

1. Ihsan Illahi (1995). Plant Physiology. Biochemical Processes in Plants. UGC Press.
2. Witham and Devlin. 1986 Exercises in Plant Physiology. AWS Publishers. Boston.
3. Taiz, L. and Zeiger, E. 2002. Plant Physiology. 3rd. Sinauer Publ. Co. Inc. Calif.
4. Salisbury, F.B. and Ross C.B. 1992. Plant Physiology. 5th Edition. Wadsworth Publishing Co. Belmont CA.
5. Hopkins, W.B. 1999. Introduction to Plant Physiology. 2nd Ed. John Wiley and Sons. New York.
6. Schultz et al. (2005). Plant Ecology. Springer-Verlag, Berlin.
7. Ricklefs, R.E. 2000. Ecology. W.H. Freeman and Co., UK.
8. Ricklefs, R.E. 2001. The Economy of Nature. W.H. Freeman and Co., UK.
9. Barbour, M. G., J. H. Burke and W.D. Pitts. 1999. Terrestrial Plant Ecology. The Benjamin-Cummings Publishing Co. Palo Alto, California, USA.
10. Chapman, J.L. and Reiss, M.J. 1995. Ecology. Principles and Applications. Cambridge University Press.
11. Hussain F. 1989. Field and Laboratory Manual of Plant Ecology. National Academy of Higher Education, Islamabad.
12. Krebs, C. J. 1997. Ecology. Harper and Row Publishers.
13. Smith, R. L. 1996. Ecology and Field Biology. Addison Wesley Longman, Inc., New York.
14. Smith, R. L. 1998. Elements of Ecology. Harper and Row Publishers. New York.
15. Subrahmanyam, N.S. and Sambamurthy, A.V.S.S. 2000. Ecology. Narosa Publishing House, New Delhi.
16. Townsend, C.R., Harper, J.L. and Begon, M.E. 2000. Essentials of Ecology. Blackwell Scientific Publications, UK.
17. Odum, E.P. 1985. Basic Ecology. W.B. Saunders.

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ZOOLOGY - IV

IV SEMESTER

PRINCIPLES OF ANIMAL PHYSIOLOGY
(A COMPARATIVE PERSPECTIVE)

4 (3+1)

(59)

ZOL-204

AIMS & OBJECTIVES:

The course aims to teach the students about:

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

COURSE CONTENTS

1. Protection, Support, and Movement

Protection: the integumentary system of invertebrates and vertebrates, movement and support: the skeletal system of invertebrates and vertebrates, movement: non-muscular movement, an introduction to animal muscles: the muscular system of invertebrates and vertebrates.

2. Communication I: Nerves

Neurons: structure and function, neuron communication, introductory accounts of resting membrane potential, action potential (nerve impulse) and transmission of the action potential between cells, invertebrate and vertebrate nervous systems: the spinal cord, spinal nerves, the brain, cranial nerves and the autonomic nervous system.

3. Communication II: Senses

Sensory reception: baroreceptors, chemoreceptors, georeceptors, hygroreceptors, phonoreceptors, photoreceptors, proprioceptors, tactile receptors, and thermoreceptors of invertebrates; lateral line system and electrical sensing, lateral-line system and mechanoreception, hearing and equilibrium in air, hearing and equilibrium in water, skin sensors of damaging stimuli, skin sensors of heat and cold, skin sensors of mechanical stimuli, sonar, smell, taste and vision in vertebrates.

4. Communication III: The Endocrine System and Chemical Messengers

Chemical messengers, hormones chemistry, and their feedback systems, mechanisms of hormone action, some hormones of porifera, cnidarians, platyhelminthes, nemertans, nematodes, molluscs, annelids, arthropods, and echinoderms invertebrates, an overview of the vertebrate endocrine system: endocrine systems of vertebrates other than birds or mammals; endocrine systems of birds and mammals.

5. Circulation, Immunity, and Gas Exchange

Internal transport and circulatory systems in invertebrates, characteristics of invertebrate coelomic fluid, hemolymph, and blood cells, transport systems in vertebrates, characteristics of vertebrate blood, blood cells and vessels; the hearts and circulatory systems of bony fishes, amphibians, reptiles, birds and mammals, the human heart, blood pressure and the lymphatic system, immunity, nonspecific defenses, the immune response, gas exchange, respiratory

surfaces. Invertebrate and vertebrate respiratory systems: cutaneous exchange, gills, lungs, and lung ventilation. Human respiratory system: gas transport.

6. Nutrition and Digestion

Evolution of nutrition: the metabolic fates of nutrients in heterotrophs; digestion: animal strategies for getting and using food, diversity in digestive structures of invertebrates and vertebrates. ~~the mammalian digestive system~~: gastrointestinal motility and its control, oral cavity, pharynx and esophagus, stomach, small intestine: main site of digestion, large intestine; role of the pancreas in digestion; and role of the liver and gallbladder in digestion.

7. Temperature and Body Fluid Regulation

Homeostasis and Temperature Regulation: The Impact of Temperature on Animal Life: Heat Gains and Losses: Some Solutions to Temperature Fluctuations: Temperature Regulation in Invertebrates, Fishes, Amphibians, Reptiles, Birds and Mammals: Heat Production in Birds and Mammals: Control of Water and Solutes (Osmoregulation and Excretion): Invertebrate and Vertebrate Excretory Systems: How Vertebrates Achieve Osmoregulation: Vertebrate Kidney Variations: Mechanism in Metanephric Kidney Functions.

8. Reproduction and Development

Asexual reproduction in invertebrates: advantages and disadvantages of asexual reproduction; sexual reproduction in invertebrates: advantages and disadvantages of sexual reproduction; sexual reproduction in vertebrates: reproductive strategies: examples of reproduction among various vertebrate classes: the human male reproductive system: spermatogenesis transport and hormonal control, reproductive function: the human female reproductive system: folliculogenesis, transport and hormonal control, reproductive function: hormonal regulation in gestation: prenatal development and birth events of prenatal development: the placenta: birth: milk production and lactation.

9. Descriptive Embryology

Fertilization; embryonic development: cleavage, and egg types: the primary germ layers and their derivatives: echinoderm embryology; vertebrate embryology: the chordate body plan; amphibian embryology; development in terrestrial environments; avian embryology; the fate of mesoderm.

PRACTICALS

1. Study of insect chitin, fish scale, amphibian skin, reptilian scales, feathers and mammalian skin.
2. Study and notes of skeleton of *Labeo*, *Rana tigrina*, *Varanus*, fowl and Rabbit.
(Note: Exercises of notes on the adaptations of skeletons to their function must be done)
3. Earthworm or leech, cockroach, freshwater muscles, *Channa* or *Catla*, *catla* or *Labeo* or any other local fish, frog, pigeon and rat or mouse and rabbits are representative animals for study in dissections.
4. Study of models or preserved brains of representative animals and notes on adaptations.
5. Study of nervous system of earthworm and a fish.
6. Study of endocrine system in an insect and a mammal.
7. Study of different types of blood cells in blood smear.
8. Study of heart, principal arteries and veins in a representative vertebrate (dissection of representative fish/mammals).
9. Study of respiratory system in cockroach or locust and a vertebrate representative (Model).

10. Study of excretory system in an invertebrate and a vertebrate representative (Model).
11. Study of nutritive canal in an invertebrate and a vertebrate representative (Dissection).
12. Study of male reproductive system in an invertebrate and a vertebrate representative (Dissection).
13. Study of female reproductive system in an invertebrate and a vertebrate representative (Dissection).
14. Study of hormonal influence of a reproductive function (Model).
15. Study of preserved advanced stages of avian and mammalian development for amniotic membranes and placenta (Model).

BOOKS RECOMMENDED

1. Miller, S.A. and Harley, J.B., 1999 & 2002. ZOOLOGY, 4th & 5th Edition (International). Singapore: McGraw-Hill.
2. Hickman, C.P., Roberts, L.S. and Larson, A., 2004. INTEGRATED PRINCIPLES OF ZOOLOGY, 11th Edition (International). Singapore: McGraw Hill.
3. Pechenik, J.A., 2000. BIOLOGY OF INVERTEBRATES, 4th Edition (International). Singapore: McGraw-Hill.
4. Kent, G.C. and Miller, S., 2001. COMPARATIVE ANATOMY OF VERTEBRATES. New York: McGraw-Hill.
5. Campbell, N.A., 2002. BIOLOGY Sixth Edition. Menlo Park, California: Benjamin/Cummings Publishing Company, Inc.
6. Miller, S.A., 2002. GENERAL ZOOLOGY LABORATORY MANUAL, 5th Edition (International) Singapore: McGraw Hill.
7. Hickman, C.P. and Kats, H.L., 2000. LABORATORY STUDIES IN INTEGRATED PRINCIPLES OF ZOOLOGY. Singapore: McGraw Hill.

MNT-204

INTRODUCTION TO MANAGEMENT
(PRINCIPLES OF MANAGEMENT)

(03)

Course Objectives:

This is a rudimentary course for the students of business administration. The focus of attention will be given to learning fundamental principles of management and of managing people and organization in a historical as well as contemporary world. Students are expected to develop analytical and conceptual framework of how people are managed in small, medium and large public and private national and international organizations.

Course Contents:

- Introduction, overview and scope of discipline
- The evolution and emergence of management thought
- Management functions
- Planning concepts, objectives, strategies and policies
- Decision making
- Organizing: departmentalization, line/staff authority, commitments and group decision making
- Staffing: principles of selection, performance, career planning
- Leading: Motivation, leadership, communication
- Controlling: the system and process and techniques of controlling
- Management and Society: future perspective

BOOKS RECOMMENDED:

- Stephen P. Robins, Mary Coult: Management
- H. Koontz, Odonnell and H. Weihrich: Management
- McFarland: Management: Foundation and Practice
- Robert M. Flumer: The New Management

Semester-IV

(Pre-Engineering Group.)

Course Code	Course Title	Credit Hours
PhyG-402 ✓	Thermodynamics & Statistical Mechanics, Modern Physics	04 ✓
MATHS-441 ✓	Linear Algebra & Differential Equations	04 ✓

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SEMESTER-IV

Course code: **MATH-441**

Title: **Linear Algebra and Differential Equations**

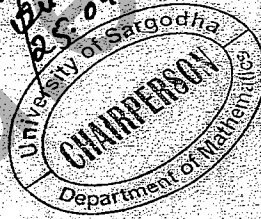
Credit Hours: **3**

Recommended Book: D. G. Zill, Michael R. Cullen: ~~Mathematical~~ **Mathematical Methods** by S.M Yusuf (Ilmi Kitab Khana, Lahore)

Reference books: **Differential Equations and Boundary Value Problems** 3rd Edition, 1997(PWS Publishing Company)

Contents: Algebra of matrices. Types of matrices. Operations on matrices. Determinant and its properties. Co factors and minors. Elementary row and column operations. Echelon form. Reduced Echelon form. Adjoint, inverse and rank of a matrix. Solution of linear algebraic system of equations (homogeneous and non-homogeneous) by use of matrices.

De Formation of differential equations. Different methods of solving first order ODE. Bernoulli's Equation. Second and higher order linear differential equations with constant co-efficients. Cauchy – Euler differential equation.



Course Contents of Physics for BS-Chemistry

THERMODYNAMICS & STATISTICAL MECHANICS, MODERN PHYSICS 4 Cr.h

Statistical Mechanics: Statistical distribution and mean values, Mean free path and microscopic calculations of mean free path. Distribution of molecular speeds, Distribution of energies, Maxwell distribution, Maxwell-Boltzmann energy distribution, Internal energy of an ideal gas. Brownian motion, Qualitative description. Diffusion, Conduction and viscosity.

Heat and Temperature: Temperature, Kinetic theory of the ideal gas, Work done on an ideal gas, Review of previous concepts. Internal energy of an ideal gas. Equipartition of energy. Intermolecular forces. Qualitative discussion. Van der Waals equation of state.

Thermodynamics: Review of previous concepts. First law of thermodynamics and its applications to adiabatic, isothermal, cyclic and free expansion. Reversible and irreversible processes, Second Law of thermodynamics, Carnot theorem, Carnot engines. Heat engine. Refrigerators. Calculation of efficiency of heat engines. Thermodynamic temperature scale: Absolute zero. Entropy, Entropy in reversible process, Entropy in irreversible process. Entropy & second law. Entropy & probability. Thermodynamic functions: Thermodynamic functions (Internal energy, Enthalpy, Gibb's functions, Entropy, Helmholtz functions) Maxwell's relations, TdS equations, Energy equations and their applications. Low Temperature Physics, Liquification of gases, Joule-Thomson effect and its equations. Thermoelectricity, Thermocouple, Seebeck's effect, Peltier's effect, Thomson effect.

MODERN PHYSICS

Quantum Mechanics: Postulates of Quantum Mechanics; Quantum operators, Linear operators & their properties e.g. momentum operator, energy operator, Eigen value equation, Eigen values and eigen functions, Schrodinger equation (time dependent and time independent without derivation) and its applications to step potential, free particle, barrier, tunneling (basic idea), particle in a well, probability density using wave functions of states.

Nuclear Physics: Basic properties of a nucleus, Mass and Atomic Numbers, Isotopes, mass and size of a nucleus, Nuclear force (Basic Idea), Nuclear Radii, Nuclear Masses, Binding energy, mass defect, Nuclear Spin and Magnetism and nuclear force.

Natural Radioactivity: Laws of radioactive decay, half life, mean life, chain disintegration, Alpha-, Beta- and Gamma decays (basic idea), Measuring ionizing radiation (units i.e. Curie, Rad etc.)

Nuclear Reactions: Basic Nuclear reactions, Q-value, Exothermic, Endothermic Nuclear model, Nuclear Reactors (Basic), Nuclear Fusion; Thermonuclear Fusion, Stars.

Introduction to Quantum Optics (Laser) and Plasma Physics:

Basic concepts of plasma and its applications, controlled thermonuclear fusion, and its basic concept of plasma and its requirements for a T-N reactor. Basic concepts and characteristics of LASER, different types of lasers, working of He-Ne Laser, semiconductor diode laser.

M. Tahir

Dr. Muhammad Nawaz Tahir (T.D)
Chairman
Department of Physics
University of Sargodha

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Semester-IV

Course: English -IV Credit Hrs 3

ENG. 204.

Course Aims:

The aim of this course is to train the students in such a manner that they can comprehend and understand different English text patterns by applying different analytical strategies. A particular care has been taken to gratify the aesthetic needs of the learners. The basic aim of this course is to develop critical reading and critical thinking among the students. The course shall enable the learners to develop vocabulary in English by reading dynamic texts and understand different composition patterns in the English language. It shall also give them orientation to different literary genres so that they could themselves be able to compose variety of texts independently.

- Interviews
- Memorandum Writing
- Comprehension & Precise-Writing
- Job-Letter & C. V. Writing
- Report- Writing

Poetry:

- | | |
|--|------------------|
| 1. Departure And Arrival | T.S. Eliot |
| 2. The Road Not Taken | Robert Frost |
| 3. Because I could not stop For Death | Emily Dickinson |
| 4. Say This City Has Ten Million Souls | W. H. Auden |
| 5. The Daisy | Francis Thompson |
| 6. Woman Work | Maya Angelou |

Short Stories:

- | | |
|--------------------|---------------------|
| 1. The Fly | Katherine Mansfield |
| 2. Araby | James Joyce |
| 3. Tell-Tale Heart | E.A. Poe |

Essays:

- | | |
|--|-----------------|
| 1. The Last Sermon by Holy Prophet (Peace Be Upon Him) | |
| 2. Work | Bertrand Russel |
| 3. Three Days to See | Helen Keller |

Novel:

- | | |
|----------------------------|------------------|
| 1. The Old Man And The Sea | Ernest Hemingway |
|----------------------------|------------------|

ading List:

- Burns & McNamara (1987) Literature: A Close Study. McMillan
- Burton, S.H. (1984) Mastering English Language. McMillan
- Devitiis, Mariani & O'Malley (1991) English Grammar for Communication. Longman
- Gill, G. (1985) Mastering English Literature. McMillan
- Guddon, J.A. (1991) Dictionary of Literary Terms and Literary Theory. Penguin
- Herta A. Murphy & Herbert W. Hildebrandt (1991) Effective Business Communication. McGRAW-HILL, INC
- Marie M. Stewart. et al (1985) Business English And Communication McGRAW-HILL, INC.
- P.C. Wren & H. Martin High School English Grammar & Composition.
- Swan, M. and Catherine (2001) How English Works. OUP.

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SEMESTER-V

MATH – 300 Basic Mathematics for Chemist (Cr. 02)

Introduction: Review of basic algebra, Graphs and their significance in chemistry. Trigonometric, Logarithmic and exponential functions. Differentiation, partial differentiation, differential equations and their use in chemical problems. Concept of maxima and minima. Integration, Determinants and Matrices, their properties and use in chemical problems. Solutions of linear equations (simple, determinant and matrices methods), operator theory, The eigen value problem and curve fitting.

Recommended Books

1. Paul M. "Maths for Chemistry" Edition 1st, Oxford University Press, UK (2006).
2. Ghram D. "Mathematics in Chemistry" Edition 1st, Prentice Hall, NY (1996).
3. Tebutt P., "Basic Mathematics for Chemists" 2nd Edition. John Wiley & Sons, NY (1998).

CHEM – 311 Analytical Chemistry (Cr.03)

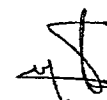
Data Handling: Introduction to Analytical Chemistry, Sampling, Types of samples, Techniques/ Steps involved in sample preparation, Drying and ignition, Weighing, Analytical balance, its construction working volumetric glassware, Errors in measurements, Calibration of glassware, Steps involved in chemical analysis, System for units of measurements and their inter conversion, Chemical concentration and preparation of solutions, Calibration and calibration curves (construction and interpretation), Standard addition and internal standard methods, Statistical treatment of analytical data; Precision, accuracy and types of errors, Sample, Population, Mean, Average, Median, Range, Standard Deviation, Variance, Significant figures, Chemical Equilibrium and its types.

Separation Techniques: Chromatography (Introduction, Classification.) TLC. Column & Ion exchange chromatography (with reference to principles & applications). Electrophoresis & Solvent Extraction.

(3+1)

Analytical Chemistry Lab – I (Cr. 01)

1. Calibration of glass ware (Pipette, Burette, Flask) used for volumetric Analysis.



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2. Use of Analytical balance and calculation of standard deviation.
3. Use of pH meter for plotting acid - base titration curve and assay of commercial caustic soda.
4. Plotting of first differential curve for titration of acetic acid and commercial soda.
5. Measurement of solubility products of sparingly soluble salts.
6. Determination of HCl by titrating with NaOH and plotting of a titration curve.
7. Packing of chromatographic column and separation of mixture of dyes.
8. Separation of various components of plant extract by column chromatography.
9. Separation of mixture of dyes by Radial chromatography.
10. Separation of mixture of Amino acids by paper chromatography.
11. Coating of TLC plates and separation of mixture of dyes.
12. Separation of mixture of Amino acids by TLC.

Recommended Books

1. Skoog, D. A. West, D. Holler, J. M.F., Crouch S. R. Fundamentals of Analytical Chemistry. 8th ed. Saunders College Publishing, Philadelphia. (2003).
2. Christian, G.D. Analytical Chemistry, John Wiley & Sons, NY (2005).
3. Harris, D.C. Quantitative Chemical Analysis, Freeman, NY (2003).

CHEM – 362 Inorganic Chemistry – I (Cr.03)

(3+1)

Survey of Inorganic Structures and Bonding: Structures of molecules having single bonds, Resonance and formal charge. Complex structures-a preview of coming attractions. Electron-deficient molecules. Structures-having unsaturated rings. Bond energies.

Chemistry of Lanthanides and Actinides: Structure, occurrence and preparation, Separation and electronic configuration, oxidation states, spectral and magnetic properties, Complex formation, Applications and uses of elements and their compounds.

Chemistry of Coordination Compounds: Introduction of d-block elements, Nomenclature, Werner's theory, Valence bond theory, Crystal field and Ligand field theory, Molecular orbital theory, Jahn-Teller Theorem, Magnetic properties, the spectrochemical series and color of metal complexes, Isomerism and Stereochemistry of coordination compounds, Geometry of complexes having coordination number 2 to 6, Applications of coordination compounds in chemistry, life and industry. Composition and Stability of Complexes.

Non – aqueous Solvents: Introduction, classification of solvents, Types of reactions in non-aqueous solvents, effect of physical and chemical properties of solvents, study of reactions in liq. NH₃, liq. SO₂, liq. HF and liq. BrF₃, Reactions in molten salt system.

Inorganic Chemistry Lab – I (Cr. 01)

1. Qualitative Analysis of inorganic mixture comprising of six radicals by micro and semimicro techniques.
2. Estimation of Halide ions (Cl, Br, I) by adsorption indicator.
3. Complexometric titrations using EDTA.
 - a. Ni
 - b. Ca (II) and Mg (II) in a mixture
 - c. Mg (II), Mn (II) and Zn (II) in a mixture.


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Recommended Books

1. Cotton, F.A. and Wilkinson, G. Advanced Inorganic Chemistry, 5th Edition, John Wiley, NY (1988).
2. Greenwood, N.N. and Easnow, A. Chemistry of the Elements, 2nd Edition, Pergamon NY (1984).
3. Joly, W.L., Principles of Inorganic Chemistry, McGraw Hill, (1985).
4. Sharpe, A.G. Inorganic Chemistry, 2nd Edition, John Wiley, NY (1987).
5. de Lavis, R., Principles of Quantitative Chemical Analysis, 1st Edition, WCB/McGraw Hill, NY (1997).
6. Harris, D.C. Quantitative Chemical Analysis. Freeman, NY (2003).

CHEM – 372 Organic Chemistry – I (Cr.03)

(3+1)

Nomenclature: IUPAC nomenclature of polyfunctional aliphatic, alicyclic, aromatic, heterocyclic, multicyclic organic compounds, spiro and allenes.

Structure and reactivity: Inductive effect, resonance, hyperconjugation, aromaticity & tautomerism. The effect of structure, medium and steric factor on the strength of acids, bases and on acid-base equilibria. Introductory linear free energy relationship.

Stereochemistry of organic compounds: Configuration vs conformation. Wedge-head, Saw-horse, Newman & Fischer projections. Baeyer's Strain theory, conformational isomerism in acyclic, alicyclic compounds (cyclobutane, cyclopentane, cyclohexane), mono / di-substituted cyclohexanes and condensed rings. Locking groups. Geometrical Isomerism: *cis/trans*, *E/Z* & *syn/anti* conventions. Optical Isomerism: Chirality and symmetry. Optical isomerism of compounds upto three asymmetric centers. Relative and absolute configuration (CIP rule & *D/L*, *R/S*, *r/s*, *aR/aS* conventions), Optical isomerism in biphenyls, allenes and spiro compounds. Racemization, resolution of racemic modification and introductory asymmetric synthesis. Stereospecificity vs stereoselectivity. Determination of configuration.

Recommended Books


1. Streitwieser, A., C. Heathcock and E. M. Kosower, Introduction to Organic Chemistry, Macmillan, NY. (1998).
2. Pine, S. H., Organic Chemistry, McGraw-Hill, NY. (1987).
3. Morrison, R. T. and R. N. Boyd, Organic Chemistry, Allyn & Bacon, London. (1987).
4. Clayden, Greeves, Warren and Wothers, Organic Chemistry, Oxford, London. (2001).
5. Kemp, W., Organic Spectroscopy, Macmillan, London. (1990).
6. Solomons, G. "Organic Chemistry" Edition 7th, McGraw-Hill, New York. (2003).

Organic Chemistry Lab. – I (Cr.01)

Separation & Identification of two and three component mixture of organic compounds by physical and chemical methods.

Recommended Books

1. Streitwieser, A., Heathcock, C. and Kosower, E. M. Introduction to Organic Chemistry, Macmillan, New York (1998).
2. Pine, S. H., Organic Chemistry. (5th Edition) McGraw-Hill, NY. (1987).
3. Solomons, T.W.G., Fundamentals of Organic Chemistry, Wiley, NY (2003).
4. Kemp, W., Organic Spectroscopy, Macmillan, London (1990).
5. Morrison, R.T. and Boyd, R.N. Organic Chemistry, Allyn & Bacon, Boston (1987).


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CHEM – 382 Physical Chemistry – I (Cr.03)

(3+1)

Chemical Thermodynamics: Review of first law of thermodynamics. Second law of thermodynamics and its applications. Clausius in equality. Nernst heat theorem and its applications. Third law of thermodynamics and determination of absolute entropy. Entropy of mixing. Partial molal quantities.

Kinetic theory of gases: Maxwell's law of distribution of velocities and derivation of average velocity, most probable velocity and root mean square velocity from the law. Significance of Maxwell's law. Derivation of Maxwell's distribution for kinetic energy. Barometric formula, effect of altitude, temperature and molecular mass on vertical distribution of particles.

Chemical Kinetics: Concept of order of reaction. Kinetics of third order reactions with different concentration and molecular identity. Kinetics of opposing, reversible, consecutive and parallel reactions. Kinetics of thermally excited chain reactions. Theories of reactions.

Physical Chemistry Lab – I (Cr.01)


1. Determination of specific and molar rotations of optically active substance in solution polarimetrically.
2. Percentage by refractometer.
3. Verification of Beer-Lambert's law, and determination of unknown concentration of KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ solution by colorimeter.
4. Determination of distribution coefficient of I_2 between H_2O and CCl_4 .
5. Preparation of buffer solution and measurement of exact pH-value by pH meter.

Recommended Books

1. Atkins P.W., "Physical Chemistry" (6th Ed). ELBS Oxford University Press (1998).
2. Alberty R. A. & Silvey., "Physical Chemistry" (7th Ed). John Wiley and Sons (1992).
3. Barrow G. M., "Physical Chemistry" (5th Ed). McGraw Hill, Inc., (1998).
4. Castellan G. W., "Physical Chemistry" (3rd Ed). Norasa Publishing House. (2004).
5. Gurdeep R. "Advanced Physical Chemistry" (3rd Ed). Krishna Prakashan Media (P) Ltd. (2008).

SEMESTER-VI**STAT- 300 Basic Statistics (Cr.02)**

1. Statistics- Introduction.
Definition, Descriptive and inferential statistics, Population, Sample, Data collecting.
2. Graphical Representation.
 - Simple Bar chart
 - Multiple Bar chart
 - Rectangle Sub-divided Chart
 - Histogram
 - Frequency Polygon
 - Histogram
 - Pi- Chart
3. Central Tendencies (A.M., G.M. Median, Mode, H.M. for Ungrouped Data.


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4. Quantiles with Interpretation (for ungrouped data).
 - Quartiles
 - Percentiles
 - Deciles
5. Measures of dispersion (Mean Deviation, Variance, Standard Deviation, Coefficient of Variation).
6. Basic Probability Theory.
7. Regression: Definitions of Simple linear regression, multiple regression (for two independent variables), and Correlation.
8. Estimation: Point estimate, interval estimates, Confidence Interval for Single Mean, Difference of Mean.
9. Testing of Hypothesis: t- test for single mean for paired samples and for Independent samples.
10. ANOVA, Multiple Comparison Test, (LSD, and DUCANSAN).
11. Chi Square for Association.

Recommended Books

1. William Navidi, Statistics for Engineers and Scientists. ISBN-13: 978-0073376332, John Wiley, New York, USA, (2010).
2. John Schuenemeyer, Larry Drew Statistics for Earth and Environmental Scientists. John Wiley, New York, USA, (2011):

CHEM – 322 Biochemistry (Cr.03)

(3 + 1)

History and Scope of Biochemistry. Origin and nature of biomolecules.

Carbohydrates: (Definition and Classification, Monosaccharides: Pyranose and Furanose ring structures. Stereoisomerism and Optical isomerism. Disaccharides; Structures, Polysaccharides, starch, Glycogen and Cellulose. Modified Carbohydrates, Glycoproteins and Glycolipids).

Proteins: (Amino acids, classification and properties. Stereochemistry, Primary, Secondary, Tertiary and Quaternary structures Biological functions of proteins and peptides, Protein folding and Stability).

Enzymes: (Chemical Nature, Nomenclature and Classification. Enzyme activity. Coenzymes and immobilized enzymes, Specificity of Enzymes, Enzyme Inhibition. Regulation of Enzyme activity).

Lipids: (Structures and classification of Fatty Acids, essential and non-essential fatty acids, Phospholipids, Fats and oils; Hydrogenation, Oxidation and Rancidity, Beta-oxidation of fatty acids, Lipid Bilayer, Lipid Mobility).

Nucleic Acids: (Purines and pyrimidines, nucleosides and nucleotides, Structural and functional differences between DNA and RNA. Types of DNA and RNA, their functions in biological systems. Central Dogma and its significance. Fundamentals of DNA Replication, Transcription and Translation).

Vitamins: (Introduction, classification, chemistry and biological significances of vitamins A, B, C, D, E and K).

Biochemistry Lab – I (Cr.01)

1. Safety Lab Practices
2. Standard Buffer preparation and use of pH meter

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3. Operation and use of micropipettes
4. Qualitative Tests for carbohydrates (Mono-, Di-, and polysaccharides, Pentoses and Hexsoses)
5. Quantitative Determination of Reducing Sugars by using Calorimetric Method (Spectrometric)
6. Enzymatic Hydrolysis of Glycogen and Starch
7. Phenyl Hydrazine Test for Reducing Sugars (Osazone Test)
8. Effect of Alaklies on Sugars
9. Qualitative tests for fats, Sterols and Phospholipids
10. Saponification Tests and Iodine Values of Fat
11. Isolation of DNA by from Plants and Animal Tissues
12. Qualitative tests for Amino Acids
13. Estimation of protein by Kjeldahl, Lowery methods
14. Separation of Amino Acids using Paper Chromatography and Thin Layer Chromatography (TLC)
15. Determination of Ash Contents of Food
16. Determination of Percentage Moisture Contents of Dry Mass in Food
17. Determination of Ascorbic acid in Lemon Juice
18. Use of Online available Protein Databases
19. Determination of Secondary structure of Proteins using online available software

Recommended Books

1. Lehninger, A.L. Principles of Biochemistry, Worth Publisher, New York (2001).
2. Voet, D. and Voet, J.G. Biochemistry, John Wiley & Sons, New York. (2001).
3. Murray, R.K., Mayes, P.A., Granner D.K. and Rodwell, V.W. Harper's Biochemistry, Appleton and Lange, UK (2000).
4. Zubay, G. Biochemistry, 4th Edition, Macmillan Publishing Co. NY (1999).
5. Stryer, L. Biochemistry. Freeman & Co. NY (1994).
6. Bryce, C.F.A. Microcomputers in Biochemistry: A practical approach, Oxford University Press, UK (2002).

CHEM – 363 Inorganic Chemistry – II (Cr.03)

(3+1)

Dipole Moments and Intermolecular Interactions: Dipole moments: Introduction, measurements & implications in inorganic molecules, dipole-dipole forces, dipole-induced dipole forces, London (dispersion) forces & other intermolecular forces, hydrogen bonding.

VSEPR model followed by VB Theory: for determination of geometries of molecules and ions containing sigma bond as well as pi-bonds, Band theory of metallic bonding (Conductors, Insulators and Semiconductors).

pi – Acceptor Ligands: Transition metal carbonyls (Mononuclear, Binuclear, Polynuclear), The eighteen electron rule as applied to metal carbonyls, Evaluation of structures based on spectroscopic evidence, Chemistry of metal carbonyls. Applications of metal carbonyls and their derivatives to catalysis and organic synthesis.

Organic Reagents used in Inorganic Analysis: Types of reagents, their specific nature and methods of applications with specific examples, Complexometric titrations involving various reagents (EDTA etc), Chelates and chelate effect, Role of organic reagents in different analytical techniques.

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Inorganic Chemistry Lab – II (Cr. I)

1. Gravimetric Estimations
 - a. Barium ions
 - b. Oxalate ions
2. Redox titrations
 - a. Cu (II) by Potassium iodate
 - b. Fe (II) by Ceric sulphate
3. Preparation of four Inorganic compounds in pure state using different techniques of synthesis
 - a. *tris* – Etylenediamine Ni(II) chloride dihydrate
 - b. Pot. Trioxalatoaluminate (III)
 - c. Ammonium Ni(II) sulphate
 - d. Hexa aquochromium (III) chloride

Recommended Books

1. Greenwood, N.N. and Easnshaw, A. Chemistry of the Elements, 2nd Edition, Pergaman, NY (1984).
2. Joly, W.L. Principles of Inorganic Chemistry, McGraw Hill, NY (1985).
3. S. Sharpe, A.G. Inorganic Chemistry, 2nd Edition, John Wiley, NY (1987).
4. de Lavis, R., Principles of Quantitative Chemical Analysis, 1st Edition, WCB/McGraw Hill, NY (1997).
5. Harris, D.C. Quantitative Chemical Analysis, Freeman, N. Y. (2003).
6. Huheey, J. E., Keiter, E. A. and Keiter, R. L., "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper and Row, New York, (2001).
7. Kotz, J. C. and Treichel, P. Chemistry and Chemical Reactivity, 4th Edition, Saunders College Publishing, NY (1999).
8. Cotton, F. A. and G. Wilkinson, Advanced Inorganic Chemistry, 5th Edition, John Wiley, NY (1988).

CHEM – 373 Organic Chemistry – II (Cr.03)

(3+1)


Introduction and classification of reaction mechanism on different basis. Benefits of thermodynamic and kinetic data towards reaction mechanism. Kinetic vs thermodynamic control. Isotopic labeling and trapping of intermediates. Selectivity (Regio-, Chemo- and Stereoselectivity) vs Stereospecificity.

Addition reactions involving C=C, C≡C and C=O. *Syn* vs *anti* additions. Factors affecting addition reactions. Conjugate (1,4-) vs direct (1,2-) additions.

Classification of elimination reactions. *Syn* / *anti* and E₁cB eliminations. E₁ vs E₂. Factors affecting eliminations.

Electrophilic and nucleophilic substitution reactions at aromatic systems. Nucleophilic substitution reactions (S_N1, S_N2, S_Ni, S_N1', S_N2', S_Ni', Neighbouring group participation etc.) at aliphatic C. Th mechanism.

Active Methylene Compounds: Enolization and acid/base catalyzed aldol condensations. Alkylation, arylation and acylation of active methylene compounds. Conditions, mechanism and synthetic applications of the following reactions. Claisen reaction, Claisen-Schmidt


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reaction, Knoevenagel reaction, Perkin reaction, Reformatsky reaction, Stobbes condensation, Darzen's glycidic ester synthesis, Mannich reaction and Wittig reaction.

Recommended Books

1. March, J., Advanced Organic Chemistry, Wiley, NY. (1992).
2. Pine, S. H., Organic Chemistry, McGraw-Hill, New York. (1987).
3. Clayden, Greeves, Warren and Wothers, Organic Chemistry, Oxford, London. (2001).
4. Gould, E. S., Mechanism and Structure in Organic Chemistry, Holt, Rinehart & Winston, New York. (1959).
5. House, H. O., Modern Synthetic Reactions, Benjamin, California. (1972).

Organic Chemistry Lab – II (Cr. 1)

Estimation of phenol & acetone, amino groups, synthesis of azodyes, iodobenzene, iodoform, sulphanic acid, cinnamic acid, benzil & benzilic acid, ethyl benzene.

Recommended Books

1. March, J., Advanced Organic Chemistry, Wiley, NY. (1992).
2. Pine, S. H., Organic Chemistry, McGraw-Hill, New York. (1987).
3. Gould, E. S., Mechanism and Structure in Organic Chemistry, Holt, Rinehart & Winston, New York. (1959).
4. House, H. O., Modern Synthetic Reactions, Benjamin, California. (1972).

CHEM – 383 PHYSICAL CHEMISTRY – II (Cr.03)

(3+1)

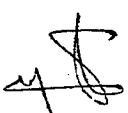
Atomic and molecular structure: (Schrodinger's wave equation. Postulates of quantum theory. Operators, Eigen value, Eigen function, orthogonality and normalized wave functions. Motion of particle in three dimensional box and idea of degeneracy. Mathematical treatment of rigid rotator and calculation of bond length of simple molecule).

Statistical thermodynamics: (Stirling approximation. Probability. Statistical treatment of entropy. The Boltzman distribution law and partition function. Physical significance of partition function. Separation of partition function. Partition function and thermodynamics functions like internal energy and entropy. Translational, rotational, vibrational and electronic partition function and their comparison).

Electrochemistry: (Concept of conductance of electrolytes. Debye-Huckle equation and limiting law. Ionic strength, weak electrolytes and Debye-Huckle theory. Activity and activity coefficients of electrolytic solutions. Determination of activities. Concentration cells. Determination of e.m.f. of concentration cells with and without transference. Fuel cells and hydrocarbon fuel cells).

Physical Chemistry Lab – II (Cr.01)

1. Determination of pKa and Ka value of a weak acid.
2. Molecular mass determination of non-electrolyte solute by cryoscopic method.
3. Determination of number of associated molecule of Benzoic acid in Benzene and to determine the Distribution coefficient of Benzoic acid between H₂O and Benzene.
4. Determination of unknown concentrations of KMnO₄ and K₂Cr₂O₇ solution spectrophotometrically.
5. Determination of percentage purity of an optically active compound.


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Recommended Books

1. Atkins P.W. "Physical Chemistry" 6th Ed. ELBS Oxford University Press, UK (1997).
2. Alberty R. and Silvey, A. "Physical Chemistry" 7th Ed. John Wiley & Sons, NY (1992).
3. Barrow G. M. "Physical Chemistry" 5th Ed. McGraw Hill, Inc. CA (1998).
4. Castellan G. W. "Physical Chemistry" 3rd Ed. Norasa Publishing House, Delhi (2004).
5. Gurdeep R. "Advanced Physical Chemistry" 3rd Ed. Krishna Prakashan Media (P) Ltd. Delhi (2008).

SEMESTER-VII**a) Compulsory Papers (Total 05 credits)****CHEM – 441 Forensic Chemistry (Cr.02)**

This subject will integrate the concept and techniques developed in chemistry, physiology and biochemistry and apply them to the pharmacology and detection of drugs and toxins. Most important topics in forensic science are fingerprinting, forensic serology, hair and fiber analysis, explosive residues, glass comparisons, drug analysis, bullet and cartridge analysis, DNA analysis, Forensic botany and forensic toxicology.

Recommended Books

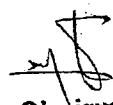
1. Bell, S. Forensic Chemistry, 1st Edition, Prentice Hall, NY (2006).
2. Jackson, A.R.W. and Jackson, J.M. Forensic Science, 1st Edition, Prentice Hall, NY (2004).
3. Khan, J., Kennedy, T.J. and Christian, D.R. Jr. Basic Principles of Forensic Chemistry, Humana Press, NJ (2009).
4. Eckert, W.G. Introduction to Forensic Sciences, 2nd Edition, Elsevier, NY. (1992).
5. Genge, N.E. The Science of Crime Scene Investigation: The Forensic Casebook, Ballentine Books, NY. (2002).

CHEM – 461 Industrial Chemistry (Cr. 03)

Chemical processes i.e. unit operations, unit process, Chemical process control and instrumentation, Safety; Hazards such as fire or toxic materials. Research and development, Important modern industries, their chemistry and technology, like pharmaceutical, polymer, paper, petroleum, oil, fats and waxes, water conditioning, flavors and food additives, sugar and starch, steel, soap and detergent etc.

Recommended Books

1. Eckenfelder, W.W. Industrial Water Pollution control, McGraw Hill Book Co. NY. (2000).
2. Durney, L.J. Graham's Electroplating Engineering Handbook, CBS Publishers and Distributors, New Delhi (1997).
3. Witcoff, H.A. and B.G. Reuben. Industrial Organic Chemicals, Wiley, NY (1996).
4. Kent, J.A. Riegel's Handbook of Industrial Chemistry, CBS Publishers and Distributors, New Delhi. (1997).
5. Kovaces, M. Pollution Control and conservation, Ellis Harwood Ltd., Chichester, (1985).


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6. McGhee, T.J. Water Supply and Sewerage. McGraw Hill Book Co. NY, (1991).
7. Chattopadhyay, A. Unit Operations in Chemical Engineering. Khanna Publishers, New Delhi (1993).
8. Smith, R. Chemical Process Design, McGraw Hill Book Co. NY, (1995).
9. Moor, W.R., An Introduction to Polymer Chemistry. London Press, London (1967).
10. Guez, R. Principles of Polymer Systems. McGraw Hill, NY (1987).
11. Crompton, T.R. Analytical Instrumentation for the water industry, Butterworth, Heinmann Ltd., Oxford. (1991).
12. Sirivastawa, A.K. Small, Medium and Large Scale Industries. Small Industries Research Institute, New Delhi, (1996).
13. Shreve, R.M. Chemical Industry Processes. McGraw Hill Publishing Co., NY (1967).

b) **Specialization (Total 11 credits)**

i) **ANALYTICAL CHEMISTRY**

CHEM – 412 Advanced Spectroscopy – I (Cr.03)

Atomic Spectrometry: Atomic Absorption and Flame Emission Spectrometry, instrumentation and applications. Emission Spectrometry with plasma and electrical discharge sources, UV/Visible Spectrophotometry: basic principle, instrumentation and applications. (3+1)


Analytical Chemistry Lab. III (Cr.01)

1. Measurement of λ_{max} and calculation of Molar absorptivity of potassium permanganate.
2. Plotting of calibration graph and measurement of unknown sample concentration.
3. Use of standard addition method in Spectrophotometry.
4. Determination of iron (II) using 1,10-phenanthroline method.
5. Determination of iron (III) using thiocyanate method involving solvent extraction.
6. Determination of phosphate by Spectrophotometry using molybdenum blue method.
7. Determination of Sodium in tap water sample by using Flame photometer.
8. Determination of Potassium in tap water sample by using Flame photometer.
9. Determination of Calcium in chalk sample by using Flame photometer.
10. Determination of Calcium in drinking water by EDTA.
11. Identification of free salicylic acid in aspirin by using TLC.
12. Determination of Methylene blue value of activated charcoal.
13. Determination of iron in tap water by AAS.
14. Determination of copper content in milk samples by AAS.

Recommended Books

1. Skoog, D. A. West, D. Holler, J. M.F., Crouch S. R. Fundamentals of Analytical Chemistry. 8th ed. Saunders College Publishing, Philadelphia (2003).
2. Christian, G.D. Analytical Chemistry, John Wiley & Sons, NY (2005).
3. Harris, D.C. Quantitative Chemical Analysis, Freeman, NY (2003).

CHEM – 413 Advanced Chromatographic Techniques (Cr.03)


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Gas-Liquid chromatography, concepts of theoretical plates, Van - deemter equation, High-performance liquid chromatography. instrumentation and applications of these techniques.

Recommended Books

1. Christian, G.D. Analytical Chemistry, John Wiley & Sons, NY (2005).
2. Harris, D.C. Quantitative Chemical Analysis, Freeman, NY (2003).
3. Skoog, D.A. West, D. Holler, J. M.F., Crouch S. R. Fundamentals of Analytical Chemistry. 8th ed. Saunders College Publishing, Philadelphia (2003).

CHEM – 414 Instrumental Methods of Analysis (Cr.03)

Potentiometry: Nernst equation, reference electrodes, Ion - selective electrodes, Glass electrodes for pH measurements. Potentiometric titrations:

Fluorescence and Phosphorescence spectrometry: Atomic and Molecular Fluorescence, basic principles and applications, Structural factors, measurements, comparison of Luminescence and UV – Visible absorption methods.

Recommended Books

1. Christian, G.D. Analytical Chemistry, John Wiley & Sons, NY (2005).
2. Harris, D.C. Quantitative Chemical Analysis, Freeman, NY (2003).
3. Skoog, D.A. West, D. Holler, J. M.F., Crouch S. R. Fundamentals of Analytical Chemistry. 8th ed. Saunders College Publishing, Philadelphia (2003).

ii) **BIOCHEMISTRY**

CHEM– 423 Bioenergetics and Metabolism (Cr.03)

(3+1)


Principles of Bioenergetics and Biochemical, Reaction Types, Glycolysis, Gluconeogenesis, and the Pentose Phosphate Pathway, Principles of Metabolic Regulation, Illustrated with the Metabolism of Glucose and Glycogen, The Citric Acid Cycle, Fatty Acid Catabolism, Amino Acid Oxidation and the Production of Urea, Oxidative Phosphorylation and Photophosphorylation. Carbohydrate Biosynthesis in Plants and Bacteria, Lipid Biosynthesis, Biosynthesis of Amino Acids, Nucleotides, and Related Molecules, Integration and Hormonal Regulation of Mammalian Metabolism

Recommended Books

1. Lehninger, A.L. Principles of Biochemistry, Worth Publisher, New York (2001).
2. Voet, D. and Voet, J.G. Biochemistry, John Wiley & Sons, New York. (2001).
3. Zubay, G. Biochemistry, 4th Edition Macmillan Publishing Co. NY (1999).
4. Stryer, L. Biochemistry, Freeman & Co. NY (1994).
5. Dawis, B.D., Dulbecco, R., Eisen, H.N. and Ginsbery, H.S. Microbiology, Harper & Row. NY (2002).

Biochemistry Lab. III (Cr.01)

1. Estimation of BMR by a formula method
2. Factors affecting the (basal) metabolic rate in an individual
3. Calculate the respiratory quotient (RQ) value.
4. Analysis of respiratory gases


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5. Estimation of sugars in blood by Colorimetric method
6. Estimation of sugars in urine by Colorimetric method
7. Estimation of protein in blood by Colorimetric method
8. Glycation
9. Determination of Secondary structure of Proteins using online available software.
10. Protein purification by using different chromatographic techniques
11. calculation of recommended daily allowance (RDA)
12. Assessment of vitamins in different food stuff.
13. Assessment of minerals in given food stuff.

CHEM – 424 Microbiology & Industrial Fermentations (Cr.03)

Scope of Microbiology and fermentation. General morphology and cytology of microorganisms. Microscopic Examination of Microorganism. Classification and methods of isolation of microorganisms. General effects of environments on microorganisms, nutrition of microorganisms. Growth (Normal growth Cycle and Continuous Culture) and Reproduction, Pure culture Study.


Introduction to industrial microbiology; Research Methodology, Bioenergetics of microorganism for the industries purpose, oxygen transfer, Industrial Uses of Bacteria, Molds, Yeast and viruses Application of chemostate and turbidostate, Microbial production of Alcohol, Citric acid and Acetic acid with mechanism; Antibiotic, enzyme production, Fermented Foods Vinegar production, Amino Acid, Petroleum Microbiology and Deterioration of Materials. (Paper, Textile and Cordage, Painted Surface) and Analytical Microbiology.

Recommended Books

1. Nelson & Cox. Lehninger Principles of Biochemistry. 5th edition W. H. Freeman (2008).
2. DJ Voet, GJ Voet and CW Pratt. Fundamentals of Biochemistry. 3rd edition. John Wiley & Sons Inc. (2008)
3. JM Berg, JL Tymoczko & L Stryer. Biochemistry. 6th edition. WH Freeman & Co. (2007)
4. Richard A. Harvey. Biochemistry. 3rd Edition (Lippincott's Illustrated Reviews Series). (2005).
5. R Murray, D Bender. Harpers Illustrated Biochemistry. 29th Edition (LANGE Basic Science), (2013).

CHEM – 425 Enzymes and Nutrition (Cr.03)

Enzyme Structure and Functions: Chemical nature, nomenclature and classification of enzymes, Cofactors, effect of different factors on enzyme activity, Kinetics Studies of substrate reactions. (MICHAELIS- MENTEN EQUATION and LINEWEAVER-BURKE PLOT) Quantitative assay of enzyme activity. substrate specificity, Enzyme substrate interactions and nature of the active site, Models Of enzyme substrate complex Mechanism of enzyme action with specific reference to Chymotrypsin and nuclease, Inhibition. Competitive, uncompetitive, non-competitive and irreversible inhibition


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Regulatory enzymes: Allosteric enzymes, Multi-enzyme systems, Zymogens, Isoenzymes
 Non-Protein Biocatalysis Ribosome's. (RNA as Enzyme), enzymatic control of metabolic pathways, Therapeutic uses of Enzyme and Immobilized enzymes.

Nutrition: Classification of Food, Source of Nutrients, Repiration, Caloric value of food, Calorimetry, Respiratory Quotient, Basal metabolic rate (BMR) and General Factor, chemical composition, functions, deficiency symptoms and requirements of Nutrients and their biological values, Balanced diet, Role of nutrition in growth, development and Chronic disease.

Recommended Books

1. Lehninger, A. L. Principles of Biochemistry, Worth Publisher, New York (2001).
2. Voet, D. and J. G. Voet, Biochemistry, John Wiley & Sons, New York. (2001).
3. Murray, R. K., P. A. Mayes, D. K. Granner and V. W. Rodwell, Harper's Biochemistry, Appleton and Lange (2000).
4. Robert, Harper's Biochemistry, 25th Edition. (2000).
5. West, Text Book of Biochemistry 4th Edition. (2000).
6. Zubay, G. Biochemistry, 4th Edition Macmillan Publishing Co. (1999).
7. Stryer, L. Biochemistry, Freeman & Co. (1994).

iii) INORGANIC CHEMISTRY

CHEM- 464 Advanced Inorganic Chemistry (Cr.03)

(3+1)

Stereochemistry Periodicity: Concepts of Stereochemistry and Periodicity (Periodic Properties), Introduction, First and Second row anomalies, the use of d-orbitals by non-metals, Reactivity and d-orbital participation, The use of p-orbitals in pi-bonding, Periodic anomalies of non-metals and post transition metals.

Nuclear Chemistry: Introduction, classification of Nuclides, Radioactivity and radioactivity series, artificial radioactivity, units of radioactivity, Determination of Half-life, Nuclear Fission and Fusion reactions, Applications of radio Isotopes as traces.

Structure of Inorganic Solids: Introduction, The close packing of spheres, the structure of ionic solids, Ionic radii, Crystal structures and defect solid state.

Thermal Methods of analysis: Introduction, instrumentation, applications.

Inorganic Chemistry Lab. III (Cr.01)

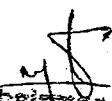
Use of some organic reagents for the estimation of various elements

- a) 8-Hydroxyquinoline Al (III) and Fe (III)
- b) Nitron (NO_3^-)
- c) Salicyladoxine Ni (II) in presence of Cu (II)
- d) Anthranilic Acid Co (II) and Zn (II)
- e) Pyrogallol Bi^{3+}

- a) Chromatographic Techniques - Column, Thin layer and Paper chromatographic techniques for the qualitative separation of inorganic compounds
- b) Applications of Solvent extraction and ion exchange techniques

Synthesis of following Inorganic compounds / Complexes in a pure state and determine their state of purity

- a. $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}$


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- b. $[\text{Co}(\text{NH}_3)_5\text{NO}_2]\text{Cl}_2$
- c. $[\text{Co}(\text{NH}_3)_5]$
- d. ONOCl
- e. $[\text{Co}(\text{en})_3]\text{Cl}_3$

Recommended Books

1. Huheey, J. E., Keiter, E. A. and Keiter, R. L. "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper and Row, New York, (2001).
2. Cotton, F. A., Wilkinson, G. and Gaus, P. L., "Basic Inorganic Chemistry", 3rd Ed., Wiley, New York, (1995).
3. Atkins, P. and Jones, L., "Chemicals Principles" Freeman & Co., NY (2002).
4. Cotton, F.A., Wilkinson, G., Murillo C.A. and Bochmann, M. "Advanced Inorganic Chemistry", 6th Ed., Wiley-Interscience, New York, (1999).
5. Bassette, J., Denney, R.C. Jefery, G.H. and Mendham, J. "Vogel's Textbook of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis". 4th Edition, English Language Book Society, UK (1981).
6. Vogel, A.I., "A Textbook of Micro and Semi-micro Qualitative Inorganic Analysis" Longman Green & Co. NY (1995).

CHEM – 465 Organometallic & Bio-inorganic Chemistry (Cr.03)

Nature of metal-carbon bonds: Compounds with Metal-Carbon single bonds; Compounds with Metal-Carbon π - bonds; Classification of organometallic compounds and 18- electron rule.


Compounds of transition metals: Single, double and triple bonds to carbon, (compound types, Acyls, Alkylidene complexes and alkylidyne complexes), delocalized hydrocarbon systems, (alkene, olefins, allyl and Butadienes), Alkyne complexes, Cyclic π complexes (four, five and six member rings),

Fundamental Process in Reactions of Organotransition Metal Complexes: Ligand Coordination & dissociation; Oxidative addition & reductive Eliminations; Insertion & Extrusion reactions; Reaction of Coordinated ligands, Applications of organometallic compounds in synthetic chemistry and industry.

Bio-Inorganic chemistry: Essential elements, Biochemistry of iron (iron storage and transport), Haemoglobin and myoglobins, Cytochromes, other natural oxygen carrier, Biochemistry of other metals (Zn, Cu, Co, Cr, Ni, and V). Metal based drugs.

Recommended Books

1. Huheey, J.E., Keiter, E.A. and Keiter, R.L. "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper and Row, New York, (2001).
2. Garry L., Miessler, D. and Tarr, A. "Inorganic Chemistry" 3rd Edition, Pearson Education, Inc. NY (2004).
3. Purcell K.F. and Kotz, J.C. "An Introduction to Inorganic Chemistry" Saunders, College, Philadelphia (1980).
4. Jordan, R.B. Reaction Mechanisms of Inorganic and Organometallic Systems, 2nd Edition, Oxford University Press, UK (1998).
5. Angelici, R. J. Synthesis and Technique in Inorganic Chemistry, 1st Edition, University Science Books, CA (1986).


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CHEM-466 Inorganic Polymers & Chemical Forces 3(3-0)

Inorganic Polymers: Molecular species (polymeric Sulphur, nitrogen compounds, Borazines, Phosphazines, Boranes, Carboranes, and Silicones)

1. Polyionic species (Isopoly and heteropoly anions of transition elements, polysilicates, and polyphosphates)
2. Metal cluster compounds

Chemical Forces: Internuclear distances and atomic radii, types of chemical forces, Hydrogen bond, Bonding in Clathrates, urea adducts, effects of Chemical forces.

Recommended Books

1. Jordan, R. B., Reaction Mechanisms of Inorganic and Organometallic Systems, 2nd Edition, Oxford University Press, (1998).
2. Angelici, R. J., Synthesis and Technique in Inorganic Chemistry, 1st Edition, University Science Books, (1986).
3. Garry L. Miessler, Donald A. Tarr, "Inorganic Chemistry" 3rd Edition, Pearson Education, Inc. (2004).
4. Keith F. Purcell and John C. Kotz, "An Introduction to Inorganic Chemistry" Saunder, College, Philadelphia (1980).
5. Huheey, J. E., Keiter, E. A. and Keiter, R. L., "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper and Row, New York, (2001).

iv) ORGANIC CHEMISTRY**CHEM-474 Reaction Mechanism (Cr. 03)****A: Redox Reactions**

Oxidation state of organic compounds. Oxidation of C=C. Mild oxidation of 1°-ols → CHO, 2°-ols → ketone. Harsh oxidation of alcohols, amines, nitriles. Reduction involving metal/metal complexes (Wilkinson's vs Crabtree catalysts), hydride (NaBH₄, LiAlH₄, DIBALH, Red-Al and their derivatives) reductions and reductions involving single electron transfer (SET).

B: Molecular Rearrangements

Classification of molecular rearrangements. Mechanism of intramolecular 1,2-shifts involving migration of a group from C to C, C to N, N to C, C to O and O to C. Mechanism and examples of Wagner-Meerwein, Pinacol-Pinacolone, Benzidine-Benzillic acid, Favorski, Wolf, Beckmann, Hofmann, Curtius, Lossen, Schmidt, Steven, Baeyer-Villiger, Dakin and Fries rearrangements.

C: Pericyclic Reactions


Introduction and classification. Hoffman, Fukii, Mobius-Huckle theories of electrocyclic and cycloaddition reactions involving 4n/4n+2 pi electrons. Diels-Alder, Alder-ene and 1,3-dipolar additions, sigmatropic reactions, Ireland-Claisen rearrangement.

D: Reactive intermediates

Structure, methods of generation, detection, reactions and synthetic applications of carbenes, nitrenes, arynes and free radicals. Role of free radicals in nature and environment.

Recommended Books

1. Smith M.B. and March, J. March's Advanced Organic Chemistry, 5th Edition, John Wiley, NY. (2001).


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2. Gould, E. S. Mechanism and Structure in Organic Chemistry, Holt, Rinehart & Winston, NY (1970).
3. Morrison, R. T. and Boyd, R. N. Organic Chemistry, Allyn & Bacon, Boston (1987).
4. House, H. O. Modern Synthetic Reactions, Benjamin, California (1972).

CHEM – 476 Spectroscopic Methods in Organic Chemistry (Cr.03)

UV/VIS Spectroscopy: Basic principle, instrumentation & sample handling, Woodward Fieser rule for conjugated dienes and unsaturated carbonyl systems. Absorption by aromatic compounds. Applications of UV-Visible spectroscopy

IR Spectroscopy: Basic Principle, Instrumentation and sample handling, Interpretation of IR spectra, Applications of IR spectroscopy.

Mass Spectrometry: Basic Principle, Instrumentation, Modes of fragmentation of various organic molecules, Determination of molecular mass, molecular formula and molecular structure, Interpretation of Mass spectrum.

NMR Spectroscopy: Basic Principle, Spin flipping, Spin relaxation, The Chemical shift, Instrumentation and Sample handling, Spin-spin splitting and coupling constant, Interpretation of NMR spectra.

Structure elucidation of organic compounds by joint applications of IR, UV, NMR spectroscopy and Mass spectrometry.

CHEM – 477 Organometallics (Cr.03)

(3+1)

Preparation and uses of organoLi, organoMg (Grignard's reagent), organoSn, organoCu, organoZn and organoPd in synthetic organic chemistry with special focus on stereochemical outcome. Brief introduction of organoB, organoSi and organoS chemistry.

Recommended Books


1. Clayden, J., Greeves, N., Warren, S. and Wothers, P., "Organic Chemistry" Edition 1st, Oxford University Press, (2001).
2. Huheey, J.E., 'Inorganic Chemistry', Harper and Row, (Latest Edition)
3. Garry L. Miessler, Donald A. Tarr, "Inorganic Chemistry" 3rd Edition, Pearson Education, Inc. (2004).
4. Keith F. Purcell and John C. Kotz, "An Introduction to Inorganic Chemistry" Saunder, College, Philadelphia (1980).

Organic Chemistry Lab-III (Cr.01)

1. Experimental techniques e.g. distillation, solvent extraction, chromatography etc.
2. Multi-step synthesis of some organic compounds.
3. Estimation of glucose and number of acetyl groups.

Recommended Books

1. Williams, D. and I. Fleming, Spectroscopic Methods in Organic Chemistry, McGraw-Hill, New York. (1995).
2. Younas, M., Organic Spectroscopy, A. H. Publisher, Lahore (2006).
3. Silverstein, R. M., G. C. Bassler and T. C. Morrill, Spectrometric Identification of Organic Compounds, Wiley, New York (2005).


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4. Kemp, W., Organic Spectroscopy. Macmillan, London (1990).

v) **PHYSICAL CHEMISTRY**

CHEM – 484 Surface Phenomena (Cr.03)

(3+1)

Surface tension, adsorption isotherms, Freundlich, Langmuir and BET isotherms. Adsorption at liquid surface, surfactants, micellization. Methods of preparation of gels and emulsions. Classification structure of gels. Thixotropy. Precipitation in gels. Liesegang rings. Emulsifiers. Properties of emulsions. Breaking of emulsions. Orientation theory. Emulsification and wetting. Significance. Sols and their preparation, properties of suspensions optical properties of sols. Determination of particle size. Kinetic properties of sols. Sedimentations of suspensions, electrical properties of sols, electrophoresis and electroosmosis. Stability of suspensions. Precipitation of sols. Molecular wt determination of macromolecules. The cause of semi-permeability. Mechanism of osmotic pressure. Determination of the molecular weight by osmometry.

Physical Chemistry Lab. III (Cr.01)

1. Determination of heat of solution of a substance by solubility method.
2. Determination of empirical formula of Ferric-salicylic acid complex colorimetrically.
3. Determination of order of reaction and the rate constant of a given reaction.
4. Verification of Freundlich isotherm for organic acids.
5. To prepare As_2S_3 sol.
6. Determination of activity coefficients by measuring electromotive force.
7. Determination of Molar extinction coefficient.

Recommended Books


1. Kaufman, E.D., "Advanced Concepts in Physical Chemistry". McGraw Hill Book Company. NY (1966).
2. Atkins, P.W. "Elementary Physical Chemistry" 2nd Edition, Freeman NY (1998).
3. Scott, S.K. "Beginning Mathematics for Physical Chemistry" Oxford University Press, UK (1996).
4. Tebutt, P., "Basic Mathematics for Chemists" 2nd Edition. John Wiley & Sons, NY (1998).
5. Gurdeep, R. "Advanced Physical Chemistry" 3rd Ed. Krishna Prakashan Media (P) Ltd. Delhi (2008).

CHEM – 485 Molecular Spectroscopy (Cr.03)

Classification of spectroscopy. Rotational spectra of rigid linear molecules and determination of bond lengths. The Stark-effect. Harmonic and anharmonic oscillator models for the energy of a diatomic molecule. Types of vibrational modes. Interpretation of IR spectra of simple molecules. Fermi resonance, applications and sampling techniques. Types of electronic transition. H-atom spectrum, energies of atomic orbital, electronic angular momentum and the fine structure. Idea of Raman scattering, Rayleigh scattering and molecular polarizability. Rotational Raman spectra of linear molecules. Symmetric top molecules and spherical top molecules, vibrational Raman spectra. Nuclear magnetic resonance spectroscopy.

Recommended Books

1. Castellan G. W. "Physical Chemistry" 3rd Ed. Norasa Publishing House, Delhi (2004).


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2. Fried, V., Hameka, H.F. and Blukis, U.U. Physical Chemistry. Macmillan Publishing Co., Inc., New York (1987).
3. Laidler K.J. and Meiser, J.H. "Physical Chemistry". Benjamin/Cummings Publishing Company, Inc., NY (1998).
4. Kaufman E.D., "Advanced Concepts in Physical Chemistry". McGraw Hill Book Company, NY (1966).
5. Colin N. Banwell and Elaine M. McCash "Fundamentals of Molecular Spectroscopy", Edition 4th, The Bath Press Avon, UK (1994).
6. Gurdeep R. "Advanced Physical Chemistry" 3rd Ed. Krishna Prakashan Media (P) Ltd. Delhi (2008).

CHEM – 486 Statistical and Quantum Mechanics (Cr.03)

Statistical ensembles, probability. Description of various systems, concept of states, accessible states and distribution. Maxwell's Boltzmann's statistics (MBS) of the systems of independent particles. Applications of partition functions of two chemical equilibrium and chemical kinetics. Bose-Einstein and Fermi-Dirac statistics (BES and FDS). Operators and their properties, angular momentum, central field problem, Hydrogen like atoms, approximate methods, perturbation method and variation principle. Valence bond theory (VBT) and Molecular Orbital theory (MOT).

RECOMMENDED BOOKS

1. Bogolubov, N.N, Bogolubov, N.N, Jr. Introduction to Quantum Statistical Mechanics, 2nd Edition, Russia (2009)
2. Gurdeep R. "Advanced Physical Chemistry" 3rd Edition, Krishna Prakashan Media (Pvt) Ltd. Dehli (2008)
3. William C. Schieve, Quantum Statistical Mechanics, Cambridge University Press, UK (2009)

SEMESTER-VIII

CHEM – 431 Environmental Chemistry (Compulsory Cr. 03)

The Human Environment. The litho, bio and hydrosphere, The nature and composition of natural waters, Water pollution, Chemistry of soil, Composition of the atmosphere, Oxides of carbon, sulphur and nitrogen in air pollution, Atmospheric Monitoring, Instrumental methods of environmental chemistry. Ozone demolition, Acid rain, Green House Effect

Recommended Books

1. Kumar, A. Environmental Chemistry, Wiley Eastern, New Delhi (2005).
2. Moore, J.W. & Moore, E.M. Environmental Chemistry, Academic Press, New York (2004).
3. Banerji, S. K. Environmental Chemistry, Tata Publisher, Delhi (2006).
4. Manahan, S. E. Environmental Chemistry, Brooks, California (2005).
5. Neil, P.O. Environmental Chemistry, Chapman, London (2004).
6. Baird, C. Environmental Chemistry, Freeman, New York (2003).

b) **Specialization (Cr. 11)**

i) **ANALYTICAL CHEMISTRY**


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CHEM – 415 Advanced Spectroscopy –II (Cr.03)

(3+1)

Mass Spectroscopy: Principle of Mass spectroscopy. Instrumentation in details, Quantitative and Qualitative application in analytical chemistry. X-rays Spectroscopy: Nature and production of X-rays. X-rays absorption. X-rays emission. Instrumentation, X-rays fluorescence analysis. Diffraction studies single crystal analysis

ANALYTICAL CHEMISTRY LAB. (Cr.01)

1. Verification of deviations from Beer-Lambert's law.
2. Determination of chloride content in drinking water samples by mercury(II) thiocyanate spectrophotometric method.
3. Determination of copper in various food samples by diethyldithiocarbamate spectrophotometric method.
4. Determination of aspirin in pharmaceutical preparation and caffeine in tea and coffee by U.V Visible Spectrophotometry involving extraction.
5. Analysis of analgesic by HPLC.
6. Quantitative and qualitative analysis of different fruit juices for vitamin C by HPLC.
7. Estimation of Sodium and Potassium in biological fluids by flame photometry.
8. Determination of calcium in milk samples by flame photometry.
9. Determination of Magnesium in tap water, food, leaves etc by AAS.
10. Determination of manganese content in tea leaves by AAS.
11. Determination of sulphate and phosphate in commercial samples by complexometric titrations using EDTA.
12. Determination of iron in pharmaceutical samples by redox titration.
13. Determination of Sodium bicarbonate contents in baking Soda powder by conductometric titration with HCl.


Recommended Books

1. Christian, G.D. Analytical Chemistry, John Wiley & Sons (2005).
2. Harris, D.C. Quantitative Chemical Analysis, Freeman, N. Y. (2003).
3. Skoog, D. A. West, D. Holler, J. M.F., Crouch S. R. Fundamentals of Analytical Chemistry. 8th ed. Saunders College Publishing, Philadelphia. (2003).

CHEM – 417 FTIR, Raman Spectroscopy, ESR and Surface Analysis (Cr.03)

Origin of Molecular spectra, Origin of infrared and Raman spectra, Normal coordinate and normal vibrations, Symmetry of normal vibration and selection rules, selection rule for infrared and Raman spectra, Metal isotope spectroscopy, vibrational spectra in gaseous phase and inert gas matrices, comparison of Raman with Infrared spectroscopy. Quantitative/Qualitative analysis. Instrumental detail and their use as analytical tool. Electron spin resonance spectroscopy: Instrumentation, Samples and sample holder, ESR spectra and Hyperfine interaction, Applications, Spin labels and spin traps. Surface Analysis: Introduction, Electron spectroscopy techniques, X-Rays photoelectron spectroscopy, Instrumentation for XPS. Sample introduction and handling for surface analysis, Analytical applications of XPS.

Recommended Books


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1. Skoog D. and West D.M., Fundamentals of Analytical Chemistry, Holt Reinhart Inc, London. (1996).
2. Christian G.D., Analytical Chemistry. John Wiley & Sons. (2010).
3. Harris D.C., Quantitative Chemical Analysis, Freeman. N. Y. (2006).
4. Douglas A. Skoog, Donald M. West, F. James Holler, Stanley R. Crouch Fundamentals of Analytical Chemistry; 8th ed. Saunders College Publishing, Philadelphia. (2003).
5. Robinson J W, Undergraduate Instrumental analysis; 7th ed. CRC Press. Taylor & Francis Group. (2014)

CHEM-418 Instrumental Methods of Analysis - II (Cr.03)

Nuclear Magnetic Resonance: Nuclear emission Alpha particles, Beta particles, Gamma – rays and neutron, Nuclear reaction; Radiochemical decay and activity, Necessary instrumentation including sources, accelerators and detectors. Thermal method of Analysis: TGA, Differential thermal analysis (DTA) and differential scanning Calorimetry (DSC), Pyrolysis and thermometric titration, type of measurements and applications of these techniques.

Recommended Books

1. Christian, G.D. Analytical Chemistry, John Wiley & Sons, NY (2005).
2. Harris, D.C. Quantitative Chemical Analysis, Freeman, NY (2003).
3. Skoog, D.A. West, D. Holler, J. M.F., Crouch S. R. Fundamentals of Analytical Chemistry. 8th ed. Saunders College Publishing, Philadelphia (2003).

ii) BIOCHEMISTRY CHEMISTRY

CHEM – 426 Chemotherapy and Immunology (Cr.03)

Chemotherapeutic Agents and Chemotherapy, Historical Highlight of chemotherapy, Characteristic of Antibodies that Qualify them as Chemotherapeutic agents, Antibiotic and their mode of action. Antifungal, Antiviral and Antitumor Antibiotic Microbiological Assay of antibiotic, antipyretics, analgesics, antimalarials, sulpha drugs and antibiotics with special reference to penicillin mechanisms of drug resistance. Non-medical uses of Antibiotic.

Principles of immunology, antigens, antibodies, characteristics of antigens and antibody reaction, allergy and hypersensitivity, The compliment System, Blood groups (A, B, O, MNO and Rh factor). Acquired immunity and Immunodeficiencies.

Recommended Books

1. Lehninger, A.L. Principles of Biochemistry, Worth Publisher, New York (2001).
2. Voet, D. and Voet, J.G. Biochemistry, John Wiley & Sons, New York. (2001).
3. Zubay, G. Biochemistry, 4th Edition Macmillan Publishing Co. (1999).
4. Stryer, L. Biochemistry, Freeman & Co. NY (1994).
5. Davis, B.D., Dulbecco, R., Eisen, H.N. and Ginsbery, H.S. Microbiology, Harper & Row. NY (2002).

CHEM – 427 Molecular Biology & Physical Techniques (Cr.03)



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(3+1)

Molecular dogma, Biosynthesis of RNA and DNA nucleosides, DNA polymerases, nucleosides catabolism, DNA as a genetic material, replication, Transcription. Translation Genetic coding. Gene and mutation units, Structure of Chromation and its functions, Gene activation, Virus replication and its protein regulation. Spectrophotometer Electrophoresis, centrifugation, Electron microscopy, PCR, DNA sequencer X-ray diffraction. Spectroscopy as applied to biological compounds etc. Use of isotopes in biochemistry.

Biochemistry Lab. (Cr.01)

Methods for the isolation of DNA and RNA, (Blood serum and plant Samples) Electrophoresis (Verticals and Horizontal), Pulsed Field Gel Electrophoresis, Capillary Electrophoresis, Immunoelectrophoresis, PCR, DNA Sequencer, Primer Designer, Southern, Northern Western blotting technique, Electrophoresis of plasma proteins, polyacrylamide gel electrophoresis. Agarose electrophoresis of DNA and RNA. Dialysis ultra filtration and lyophilization.

Recommended Books

1. Lehninger, A.L. Principles of Biochemistry, Worth Publisher, New York (2001).
2. Voet, D. and Voet, J.G. Biochemistry, John Wiley & Sons, New York. (2001).
3. Zubay, G. Biochemistry, 4th Edition Macmillan Publishing Co. (1999).
4. Stryer, L. Biochemistry, Freeman & Co. NY (1994).
5. Davis, B.D., Dulbecco, R., Eisen, H.N. and Ginsbery, H.S. Microbiology, Harper & Row. NY (2002).

CHEM – 428 Endocrine Systems (Cr.03)

Endocrine System: Introduction, Chemical nature of Hormones, common characteristics, mode of action, chemistry, metabolism and biological functions of Pituitary, Adrenal, Thyroid, Parathyroid, Pancreatic and gonadal hormones.


Biochemistry and body fluids: Composition and function of Blood, blood plasma, Blood proteins, Red blood cells, Haemoglobin, White blood cells, Platelets, Blood coagulation and blood pressure, Antibodies, Antigens and blood groups. Composition of Urine, Extra-cellular fluid like cerebrospinal fluid, Lymph sweats tears, Synovial fluid and interstitial fluid.

Recommended Books

1. Lehninger, A. L. Principles of Biochemistry, Worth Publisher, New York (2001).
2. Voet, D. and J. G. Voet, Biochemistry, John Wiley & Sons, New York. (2001).
3. Zubay, G. Biochemistry, 4th Edition Macmillan Publishing Co. (1999).
4. Stryer, L. Biochemistry, Freeman & Co. (1994).
5. Davis, B. D., R. Dulbecco, H. N. Eisen and H. S. Ginsbery, Microbiology, Harper & Row. (2002).

ii) INORGANIC CHEMISTRY

CHEM – 467 Homogeneous Catalysis by Transition Metal Complexes (Cr.03) (3+1)
Reaction of CO and Hydrogen (Hydroformylation, Reductive Carbonylation, Reduction of CO by hydrogen, Synthesis gas and the water gas shift reaction)


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Carbonylation reaction (Synthesis of methanol and methyl acetate, Adipic ester, other Carbonylation reactions, Decarbonylation reactions)
Catalytic addition of molecules to C - C multiple bonds (Homogeneous hydrogenation, Hydrocylation and Hydrocyanation)

Inorganic Chemistry Lab. Iv (Cr.01)

Instrumental Methods of Analysis

Conductometry

1. Titration of Strong acid and Weak acid with a Strong base
2. Precipitation Titration involving AgNO_3 and KCl
3. Determination of Dissociation Constant (K_a) for Acetic Acid

Spectrophotometry (Colorimetry)

1. Microdetermination of Cr (III) by diphenylcarbazide
2. Determination of Fe (II) by 1:10 - Phenanthroline
3. Determination of Nitrites
4. Determination of Fe (III) by 8 - hydroxyquinoline

Potentiometry

1. Determination of K_1 , K_2 , and K_3 for H_3PO_4
2. Determination of Chloride in the presence of Iodide and evaluation of K_{sp} of AgI and AgCl
3. Determination of Co (II)
4. Determination of Fe (II)

Recommended Books

1. Jordan, R.B. Reaction Mechanisms of Inorganic and Organometallic Systems, 2nd Edition, Oxford University Press, UK (1998).
2. Kotz, J.C. and Treichel, P. Chemistry and Chemical Reactivity, 4th Edition, Saunders College Publishing, NY (1999).
3. Angelici, R.J. Synthesis and Technique in Inorganic Chemistry, 1st Edition, University Science Books, CA (1986).
4. Garry L. Miessler, D. and Tarr, A. "Inorganic Chemistry" 3rd Edition, Pearson Education, Inc. NY (2004).
5. Purcell K.F. and Kotz, J.C. "An Introduction to Inorganic Chemistry" Saunder, College, Philadelphia (1980).

CHEM - 468 Inorganic Reactions Mechanism (Cr.03)

Kinetics and Mechanisms of Inorganic Reactions: Rate law, Stationary State approximation, Inert and labile complexes, Substitution reaction
i) Octahedral Complexes (Acid hydrolysis, Acid catalyzed equation, Anation reactions, Base hydrolysis, Attack on ligands, Steric effects of inert ligand)
ii) Square planar Complexes (Nucleophilic reactivity, Trans effect, Cis effect, effect of leaving group. Electron transfer processes (outer and inner sphere reactions). Complimentary and Non - Complimentary reactions.

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Mechanism of Oxidative Addition and Reductive Eliminations: Oxidative Addition, One electron oxidative addition, Addition of Oxygen, Addition of bimetallic species, Hydrogen addition, HX addition, Organic halides, Reductive Elimination.

Recommended Books

1. Jordan, R. B., Reaction Mechanisms of Inorganic and Organometallic Systems, 2nd Edition, Oxford University Press, (1998).
2. Kotz, J. C. and P. Treichel, Chemistry and Chemical Reactivity, 4th Edition, Saunders College Publishing, (1999).
3. Garry L. Miessler, Donald A. Tarr, "Inorganic Chemistry" 3rd Edition, Pearson Education, Inc. (2004):
4. Keith F. Purcell and John C. Kotz, "An Introduction to Inorganic Chemistry" Saunder, College, Philadelphia (1980).

CHEM – 469 Physical Methods in Inorganic Chemistry (Cr.03)

Thermogravimetric Analysis, Thermogravimetry (TG), Differential Thermal Analysis (DTA) and Differential Scanning Calorimetry (DSC), Separation Methods (Solvent Extraction, Column, TLC and Ion Exchange Chromatography), Potentiometry, Conductometry.

Recommended Books

1. Huheey, J.E., Keiter, E.A. and Keiter, R.L., "Inorganic Chemistry: Principles of Structure and Reactivity", 4th Ed., Harper and Row, New York, (2001).
2. Jordan, R.B., Reaction Mechanisms of Inorganic and Organometallic Systems, 2nd Edition, Oxford University Press, UK (1998).
3. Kotz, J.C. and Treichel, P. Chemistry and Chemical Reactivity, 4th Edition, Saunders College Publishing, NY (1999).
4. Angelici, R.J. Synthesis and Technique in Inorganic Chemistry, 1st Edition, University Science Books, CA (1986).

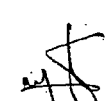
iv) **ORGANIC CHEMISTRY**

CHEM – 478 Organic Synthesis (Cr.03)

Introduction to retrosynthesis. Retrosynthetic analysis, Functional group inter-conversion (FGI), C – C, C – N and C – O bond formation. Applications to the synthesis of various target molecules. Difunctionalized compounds. Role of crown ethers and quaternary ammonium salts in organic synthesis. Protective groups. Recent trends in organic synthesis.

Recommended Books

1. Clayden, J., Greeves, N., Warren, S. and Wothers, P., "Organic Chemistry" 1st Edition, Oxford University Press, UK (2001).
2. Smith M.B. and March, J. *March's Advanced Organic Chemistry*, 5th Edition, John Wiley, NY. (2001).
3. Pine, S.H. *Organic Chemistry*, (5th Edition) McGraw-Hill, NY. (1987).
4. Gould, E. S, *Mechanism and Structure in Organic Chemistry*, Holt, Rinehart & Winston, NY (1970).
5. Morrison, R.T. and Boyd, R.N. *Organic Chemistry*, Allyn & Bacon, Boston (1987).


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CHEM – 479 Chemistry of Natural Products (Cr.03)

Introduction to natural products. classification, isolation, biosynthesis and structure elucidation of steroids, terpenoids alkaloids, carotenes, vitamins and flavonoids.

Organic Chemistry Lab. IV (Cr.01)

1. Multistep synthesis of different types of organic compounds. Purification of the products by chromatographic and other techniques.
2. Isolation and purification of some natural products.
3. Conformation of the products by different techniques e.g. elemental analysis, spectroscopy etc.

Recommended Books

1. Finar, I.L., Natural Product Chemistry, Vol-I, Longman, London. (2001).
2. Streitwieser, A., Heathcock, C. and Kosower, E.M. Introduction to Organic Chemistry, Macmillan, New York. (1998).
3. Clayden, J., Greeves, N., Warren, S. and Wothers, P. "Organic Chemistry" Edition 1st, Oxford University Press, UK (2001).

v) PHYSICAL CHEMISTRY (Cr.03)

(3+1)

CHEM – 487 Advanced Approach of Homogeneous and Heterogeneous Kinetics (Cr.03)

Liquids and gaseous systems of inorganic and organic reactions. Single systems, double systems. Study of reactions on solid surfaces. Single reacting gas, retardation by reaction products, Two reacting gases, retardation by reactants, adsorp-heterogeneous reaction, Reactions in solution, Influence of solvents involving ions, primary and secondary salt effect on kinetics of the reactions. Comparison between homogeneous and heterogeneous kinetics.


Physical Chemistry Lab. (Cr.01)

1. Determination of equilibrium constant of reversible reaction

$$I_2 + I^- \rightleftharpoons I_3^-$$
 and to evaluate ΔG° .
2. Determination of molecular mass of polymer by viscosity method.
3. Determination of flocculation value of electrolytes and to verify Hardy-Schultz rule.
4. Determination of activation energy of a chemical reaction.
5. Study of variation of conductance of solution of weak and strong electrolytes with concentration (a) pure solvents (b) binary mixture of solvents
6. Determination of heat of solution of a substance from solubility measurements and to determine thermodynamic quantities like ΔG° , ΔH° , ΔS° of the solution.
7. Potentiometric titration

Recommended Books

1. Atkins P.W. "Physical Chemistry" 6th Ed. ELBS Oxford University Press, UK (1997).
2. Alberty, R. and Silvey, A. "Physical Chemistry" 7th Ed. John Wiley & Sons, NY (1992).


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3. Barrow, G. M. "Physical Chemistry" 5th Ed. McGraw Hill, Inc. CA (1998).
4. Castellan, G.W. "Physical Chemistry" 3rd Ed. Norasa Publishing House, Delhi (2004).
5. Fried, V., Hamaka, H.F. and Blukis, U.U. Physical Chemistry. Macmillan Publishing Co., Inc., New York (1987).
6. Laidler, K.J. and Meiser, J.H. "Physical Chemistry" Benjamin/Cummings Publishing Company, Inc. NY (1998).
7. Kaufman, E.D. "Advanced Concepts in Physical Chemistry". McGraw Hill Book Company, NY (1966).
8. Atkin, P.W. "Elementary Physical Chemistry" 2nd Edition, Freeman, NY (1998).
9. Scott, S.K. "Beginning Mathematics for Physical Chemistry" Oxford University Press (1996).
10. Tebutt, P. "Basic Mathematics for Chemists" 2nd Edition. John Wiley & Sons, NY (1998).
11. Gurdeep, R. "Advanced Physical Chemistry" (3rd Ed). Krishna Prakashan Media (P) Ltd. Delhi (2008).

CHEM – 488 Polymers and Photochemistry (Cr.03)

Classification of polymers. Kinetics of condensation, addition and co-polymerisation reactions. Molecular mass determination by different methods laws of photochemistry. Quantum efficiency and its determination. Photochemical reactions. Photosensitised reactions. Phosphorescence, fluorescence, chemiluminescence, Lasers.

Recommended Books


1. Atkins, P.W. "Physical Chemistry" 6th Ed. ELBS Oxford University Press, UK (1997).
2. Alberty, R. and Silvey, A. "Physical Chemistry" 7th Ed. John Wiley & Sons, NY (1992).
3. Castellan, G. W. "Physical Chemistry" 3rd Ed. Norasa Publishing House, Delhi (2004).
4. Fried, V., Hamaka, H.F. and Blukis, U.U. Physical Chemistry. Macmillan Publishing Co., Inc., New York (1987).
5. Laidler, K.J. and Meiser, J.H. "Physical Chemistry". Benjamin/Cummings Publishing Company, Inc. NY (1998).
6. Kaufman, E.D. "Advanced Concepts in Physical Chemistry". McGraw Hill Book Company, NY (1966).
7. Atkin, P.W. "Elementary Physical Chemistry" 2nd Edition, Freeman NY (1998).
8. Scott, S. K. "Beginning Mathematics for Physical Chemistry" Oxford University Press, UK (1996).
9. Gurdeep, R. "Advanced Physical Chemistry" 3rd Ed. Krishna Prakashan Media (P) Ltd. Delhi (2008).

CHEM – 489 Elementary Group Theory (Cr.03)

Symmetry, Symmetry elements and operations, Point groups, Group representation and Character table, Reducible and irreducible representation, Application of Group theory to Valence bond, Molecular orbital, Crystal field theories and IR spectra.


Recommended Books

1. Atkins P.W., "Physical Chemistry" (6th Ed). ELBS Oxford University Press (1998).
2. Alberty R. A. & Silvey. "Physical Chemistry" (7th Ed). John Wiley & Sons (1992).
3. Barrow G. M., "Physical Chemistry" (5th Ed). McGraw Hill, Inc., (1998).
4. Castellan G. W., "Physical Chemistry" (3rd Ed). Norasa Publishing House.
5. Fried V., U. Blukis, H.F. and Hamaka, "Physical Chemistry". MacMillan Publishing Company, Inc. (1987).


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- Laidler K.J. & J.H. Meiser.. "Physical Chemistry". Benjamin/Cummings Publishing Company, Inc. (1998).
- Kaufman E.D.. "Advanced Concepts in Physical Chemistry". McGraw Hill Book Company. (1966).
- Akin P.W.. "Elementary Physical Chemistry" 2nd Edition. Oxford University Press (1998).
- Scott S. K. "Beginning Mathematics for Physical Chemistry" Oxford University Press (1996).

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