PANJAB UNIVERSITY, CHANDIGARH-160014 (INDIA)

(Estd. under the Panjab University Act VII of 1947—enacted by the Govt. of India)

SYLLABI

FOR

B.A. & B.Sc. (GENERAL) FIRST YEAR
(SEMESTER SYSTEM)
EXAMINATIONS, 2020-2021

(SEMESTER : FIRST AND SECOND)

i.e

First Semester **:** ***November/December, 2020***
Second Semester **:** ***April/May, 2021***

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COMPUTER SCIENCE

SEMESTER-I

SCHEME OF EXAMINATION

FIRST SEMESTER			Exam . Hrs	Ext.	Int.	Max. Marks
Paper – CS01	**Theory-A**	**Computer Fundamentals**	**3**	**30**	**5**	**35**
Paper –CS02	**Theory-B**	**PC Software**	**3**	**30**	**5**	**35**
Paper – PCS01	**Practical-C**	**Practical Based on Paper – CS01**	**3**	**30**	**--**	**30**

Note : Practical marks will include the appropriate weightage for proper maintenance of Lab. Record.

Paper-CS01 : Computer Fundamentals

Objective : To teach the students the fundamentals of computer related to its hardware & software.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT - I

Computer Appreciation: Introduction to computers, characteristics of computer; History of computers; Classification of computers on size: (Micro, Mini, Mainframe and super computers), Working Principles, Generations; Applications of computers; commonly used terms–Hardware, Software, Firmware. Basic Computer Organization: Block diagram of computer system, Input unit, Processing Unit and Output Unit; Description of Computer input devices: Keyboard, Mouse, Trackball, Pen, Touch screens, Scanner, Digital Camera; Output devices: Monitors, Printers, Plotters.

UNIT –II

Computer Memory: Representation of information: BIT, BYTE, Memory, Memory size; Units of measurement of storage; Main memory: main memory organization, RAM, ROM, PROM, EPROM; Secondary storage devices: Sequential Access Memory, Direct Access Memory Magnetic Tapes, Magnetic disks, Optical disks: CD, DVD; Memory storage devices: Flash Drive, Memory card;

UNIT – III

Types of software: System and Application software; **Programming Languages**: Generation of Languages; Translators - Interpreters, Compilers, Assemblers and their comparison. **Range of Applications**: Scientific, Word Processing, Spread Sheets, E-commerce, Business, Educational, Industrial, National level weather forecasting, Remote Sensing, Planning Multilingual Applications.

UNIT – IV

Operating Systems : Components of Operating System; Functions of Operating System; Types of Operating System; Linux/Dos/Windows. **Computers and Communication**: Single user, multi-user, workstation, and client server systems. Computer networks, Network protocols. LAN, WAN, Services offered by Internet.

Suggested Readings :

1. Basandra, S.K. : Computers Today, Galgotia.
2. Sinha P.K. & Sinha Priti : Computer Fundamentals, BPB Publications

Paper-CS02: PC Software

Objective : To teach the basic functionality of Disk Operating System & Windows. To impart detailed knowledge for creating word processing, spreadsheet & presentation documents.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT – I

Concept of files and directories; Disk Operating System: DOS, System Files, types of DOS commands: Internal and External commands: Introduction to AUTOEXEC.BAT, Directory commands: XCOPY, DEL, RENAME, ATTRIB, BACKUP, RESTORE, FIND, SYS; General commands: TYPE, DATE, TIME, PROMPT; Batch Files, Wild Cards, Line Editor.

UNIT – II

Introduction to graphical user interface, window operating system, Anatomy of windows, organizing folders and files, recycle bin, my computer, windows explorer, control panel.

UNIT – III

Word Processing : Basics of Word Processing; Opening, Creating, Saving, Printing and Quitting Documents, Using the Interface (Menu Toolbars), Editing Text (Copy, Delete, Move), Finding and Replacing Text, Spell Check, Autocorrect; Auto Text, Character formatting, Page formatting; Document Enhancement; Adding Borders and shading, Adding Headers and Footers, Setting up Multiple columns, Sorting blocks, Adjusting Margins and Hyphenating Documents, Creating Master Documents, Creating Data Source, Merging Documents, Using Mail merge feature for labels and envelops; Inserting Pictures, Tables, Working with equations.

UNIT – IV

Spread Sheet : Worksheet overview, Row, Column, Cells, Menus, Creating Worksheet, Opening, Saving, Printing Worksheets; Calculations, Auto fill, Working with Formulae, Data Formatting (number formatting, date formatting), Working with Ranges, Establishing Worksheet links; Creating, Sorting and Filtering Data Base; Creating chart, Adding Titles, Legends etc. to charts, Printing Charts, Creating Macros, Record Macros, Running Macros, Assigning Macros to Buttons, Functions (Statistical, Financial, Mathematical, String, Date and Time).

MS-Power Point: Creating, Saving, Printing Presentation; Selecting Design Templates, Animations and Transitions, Auto Content Wizard.

Suggested Readings :

1. Ludd Robbins : *Mastering DOS.*
2. Alan R. Miller : *The ABC's of DOS-6.2.*
3. Richard Allen King : *MS-DOS H. B.*
4. Gilbert Held : *IBM PC and PCXT User's Reference Manual.*
5. Cowart, Robert : *Using Microsoft Windows 2000 Professional,* Que Publishing, 2000.
6. Taxali, Ravikant : *PC Software Made Simple,* New Delhi.
7. Mansfield, Ron : *Compact Guide to Windows, Word & Excel.*

Paper – PCS01 : Practical : Practicals Based on Paper CS02

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COMPUTER SCIENCE
SEMESTER-II

SCHEME OF EXAMINATION

SECOND SEMESTER			Exam. Hrs	Ext.	Int.	Max. Marks
Paper – CS03	**Theory-A**	**Operating System Concepts**	**3**	**30**	**5**	**35**
Paper –CS04	**Theory-B**	**C Programming**	**3**	**30**	**5**	**35**
Paper – PCS02	**Practical-C**	**Practical Based on Paper – CS04**	**3**	**30**	**--**	**30**

Paper-CS03: Operating System Concepts

Objective : To teach the students various operating system concepts relating to managing processes, memory and deadlocks.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT - I

Operating Systems (OS): Introduction, need of operating system and functions of operating system, Types of OS: Multi-user, Multitasking, Multiprocessing and Real time Operating Systems, Parallel systems, Distributed systems; Structure of Operating System;

UNIT - II

Process Management: Introduction to Process, PCB, Process States, CPU Scheduling: Scheduling Criteria and Algorithms: FCFS, SJF, Priority, Round Robin, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling.

UNIT - III

Deadlocks: Introduction, Necessary and sufficient conditions for Deadlocks, Resource allocation graph, Introduction to methods for handling deadlocks, deadlock prevention, deadlock avoidance: Banker Algorithm, deadlock detection and recovery.

UNIT - IV

Memory Management: Logical vs Physical address space, Swapping, Introduction to Paging, Segmentation, Virtual Memory-Demand paging, Introduction to Page Replacement algorithms: FIFO, Optimal Page replacement and LRU

Suggested Readings :

Essential :

1. Peterson, J.L.& Silberschatz, A., Operating System Concept, Addison Wesley, reading.

Further Reading :

2. Brinch, Hansen, Operating System Principles, Prentice Hall of India
3. Haberman, A.N., Introducing to Operating System Design Galgotia Publication, New Delhi

Paper-CS04 : C Programming

Objective : To teach the student basic constructs of 'C' programming language and enable them to create 'C' based applications.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT – I

Programming Process: Steps in developing of a program, Data Flow Diagram, Decision Table, Algorithm development, Flowchart, Pseudo Code, Testing and Debugging.

Fundamentals of C Languages: History of C, Character Set, Identifiers and Keywords, Constants, Types of C Constants, Rules for Constructing Integer, Real and character Constants, Variables, Data Types, rules for constructing variables.

UNIT – II

Operators and Expressions: C Instructions, Arithmetic operators, Relational operators, Logical operators, Assignment Operators, Type Conversion in Assignments, Hierarchy of Operations, Standard and Formatted Statements, Structure of a C program , Compilation and Execution.

Decision Control Structure: Decision making with IF-statement, IF-Else and Nested IF-Else, The else if Clause.

Loop Control Structure: While and do-while, for loop and Nested for loop,

Case Control Structure: Decision using switch, The goto statement.

UNIT – III

Functions: Library functions and user defined functions, Global and Local variables, Function Declaration, Calling and definition of function, Methods of parameter passing to functions, recursion, Storage Classes in C.

Arrays: Introduction, Array declaration, Accessing values in an array, Initializing values in an array, Single and Two Dimensional Arrays, Initializing a 2-Dimensional Array, Memory Map of a 2-Dimensional Array, Passing array elements to a function.

UNIT – IV

String Manipulation in C: Declaring and Initializing string variables, Reading and writing strings, String Handlingfunctions(strlen(), strcpy(), strcmp(), strcat()).

Structures and Unions: Declaration of structures, Structure Initialization, Accessing structure members, Union, Difference between Structure and Union .

Suggested Readings :

Essential :

1. Yashavant P. Kanetkar : Let us C, BPB Publications, New Delhi.

Further Reading :

2. Salaria, R.S. : Test Your Skills in C, Salaria Publications, New Delhi.
3. C. Balaguruswami : Programming with C Language, Tata McGraw Hill, New Delhi.
4. Byron S. Gottfried : Programming in C, McGraw Hills Publishers, New York.
5. M.T. Somashekara : Programming in C, Prentice Hall of India.

Paper – PCS02 : Practical : Practical Based on Paper CS04.

PHYSICS

A. Sc. (GENERAL) FIRST YEAR (1st and 2nd Semester) EXAMINATION, 2020-21

General Instructions for teachers, students and paper setters :

1. There will be three papers of theory and one laboratory (practical course). Each of the theory papers is allocated 25 marks including 3 (three) marks for the Internal assessment. **The Practical examination is of 50 marks including 5 (Five) marks for the Internal assessment and will be held along with the second semester examination.**
2. The number of lectures per week will be three for each theory paper and six for practicals.
3. The examination time for each theory paper as well as practical paper will be three hours.
4. Each theory paper will consist of **seven** questions comprising of three sections. First two sections will comprise of **three** questions from each of Units I and II of syllabus, and the third section will comprise of **one compulsory** question of **ten** short answer type parts covering whole syllabus. The question paper will be set for 44 marks - **All the questions in first and second sections will carry 9 (nine) marks each and the compulsory question will carry 8 marks.** Student will attempt two questions from each of the first two sections and any eight parts of the compulsory question. **After evaluation of the answer books out of 44 marks, the marks will be given out of 22 marks.**
5. The numerical problems/exercises in the question paper should be 25-30%.
6. Student will attempt two questions from each Unit (I-II) and any six parts of question seven.
7. The use of Non-programmable calculators will be allowed (paper setter should explicitly mention this in the question paper) in the examination centre but these will not be provided by the University/College. Mobile phones and pagers are not allowed in the examination hall.

Papers, marks and teaching hours allocation :

Paper A :	Mechanics	Total Teaching hrs. 30
Paper B :	Vibrations, Waves and EM Theory	Total Teaching hrs. 30
Paper C :	Electricity and Magnetism	Total Teaching hrs. 30
	Physics Practicals	Total Teaching hrs. 45

* marks allotted for internal assessment.

PHYSICS

SEMESTER – I

Paper A: MECHANICS-I (30 Hrs.)

UNIT-I

Cartesian and spherical polar co-ordinate systems, Two- and three-dimensional coordinate systems, area, volume, displacement, velocity, and acceleration in these systems, solid angle.
Centre of mass, linear momentum, angular momentum, torque, potential energy and kinetic energy of a system of particles.
Relationship of conservation laws of linear momentum, angular momentum and energy, and symmetries of space and time.

UNIT-II

Various forces in nature, relative strengths and spatial dependence,
Motion under force obeying inverse square law, equivalent one body problem.
Motion under central forces, equation of motion under central force, equation of orbit and turning points, Kepler's Laws.
Elastic collision in Lab. and C.M. systems, relationships of velocities, angles, and kinetic energies in these two systems, cross section of elastic scattering, Rutherford scattering.

Books Suggested :

Essential Readings :

1. Mechanics, H.S. Hans & S.P. Puri.
2. Mechanics, Berkeley, Vol. I, C. Kittle.

Further Readings :

1. *An Introduction to Machines*, Daniel Kleppner & Robert J. Kolenkow (TMH).
2. *Introduction of Classical Mechanics,* R.G. Takwale & P.S. Puranik (TMH, 2000).

Paper B: VIBRATIONS, WAVES & E.M. THEORY-I (30 Hrs.)

UNIT-I

Simple harmonic motion, energy of a SHM, Compound Pendulum, Torsional Pendulum, Electrical Oscillations, Transverse Vibrations of a mass on a string, composition of two perpendicular SHM of same period and of period in ratio 1: 2. Decay of free vibrations due to damping, differential equation of motion, types of damping, determination of damping co-efficient; Logarithmic decrement, relaxation time and Q- Factor. Electromagnetic damping (Electrical oscillator).

UNIT-II

Differential equation for forced mechanical and electrical oscillators, Transient and steady state behaviour. Displacement and velocity variation with driving force frequency, variation of phase with frequency, resonance. Power supplied to an oscillator and its variation with frequency. Q-value and band width. Q-value as an amplification factor. Stiffness, coupled oscillators, Normal co-ordinates and normal modes of vibration, Inductance coupling of electrical oscillators.

Books Suggested :

Essential Readings :

1. *Text Book of Vibrations and Waves* by S.P. Puri (Macmillan India Ltd.).
2. *Physics of Vibrations and Waves* by H.J. Pain, ELBS & John Wiley, London.

Further Readings :

1. *Vibrations and Waves* by A.P. French (Arnold Heinemann India, New Delhi).
2. *The Mathematics of Waves and Vibrations* by P.K. Ghosh (Mcmillan India).
3. *Waves and Oscillations* by N. Subrahmanayam & B. Lal (Vikas Pub., Delhi).

Paper–C : ELECTRICITY AND MAGNETISM-I (30 Hrs.)

UNIT-I

Basic ideas of Vector Calculus, Gradient, Divergence, curl in Cartesian coordinates and their useful relations, physical significance and applications, Conservative field, Greens's theorem in a plane, Laplacian in Rectangular coordinates. Stoke's theorem, Gauss's divergence theorem, Coulomb's Law for point charges and continuous distribution of charges, electric field due to dipole, line charge, charged ring, circular disc and sheet of charge, Gauss's Law and its differential form.

UNIT-II

Work and potential difference, Potential difference as line integral of field, Electric potential due to dipole and quadrupole and its applications in Electrostatic field, Electric field as gradient of scalar potential, curl **E** = 0. Calculation of **E** due to a point charge and dipole from potential. Poisson and Laplace's equation, Concept of electrical images. Calculation of electric potential and field due to a point charge placed near an infinitely conducting sheet.

Polarisation of matter, atomic and molecular dipoles, induced dipole moment and atomic polarizability. Electric susceptibility and polarization vector. Relation $K = 1 + \chi$, Gauss's law for dielectrics. Displacement vector, Div. **D** = 0, Energy stored in dielectric medium.

Books Suggested :

Essential Readings :

1. *Electricity & Magnetism* by A.S. Mahajan & A.A. Rangwala (Tata McGraw Hill).
2. *Fundamentals of Electricity and Magnetism* by Arthur F. Kipp.
3. *Electricity and Magnetism, Berkeley Physics Course, Vol. II* by E.M. Purcell.
4. *Introduction to Classical Electrodynamics* by David Griffith, Prentice Hall.

Further Readings :

1. *Electricity & Magnetism,* 4th Edition, W.J. Duffin.
2. *EM Waves and Radiating Systems,* Edward C. Jordan and K. G. Balmain, Prentice Hall.

PHYSICS PRACTICALS

The activities given in the section "Analysis of Experimental Data" are compulsory for all the students in the First semester.

The students are required to perform all the Nine experiments from each of the Units I and Unit II. The Practical examination will be held along with the second semester examinations.

The aim of project work is to develop the scientific and technical temper in the students and as such it may consist of development of a laboratory experiment, fabrication of a device or electronic circuit etc. The student will prepara a project report of about 10 pages. Assessment of the project work will be done on the basis of effort put in the execution of the project, report prepared, and viva-voce.

General Guidelines for Physics Practical Examinations :

Total : 50 marks

1. The distribution of marks is as follows :

(i)	One full experiment out of section–A requiring the student to take some data, analyse it and draw conclusions. (Candidates are expected to state their results with limits of error).	20
(ii)	One exercise based on experiment or Computer Programming from the Unit assigned to the student for the semester	7
(iii)	Viva-Voce and Record (Practical file)	10
(iv)	Project	8
(v)	Internal Assessment	5

Note for Examiners :

2. The marks scored under each head must be clearly written on the answer sheet.
3. There will be one session of 3 hours duration. The paper will have two sections. Section-A will consist of 4 experiments from each of Unit I and Unit II, out of which an examinee will mark 3 experiments from either of units and one of these is to be allotted by the external examiner.
4. Section–B will consist of exercises which will be set by the external examiner on the spot. The length of the exercises should be such that any of these could be completed in one hour.
5. The examiner should take care that the experiment allotted to an examinee from section–A and exercise allotted from section–B are not directly related to each other.
6. Number of candidates in a group for practical examination should not exceed **12**.
7. In a single group, no experiment to be allotted to more than three examinees in the group.

Analysis of Experimental Data (Compulsory for all students in first semester):

Objectives :

(i) Knowledge of propagation of errors.
(ii) Knowledge of significant figures, Determination of standard deviation and probable error and their use in interpretation of the experimental result.
(iii) Familiarity with the method of least square fitting of experimental data to a curve.

LIST OF EXPERIMENTS :

UNIT-I

MECHANICS

I. Measurements :

Objectives :

(i) Measurements of time, length, thickness and curvature, pressure, humidity
(ii) Concepts of least count, horizontal, vertical and angular alignments

Activities :

(i) To measure internal/external diameter of a hollow cylinder using Vernier calipers
(ii) To measure thickness of wire
(iii) To measure curvature of a lens
(iv) To measure pressure using Barometer
(v) To measure humidity using dry and wet thermometer

II. Rotation :

Objectives :

(i) Study of rotational motion.
(ii) Establishing relationship between different quantities.

Activities :

(i) To study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations using objects of various geometrical shapes but of same mass).

(ii) To establish relationship between torque and angular acceleration using fly wheel.

III. One-Dimensional Collisions :

Objectives :

(i) Conservation of linear momentum and kinetic energy in elastic collisions.
(ii) Dependence of fraction of kinetic energy transferred on the masses of colliding bodies.
(iii) Idea of coefficient of restitution.

Activities :

To determine energy transfer, coefficient of restitution and verify laws of conservation of linear momentum and kinetic energy in elastic collisions using one dimensional collisions of hanging spheres.

IV. Compound Pendulum :

Objectives :

(i) Idea of equivalent simple pendulum.
(ii) Concepts of centre of suspension and oscillation.
(iii) Dependence of time period on moment of Inertia .
(iv) Radius of gyration.
(v) Determination of g.

Activities :

(i) Measure time period as a function of distance of centre of suspension (oscillation) from centre of mass, plot relevant graphs, determine radius of gyration and acceleration due to gravity.
(ii) Find the value of g by Katers' or Bar pendulum.

V. Torsion Pendulum :

Objectives :

(i) Idea of torsional vibration, dependence of time period on M.O.I. and restoring torque.
(ii) Modulus of rigidity.

Activity :

Measure time period of oscillation of a Maxwell needle and determine modulus of rigidity of the material of a given wire.

VI. Damped Oscillator :

Objectives :

(i) Study damped oscillations.
(ii) Coefficient of damping, quality factor etc.

Activities :

To measure/obtain logarithmic decrement, coefficient of damping, relaxation time, and quality factor of a damped simple pendulum.

VII. Elasticity :

Objective :

Knowledge of elastic constants and related quantities.

Activities :

(i) Study of bending of beams and determination of Young's Modulus.
(ii) Determination of Poisson's ratio for rubber/plastic.

VIII. Standing waves :

Objective :

Standing waves on a string and in air.

Activities :

(i) Melde's experiment.
(ii) Kundt's tube.

IX. Viscosity :

Objective :

Knowledge of viscosity of liquids.

Activity :

Determination of coefficient of viscosity of a given liquid by Stoke's method and study its temperature dependence.

Computer based activities : Elementary C language programs, flowcharts and their interpretation.

1. To print out all natural even/odd numbers from a given series of natural numbers.
2. Numerical solution of equations of motion.
3. To calculate first ten prime numbers.

UNIT-II

ELECTRICITY AND MAGNETISM

I. Objective :

Measurement of resistance, voltage, current and electric energy.

Activities :

(i) To use a multimeter for measuring AC and DC voltage and resistance.
(ii) Measurement of resistance of LDR - To study inverse-square law (concept of solid angle and inverse square law) using linear LDR and light source.
(iii) Observations and measurements using an Electric energy meter. To find wattage of given bulb or heater.
(iv) To study the efficiency of an electric kettle or heater element with varying input voltage.

II. Low Resistance Measurements :

Objectives :

(i) Inadequacy of Wheatstone bridge to measure low resistances.
(ii) Acquaintance with a method of measuring low resistances.

Activity :

To determine low resistance with Carey Fosters Bridge.

III. Magnetic Field :

Objectives :

(i) Familiarity with the magnetic field produced by a solenoid.
(ii) Dependence of solenoidal field on number of turns and current.
(iii) Permeability of air.

Activities :

To study the magnetic field produced by a current carrying solenoid using a search coil and calculate permeability of air.

IV. Electromagnetic Induction :

Objective :

Verification of laws of electromagnetic induction.

Activity :

To study the induced e.m.f. as function of the velocity of the magnet.

V. Magnetism and current :
Objectives and Activities :

Force on a conductor carrying current in a magnetic field.

VI. LCR Circuits :

Objective :

Study of phase relationship between currents and voltages in ac circuits.

Activity :

Study of phase relationships using impedance triangle for LCR circuit and calculate impedance.

VII. Resonant Circuits :

Objective :

Concepts of resonance and Q-value.

Activities :

(i) Resonance in a series LCR circuits for different R-value and calculate Q-value.
(ii) Resonance in a parallel LCR circuits for different R-value and calculate Q-value.
(iii) To determine the dielectric constant of a solid by resonance method.

VIII. Capacitance :

Objectives :

(i) Measurement of capacitance, dielectric constant.
(ii) Concept of time constant and time base circuit.
(iii) Knowledge of a-c Bridges.

Activities :

(i) Capacitance by flashing and quenching of a neon lamp.
(ii) Measurement of capacitance, determination of permittivity of a medium, air and relative permittivity by De-Sauty's bridge.

IX. Self Inductance :

Objectives :

(i) Knowledge of a-c bridges.
(ii) Concept of self-inductance.

Activities :

(i) To determine L using Anderson Bridge.

Computer based activities: Elementary C language programs, flowchart and their interpretation.

1. To rearrange a list of numbers in ascending and descending orders.
2. To compile a frequency distribution and evaluate moments such as mean; standard deviation etc.
3. To evaluate sum of finite series and the area under a curve.

Texts and Reference Books :

1. *"B.Sc. Practical Physics by C.L. Arora, S.Chand & Co. (2014).*
2. *"A Laboratory Manual of Physics for Undergraduate Classes"* by D.P. Khandelwal.
3. *"Programming with C, Schaum series"* by Byron Gottfried & Jitender Chhabra

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PHYSICS

SEMESTER–II

Paper A : MECHANICS – II

UNIT-I

Rigid Body motion; Rotational motion, principal moments and Axes, Euler's equations, precession and elementary gyroscope.
Galilean transformations and Invariance, Transformation equations for inertial frames inclined to each other, Non-Inertial frames. Fictitious forces in a rotating frames of reference, Centrifugal and Coriolis forces due to rotation of earth, Foucault's pendulum.
Concept of stationery universal frame of reference and ether, Michelson-Morley experiment and its results.

UNIT-II

Postulates of special theory of relativity, Lorentz transformations, Kinematical consequences of Lorentz transformations – length contraction and time dilation, Twin paradox, Transformation of velocities, Simultaneity of relativity, Velocity of light in moving fluid, Relativistic Doppler effect.
Variation of mass with velocity, mass-energy equivalence, rest mass in an inelastic collision, relativistic momentum & energy, their transformation, concepts of Minkowski space, four vector formulation.

Books Suggested :

Essential Readings :

1. Mechanics, Berkeley, Vol. I, C. Kittle.
2. Mechanics, H.S. Hans & S.P. Puri.

Further Readings :

1. *Mechanics & Relativity (3rd Edition)*, Vidwan Singh Soni (PHI Learning, New Delhi, 2013)
2. *An Introduction to Machines,* Daniel Kleppner & Robert J. Kolenkow (TMH).
3. *Introduction of Classical Mechanics,* R.G. Takwale & P.S. Puranik (TMH, 2000).
4. *Basic Concepts of Relativity*, R.H. Good (East-West Press, New Delhi, 1974).

Paper B: VIBRATIONS, WAVES & E.M. THEORY-II (30 Hrs.)

UNIT-I

Waves in physical media, Wave equation and its solution, Types of waves, particle velocity, acceleration and energy in progressive waves. Longitudinal waves on a rod.
Transverse waves on a string, characteristic impedance of a string, Waves in absorbing media.
Reflection and Transmission of transverse waves on a string at discontinuity, Reflection and transmission of energy.
Reflection and transmission of longitudinal waves at a boundary.
Standing wave ratio, Impedance matching, Energy of vibrating string. Wave and group velocity.

UNIT-II

Physical interpretation of Maxwell's equations, E.M. waves and wave equation in a medium having finite permeability, permittivity and conductivity. Energy flow due to EM wave - Poynting vector, Impedance of a dielectric to EM waves. EM waves in a conducting medium and skin depth. Impedance and Refractive index of a dielectric and a conductor.
Reflection and transmission of EM waves at a boundary of two dielectric media for normal and oblique incidence.
Reflection of EM waves from the surface of a conductor at normal incidence.

Essential Readings :

Books Suggested :

1. *Text Book of Vibrations and Waves* by S.P. Puri (Macmillan India Ltd.).
2. *Physics of Vibrations and Waves* by H.J. Pain, ELBS & John Wiley, London.
3. *EM Waves and Radiating Systems* by Edward C. Jordan and K.G. Balmain, Prentice Hall.

Further Readings :

1. *Vibrations and Waves* by A.P. French (Arnold Heinemann India, New Delhi).
2. *The Mathematics of Waves and Vibrations* by P.K. Ghosh (Mcmillan India).
3. *Waves and Oscillations* by N. Subrahmanayam & B. Lal (Vikas Pub., Delhi).

Paper-C: ELECTRICITY AND MAGNETISM-II (30 Hrs.)

UNIT-I

Current and current density, equation of continuity. Microscopic form of Ohm's Law ($\mathbf{J} = \sigma\mathbf{E}$) and conductivity. Failure of Ohm's Law. Invariance of charge. **E** in different frames of reference. Field of a point charge moving with constant velocity. Force between parallel currents.
Behaviour of various substances in magnetic field. Definition of M and H and their relation to free and bound currents. Permeability and susceptibility and their interrelationship. B-H curve and energy loss in hysteresis, Langevin theory of diamagnetism.

UNIT-II

Lorentz's force. Definition of **B**. Biot Savart's Law and its application to long straight wire, circular current loop and solenoid. Ampere's Circuital law and its application. Divergence and curl of **B**. Hall effect, expression and co-efficient. Vector potential, Definition and derivation, current density— definition, its use in calculation of change in magnetic field at a current sheet. Energy stored in magnetic field, Faraday's Law of EM induction, Displacement current, Mutual inductance and reciprocity theorem. Self inductance for solenoid.

Books Suggested :

Essential Readings :

1. *Electricity & Magnetism,* A.S. Mahajan & A.A. Rangwala (Tata McGraw Hill).
2. *Fundamentals of Electricity and Magnetism* by Arthur F. Kipp.
3. *Electricity and Magnetism, Berkeley Physics Course, Vol. II* by E.M. Purcell.
4. *Introduction to Classical Electrodynamics* by David Griffith, Prentice Hall.

Further Readings :

1. *Electricity & Magnetism,* 4th Edition, W.J. Duffin.
2. *EM Waves and Radiating Systems,* Edward C. Jordan and K. G. Balmain, Prentice Hall.

PHYSICS PRACTICALS

The Practical examination will be held along with the second semester examinations. General Guidelines for Physics Practical Examinations and syllabus is given in syllabus for Semester I.

CHEMISTRY
SEMESTER – I

Scheme of Teaching and Examination

Paper	*Course*	*Teaching Hrs.*		*Max. Marks*
I	Inorganic Chemistry-A	30	3 periods per week	22 + 3 internal assessment
II	Organic Chemistry-A	30	3 periods per week	22 + 3 internal assessment
III	Physical Chemistry-A	30	3 periods per week	22 + 3 internal assessment
IV	Laboratory Practicals		6 periods per week	22 + 3 internal assessment
		Total :	**15 periods/week**	**100**

Paper 1 – INORGANIC CHEMISTRY-A

Time: 3 Hrs.
Max. Marks: 22+3
30 Hrs. (2 Hrs/week)
3 Periods/week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester System) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Atomic Structure

Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Ψ and Ψ^2, quantum numbers, radial and angular wave functions and probability distribution curves, shapes of *s*, *p*, *d* orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements and ions.

UNIT-II (7 Hrs.)

Periodic Properties

Position of elements in the periodic table; effective nuclear charge and its Calculations Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour.

UNIT-III (7 Hrs.)

Chemistry of Noble Gases and *s*-Block Elements

Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds. Comparative study, diagonal relationships, salient features of hydrides, solvation and complexation tendencies including their function in biosystems, an introduction to alkyls and aryls.

UNIT-IV (8 Hrs.)

Chemical Bonding-I

Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7, $SnCl_2$, XeF_4, BF_4^-, PF_6^-, $SnCl_6^{2-}$. Valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, ICl_2^- and H_2O. MO theory, homonuclear (elements and ions of 1st and 2nd row), and heteronuclear (BO, CN, CO^+, NO^+, CO, CN^-), diatomic molecules. Percentage ionic character from dipole moment and electronegativity difference.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman & Hall Ltd., 1991.
3. Shriver, D.E., Atkins, P.W., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.
4. Douglas, B., Medaniel, D., Atenander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994,
5. Porterfeild, W.W., Wesky, A., Inorganic Chemistry; Pubs: Addison-Wesky Publishing Company, 1984.
6. Miessler, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004,
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B.Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.K., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

Paper-II: ORGANIC CHEMISTRY-A

Time: 3 Hrs.
Max. Marks: 22+3
30 Hrs. (2 Hrs/week)
3 Periods/week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester System) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Structure and Bonding:
Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bond, Van der Waals interactions, resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

Mechanism of Organic Reactions:
Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles. Types of organic reactions. Energy considerations.

Reactive intermediates-Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning formal charges on intermediates and other ionic species.

Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

UNIT –II (7 Hrs.)

Alkanes and Cycloalkanes:
Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes
Mechanism of free radical halogenation of alkanes: Orientation, reactivity and selectivity. Cycloalkanes – nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitation. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds

UNIT-III (8 Hrs.)

Stereochemistry of Organic Compounds I:
Concept of isomerism, Types of isomerism.
Optical isomerism – Elements of symmetry, molecular chirality, enantiomers, stereogenic center, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centers, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization.

Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

UNIT-IV (7 Hrs.)

Stereochemistry of Organic Compounds II:

Geometric isomerism: Determination of configuration of geometric isomers. E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

Conformational isomerism – Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono and disubstituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.
Difference between configuration and conformation.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.
3. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson education, 2008.
4. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985.
5. Carey, F.A., Sundberg, R.J., Advanced Organic Chemistry Part B: Reactions and Synthesis;5th edition, Pubs: Springer, 2007.

Paper-III: PHYSICAL CHEMISTRY-A

Time: 3 Hrs.
Max. Marks: 22+3
30 Hrs. (2 Hrs/week)
3 Periods/week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Physical Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester System) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance may be given to requisite intellectual and laboratory skills**.**

UNIT-I (8 Hrs.)

Mathematical Concepts and Evaluation of Analytical Data:

Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation and integration of functions like e^x, x^n, sin x, log x; maxima and minima, partial differentiation and reciprocity relations.

Terms of mean and median, precision and accuracy in chemical analysis, determining accuracy of methods, improving accuracy of analysis, data treatment for series involving relatively few measurements, linear least squares curve fitting, types of errors, standard deviation.

UNIT-II (7 Hrs.)

Gaseous States:

Postulates of kinetic theory of gases, deviation from ideal behavior, Van der Waal's equation of state.

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of Van der Waal's equation, relationship between critical constants and Van der Waal's constants, the law of corresponding states, reduced equation of state.

Molecular Velocities*:* Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquification of gases (based on Joule-Thomson effect).

UNIT-III (8 Hrs.)

Chemical Kinetics-I

Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction- concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half life period and isolation method.

Radioactive decay as a first order phenomenon.

UNIT-IV (7 Hrs.)

Chemical Kinetics-II

Theories of Chemical Kinetics: Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

Catalysis and general characteristics of catalytic reactions, Homogeneous catalysis, acid-base catalysis and enzyme catalysis including their mechanisms, Michaelis Menten equation for enzyme catalysis and its mechanism.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 2002.
9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book company, 1989.

Paper-IV: LABORATORY PRACTICALS **Max. Marks: 22+3**
6 Periods/week

INORGANIC CHEMISTRY

(a) QUALITATIVE ANALYSIS:

Semimicro Analysis, cation analysis, separation and identification of ions from groups I, II, III, IV, V and VI. Anion analysis (4 ions).

Instruction to Examiners: Four ions with no interference (anions such as PO^{3-}, BO^{3-}_3 and similar anions like Cl^-, Br^-, I^- etc. and cattons from the same group) may not be given.

(b) QUANTITATIVE ANALYSIS:

Volumetric titrations involving acid-base, $KMnO_4$ and $K_2Cr_2O_7$.

There are three experiments - one involving acid-base titrations, one involving $KMnO_4$ and one involving $K_2Cr_2O_7$.

1. Determination of strength of Na_2Co_3 solution by titrating it against a standard solution of HCl.
2. Determination of molarity of $KMnO_4$ solution by titrating it against a standard solution of Oxalic acid.
3. Standarise the given $K_2Cr_2O_7$ solution by titrating it against a standard solution of Mohr's Salt.

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. I. Qualitative Analysis : 10 marks

Q.No. II. Quantitative Analysis : 06 marks

Q.No. III. Viva-Voce :03 marks

Ask three questions (1 marks each) related to chemistry practicals. :03 marks

Q.No. IV. Note Book

Books Suggested (Laboratory Courses)

1. Svehla, Vogel's Qualitative Inorganic Analysis (revised); 7th edition Pubs: Orient Longman, 1996.
2. Bassett, J., Denney, R.C., Jeffery, G.H., Mendham, J., Vogel's Textbook of Quantitative Inorganic Analysis (revised); 4th edition, 1978.
3. Palmer, W.G., Experimental Inorganic Chemistry; 1st edition, Pubs: Cambridge, 1954.
4. Brauer, Handbook of Preparative Inorganic Chemistry; 2nd edition, Pubs: Academic Press, 1963, Vol. I, & 1965, Vol. II.
5. Audrieth, L.F., Inorganic Synthesis; Pubs: McGraw Hill, 1950, Vol. 3rd; E.G. Rochow, 1960 Vol. VI; J. Kleinberg, 1963, Vol. 7; S.Y. Tyree, 1967 ,Vol.9; E.L. Muetterties, 1967, Vol.10; W.L. Jolly 1986, Vol 11; R.W. Parry 1970, Vol. 12; F.A. Cotton 1972, Vol. 13; A.G. Mac Diarmid, 1977, Vol. 17.
6. Bansal, R.K., Laboratory Manual of Organic chemistry; 3rd edition, Pubs: Wiley Eastern Limited, 1994.

CHEMISTRY
SEMESTER –II

Scheme of Teaching and Examination

Paper	*Course*	*Teaching Hrs.*		*Max. Marks*
V	Inorganic Chemistry-B	30	3 periods per week	22 + 3 internal assessment
VI	Organic Chemistry-B	30	3 periods per week	22 + 3 internal assessment
VII	Physical Chemistry-B	30	3 periods per week	22 + 3 internal assessment
VIII	Laboratory Practicals		6 periods per week	22 + 3 internal assessment
		Total :	**15 periods/week**	**100**

Paper V – INORGANIC CHEMISTRY –B

Time: 3 Hrs.
Max. Marks: 22+3
30 Hrs. (2 Hrs/week)
3 Periods/week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester System) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (7 Hrs.)

Chemical Bonding-II

Ionic Solids – Concept of close packing., Ionic structures, (NaCl type, Zinc blende, Wurtzite, CaF_2 and antifluorite), radius ratio rule and coordination number, limitation of radius ratio rule, lattice defects, semiconductors.

UNIT-II (8 Hrs.)

Chemical Bonding-III

Lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule. Metallic bond-free electron, valence bond and band theories. Weak Interactions – Hydrogen bonding, Van der Waals forces.

UNIT-III (7 Hrs.)

***p*-Block Elements-I**

Comparative study (including diagonal relationship) of groups 13-14 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-14, hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons.

UNIT-IV (8 Hrs.)

***p*-Block Elements-II**

Comparative study of groups 15-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 15-17, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman & Hall Ltd., 1991.
3. Shriver, D.E., Atkins, P.W., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.
4. Douglas, B., Medaniel, D., Atenander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994,
5. Porterfeild, W.W., Wesky, A., Inorganic Chemistry; Pubs: Addison-Wesky Publishing Company, 1984.
6. Miessler, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004,
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B.Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.K., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

Paper-VI: ORGANIC CHEMISTRY-B

Time: 3 Hrs.
Max. Marks: 22+3
30 Hrs. (2 Hrs/week)
3 Periods/week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester System) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Alkenes, Cycloalkenes

Nomenclature of alkenes, methods of formation, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. The Saytzeff's Rule, Hofmann elimination, physical properties and relative stabilities of alkenes.

Chemical reactions of alkenes – mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration – oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with $KMnO_4$. Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

UNIT-II (7 Hrs.)

Dienes and Alkynes

Methods of formation, conformation and chemical reactions of cycloalkenes.

Nomenclature and classification of dienes : Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions, Diels-Alder reaction.

Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of electrophilic and nucleophilic addition reactions, hydroboration-oxidation, metal-ammonia reductions, oxidation and polymerization.

UNIT-III (8 Hrs.)

Arenes and Aromaticity:

Nomenclature of benzene derivatives. The aryl group, Aromatic nucleus and side chain, Structure of benzene : Molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture.

Aromaticity: The Huckel rule, aromatic ions.

Aromatic electrophilic substitution – General pattern of the mechanism, role of σ and π – complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkylbenzenes, alkynyl benzenes and biphenyl.

UNIT-IV **(7 Hrs.)**

Alkyl and Aryl Halides

Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, S_N2 and S_N1 reactions with energy profile diagrams.
Polyhalogen compounds : chloroform, carbon tetrachloride.
Methods of formation of aryl halides, nuclear and side chain reactions. The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.
Relative relativities of alkyl halides vs. allyl, vinyl and aryl halides.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.
ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.
iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.
3. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson education, 2008.
4. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985.
5. Carey, F.A., Sundberg, R.J., Advanced Organic Chemistry Part B: Reactions and Synthesis; 5th edition, Pubs: Springer, 2007.

Paper-VII: PHYSICAL CHEMISTRY-B

Time: 3 Hrs.
Max. Marks: 22+3
30Hrs.
(2 Hrs/week)
3 Periods/week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Physical Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester System) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance may be given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Thermodynamics-I:

Definition of Thermodynamic Terms: System, surroundings etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy, Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's Law-Joule-Thomson coefficient and inversion temperature. Calculations of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

UNIT-II (7 Hrs.)

Thermochemistry:

Standard state, standard enthalpy of formation-Hess's Law of constant Heat Summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy. Kirchoff's equation.

UNIT- III (7 Hrs.)

Colloidal State:

Definition of colloids, classification of colloids.

Solids in liquids (sols): Properties –kinetic, optical and electrical; stability of colloids, protective action, Hardy-Schulze rules, gold number.

Liquids in liquids (emulsions) : Types of emulsions, preparation. Emulsifier.

Liquids in solids (gels): Classification, preparation and properties, inhibition, general applications of colloids.

UNIT-IV (8 Hrs.)

Solutions, Dilute Solutions and Colligative Properties:

Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient.

Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression of freezing point. Experimental methods for determining various colligative properties.

Abnormal molar mass, degree of dissociation and association of solutes.

Instructions for paper setters and candidates:

i. ***Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.***
ii. ***The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.***
iii. ***Compulsory question carries six marks and remaining all questions carry four marks each.***

Books suggested

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.
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9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book company, 1989.

Paper-VIII: LABORATORY PRACTICALS **Max. Marks: 22+3**
6 Periods/week

ORGANIC CHEMISTRY AND GREEN CHEMISTRY PRACTICALS
Crystallization and determination of melting points

Concept of induction of crystallization

1. Phthalic acid from hot water (using fluted filter paper and stemless funnel).
2. Acetanilide from boiling water.
3. Benzoic acid from water

PHYSICAL CHEMISTRY

1. Refractive indices
   Determine the Refractive indices of given liquids (water, acetone, methanol, ethylacetate, cyclohexane) by Abbe's refractometer & calculate their specific refractions.
2. Viscosity
   To determine the viscosity of Brine Solution (20%), n-Butyl alcohol, cyclohexane
3. Surface Tension
   To determine the surface tension of Brine Solution (20%), n-Butyl alcohol, cyclohexane

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. I. Physical Chemistry : 10 marks
Q.No. II. Organic Chemistry : 06 marks
Q.No. III. Viva-Voce : 03 marks
Ask three questions (1 marks each) related to chemistry practicals.

Q.No. IV. Note Book : 03 marks

Books Suggested (Laboratory Courses)

1. Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition Pubs: R. Chand & Co., New Delhi, 2002.
2. Das, R.C., Behra, B., Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd., 1998.
3. Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman Group Ltd., London & New York, 1978.

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PANJAB UNIVERSITY, CHANDIGARH-160014 (INDIA)

(Estd. under the Panjab University Act VII of 1947—enacted by the Govt. of India)

SYLLABI

FOR

B.A. & B.Sc. (GENERAL) SECOND YEAR
(SEMESTER SYSTEM)
EXAMINATIONS, 2020-2021

(SEMESTER : THIRD AND FOURTH)

i.e

Third Semester : November/December, 2020
Fourth Semester : April/May, 2021

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ENGLISH (Compulsory)
(FOR B.Sc. CANDIDATES ONLY)

SEMESTER-III

Note:

(i) There will be one paper of 40 marks, 5 marks are reserved for the Internal Assessment and 5 for the Practical Work. Total is 50.

(ii) The paper shall consist of Two Units. Unit I will be text specific and Unit II shall deal with different aspects of Communication and Language skills.

(iii) For Unit I, the prescribed text is **Varieties of Expression,** Ed. A. H. Tak, Foundation Books. Only four prose chapters and two dramas have been recommended for the study. The relevant sections, however, are as follows:

Unit I

Prose : Chapters 1-4
Drama : Dramas 1-2

Unit II

Note (iv) No text book is recommended for Unit II, but a few books that may be used for this Unit are listed towards the end. Unit II shall consist of the following:

Business Communication: It shall focus on different aspects of communication in general and business communication in particular, communication within organizations, types of communication and significance of positive attitude in improving communication.

Writing Skills: This section shall focus on letters of all kinds, tender notices, auction notices, public notices; and memos.

Practical work:-

Teacher should assign some project or practical work to the students. This should be in the nature of guided activity, which the students shall have to complete under the direct supervision of the teacher. The students may be given projects on a variety of subjects relating to their discipline i.e. business, commerce, accounts etc. Preferably, they should be given minor projects (to be completed within less than two weeks, and length not exceeding 20 pages) in consultation with teachers of commerce. However, the evaluation of the projects should be done only by the Language Teachers, who must keep all the basic criteria of good writing in mind while doing so.

(Note*: In case of private candidates and students of University School of Open Learning, the marks obtained by them out of 40 will be proportionately increased out of 50).*

Testing Scheme:

The examination paper shall be divided into two sections, corresponding to two units already proposed in the syllabus. The distribution of questions and marks in Unit I shall be as follows:

Section I (It is text-based and corresponds to Unit I in the syllabus)

It shall consist of six short questions. Three from Prose and three from drama (not exceeding 50-60 words) out of which a student will be expected to attempt any **two** from **Prose** and **two** from **Drama**. This question shall be based upon the prescribed text **Varieties of Expression** and cover a wide rangeof issues, topics and problems.

10 marks

It shall consist of four long questions – **Two** from **Prose** and **two** from **Drama** (not exceeding 100-150 words) out of which a student will be expected to attempt **two**- one from Prose and one from Drama.

5 marks

Note: The question 1 & 2 should be so designed as to cover all the chapters prescribed (Prose & Drama)

It shall exclusively be a test of vocabulary, but designed strictly on the lines of various exercises given at the end of each chapter in the prescribed text. The candidate shall be given **five** words in one column and asked to match them with words/meanings in the next column. **5 marks**

Unit II

This question shall test a student's ability to write letter of various kinds (not more than 200 words). Again, there will be internal choice here. **5 marks**

Memos/Tender Notices/Auction Notices/Public Notices. **10 marks**

One short question to test the students' understanding of various aspects of Business Communication.

5 marks

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ENGLISH (Compulsory)

(FOR B.Sc. CANDIDATES ONLY)

SEMESTER-IV

Note:

(i) There will be one paper of 40 marks, 5 marks are reserved for the Internal Assessment and 5 for the Practical Work. Total is 50.

(ii) The paper shall consist of Two Units. Unit I will be text specific and Unit II shall deal with different aspects of Communications and Language skills.

(iii) For Unit I, the prescribed text is **Varieties of Expression,** Ed. A. H. Tak, Foundation Books. Only four prose chapters and two dramas have been recommended for the study. The relevant sections, however, are as follows:

Unit I

Prose : Chapters 5-8
Drama : Dramas 3-4

Unit II

Note (iv) No text book is recommended for Unit II, but a few books that may be used for this Unit are listed towards the end. Unit II shall consist of the following:

Writing Skills: This section shall focus on précis-writing, curriculum vitae, short, formal reports (not exceeding 200 words) and advertisements relating to product promotion etc.

Modern Forms of Communication: Here special emphasis shall be given to teaching the format of E-mails, Fax Messages, Audio-Visual Aids and Power-Point Presentations.Apart from this, the students shall also be given basic lessons in Effective Listening, Non-Verbal Communication. How to Prepare for an Interview & Group Discussion etc.

Practical Work:

Teacher should assign some project or practical work to the students. This should be in the nature of guided activity, which the students shall have to complete under the direct supervision of the teacher. The students may be given projects on a variety of subjects relating to their discipline i.e. business, commerce, accounts etc. Preferably, they should be given minor projects (to be completed within less than two weeks, and length not exceeding 20 pages) in consultation with teachers of commerce. However, the evaluation of the projects should be done only by the Language Teachers, who must keep all the basic criteria of good writing in mind while doing so.

(Note*: In case of private candidates and students of University School of Open Learning, the marks obtained by them out of 40 will be proportionately increased out of 50).*

Testing Scheme:

The examination paper shall be divided into two sections, corresponding to two units already proposed in the syllabus. The distribution of questions and marks in Section I shall be as follows:

Unit I (It is text-based and corresponds to Unit I in the syllabus)

It shall consist of six short questions. Three from Prose and three from drama (not exceeding 50-60 words) out of which a student will be expected to attempt any four, **Two** from **Prose** and **two** from **Drama**. This question shall be based upon the prescribed text **Varieties of Expression** and cover a wide range of issues, topics and problems.

10 marks

It shall consist of four long questions – **Two** from **Prose** and **two** from **Drama** (not exceeding 100-150 words) out of which a student will be expected to attempt **two**- one from Prose and **one** from Drama.

5 marks

Note: The question 1 & 2 should be so designed as to cover all the chapters prescribed (Prose & Drama)

It shall exclusively be a test of vocabulary, but designed strictly on the lines of various exercises given at the end of each chapter in the prescribed text. The candidate shall be given **five** words in one column and asked to match them with words/meanings in the next column. **5 marks**

Unit II

Short Survey Report (150-200 words) with internal choice. **5 marks**

Precis of 200 words. **10 marks**

Definition/Format of modern forms of communication to be tested.
(e-mail, fax, videoconferencing) **5 marks**

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COMPUTER SCIENCE
SEMESTER-III

SCHEME OF EXAMINATION

THIRD SEMESTER			Exam . Hrs	Ext.	Int.	Max. Marks
Paper – CS05	**Theory-A**	**Computer Organization**	**3**	**30**	**5**	**35**
Paper –CS06	**Theory-B**	**Object Oriented Programming using (C++)**	**3**	**30**	**5**	**35**
Paper – PCS03	**Practical-C**	**Practical Based on Paper – CS06**	**3**	**30**	**--**	**30**

Note : Practical marks will include the appropriate weightage for proper maintenance of Lab. Record.

Paper-CS05 : Computer Organization

Objective : To teach the students the basics of computer organization, Microprocessor & basic know how about system maintenance.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT - I

Representation of Information : Number system: Binary, Decimal, Hexadecimal, Octal; Conversions; integer and floating point representation, character codes (ASCII, EBCDIC), error detection and correction codes: Parity bit method, Hamming code; Boolean algebra.

UNIT – II

*Basic Building Blocks :*Combinatorial logic design : Gates, Half Adder, Full Adder, Encoder, Decoder, Multiplexer : Sequential Building Block : Flip-Flops, Registers, Counters: Synchronous and Asynchronous Counters, Bus.

Microinstructions : Register Transfer, Arithmetic, Logical and Shift Operations; Instruction : Instruction Format, Instruction Cycle; Interrrupt: Interrupt types, Interrupt Cycle.

UNIT – III

Micrprocessor : Architecture of 8086/8088 Processor Model; Instruction Set; Addressing Modes: Registgers used in Mircoprocessor.

Assembly Language : Features of Assembly Language, Machine Language vs Assembly Language, Pseudo Instruction; use of Assembly for programs: Addition, Subtraction, Multiplication using Subroutines and Basic Input/Output.

UNIT – IV

System Maintenance : Introduction to various physical components of a computer, Physical Inspection and Diagnostics on PC, types of displays and other peripheral devices, installing software; Functional description of various Internal and External cards; Viruses: Types of Computer Viruses, Detection of Viruses, Protection from Viruses.

Suggested Readings :

Essential :

1. Mano, M.M. : *Computer System Architecture*, 3rd Ed., Dec., 1998, PHI.

Further Reading :

2. Tannenbaum, A.S. : *Structured Computer Organization*, 3rd Ed., Oct., 1993, PHI.

3. Gear, C.W. : *Computer Organisation and Programming*, McGraw Hill, 1975.

4. Langholz, G., Grancioni, J. & Kandel, A. : *Elements of Computer Organization*, Prentice Hall International, 1988.

5. Hayes : *Computer Architecture and Organization*, McGraw Hill, International Edition.

6. Sloan, M.E. : *Computer Hardware and Organization*, 2nd Edition, Galgotia Pvt. Ltd.

Paper-CS06 : Object Oriented Programming (using C++)

Objective : To teach the students the implementation of various object oriented programming concepts through C++ programming

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT – I

Basic Concepts of Object Oriented Programming(OOP) : Object, Class, Encapsulation, Data Hiding, Inheritance, Polymorphism. Analysis and design of system using Object Oriented Approach, Benefit of OOPs.

Structure of a C++ Program : Include files, Declaration of class, Main function, I/O streams.

Classes : Class Declaration : Data Members, Member Functions, Private and Public members, data hiding and encapsulation, arrays within a class.

Objects : Creating Objects, Accessing class data members, Accessing member functions, Methods of passing arguments to functions.

UNIT – II

Object Concepts: Arrays of Objects, Objects as function arguments: Pass by value, Pass by Reference, Pointers to Objects.

Functions in C++ : Member function definition inside the class declaration and outside the class declaration, scope resolution operator, Private and Public member function, Nesting of member functions, Static and Friend functions.

UNIT – III

Constructors and Destructors: Constructors: Declaration and Definition, Default Constructors, Parameterized Constructors, Copy Constructors. *Destructors*: Definition and use.

Inheritance – Extending Classes : Concept of inheritance, base class, derived class, defining derived classes, visibility modes, private, public, protected; single inheritance : privately derived, publicly derived; making a protected member inheritable, access control to private and protected members by member functions of a derived class, multilevel inheritance, nesting of classes.

UNIT – IV

Polymorphism : Definition, types, Function overloading, Operator Overloading, Virtual functions and pure virtual functions.

Suggested Readings :

Essential :

1. Stroustrup : ***The C ++ Programming Language,*** **Addison Wesley.**
2. E. Balaguruswamy : ***Object Oriented Programming with C++,*** **TMH.**

Further Reading :

3. Robert Lafore : ***OOP in Turbo C++,*** **Galgotia.**
4. Herbert Schildt : ***Schildt's Advanced Win 95 Prog. in C & C++,*** **TMH.**
5. Herbert Schildt : ***C++ The Complete Reference,*** **TMH.**

Paper – PCS03 : Practical Based on Paper CS06

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COMPUTER SCIENCE
SEMESTER-IV

SCHEME OF EXAMINATION

FOURTH SEMESTER			Exam . Hrs	Ext.	Int.	Max. Marks
Paper – CS07	**Theory-A**	**Database Concepts**	**3**	**30**	**5**	**35**
Paper –CS08	**Theory-B**	**Data Structures**	**3**	**30**	**5**	**35**
Paper – PCS04	**Practical-C**	**Practical Based on Paper – CS08**	**3**	**30**	**--**	**30**

Note : Practical marks will include the appropriate weightage for proper maintenance of Lab. Record.

Paper-CS07: Database Concepts

Objective : To teach the underlying concepts of database system in depth to students.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT – I

Basic Concepts: A Historical perspective, File Systems vs. DBMS, Characteristics of the Data Base Approach, Abstraction and Data Integration, Database users, Advantages and Disadvantages of DBMS, Implication of Database approach; Data Independence.

UNIT – II

Relational Data Model: Relational model concepts, Integrity constraints over Relations, Conventional Data Models : An overview of Network and Hierarchical Data Models. The 12 Rules (Codd's Rule) for an RDBMS; Entity Relationship model.

UNIT – III

Relational Algebra and Calculus: Storage Organization for Relations, Relational Algebra: Operations - union, intersection, difference, Cartesian product, projection, selection, division and relational algebra queries; Relational Calculus: Tuple oriented and domain oriented relational calculus and its operations.

UNIT – IV

Advance concepts: Client-Server Architecture, 3-tier Architecture of database, Distributed databases, Normalization: First, second and third Normal Form, Boyce Codd Normal Form; Database Integrity: entity and referential; Security: , Concurrency, Recovery

Suggested Reading

Essential :

1. Date, C.J., 1981 : *An Introduction to Data Base Systems*, Vols. I and II, Addison-Wesley.

Further Readings

2. Ullman, Jeffrey D., : *Principles of Data Base Systems*, 2nd Edition, Galgotia Publ. Pvt. Ltd. 1982.
3. Whittington, R.P. : *Data Base System Engineering*, Clavendon Press.
4. Pratt, P., 1987 : *Data Base Systems Management and Design*, Boyd and Fraser Publ.
Comp.

Paper-CS08 : Data Structures

Objective : To teach the students various data structures and operations performed on them using algorithms. The students will be capable to implement these operations using any programming language.

Note : (i) The question paper will consist of Four units.

(ii) Examiner will set total of **NINE** questions comprising **TWO** questions from each unit and **ONE** compulsory question of short answer type covering the whole syllabi.

(iii) The students are required to attempt **ONE** question from each unit and the compulsory question.

(iv) All questions carry equal marks unless specified.

UNIT – I

Basic Concepts: Introduction to Complexity, Data Structure and Data Structure operations. Applications of Data Structure, Basic data Structures; **Arrays**: Introduction, Types of Array, Memory representation, Applications and operations. **Stacks**: Introduction, memory representation, Applications and operations

UNIT – II

Linked List: Operations:-traversing, searching, inserting, deleting, operations on header linked list, circular linked list, doubly linked list, memory representation, Applications, polynomial manipulation; **Queue**: Introduction, Types, Memory Representation and Applications.

UNIT – III

Trees – Definition and Basic concepts, Representation in Contiguous Storage, Binary Tree, Binary Tree Traversal, Binary Search tree; **Graphs**: Introduction, Memory Representation, Graph Traversal (DFS and BFS).

UNIT – IV

Searching: Binary and Linear Search; **Sorting**: Bubble sort, Insertion sort, Selection sort, Merge Sort, Quick sort.

Suggested Readings :

Essential :

1. Lipschuitz L. Seymour, 2001 : Data Structure, Schaum Outline Series, TMH, New Delhi.

Further Readings :

2. Tannenbaum, Aaro M., 1990 : Data Structure Using C, Pearson.

Paper – PCS04 : Practical Based on Paper CS08 – Implement Data Structures Operations using C / C++.

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PHYSICS

B.Sc. (GENERAL) SECOND YEAR (3rd and 4th Semester) EXAMINATION, 2020-2021

General Instructions for teachers, students and paper setters:

1. There will be three papers of theory and one laboratory (practical course). Each of the theory papers is allocated 25 marks including 3(three) marks for the Internal Assessment. The Practical examination is of 25 marks including 3 (three) marks for the Internal assessment. The exams will be conducted every semester.

2. The number of lectures per week will be three for each theory paper and six for practicals.

3. The examination time for each theory paper as well as practical paper will be three hours.

4. Each theory paper will consist of seven questions comprising of three sections. First two sections will comprise of three questions from each of Units I and II of syllabus, and the third section will comprise of one compulsory question of ten short answer type parts covering whole syllabus. The question paper will be set for 44 marks - All the questions in first and second sections will carry 9 (nine) marks each and the compulsory question will carry 8 marks. Student will attempt two questions from each of the first two sections and any eight parts of the compulsory questions. After evaluation of the answer books out of 44 marks, the marks will be given out of 22 marks.

5. The numerical problems/exercises in the question paper should be 25-30%.

6. The use of Non-programmable calculators will be allowed (paper setter should explicitly mention this in the question paper) in the examination centre but these will not be provided by the University/College. Mobile phones and pages are not allowed in the examination hall.

7. External examiners will be sent for Practical examinations.

PHYSICS

SEMESTER-III

Papers, marks and teaching hours allocation:

Paper A	:	Statistical Physics and Thermodynamics – I	Total Teaching hrs. 30
Paper B	:	Optics and Lasers –I	Total Teaching hrs. 30
Paper C	:	Quantum Physics-I	Total Teaching hrs. 30
		Physics Practicals	Total Teaching hrs. 45

Paper A : STATISTICAL PHYSICS AND THERMODYNAMICS-I (30 Hrs.)

UNIT-I

Basic ideas of Statistical Physics, Scope of Statistical Physics, basic ideas about probability, distribution of four distinguishable particles in two compartments of equal size. Concept of macrostates, microstates, thermodynamic probability, effects of constraints on the system, distribution of n particles in two compartments, deviation from the state of maximum probability, equilibrium state of dynamic system, distribution of distinguishable n particles in k compartments of unequal sizes.

UNIT-II

Phase space and its division into elementary cells, three kinds of statistics. The basic approach in the three statistics. Maxwell-Boltzman statistics applied to an ideal gas in equilibrium, experimental verification of Maxwell-Boltzman's law of distribution of molecular speeds.
Need of quantum statistics--B.E. statistics, derivation of Planck's law of radiation, deduction of Wien's displacement law and Stefan's law from Planck's law, F.D. statistics, Comparison of M.B., B.E. and F.D. statistics.

Books Suggested :

Essential Readings :

1. "*Statistical Physics and Thermodynamics*", V.S. Bhatia, (Shoban Lal Nagin Chand, Jalandhar).
2. "*A Treatise on Heat*" Saha and Srivastava (Indian Press, Ahmedabad, 1972).

Further Readings:

1. *Thermal Physics* by C. Kittel & H. Kroemer, CBS Pub., 1987.
2. *Thermal Physics*, S.C. Garg, R.M. Bansal, and C.K. Ghosh, TMH, 2000.

Paper-B : OPTICS AND LASERS-I (30 Hrs.)

UNIT-I

Interference : Concept of coherence, spatial and temporal coherence, coherence time, coherence length, area of coherence. Conditions for observing interference fringes. Interference by wavefront division and amplitude division. Young's double slit experiment. Lloyd's mirror and Fresnel's biprism, phase change on reflection. Newton's rings,Michelson interferometer—working, principle and nature of fringes. Interference in thin films, Role of interference in anti-reflection. Multiple beam interference, Fabry-Perot interferometer, nature of fringes, finesse.

UNIT-II

Diffraction : Huygen-Fresnal theory half period zones, zone plates. Distinction between Fresnel and Fraunhofer diffraction. Fraunhofer diffraction due to single slit and intensity distribution,double slits & multiple slits(qualitative). Fraunhofer diffraction at rectangular (qualitative discussion)and circular apertures. Effects of diffraction in optical imaging, resolving power of microscope and telescope, diffraction grating, its use as a spectroscopic element, resolving power, Moire's fringes.

Polarization : Concept and analytical treatment of unpolarised, plane polarized and elliptically polarized light. Double refraction, Nicol prism, sheet polarisers, retardation plates. Production and analysis of polarized light (quarter and half wave plates).

Books Suggested :

Essential Readings:

1. *Optics*, Jenkins and White, McGraw Hill.
2. *Optics*, Ajoy Ghatak, McMillan India.
3. *Physics for Degree Students*, C. L. Arora and P .S. Hemne, S. Chand & Co., 2014.

Further Readings:

1. *Optics*, Born and Wolf, Pergamon.

Paper-C : QUANTUM PHYSICS-I (30 Hrs.)

UNIT-I

Formalism of Wave Mechanics :

(i) Plancks's formula of Black body radiation and energy quantization,
Wave-particle duality – Photoelectric effect, X-ray diffraction, Compton effect, Pair production, Photon and gravity.
De Brogile waves, wave packet, Phase velocity and Group velocity, Electron microscope, Particle in a box, Particle diffraction, Davisson-Germer experiment, Interferferometry with particles.
Uncertainty principle with illustrations, Principle of complementarity. (Chapters 2 and 3 of book 1 or Chapters 1-3 of book 2)

(ii) Quantum mechanics, Wave equation, Plausible arguments leading to time-dependent Schrodinger equations, Born's interpretation of Wave function, complex character, continuity and boundary conditions, probability interpretation, normalization, Probabilty current, Probability conservation equation, Principle of superposition.

(iii) Fundamental postulates of quantum mechanics. Eigenvalues and eigenfunctions. Operator formalism, Position, momentum and energy operators, expectation values, Ehrenfest theorem, Hermitian operators.

(Chapter 5 of book 1 and book 2)

UNIT-II

Problems in One and Three Dimensions :

(a) Steady-state Schrodinger equation, Appliction to stationary states for one dimension, Potential step. potential barrier, Tunnel effect examples, Scanning Tunneling microscope, rectangular potential well, Linear harmonic oscillator.

(Chapter 5 of book 1 and book 2)

(ii) Schrödinger equation for spherically symmetric potential, spherical harmonics, hydrogen atom energy levels and eigenfunctions, Principal, Orbital and Magnetic quantum numbers, Electron probability density.

(Chapter 6 of book 1 and book 2)

Books Suggested :

Essential Readings :

1. *Concept of Modern Physics, A. Beiser, S. Mahajan and S. R. Choudhury, Tata McGraw Hill, 6th Edition.*
2. *Quantum Physics of Atoms, Molecular, R. Eisberg & R.Resnick, Second Edition, John Wiley, 2002.*
3. *Physics for Degree Students, C.L. Arora and P.S. Hemne, S. Chand & Co., 2014*

Further Readings :

1. *Modern Physics,* J. Bernstein, P.M. Fishbane, S.G. Gasiorowicz, Pearson, 2000.
2. *Elements of Modern Physics*, S.H. Patil, McGraw Hill, 1998.
3. *Quantum Mechanics*, E. Merzbacaher, II Ed., John Wiley.

PHYSICS PRACTICALS

The students are required to perform all the Nine experiments from each of the Units I and Unit II .The Practical examination will be held along with the fourth semester examination.

The aim of the project work is to develop the scientific and technical temper in the students and as such it may consist of development of a laboratory experiment,fabrication of a device or electronic circuit etc. The student will prepare a project report of about 10 pages. Assessment of the project work will be done on the basis of the effort put in the execution of the project, report prepared and viva-voce.

General Guidelines for Physics Practical Examinations :

Total : 50 marks

1. The distribution of marks is as follows :

(i) One full experiment out of section–A requiring the student to take some data, analyse it and draw conclusions. (Candidates are expected to state their results with limits of error).	20
(ii) One exercise based on experiment or Computer Programming from the Unit assigned to the student for the semester	7
(iii) Viva-Voce and Record (Practical file)	10
(iv) Project	8
(v) Internal Assessment	5

Note for Examiners :

2. The marks scored under each head must be clearly written on the answer sheet.
3. There will be one session of 3 hours duration. The paper will have two sections. Section–A will consist of 4 experiments from each of Units I and Unit II, out of which an examinee will mark 3 experiments from either of units and one of these is to be allotted by the external examiner.
4. Section–B will consist of exercises/computer based activities which will be set by the external examiner on the spot. The length of the exercises should be such that any of these could be completed in one hour.
5. The examiner should take care that the experiment allotted to an examinee from section-A and exercise allotted from section–B are not directly related to each other.
6. Number of candidates in a group for practical examination should not exceed **20**.
7. In a single group, no experiment be allotted to more than three examinees in the group.

List of Experiments :

UNIT-I

A. Statistical Physics and Thermodynamics :

I. To study adiabatic expansion of a gas.

II. To measure thermal expansion of crystal using interference fringes.

III. To measure thermal conductivity in poor conductor by Lee's method.

IV. Thermo emf calibration, comparison.

V. Total radiation law, temperature dependence of radiation.

VI. To study Probability distribution using coloured dice, coins.

B. Optics and Lasers :

VII. To determine the refractive index of a liquid using spectrometer.

VIII. To determine the Cauchy's constants.

IX. To study the refractive index of a doubly refracting prism.

X. Study of rotation of plane of polarization with a polarimeter.

XI. To determine the wave length of a given light using biprism.

Exercises :

1. To measure the thermo e.m.f.
2. To determine the heating efficiency of an electric kettle with varying voltages.
3. To measure the angle of rotation of plane of polarization for the given liquid.
4. To determine the least count and setup the spectrometer for minimum deviation position of the prism.

Computer Based Activities : Elementary C language programs.

1. Motion of particle in a central force field.
2. Calculation of days between two dates of a year.
3. To check if triangle exists and the type of the triangle.

UNIT-II

C. Optics and Lasers :

I. To determine the wave length and dispersive power using plane diffraction grating (use Hg source).

II. To determine the resolving power of a telescope.

III. To determine the resolving power of a grating.

IV. Set up Newton's rings to determine wave length of sodium light.

V. To measure an inaccessible height using sextant.

VI. To determine the principal points of a lens system.

VII. To determine the divergence and wave length of a given laser source.

D. Quantum Physics:

VIII. To study the Photoelectric effect and determine the value of Planck's constant.

IX. To study the gas discharge spectrum of hydrogen.

X. To study the absorption spectra of iodine vapours.

XI. To determine the ionization potential of mercury.

Exercises :

1. To measure the diameter of Newton's rings.
2. Study of variation of light intensity using photovoltaic cell/inverse square law.
3. To determine the angle of wedge using interference method.
4. To measure the angle of elevation of a tall building.

Computer Based Activities : Elementary C language programs.

1. To find the sum of the sine and cosine series and print out the curve.
2. To find Sum and Product of Matrices
3. Motion of a projectile using computer simulation.

Text and Reference Books :

1. *A Laboratory Manual of Physics for Undergraduate Classes*, D.P. Khandelwal.
2. *B.Sc. Practical Physics, C.L.* Arora (S. Chand) & Co. (2014)
3. *Numerical Analysis* by C. Dixon.
4. *Programming with C, Schaum series* by Byron Gottfried & Jitender Chhabra.

PHYSICS

SEMESTER – IV

Papers, marks and teaching hours allocation:

Paper A	:	Statistical Physics and Thermodynamics – II	Total Teaching hrs. 30
Paper B	:	Optics and Lasers –II	Total Teaching hrs. 30
Paper C	:	Quantum Physics-II	Total Teaching hrs. 30
		Physics Practicals	Total Teaching hrs. 45

Paper A : STATISTICAL PHYSICS AND THERMODYNAMICS-II (30 Hrs.)

UNIT-I

Statistical definition of entropy, change of entropy of a system, additive nature of entropy, law of increase of entropy, reversible and irreversible processes with examples. Work done in a reversible process. Examples of increase of entropy in natural processes. Entropy and disorder.
Brief review of the terms and Laws of Thermodynamics, Carnot's Cycle. Entropy changes in Carnot's Cycle. Applications of thermodynamics to thermoelectric effect, change of entropy along a reversible path in a P.V. diagram, entropy of a perfect gas. Equation of state of ideal gas from simple statistical consideration. Heat death of the universe.

UNIT-II

Derivation of Maxwell's thermodynamical relations and applications, cooling produced by adiabatic stretching, adiabatic compression, change of internal energy with volume. Expression for (C_p-C_v), change of state and Clayperon Equation. Thermodynamical treatment of Joule-Thomson effect. Use of Joule-Thomson effect for liquification of helium. Production of very low temperature by adiabatic demagnetisation.

Books Suggested :

Essential Readings:

1. *"Statistical Physics and Thermodynamics",* V.S. Bhatia, (Shoban Lal Nagin Chand, Jalandhar)
2. *"A Treatise on Heat"* Saha and Srivastava (Indian Press, Ahmedabad, 1972.)

Further Readings :

1. *Thermal Physics by C.* Kittel & H. Kroemer, CBS Pub., 1987
2. *Thermal Physics,* S.C. Garg, R.M. Bansal, and C.K. Ghosh, TMH, 2000.

Paper-B : OPTICS AND LASERS-II (30 Hrs.)

UNIT-I

Laser Fundamentals :
Interacation of light with matter : Absorption, spontaneous emission, stimulated emission, Wave mechanical explanation, Properties of Spectral Lines, Temporal and spatial coherence, Charatertistics of stimulated emission, Einstein coefficients and their relations, Light amplification and threshold condition ,Population inversion, Kinetics of optical absorption (qualitative account only), Qualitative account of Collisional broadening, Doppler broadening & Natural broadening, Mechanism of Luminescence.
Lasing action, Components of Laser, Elementary theory of optical cavity, longitudinal and transverse modes, Principal pumping schemes, Three level and four level laser schemes.

UNIT-II

Laser Systems : Types of lasers, Ruby and Nd : YAG lasers. He–Ne, Dye and CO_2 lasers – construction, mode of creating population inversion and output characteristics.
Applications of lasers—a general outline, Holography. Principle, recording of hologram and reconstruction of image.
Fiber Optics : Photonics, Optical fibre, Construction, Numerical aperture, acceptance angle, skip distance, Step index fibre – single mode and multimode, Graded index fibre, Losses in optical fibre, Material losses and Rayleigh scattering, bending losses, Intermodal and intramodal dispersion.
Splicing techniques, Optical fibre based communication system, Medical applications.

Books Suggested :

Essential Readings :

1. *Laser Fundamentals,* W.T. Silfvast, Foundation Books.
2. *Lasers and Non-linear Optics,* B.B. Laud, Wiley Eastern Limited.
3. *A text book of Optics,* Subtahmanyam N., Lal B. and Avadhanulu, M. N., S. Chand & Co., 2012.
4. *Optical Fiber Communication,* Keiser, MH.

Further Readings :

1. *Lasers,* Svelto Pergmon.

Paper-C : QUANTUM PHYSICS-II (30 Hrs.)

UNIT-I

Radiative transitions, selection rules and life times,
Spectrum of hydrogen atom.
Normal Neeman effect and experiment, Degeneracy of H-atom energy levels, fine structure, Electron angular momentum, Larmor's frequency, electron spin angular momentum, Exclusive principle, Stern-Gerlach experiment, spin-orbit coupling, electron magnetic moment, total angular momentum, Hyperfine structure, examples of one electron systems, Anomalous Zeeman effect, Lande-g factor (sodium D-lines). Paschen-Back Effect, Stark Effect.

(Chapters 6 & 7 of Book 1, Chapters 8-10 of Book 2)

UNIT-II

Symmetric and Antisymmetric wave functions, exclusion principle, Many electron atoms, Slater determinant, Electronic configurations, Hund's rule, Spin-Orbit coupling, L-S coupling, J-J couplings, term symbols. Atomic spectra of H, Na, He and Hg, selection rules.

X- ray spectra, nomenclature, Selection rules, Mosley law, Auger effect.

Molecular bonding, H_2^+ ion and H_2 molecules, Complex molecules, molecular spectra, selection rules, symmetric structures, rotational vibrational levels and spectra of diatomic molecules,vibration-rotation spectra, electronic spectra of molecules, Franck Condon principle, fluorescence and phosphorescence, Raman Effect, Magnetic resonance experiments.

(Chapters 7 & 8 of Book 1, Chapter 12 of Book 2)

Books Suggested :

Essential Readings :

1. *Concepts of Modern Physics,* A. Beiser, S. Mahajan and S. R. Choudhary, Tata McGraw Hill, 6th Edition.
2. *Quantum Physics of Atoms, Molecular,* R. Eisberg & R. Resnick, Second Edition, John Wiley, 2002.
3. *Physics for Degree Students,* C.L. Arora and P.S. Hemne, S.Chand & Co., 2014.
4. *Elements of Modern Physics,* S.H. Patil, McGraw Hill, 1998.

Further Readings :

1. *Fundamentals of Molecular Spectroscopy,* C.N . Banwell, T.M.H., 1972
2. *Atomic and Molecular Spectra,* Rajkumar (Kedarnath Ramnath Prakashan, Meerut).
3. *Atomic Spectra,* H.G. Kuhn, Academic Press, N.Y.

PHYSICS PRACTICALS

The Practical examination will be held along with the fourth semester examinations. General Guidelines for Physics Practical Examinations and syllabus is given in syllabus for Semester III.

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CHEMISTRY

B.Sc. (GENERAL) SECOND YEAR EXAMINATION, 2020-2021

Scheme of Teaching and Examination

SEMESTER-III

Paper	Course	Teaching Hrs.		Max. Marks
IX	Inorganic Chemistry-A	30	3 periods per week	22+3 internal assessment
X	Organic Chemistry-A	30	3 periods per week	22+3 internal assessment
XI	Physical Chemistry-A	30	3 periods per week	22+3 internal assessment
XII	Laboratory Practicals		6 periods per week	22+3 internal assessment
	Total		**15 periods/week**	**100**

SEMESTER-IV

Paper	Course	Teaching Hrs.		Max. Marks
XIII	Inorganic Chemistry-B	30	3 periods per week	22+3 internal assessment
XIV	Organic Chemistry-B	30	3 periods per week	22+3 internal assessment
XV	Physical Chemistry-B	30	3 periods per week	22+3 internal assessment
XVI	Laboratory Practicals		6 periods per week	22+3 internal assessment
	Total		**15 periods/week**	**100**

Total Marks	
SEMESTER-III-	**100**
SEMESTER-IV-	**100**
	200

CHEMISTRY

SEMESTER-III

Paper	Course	Teaching Hrs.		Max. Marks
IX	Inorganic Chemistry-A	30	3 periods per week	22+3 internal assessment
X	Organic Chemistry-A	30	3 periods per week	22+3 internal assessment
XI	Physical Chemistry-A	30	3 periods per week	22+3 internal assessment
XII	Laboratory Practicals		6 periods per week	22+3 internal assessment
		Total	**15 periods/week**	**100**

Paper-IX: INORGANIC CHEMISTRY-A

Time : 3 Hrs
Max. Marks : 22+3
60 Hrs. (2 Hrs/Week)
3 Periods/Week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(8 Hrs.)**

Chemistry of Elements of First Transition Series:
Characteristic properties of *d*-block elements.

Properties of the elements of the first transition series, their simple compounds and complexes, illustrating relative stability of their oxidation states, coordination number and geometry.

UNIT-II **(7 Hrs.)**

Chemistry of Elements of Second and Third Transition Series:
General characteristics, comparative treatment with their 3*d*-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry.

UNIT-III **(8 Hrs.)**

Chemistry of Coordination Compounds-I
Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds

UNIT-IV **(7 Hrs.)**

Chemistry of Coordination Compounds-II
Valence bond theory of transition metal complexes. Properties of Coordination compounds i.e. magenetic properties, colours (Qualitative approach only), use of coordination compounds.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books Suggested

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.

2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.

3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.

4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.

5. Porterfield, W.W., Wesley, A., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.

6. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.

7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.

8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.

9. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

Paper-X: ORGANIC CHEMISTRY-A **Time : 3 Hrs**
Max. Marks : 22+3
60 Hrs. (2 Hrs/Week)
3 Periods/Week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(8 Hrs.)**

Alcohols and Phenols:

Classification and nomenclature

Monohydric alcohols-Nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric and Trihydric alcohols-Nomenclature, methods of formation, chemical reactions of vicinal glycols and glycerol.

Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, and Reimer-Tiemann reaction.

UNIT-II **(8 Hrs.)**

Aldehydes and Ketones I

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties.

UNIT-III **(7 Hrs.)**

Aldehydes and Ketones-II

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction, Mannich reaction.

Use of acetals as protecting group. Oxidation of aldehydes, Baeyer-Villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.

UNIT-IV

Carboxylic Acids: **(7 Hrs.)**

Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substitutions on acid strength. Preparations of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides, Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions of halo acids. Hydroxyl acids: Malic, tartaric and citric acids(structural features only).

Methods of formation and chemical reactions of unsaturated monocarboxylic acids.

Dicarboxylic acids: Methods of formation and effects of heat and hydrating agents.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.

2. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.

3. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: Wiley Eastern Limited, 1985, Vol. I, II, III.

4. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.

5. Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.

6. Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs: Macmillan Publishing Company, 1989.

Paper-XI: PHYSICAL CHEMISTRY-A

Time : 3 Hrs.
Max. Marks:22+3
60 Hrs. (2 Hrs./Week)
3 Periods/Week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Liquid State:
Intermolecular forces, structure of liquids (a qualitative description).
Structural differences between solids, liquids and gases.
Liquid Crystals : Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

UNIT-II (7 Hrs.)

Chemical Equilibrium:
Equilibrium constant and free energy. Thermodynamic derivation of law of mass of mass action. Le - Chatelier's principle.
Reaction isotherm and Reaction isochore-Clapeyron equation and Clausius –Clapeyron equation, applications.

UNIT-III (8 Hrs.)

Thermodynamics-II:
Second Law of Thermodynamics: Need for the law, different statements of the law, Carnot cycle and its efficiency, Carnot theorem. Thermodynamic scale of temperature.

Concept of Entropy: Entropy as a state function, entropy as a function of V & T, entropy as a function of P & T, entropy change in physical change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

UNIT-IV (7 Hrs.)

Thermodynamics-III:
Third Law of Thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz functions (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Companies Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems, Pubs: Wiley Eastern Limited, 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd, 2002.
9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
10. Metz, C.R., Theory and problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book Company, 1989.

Paper-XII: LABORATORY PRACTICALS

Max. Marks:22+3

Inorganic Chemistry **6 Periods/week**

Quantitative Analysis

Volumetric Analysis:

a) Estimation of calcium content in chalk as calcium oxalate by permanganometry.
b) Estimation of hardness of water by EDTA.
c) Estimation of ferrous and ferric by dichromate method.
d) Estimation of copper using sodium thiosulphate

Gravimetric Analysis

Analysis of Cu as CuSCN and Ni as Ni (dimethylgyoxime)$_2$.

Physical Chemistry

Thermochemistry:

a) To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
b) To determine the enthalpy of neutralization of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionization of the weak acid/weak base. pH of a Buffer solution, Determination of ionization constant of a weak acid.

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. I. Inorganic Chemistry : 09 marks
Q.No. II. Physical Chemistry : 06 marks
Q.No. III. Viva-Voce : 04 marks
Ask four questions (2 marks each) related to chemistry practicals.
Q.No. IV. Note Book : 03 marks

Books Suggested (Laboratory Courses)

1. Furniss, B.S., Hannaford, A.J., Rogers, V., Smith, P.W.G., Tatchell, A.R., Vogel's Text Book of Practical Organic Chemistry; 4th edition, Pubs: Longman group, 1978.

2. Bansal, R.K., Laboratory Manual of Organic Chemistry; 3rd edition, Pubs:Wiley Eastern Limited, New Delhi, 1994.

3. Furniss, B.S., Hannaford, A.J., Smith, P.W.G., Tatchell, A.R., Vogel's Textbook of Practical Organic Chemistry; 5th edition, Pubs: Dorling Kindersley (India) Pvt. Ltd. Delhi., 2006.

4. Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition, Pubs: R. Chand & Co., New Delhi, 2002.

5. Das, R.C., Behra, B., Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd., 1983.

6. Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman Group Ltd., London & New York, 1978.

CHEMISTRY

SEMESTER-IV

Paper	Course	Teaching Hrs.		Max. Marks
XIII	Inorganic Chemistry-B	30	3 periods per week	22+3 internal assessment
XIV	Organic Chemistry-B	30	3 periods per week	22+3 internal assessment
XV	Physical Chemistry-B	30	3 periods per week	22+3 internal assessment
XVI	Laboratory Practicals		6 periods per week	22+3 internal assessment
		Total	**15 periods/week**	**100**

Paper-XIII: INORGANIC CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
60 Hrs. (2 Hrs/Week)
3 Periods/Week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Chemistry of Lanthanide Elements:
Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.

Chemistry of Actinides:
General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, similarities between the later actinides and the later lanthanides.

UNIT-II (7 Hrs.)

Acids and Bases:
Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.

UNIT-III (8 Hrs.)

Oxidation and Reduction:
Use of redox potential data – analysis of redox cycle, redox stability in water – Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

UNIT-IV **(7 Hrs.)**

Non-aqueous Solvents:
Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH_3 and liquid SO_2.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books Suggested

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.

2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.

3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.

4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.

5. Porterfield, W.W., Wesley, A., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.

6. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.

7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.

8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.

9. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.

Paper-XIV: ORGANIC CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
60 Hrs. (2 Hrs/Week)
3 Periods/Week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Carboxylic Acid Derivatives:
Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Relative stability & reactivity of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution.

Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis (acidic and basic).

UNIT-II (8 Hrs.)

Ethers , Epoxides Fats, Oils and Detergents:
Nomenclature of ether and methods of their formation, physical properties. Chemical reaction-cleavage and autoxidation, Ziesel's method.

Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

Natural fats, edible and industrial oils of vegetable origin, common fatty acids, glycerides, hydrogenation of unsaturated oils. Saponification value, iodine value, acid value. Soaps, synthetic detergents; alkyl and aryl sulphonates.

UNIT-III (7 Hrs.)

Organic Compounds of Nitrogen:
Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

Structure and nomenclature of amines, physical properties. Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysis. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction.

UNIT-IV

Heterocyclic Compounds: **(7 Hrs.)**

Introduction: Moleculer Orbital picture and aromatic character of pyrrole, furan, thiophene, pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives.Comparision of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed-five and six-membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis. Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

.

Books suggested

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.

2. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.

3. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: Wiley Eastern Limited, 1985, Vol. I, II, III.

4. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007.

5. Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.

6. Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs: Macmillan Publishing Company, 1989.

Paper-XV: PHYSICAL CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
60 Hrs. (2 Hrs/Week)
3 Periods/Week

OBJECTIVE OF THE COURSE

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I (8 Hrs.)

Phase equilibrium:

Statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system—water, CO_2 and S systems.

Phase equilibria of two component system –solid –liquid equilibria, simple eutectic – Bi-Cd system, desiliverisation of lead.

Solid solutions—compound formation with congruent melting point (Mg-Zn) and incongruent melting point, (NaCl-H_2O) system. Freezing mixtures, acetone-dry ice.

Partially Miscible Liquids –Phenol-water, trimethylamine – water, nicotine –water systems.

Nernst distribution law-thermodynamic derivation, applications.

UNIT-II (7 Hrs.)

Electrochemistry –I:

Electrical transport –Conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions and Kohlrausch Law, Arrhennius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

UNIT-III (8 Hrs.)

Electrochemistry-II:

Types of reversible electrodes – gas metal – ion, metal –insoluble salt – anion and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode – reference electrodes – standard electrode potential, sign conventions, electrochemical series and its significance.

UNIT-IV **(7 Hrs.)**

Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells.

E.M.F. of a cell and its measurements. Computation of cell E.M.F. Calculation of thermodynamic quantities of cell reactions (ΔG, ΔH and K), Polarization, over potential and hydrogen overvoltage.
Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each..

Books suggested

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.

2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.

3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Companies Inc, 1996.

4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.

5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.

6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.

7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems, Pubs: Wiley Eastern Limited, 1991.

8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd, 2002.

9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.

10. Metz, C.R., Theory and problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book Company, 1989.

Paper-XVI LABORATORY PRACTICALS

Max. Marks: 22+3
6 Periods/week

Organic Chemistry

Laboratory Techniques:

a) Determination of R_f values and identification of organic compounds. Separation of isometric mixture of Ortho and paranitroaniline using hexane and ethyl acetate (8.5 : 1.5) by thin layer chromatography.

b) Extraction of caffeine from tea leaves.

Qualitative Analysis:

Detection of elements (N, S and halogens) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide), in simple organic compounds.

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. I. Organic Chemistry: (analysis of organic compound) : 09 marks
Q.No II. TLC experiment, Extraction of caffeine) : 06 marks
Q.No. III. Viva-Voce : 04 marks
Ask four questions (2 marks each) related to chemistry practicals.
Q.No. IV. Note Book : 03 marks

Books Suggested (Laboratory Courses)

1. Furniss, B.S., Hannaford, A.J., Rogers, V., Smith, P.W.G., Tatchell, A.R., Vogel's Text Book of Practical Organic Chemistry; 4th edition, Pubs: Longman group, 1978.

2. Bansal, R.K., Laboratory Manual of Organic Chemistry; 3rd edition, Pubs : Wiley Eastern Limited, New Delhi, 1994.

3. Furniss, B.S., Hannaford, A.J., Smith, P.W.G., Tatchell, A.R., Vogel's Textbook of Practical Organic Chemistry; 5th edition, Pubs: Dorling Kindersley (India) Pvt. Ltd. Delhi., 2006.

4. Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition, Pubs: R.Chand & Co., New Delhi, 2002.

5. Das, R.C., Behra, B., Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd., 1983.

6. Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman Group Ltd., London & New York, 1978.

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PANJAB UNIVERSITY, CHANDIGARH-160014 (INDIA)

(Estd. under the Panjab University Act VII of 1947—enacted by the Govt. of India)

SYLLABI

FOR

B.A. & B.Sc. (GENERAL) THIRD YEAR (SEMESTER SYSTEM) EXAMINATIONS, 2020-2021

(SEMESTER : FIFTH AND SIXTH)

i.e

Fifth Semester : November/December, 2020
Sixth Semester : April/May, 2021

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COMPUTER SCIENCE
SEMESTER-V

SCHEME OF EXAMINATION

FIFTH SEMESTER			Exam . Hrs	Ext.	Int.	Max. Marks
Paper – CS09	Theory-A	Project Management	3	30	5	35
Paper –CS10	Theory-B	Relational Database Management System	3	30	5	35
Paper – PCS05	Practical-C	Practical Based on Paper – CS10	3	30	--	30

Paper Code: CS09

Paper Title: Project Management

Objective: The student will come to know how a project needs to established, organized , coordinated ,controlled and evaluated.

Note: (i) The syllabus of this paper has been divided into four units.
(ii) Examiner will set total nine questions comprising two questions from each unit and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the entire Compulsory question.
(iv) All questions carry equal marks, unless specified.

UNIT I

1. Concepts of Project Management :
Concept of a project, Characteristic features of a project, Categories of project, Project life cycle phases, Project Management Concepts, Tools and Techniques for Project Management, Introduction of Computerised project management systems, Roles and Responsibilities of a Project Manager.

2. Establishing the Project :
Feasibility Report : Raw material survey, Demand study, Technical study, Location study; Financing Arrangements, Preparation of Cost Estimates, Finalisation of Project Implementation Schedule, Evaluation of the Project Profitability, Fixing the zero date.

UNIT II

3. Organizing human resource:
Delegation, Project organization: Matrix, Tax force and Totally projectized organization;

4. Organizing the Project:
Working of Systems, Design of Systems, Project Work System Design, Work Breakdown Structure, Project Execution Plan, Project Procedure Manual, Project Control System, Planning, Scheduling and Monitoring.

UNIT III

5. Project Directions, Coordination and Control:
Project Direction, Communications in a Project, Project Coordination, Project Control, Scope/Progress Control, Performance Control, Schedule Control, and Cost Control.

6. Project Management Performance:
Performance Indicators, Performance Improvement, Project Management Environment.

UNIT IV

7. Report Writing - I:
Characteristics of Reports, Importance of Reports, Types of Reports, Structure and layout of Reports: front matter, main body, back matter;Preparatory Steps to Writing Reports: Evaluation of material, Note making, Organising material, Principle of organisation, Making outline

8. Report Writing- II:
Elements of Style; Use of Illustrations: types; Writing the Report: Rough draft, Process of writing, Order of writing, Final draft, Check list for reports;SpecimenReports: technical report;

REFERENCES

1. Choudhary, S., 1988 : Project Management, Tata McGraw-Hill Publishing CompanyLimited, 1988 (Recommended as a text-book for the syllabus contents upto Unit III).
2. Sharma, R.C., and Krishna Mohan, 1996 : Business Correspondence and Report Writing, Second Edition, Tata McGraw-Hill Publishing Company Ltd., 1978 (Recommended as a text-book for the syllabus contents for Unit IV).
3. Gopalakrishnan, P. & Rama Moorthy, V.E., 1993. : Text Book of Project Management, Mac Million India Ltd.
4. Harrison, F.L., 1992. : Advanced Project Management, A Structured Approach (Third Edition), Metropolitan.
5. Srinath, I. S., 1989. : PERT & CPM, Principles and Applications, Third Edition, Affiliated East-West Press Pvt. Ltd.
6. Rodrigues, M.V., 1992 : Effective Business Communication, Concept Publishing Company, 1992.

Paper Code: CS10

Paper Title: Relational Database Management System

Objectives: This course will enable the student to get well versed with the SQL and PL/SQL concepts.

Note: (i) The syllabus of this paper has been divided into four units.
(ii) Examiner will set total nine questions comprising two questions from each unit and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the entire Compulsory question.
(iv) All questions carry equal marks, unless specified.

UNIT I

1. Interactive SQL : SQL commands; Data Definition Language Commands; Data Manipulation Language Commands; Data types, Insertion of data into the tables; Viewing of data from the tables; Conditional viewing of data; Deletion operations; Updating the contents of the table; Modifying the structure of the table; Renaming table; Destroying tables.

2. Data Constraints: Types of Data Constraints; Column Level Constraints; Table Level Constraints; Null value concepts; The UNIQUE Constraint; The PRIMARY Constraint; The FOREIGN key Constraint; The CHECK Constraint; Viewing the User Constraint.

UNIT – II

3. SQL Operators and Functions: Arithmetic operators, Logical operators, Range searching, Pattern matching; Using DUAL, SYSDATE;SQL Functions: Group, Scalar, Aggregate, Numeric, String and Date Functions.

4. Grouping data from tables in SQL : GroupBy , Having clause, Subqueries, Collating Information: Equi Joins, Cartesian Joins, Outer Joins, Self Joins; SET Operators: Union, Intersect, Minus; Nested Queries.

UNIT III

5. Indexes: Creation, Types, Dropping an index; Introduction to Views, Manipulating the Base table(s) through views, Rules of DML Statements on Join Views, Dropping a View, Inline Views, Materialized Views.

6. Sequences: Creation, Reference and Alteration; Database Security and Privileges: Grant Command, Revoke Command, Application Privileges Management, COMMIT and ROLLBACK.

UNIT IV

7. PL/SQL-I: Introduction to PL/SQL, The Advantage of PL/SQL, PL/SQL block structure, PL/SQL Architecture, Fundamentals of PL/SQL, PL/SQL Data types, Variables and constants, Scope and visibility of a variable, Assignments and expressions, Operator precedence, Conditional and iterative control, SQL within PL/SQL, writing PL/SQL code.

8. PL/SQL-II: Cursor management in PL/SQL, Cursor manipulation, Implicit and Explicit cursor attributes, Exceptional Handling, Subprograms in PL/SQL, Procedure, Functions, and Triggers.

References:

1. Ivan Bayross: SQL, PL/SQL the programming language of oracle, BPB publications.
2. Kevin Loney :Oracle Complete Reference, McGraw-Hill
3. James T. Perry &Josesph G. Lateer: Understanding Oracle, BPB
4. Mukhi, Vijay 1992: Mastering Oracle 6.0, BPB Publications.

Paper – PCS05 : Practical Based on Paper CS10 – Relational Database Management System.

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COMPUTER SCIENCE
SEMESTER-VI

SCHEME OF EXAMINATION

FIFTH SEMESTER			Exam . Hrs	Ext.	Int.	Max. Marks
Paper – CS11	**Theory-A**	**E-Commerce**	**3**	**30**	**5**	**35**
Paper –CS12	**Theory-B**	**Web Programming**	**3**	**30**	**5**	**35**
Paper – PCS06	**Practical-C**	**Practical Based on Paper – CS12**	**3**	**30**	**--**	**30**

Paper Code: CS11

Paper Title: E-Commerce

Objective: To develop an understanding of concepts of E-Commerce

Note: (i) The syllabus of this paper has been divided into four units.
(ii) Examiner will set total nine questions comprising two questions from each unit and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the entire Compulsory question.
(iv) All questions carry equal marks, unless specified.

UNIT I

1. E-Commerce: Introduction, History, Motivation for E-Commerce, Types of Ecommerce, Advantages, Limitations, E-Commerce applications : Business-to-consumer, Business-to-Business, Consumer-to-Business, Consumer-to-Consumer, Business-within-Business.

2. Internet and www: Introduction, History, Benefits of www, Internet Service Providers, Web and Electronic commerce,Web architecture and its components, Interactive web applications, Web and database integration, Web software development tools, Search engines.

UNIT II

3. Website designing and hosting: Life cycle of website building, Website content andtraffic management, Working of ISPs, Choosing an ISP, Choosing and registering a domain name.

4. Implementation and Maintenance of E-Commerce: Implementation strategies, Maintenance strategies, Legal and Ethical issues in E-commerce.

UNIT III

5. Payment Systems : From Barter to money, Requirements of Internet-based payments,Electronic payment media : Credit cards, Debit cards, Smart cards, e-wallets, Issues and implications of payment systems, Latest trends in payment systems.

6. Marketing on the Internet: Internet marketing techniques and cycles, Attracting and Tracking customers, Pros and cons of online marketing.

UNIT IV

7. Firewalls and Network Security: Types of firewall, Gateways, Proxy Servers and its advantages and disadvantages; Transaction Security: Types of transaction, Requirements for transaction, Encryption: asymmetric and symmetric encryption; Digital signatures, Digital certificates, Implementation and management issues.

REFERENCES :

1. Kalakota Ravi & Andrew B. Whinston, 1997 : Electronic Commerce, A manager's Guide, Person Education.
2. Elias M. Awad, 2006 : Electronic Commerce from vision to fulfillment, PHI.
3. P.T. JOSEPH, S.J., 2015 : E-COMMERCE, Fifth Edition: AN INDIAN PERSPECTIVE, PHI.
4. PKenneth C, Landon, Carol Guercio Traver, 2010 : E-Commerce – Business Technology society, Pearson Education.

Paper Code: CS12

Paper Title: Web Programming

Objectives: This course will enable the student to build and publish web sites using HTML, CSS, JavaScript and PHP.

Note: (i) The syllabus of this paper has been divided into four units.
(ii) Examiner will set total nine questions comprising two questions from each unit and one compulsory question of short answer type covering whole syllabi.
(iii) The students are required to attempt one question from each unit and the entire Compulsory question.
(iv) All questions carry equal marks, unless specified.

UNIT - I

1. Basic Terminology : Web Server; Web Browser, Understanding Communication between a Browser and Web Server, Webpage, Website, Static Website, Dynamic Website, Internet, Intranet, Extranet, WWW, URL.

2. HTML : HTML Program Structure, Paragraph Breaks, Line Breaks; Emphasizing Text: Heading Styles, Drawing Lines; Text Styles :Bold, Italics, Underline; Other Text Effects: Centering of text and images etc; Lists: Unordered List, Ordered Lists, Definition lists; Adding Graphics to HTML Documents using the Border, Width, Height and Align; Tables: Caption Tag, Width, Border, Cell padding, Cell spacing, BGCOLOR, COLSPAN and ROWSPAN Attributes.

UNIT - II

3. Linking Documents : Anchor tag, External Document References, Internal Document References and Image Maps; Frames: Introduction to Frames: The <FRAMESET> tag, The <FRAME> tag, Targeting Named Frames

4. DHTML: Introduction to Cascading Style Sheets (CSS), Style tag, Link tag, Types of CSS: In-Line, Internal, External; Forms: Attributes of Form element: Input element, Text Element, Password, Button, Submit Button, Reset Button, Checkbox, Radio, TextArea, Select and Option.

UNIT - III

5. JavaScript: Introduction and Features of JavaScript, Writing JavaScript into HTML,Tokens, Data Types, Variables, Operators, Control Constructs, Strings Arrays, Functions, Document Object Model, CoreLanguage Objects, Client Side Objects, Event Handling, Applications related to client side formvalidation, Built-In Objects in JavaScript: String Object, Math Object, Date Object;

UNIT - IV

6. Introduction to PHP : PHP Installation and Configuration; Naming files, Comments,Variables, Operators, Arrays, Flow Control Structures, More language basics; User-defined functions; Input validation, Working with Mathematical, String, Date and Time functions

REFERENCES

1. Bayross, Ivan : Wen enabled commercial applications development using HTML, Javascript , DHTML and PHP by BPB, Latest reprint
2. Wanger&Wyke : Java Script Unleased, Pearson Education, New Delhi.2
3. Thomas Powell : HTML & CSS: The Complete Reference
4. John Pollock : JavaScript, A Beginner's Guide
5. Steven Holzner PHP: The Complete Reference, Tata McGraw Hill
6 Kelvin Tetroi: Programming PHP , O'Reilly Media

Paper – PCS06 : Practical Based on Paper CS12 – Web Programming.

PHYSICS

B.Sc. (GENERAL) THIRD YEAR (5th and 6th Semester) EXAMINATION, 2020-2021

General Instructions for teachers, students and paper setters :

1. There will be three papers of theory and one laboratory (practical course). Each of the theory papers is allocated 25 marks including 3(three) marks for the Internal assessment.
   The Practical examination is of 50 marks including 5 (Five) marks for the Internal assessment and will be held along with the sixth semester examination.
2. The number of lectures per week will be three for each theory paper and six for practicals.
3. The examination time for each theory paper will be three hours and it will be four hours for practicals.
4. Each theory paper will consist of **seven** questions comprising of three sections. First two sections will comprise of **three** questions from each of Units I and II of syllabus, and the third section will comprise of **one compulsory** question of **ten** short answer type parts covering whole syllabus. The question paper will be set for 44 marks - **All the questions in first and second sections will carry 9 (nine) marks each and the compulsory question will carry 8 marks.** Student will attempt two questions from each of the first two sections and any eight parts of the compulsory question. **After evaluation of the answer books out of 44 marks, the marks will be given out of 22 marks.**
5. The numerical problems /exercises in the question paper should be 25-30%.
6. The use of Non-programmable calculators will be allowed (paper setters should explicitly mention this on the question paper) in the examination centre but these will not be provided by the University/College. Mobile phones and pagers are not allowed in the examination hall.

PHYSICS

SEMESTER – V

Papers, marks and teaching hours allocation:

Paper A :	Condensed Matter Physics - I	Total Teaching hours 30
Paper B :	Electronics and Solid State Devices - I	Total Teaching hours 30
Paper C :	Nuclear & Particle Physics - I	Total Teaching hours 30
	Physics Practicals	Total Teaching hours 45

Paper A : CONDENSED MATTER PHYSICS - I (30 Hrs.)

UNIT-I

Crystal structure: Symmetry operations for a two dimensional crystal. Two dimensional Bravais lattices, Three dimensional Bravais lattices, Basic primitive cells, Crystal planes and Miller indices, Diamond and NaCl structure. Crystal diffraction : Bragg's Law, Determination of crystal structure, Laue equations, Reciprocal lattices of SC, BCC and FCC, Bragg's law in reciprocal lattice, Brillouin zones and its derivation in two dimensions, structure factor and atomic form factor.

UNIT-II

Band Theory of solids, periodic potential and Bloch theorem, Kronig-Penney model, band gaps, band structures in conductors, direct and indirect semiconductors and insulators.
Free electron theory of metals, effective mass, drift current, mobility and conductivity (carrier concentration and mobility of carriers) and their variation with temperature in semi-conductors, Fermi level positions in intrinsic and extrinsic semiconductors, Wiedemann-Franz law, Hall effect in metals and semiconductors.

Recommended Books :

Essential Readings :

1. *Introduction to Solid State Physics, C.* Kittel, Wiley Eastern
2. *Elements of Modern Physics,S.*H. Patil, Tata McGraw Hill, 1985.
3. *Solid State Physics, 6th Edition, S.O.* Pillai, *New Age International Publishers.*
4. *Physics for Degree Students,* C.L. Arora and P.S. Hemne, S. Chand & Co., 2014.

Further Readings :

1. *Elements of Solid State Physics,* 2nd Edition, J.P. Srivastava, Prentice Hall.
2. *Elementary Solid State Physics,* M. Ali Omar, Pearson.
3. *Crystallography for Solid State Physics,* A.R. Verma, O.N. Srivastava, Wiley Eastern.

Paper-B : ELECTRONICS AND SOLID STATE DEVICES - I (30 Hrs.)

UNIT-I

Concepts of current and voltage sources, Thevenin's theorem, Norton's theorem, Source conversion.
CRO, Block diagram, construction and principle of working, Use of CRO for frequency, time period, special features of dual trace, phase measurements.

Energy band diagrams in semiconductors, Direct and indirect semiconductors, Formula to calculate Position of Fermi level in p and n semiconductors, Barrier formation, energy band diagram of p-n junction, Formula for Depletion width, Qualitative ides of current flow mechanism in forward and reverse biased diode, v-i characteristics, static and dynamic resistance, Depletion and diffusion capacitance, zener diode, LED, photodiode and solar cell.

(Book 1, Book 3)

UNIT-II

Diode circuits, Clipping circuits, Rectification: half wave, full wave and bridge rectifiers, filter circuits (C, LC and π filters), rectification efficiency and ripple factor in LC filter, voltage regulation circuit using zener diode, voltage multiplier circuits.
Bipolar Junction transistors : Structure and working, different currents in transistor, switching action.
Characteristics of CB, CE and CC configurations, Active, cutoff and saturation regions.
Load line analysis of transistors, Q-point, Transistor biasing and stabilization of operating point, fixed bias, collector to base bias, bias circuit with emitter resistor, voltage divider biasing circuit.
Working ans analysis of CE amplifier using h-parameters, current, voltage and power gain, input and output impedance. Class A, B and C amplifiers.

(Book 1, Book 2)

Recommended Books :

Essential Readings :

1. Electronic Devices and Circuit Theory, 7th Ed., R. Boylestad, L. Nashelsky, Prentice Hall Inc.
2. *Electronic Principles, A.P*. Malvino, and D.J. Bates, *7th ed*. McGraw Hill
3. *Solid State Electronic Devices*, 6th Ed., Ben G. Streetman and S. Banerjee, Eastern Economy Edition.

Further Readings :

1. *Basic Electronics*, 5th Edition, B.L. Thareja, S. Chand.
2. *Basic Electronics and Linear Circuits, N.N.* Bhargave, D.C. Kulshreshtha, and S.C. Gupta,Tata Mc Graw Hill.
3. *Foundations of Electronics, D.* Chatopadhyay, P.C. Rakshit, B. Saha, and N.N. Purkit, New Age International

Paper-C : NUCLEAR AND PARTICLE PHYSICS - I (60 Hrs.)

UNIT-I

General properties of Nuclei : Constituents of nucleus and their intrinsic properties, Quantitative facts about nuclear size, mass, density, binding energy and its variation with mass number, Wave mechanical properties of nucleus, angular momentum, parity; magnetic moment and electric moments of the nucleus. properties of nuclear forces and saturation, meson theory of nuclear forces
Nuclear Models : Liquid drop model, semi-empirical mass formula, most stable isobar.
Evidence for nuclear shell structure, Nuclear shell model, concept of mean field.

UNIT-II

Radioactive decay, Units of radioactivity (Ci and Bq), Successive disintegration, Natural radioactivity, Radioactive series, Carbon dating.
Alpha decay, energetic, alpha spectrum, Gamow's theory of alpha decay, Geiger-Nuttal rule.
Beta decay, Qualitative discussion of beta spectrum, Evidence of existence of Neutrino, Conservation of nuclear energy in Beta minus, Beta plus and Electron capture decays.
Gamma-ray emission, selection rules, Internal conversion.

Nuclear Reactions: Types, Concept of compound and direct (pickup and stripping) reactions, Reaction differential and integral cross section, units, conservation laws and kinematics, Q-value equation, Coulomb (Rutherford) scattering cross section and distance of nearest approach.
Energy classification of neutrons, Nuclear fission in reactors, Reactor facilities available in India, Nuclear fusion in stars.

Recommended Books :

Essential Readings:

1. *Concept of Modern Physics,* 6th Ed., A. Beiser, S. Mahajan and S.R. Choudhury, Tata McGraw Hill.
2. *Nuclear Physics, I.* Kaplan,Addition-Wesley, Publishing Company Inc.
3. *Physics for Degree Students*, C.L. Arora and P.S. Hemne, S. Chand & Co., 2014.

Further Readings :

1. *An Introduction to Nuclear Physics, M.R.* Bhiday, and V.A. Joshi, Orient Longman.
2. *Concepts of Nuclear Physics, B.L.* Cohen, Tata McGraw Hill
3. *Fundamentals of Nuclear Physics, J.* Verma, CBS.

PHYSICS PRACTICALS

The students are required to perform all the Nine experiments from each of the Units I and Unit II . The Practical examination will be held along with the sixth semester examination.

The aim of the project work is to develop the scientific and technical temper in the students and as such it may consist of development of a laboratory experiment, fabrication of a device or electronic circuit etc. The student will prepare a project report of about 10 pages. Assessment of the project work will be done on the basis of the effort put in the execution of the project, report prepared and viva-voce.

General Guidelines for Physics Practical Examinations :

Total : 50 marks

1. The distribution of marks is as follows :

(i)	One full experiment out of section–A requiring the student to take some data, analyse it and draw conclusions. (Candidates are expected to state their results with limits of error).	20
(ii)	One exercise based on experiment or Computer Programming from the Unit assigned to the student for the semester	7
(iii)	Viva-Voce and Record (Practical file)	10
(iv)	Project	8
(v)	Internal Assessment	5

Note for Examiners :

2. The marks scored under each head must be clearly written on the answer sheet.
3. There will be one session of 3 hours duration. The paper will have two sections. Section–A will consist of 4 experiments from each of Units I and Unit II, out of which an examinee will mark 3 experiments from either of units and one of these is to be allotted by the external examiner.
4. Section–B will consist of exercises/computer based activities which will be set by the external examiner on the spot. The length of the exercises should be such that any of these could be completed in one hour.
5. The examiner should take care that the experiment allotted to an examinee from section-A and exercise allotted from section–B are not directly related to each other.
6. Number of candidates in a group for practical examination should not exceed 12.
7. In a single group, no experiment be allotted to more than three examinees in the group.

List of Experiments :

Note : Each student should perform ***at least Nine experiments*** in the laboratory.

UNIT-I

I CONDENSED MATTER PHYSICS:

(i) Measurement of reverse saturation current in p-n junction diode at various temperatures and to find the approximate value of energy gap.
(ii) To draw forward and reverse bias characteristics of a p-n junction diode and draw a load line.
(iii) Study of a diode as a clipping element.
(iv) To measure the magnetic susceptibility of $FeCl_2$ solution by Quincke's method.

II ELECTRONICS AND SOLID STATE DEVICES :

(v) To study the response of RC-circuit to various input voltages (square, sine and triangular).
(vi) To measure the efficiency and ripple factors for (a) Half-wave, (b) Full wave, and (c) Bridge rectifier circuits.
(vii) To study the reduction in the ripples in the rectified output with RC, LC and π-filters.
(viii) To draw the characteristics of a Zener diode and LED using constant current source.
(ix) To study the stabilization of output voltage of a power supply with Zener diode.
(x) To set up an oscillator and study its output on CRO for different V values.
(xi) To study the characteristics of a thermistor and find its parameters.

Exercises :

1. Any one exercise based on the above given experiments.

Computer Based Activities : Elementary C language programs.

1. Print a 2D array in spiral form.
2. To find determinant of a given matrix.
3. To find inverse of a given matrix.
4. To interpolate the data values from the given set.

UNIT-II

I CONDENSED MATTER PHYSICS:

(i) To trace the B-H curves for different materials using CRO and find the magnetic parameters from these.
(ii) To find the conductivity of a given semi-conductor crystal using four probe method.
(iii) To determine the Hall coefficient for a given semiconductor.

II ELECTRONICS AND SOLID STATE DEVICES :

(iv) To measure and plot Common Emitter Characteristics of a transistor (pnp or npn).
(v) To plot Common Base Characteristics and determine h-parameters of a given transistor.
(vi) To draw output and mutual characteristics of an FET and determine its parameters.
(vii) To study the gain of an amplifier at different frequencies and to find band-width and gain-band- width product.

III NUCLEAR PHYSICS :

(viii) To draw the Plateau of a GM counter and find its dead time.

(ix) To study the statistical fluctuations using GM counter.

(x) To study the absorption of beta-particles and determine the end point energy using GM counter. Also determine the absorption co-efficient (for aluminium) from it.

(xi) Verification of Rutherford Scattering experiment-mechanical analogue.

Exercises :

1. Any one exercise based on the above given experiments.

Computer Based Activities : Elementary C language programs.

1. To solve simultaneous equations by elimination method.
2. Fitting a straight line or a simple curve of a given data.
3. Convert a given integer into binary and octal/hexadecimal system and vice versa.

Text and Reference Books :

1. *"A Laboratory Manual of Physics for Undergraduate Classes" by D.P.* Khandelwal.
2. *"B.Sc. Practical Physics" by C.L. Arora, S. Chand & Co. (2014)*
3. *"Numerical Analysis" by C. Dixon*
4. *Programming with C,* Byron Gottfried & Jitender Chhabra, *Schaum series*

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PHYSICS

SEMESTER – VI

Papers, marks and teaching hours allocation:

Paper A :	Condensed Matter Physics - II	Total Teaching hours 30
Paper B :	Electronics and Solid State Devices - II	Total Teaching hours 30
Paper C :	Nuclear & Particle Physics - II	Total Teaching hours 30
	Physics Practicals	Total Teaching hours 45

Paper A : CONDENSED MATTER PHYSICS - II (30 Hrs.)

UNIT-I

Lattice Dynamics : Lattice vibrations and phonons, Scattering of photons by phonons, Dynamics of a linear chain of similar atoms and chain of two types of atoms, optical and acoustic modes, Density of modes, Einstein and Debye theories of specific heats of solids.

Magnetic classification of materials (Dia, para, ferro, ferri, antiferro), Langevin theory of dia and paramagnetism, Quantum theory, Weiss's theory of Ferromagnetism, temperature dependence, hysteresis of ferromagnetic materials.

UNIT-II

Dielectric constant & polarizability, electric susceptibility, Clausius Mosotti equation, frequency dependence, ferroelectrics and Piezoelectrics.

Liquid crystals, various types and properties. Applications.

Superconductivity: Meisner effect, London's equation and penetration depth, critical magnetic field and temperature, DC and AC Josephson effect, BCS theory (formation of cooper pairs), ground state and energy gap.

Basic ideas of materials at nanoscale: Difference from bulk material properties, Nanoparticles, introduction to fabrication and characterization techniques, Carbon Nanostructures - nanotubes, grapheme. Applications of nanotechnology in various fields.

Recommended Books :

Essential Readings :

1. *Introduction to Solid State Physics, C.* Kittel, Wiley Eastern
2. *Elements of Modern Physics,S.*H. Patil, Tata McGraw Hill, 1985.
3. *Solid State Physics, 6th Edition,* S.O. Pillai, New Age International Publishers.
4. *Fundamental of Physics, Vol. II,* R.M.P. Jaiswal, S.K. Gupta and A. Rani, R. Chand and Co.

Further Readings :

1. *Elements of Solid State Physics,* 2nd Edition, J.P. Srivastava, Prentice Hall.
2. *Elementary Solid State Physics,* M. Ali Omar, Pearson.
3. *Crystallography for Solid State Physics,* A.R. Verma, O.N. Srivastava, Wiley Eastern.

Paper-B : ELECTRONICS AND SOLID STATE DEVICES - II (30 Hrs.)

UNIT-I

Structure and working of JEFT, characteristics, drain and transconductance curve, FET amplifier and its voltage gain, Structure and working of MOSFET.

Feed back in amplifiers, voltage gain of negative feedback amplifier, advantages of negative voltage feedback, negative current feedback circuit, emitter follower.

Theory of sinusoidal oscillations, loop gain and phase, Lead-lag RC circuit, Wein bridge oscillator. Barkhausen criterion of sustained oscillations, positive feedback amplifier, LC oscillators, Colpitts and Hartley oscillators.

(Book1, Book2)

UNIT-II

Operational amplifier (black box approach) : Characteristics of ideal and practical opamp 741, open-loop and closed-loop gain, characteristics and applications - inverting and non-inverting amplifiers, adder, subtractor, differentiator and integrator, Comparator, Timer IC555, pin diagram and its applications as astable and monostable multivibrator.

(Book1, Book2)

Analog and digital circuits, binary numbers, decimal to binary conversions, AND, OR, NOT gates, NAND NOR gates as universal gates, XOR and XNOR gates.

De Morgan's theorem, Simplification of logic circuit using Boolean algebra, Minterms and Maxterms, Conversion of a truth table into an equivalent logic circuit by Sum of products method. (Book 3)

Analog and digital communication systems, Amplitude and Frequency modulation, Power in AM wave, generation and detection, Brief account of Satellite communication, Sky-wave communication, and mobile communication.

Recommended Books :

Essential Readings :

1. *Electronic Devices and Circuit Theory*, 7th Ed., R. Boylestad, L. Nashelsky, Prentice Hall Inc.
2. *Electronic Principles, A.P.* Malvino, and D.J. Bates, 7th *ed.* McGraw Hill
3. Digital Principles and Applications, 7th Ed., A.P. Malvino, D.P. Leach and Saha, 2011, Tata McGraw Hill

Further Readings :

1. *Basic Electronics*, 5th Edition, B.L. Thareja, S. Chand.
2. *Basic Electronics and Linear Circuits, N.N.* Bhargave, D.C. Kulshreshtha, and S.C. Gupta,Tata McGraw Hill.
3. *Foundations of Electronics, D.* Chatopadhyay, P.C. Rakshit, B. Saha and N.N. Purkit, New Age International

Paper-C : NUCLEAR AND PARTICLE PHYSICS - II (30 Hrs.)

UNIT-I

Interaction of nuclear radiation with matter: Energy loss due to ionization (Bethe Bloch formula), Range and energy straggling, Energy loss of electrons and positrons, radiation loss by fast electrons, Bremsstrahlung, electron-positron annihilation, production of Cerenkov radiation,
Gamma-ray interaction with matter, photoelectric effect, Compton scattering, pair production (qualitative description).
Detectors for nuclear radiation: Gas-filled detectors, Ionization chamber, proportional counter, G.M. counter, Scintillation detector and Photomultiplier tube, Brief account of Semiconductor detectors.

UNIT-II

Particle Physics : Particle interactions : basic features and their exchange particles, Classification of elementary particles, properties, decay modes of leptons and mesons, Antiparticles, charge conjugation
Symmetries and Conservation principles, Lepton number, baryon number, Isospin, Hypercharge, Strangeness and charm, Gell-mann Nishijima formula
Concept of the quark model, color quantum number and gluons.
Origin and composition of Cosmic rays, Secondary cosmic rays, Effect of magnetic field of earth, Van Allen belts.
Particle accelerators: Cockcroft-Walton accelerator, Van-de Graaff generator, Tandem accelerator Linear accelerator, Cyclotron. Brief account of Syncrhrotron, Accelerator facilities available in India.

Recommended Books :

Essential Readings:

1. *Concept of Modern Physics,* 6th Ed., A. Beiser, S. Mahajan and S.R. Choudhury, Tata McGraw Hill.
2. *Nuclear Physics, I.* Kaplan,Addition-Wesley, Publishing Company Inc.
3. *Physics for Degree Students,* C.L. Arora and P.S. Hemne, S. Chand & Co., 2014.
4. *An Introduction to Nuclear Physics, M.R.* Bhiday, and V.A. Joshi, Orient Longman.

Further Readings :

1. *Concepts of Nuclear Physics, B.L.* Cohen, Tata McGraw Hill
2. *Fundamentals of Nuclear Physics, J.* Verma, CBS.

PHYSICS PRACTICALS

The Practical examination will be held along with the sixth semester examinations.General Guidelines for Physics Practical Examinations and syllabus is given in syllabus for Semester V.

CHEMISTRY

SEMESTER-5th

Scheme of Teaching and Examination

Paper	*Course*	*Teaching Hrs.*		*Max. Marks*
XVII	Inorganic Chemistry-A	30	3 periods per week	22+3 internal assessment
XVIII	Organic Chemistry-A	30	3 periods per week	22+3 internal assessment
XIX	Physical Chemistry-A	30	3 periods per week	22+3 internal assessment
XX	Laboratory Practicals		6 periods per week	22+3 internal assessment
		Total	*15 periods/week*	*100*

SEMESTER-6th

Scheme of Teaching and Examination

Paper	*Course*	*Teaching Hrs.*		*Max. Marks*
XXI	Inorganic Chemistry-B	30	3 periods per week	22+3 internal assessment
XXII	Organic Chemistry-B	30	3 periods per week	22+3 internal assessment
XXIII	Physical Chemistry-B	30	3 periods per week	22+3 internal assessment
XXIV	Laboratory Practicals		6 periods per week	22+3 internal assessment
		Total	*15 periods/week*	*100*

Total Marks

SEMESTER-5-100

SEMESTER-6-100

200

CHEMISTRY

SEMESTER-5th

Scheme of Teaching and Examination

Paper	*Course*		*Teaching Hrs.*	*Max. Marks*
XVII	Inorganic Chemistry-A	30	3 periods per week	22+3 internal assessment
XVIII	Organic Chemistry-A	30	3 periods per week	22+3 internal assessment
XIX	Physical Chemistry-A	30	3 periods per week	22+3 internal assessment
XX	Laboratory Practicals		6 periods per week	22+3 internal assessment
	Total		*15 periods/week*	*100*

Paper-XVII: INORGANIC CHEMISTRY-A

Time : 3 Hrs
Max. Marks: 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(8 Hrs.)**

Metal – Ligand Bonding in Transition Metal Complexes:

Limitations of valence bond theory, an elementary idea of crystal – field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal – field parameters, Spectro chemical Series.

UNIT-II **(7 Hrs.)**

Thermodynamic and Kinetic Aspects of Metal Complexes :

A brief outline of thermodynamic and Kinetic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes.

UNIT-III **(8 Hrs.)**

Organometallic Chemistry:

Definition, nomenclature and classification of organometallic compounds. Preparation, properties, bonding and applications of alkyls and aryls of Li, Al , Hg, Sn and Ti, a brief account of metal – ethylenic complexes and homogeneous hydrogenation, mononuclear carbonyls and the nature of bonding in metal carbonyls

UNIT-IV **(7 Hrs.)**

Bioinorganic Chemistry:
Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions. Nitrogen fixation.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.
ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.
iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman and Hall Ltd., 1991.
3. Shriver, D.E., Atkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.
4. Dauglas, B., McDaniel, D., Alexander, J., Conepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1999.
5. Porterfeild, W.W., Inorganic Chemisty; Pubs: Addison-Wesley Publishing Company, 1984.
6. Miessur, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Ltd., 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
9. Puri, B.R., Sharma, L.P., Kalia, K.C. Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publishers. 2006-07.

Paper-XVIII: ORGANIC CHEMISTRY-A

Time : 3 Hrs
Max. Marks : 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I

Electromagnetic Spectrum: Absorption Spectra –I: **(7 Hrs.)**
Ultraviolet (UV) absorption spectroscopy – Absorption laws (Beer – Lambert Law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones.

Woodward Fieser Rules and their applications in calculating maximum values of conjugated alkenes (cyclic as well as acyclic) and conjugated carbonyl compounds.

UNIT-II **(7 Hrs.)**

Electromagnetic Spectrum: Absorption Spectra-II:

Infrared (IR) absorption spectroscopy – Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds.

Problems pertaining to the structure elucidation of simple organic compounds using UV, IR and PMR spectroscopic techniques.

UNIT-III **(8 Hrs.)**

Spectroscopy:

Nuclear magnetic resonance (NMR) spectroscopy.
Proton magnetic resonance (^{1}H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, spin-spin splitting and coupling constants, area of signals, interpretation of PMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromoethane, ethyl acetate, toluene and acetophenone.

UNIT-IV **(8 Hrs.)**

Carbohydrates:

Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D (+) – glucose. Mechanism of mutarotation.

Structure of ribose and deoxyribose.

An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.

Instructions for paper setters and candidates:

i. ***Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.***
ii. ***The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.***
iii. ***Compulsory question carries six marks and remaining all questions carry four marks each.***

Books suggested

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2. Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.
3. Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985, Vol. I.II, III.
4. Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.
5. Solomons, T.W., Fundamentals of Organic Chemistry; 5th edition, Pubs: John Wiley & Sons, 1997.
6. Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs: Macmillan Publishing Company, 1989.

Paper-XIX: PHYSICAL CHEMISTRY-A

Time : 3 Hrs
Max. Marks : 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(8 Hrs.)**

Elementary Quantum Mechanics-I:

Black-body radiation, Planck's radiation law, photoelectric effect, heat capacity of solids, Bohr's model of hydrogen atom (no derivation) and its defects, Compton effect.

De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box.

Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

UNIT-II (7 Hrs.)

Elementary Quantum Mechanics-II:

Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O.'s by LCAO – H_2^+ ion. Calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, $\sigma*$, π, π^* orbitals and their characteristics. Hybrid orbitals – sp, sp^2, sp^3; calculation of coefficients of A.O.'s used in these hybrid orbitals.

Introduction to valence bond model of H_2, comparison of M.O. and V.B. models.

UNIT-III (8 Hrs.)

Photochemistry-I:

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of Photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram depicting various processes occurring in the excited state.

UNIT-IV (7 Hrs.)

Photochemistry-II:

Qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples).Photochemistry of carbonyl compounds and alkenes.

Instructions for paper setters and candidates:

i. Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.

ii. The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.

iii. Compulsory question carries six marks and remaining all questions carry four marks each.

Books suggested

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford university press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Company Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; I edition, Pubs: John Wiley & Sons Inc., 1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems, Pubs: Wiley Eastern limited, 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd, 2002.
9. Moore, W.J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd., 1983.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book Company, 1989.
11. Banwell, C.N., McCash, E.M., Fundamentals of Molecular Spectroscopy; 4th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 1999.
12. Atkins, P. Friedman, R. Molecular Quantum Mechanics; 4th edition Pubs: Oxford University Press, 2007.
13. Levine, I.N., Quantum Chemistry; 5th edition, Pubs: Prentice Hall International Inc., 2000.

Paper – XX: LABORATORY PRACTICALS **Max. Marks: 22+3**

INORGANIC CHEMISTRY

Synthesis and Analysis: **6 Periods/ week**

(a) Preparation of sodium trioxalatoferrate (III), $Na_3[Fe(C_2O_4)_3]$ and determination of its composition by permaganometry.

(b) Preparation of copper tetraammine complex $[Cu(NH_3)_4]SO_4$.

(c) Preparation of cis-and trans-bisoxalatodiaqua chromate (III) ion.

Instrumentation

Solvent Extraction

Separation and estimation of Mg(II) and Fe(II).

PHYSICAL CHEMISTRY

Electrochemistry

(a) To determine the strength of the given acid conductometrically using standard alkali solution.

(b) To determine the solubility and solubility product of a sparingly soluble electrolyte conductomertircally.

(c) To study the saponification of ethyl acetate conductometrically.

(d) To determine the ionization constant of a weak acid conductometrically.

(e) To study the distribution of iodine between water and CCl_4.

(f) To study the distribution of benzoic acid between benzene and water.

Molecular Weight Determination

(a) Determination of molecular weight of a non – volatile solute by Rast method.

(b) Determination of the apparent degree of dissociation of an electrolyte (e.g. NaCl) in aqueous solution of the substance.

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. 1*. Preparation of an inorganic complex : 7 marks

Q.No. 2. Physical Chemistry : 7 marks

Students shall be allowed the choice to opt for one experiment out of the three offered. The candidate will write theory, short procedure and calculations of that experiments in the next 10 minutes. Note – Book / Books is/are not allowed during writing.

Q.No. 3. Viva-Voce : 5 marks

Minimum of four questions (2 marks each) be asked on the background of practical course.

Q.No. 4. Note Book : 3 marks

*If a question on preparation is asked, then the students shall be required to give Equation, requirements & short procedure in the first 10 minutes. Note Books are not allowed during writing.

Books Suggested (Laboratory Courses)

1. Denny, R.C. Vogel's Quantitative Inorganic Analysis; 4th edition, Pubs: English Language Book Society, 1985.
2. Harwoor, L.M., Moody, J., Experimental Organic Chemistry; 1st edition, Pubs: Blackwell Scientific Publicaitons, 1989.
3. Palmer, W.G., Jamer, C., Swinehart, S., Experimental Inorganic Chemistry; 1st edition, Pubs: Perlkin-Elmer Corporation, 1969.
4. Forniss, B.S., Rogers, V., Vogel's Text Book of Practical Organic Chemistry; Pubs: Dorling Kindhsky Pvt. Ltd., 1989.
5. Garland, C.W., Experiments in Physical Chemistry; 1st edition, Pubs: McGraw Hill Book Company, 1989.
6. Bansal, R.K., Laboratory Manual of Organic Chemistry; 3rd edition, Pubs: Wiley Eastern Limited, 1994.
7. Furniss, B.S., Hannaford, A.J., Rogers, V., Smith, P.W.G., Tatchell, A.R., Vogel's Text Book of Practical Organic Chemistry; 4th edition, Pubs: Longman group, 1978.
8. Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition, Pubs: R.Chand & Co., New Delhi, 2002.
9. Das, R.C., Behra, B. Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd., 1983.
10. Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman group Ltd. London & New York, 1978.

CHEMISTRY
SEMESTER-6th
Scheme of Teaching and Examination

Paper	*Course*	*Teaching Hrs.*		*Max. Marks*
XXI	Inorganic Chemistry-B	30	3 periods per week	22+3 internal assessment
XXII	Organic Chemistry-B	30	3 periods per week	22+3 internal assessment
XXIII	Physical Chemistry-B	30	3 periods per week	22+3 internal assessment
XXIV	Laboratory Practicals		6 periods per week	22+3 internal assessment
		Total	*15 periods/week*	*100*

Paper-XXI: INORGANIC CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course
To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(7 Hrs.)**

Silicones and Phosphazenes:

Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.

UNIT-II **(8 Hrs.)**

Hard and Soft Acids and Bases (HSAB):

Classification of acids and bases as hard and soft Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

UNIT-III **(8 Hrs.)**

Electronic Spectra of Transition Metal Complexes:
Types of electronic transitions, L – S coupling, selection rules for *d-d* transitions, spectroscopic ground states, Orgel – energy level diagram for d^1 and d^9states, discussion of the electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex ion.

UNIT-IV **(7 Hrs.)**

Magnetic Properties of Transition Metal Complexes:

Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. Correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3*d*-metal complexes.

Instructions for paper setters and candidates:

i ***Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.***

ii ***The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.***

iii ***Compulsory question carries six marks and remaining all questions carry four marks each.***

Books suggested

1 Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
2 Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman and Hall Ltd., 1991.
3 Shriver, D.E., Atkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.
4 Dauglas, B., McDaniel, D., Alexander, J., Conepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1999.
5 Porterfeild, W.W., Inorganic Chemisty; Pubs: Addison-Wesley Publishing Company, 1984.
6 Miessur, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
7 Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Ltd., 1991.
8 Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
9 Puri, B.R., Sharma, L.P., Kalia, K.C. Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publishers. 2006-07.

Paper-XXII: ORGANIC CHEMISTRY-B

Time : 3 Hrs
Max. Marks: 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(8 Hrs.)**

Amino Acids, Peptides, Proteins and Nucleic Acids:

Classification, structure and stereochemistry of amino acids. Acid- base behavior, isoelectric point and electrophoresis. Preparation and reactions of α - amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid – phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation.

Nucleic Acids : Introduction. Constituents of nucleic acids. Ribonucleosides and ribonucleotides. The double helical Structure of DNA.

UNIT-II **(7 Hrs.)**

Synthetic Polymers:

Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler – Natta polymerization and vinyl polymers.

Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes.

Natural and synthetic rubbers.

UNIT-III **(7 Hrs.)**

Organic Synthesis via Enolates:

Acidity of ά-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation and acylation of enamines.

UNIT-IV **(8 Hrs.)**

Organometallic Compounds:

Organomagnesium Compounds: The Grignard reagents – Formation, structure and chemical reactions.

Organozinc Compounds: Formation and Chemical reactions.

Organolithium Compounds: Formation and Chemical reactions.

Instructions for paper setters and candidates:

i. ***Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.***

ii. ***The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.***

iii. ***Compulsory question carries six marks and remaining all questions carry four marks each.***

Books suggested

1 Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992.
2 Wade Jr., L.G., Singh, M.S., Organic Chemistry; 6th edition, Pubs: Pearson Education, 2008.
3 Mukherji, S.M., Singh, S.P., Kapoor, R.P., Organic Chemistry; Pubs: New Age International, 1985, Vol. I.II, III.
4 Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000.
5 Solomons, T.W., Fundamentals of Organic Chemistry; 5th edition, Pubs: John Wiley & Sons, 1997.
6 Streitwieser, A., Clayton, Jr., Heathcock, H., Introduction to Organic Chemistry; 3rd edition, Pubs: Macmillan Publishing Company, 1989.

Paper-XXIII: PHYSICAL CHEMISTRY-B

Time : 3 Hrs
Max. Marks : 22+3
30 Hrs. (2 Hrs/Week)
3 Periods/Week

Objective of the course

To teach the fundamental concepts of Chemistry and their applications. The syllabus pertaining to B.Sc. (GENERAL) (Semester system) in the subject of Chemistry has been upgraded as per provision of the UGC module and demand of the academic environment. The course contents have been revised from time to time as per suggestions of the teachers of the Chemistry working in the Panjab University, Chandigarh and affiliated colleges. The syllabus contents are duly arranged unit wise and contents are included in such a manner so that due importance is given to requisite intellectual and laboratory skills.

UNIT-I **(7 Hrs.)**

Solid State-I:

Definition of space lattice, unit cell and Miller Indices

Laws of Crystallography – (i) Law of Constancy of Interfacial Angles, (ii) Law of Rationality of Indices, (iii) Law of Symmetry. Symmetry elements in crystals.

UNIT-II **(8 Hrs.)**

Solid State-II:

X- ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method). Applications of Powder diffraction for structure determination, Thermal and photochemical reaction in solid state

UNIT-III **(8 Hrs.)**

Spectroscopy :

Introduction : Electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

Rotational Spectrum:

Diatomic molecules. Energy levels of a rigid rotor (semi – classical principles), selection rules, spectral intensity, determination of bond length, qualitative description of non-rigid rotor, isotope effect.

UNIT-IV **(7 Hrs.)**

Vibrational Spectrum:

Infrared Spectrum : Energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups. Raman Spectrum : Concept of polarizability, pure rotational and pure vibrational, Raman spectra of diatomic molecules, selection rules.

Electronic Spectrum:

Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle.

Qualitative description of σ, π – and n M.O., their energy levels and the respective transitions.

Instructions for paper setters and candidates:

i. ***Examiner will set total of NINE questions comprising TWO questions from each unit and ONE compulsory question of short answer type covering whole syllabi.***
ii. ***The students are required to attempt FIVE questions in all, ONE question from each unit and the Compulsory question.***
iii. ***Compulsory question carries six marks and remaining all questions carry four marks each.***

Books suggested

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2 Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3 Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Company Inc, 1996.
4 Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.
5 Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6 Albert, R.A., Silbey, R.J., Physical Chemistry; I edition, Pubs: John Wiley & Sons Inc., 1992.
7 Dogra, S.K., Dogra, S., Physical Chemistry Through Problems, Pubs: Wiley Eastern limited, 1991.
8 Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd, 2002.
9 Moore, W.J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd., 1983.
10 Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book Company, 1989.
11 Banwell, C.N., McCash, E.M., Fundamentals of Molecular Spectroscopy; 4th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 1999.
12 Atkins, P. Friedman, R. Molecular Quantum Mechanics; 4th edition Pubs: Oxford University Press, 2007.
13 Levine, I.N., Quantum Chemistry; 5th edition, Pubs: Prentice Hall International Inc., 2000.

Paper – XXIV: LABORATORY PRACTICALS Max. Marks: 22+3

ORGANIC CHEMISTRY
Laboratory Techniques
Column Chromatography
Separation of fluorescein and methylene blue.
Separation of leaf pigments from spinach leaves.

Synthesis of Organic Compounds

(a) Aliphatic electrophilic substitution.
Preparation of iodoform from ethanol and acetone.
(b) Aromatic electrophilic substitution.
Nitration

Preparation of m-dinitrobenzene
Preparation of p-nitroacetanilide
Preparation of p-iodoaniline from aniline.
Preparation of methyl orange from N,N-dimethyl aniline and sulphanilic acid.

Halogenation

Preparation of p-bromoacetanilide

Preparation of 2,4,6 – tribromophenol

(c) Oxidation

Preparation of benzoic acid from toluene.

(d) Reduction

Preparation of aniline from nitrobenzene

Preparation of m-nitroaniline from m - dinitrobenzene

Stereochemical study of Organic Compounds via Models

R and S configuration of optical isomers.

E, Z configuration of geometrical isomers

Conformational analysis of cyclohexanes and substituted cyclohexanes.

General Instruction to the Examiners:

Note: Practical examination will be of four hours duration & shall consist of the following questions:

Q.No. 1*. Preparation of an organic compound : 7 marks

Q.No. 2. Experiment based onLaboratory Technique : 7 marks

Students shall be allowed the choice to opt for one experiment out of the three offered. The candidate will write theory, short procedure and calculations of that experiments in the next 10 minutes. Note – Book / Books is/are not allowed during writing.

Q.No. 3. Viva-Voce : 5 marks

Minimum of four questions (2 marks each) be asked on the background of practical course.

Q.No. 4. Note Book : 3 marks

*If a question on preparation is asked, then the students shall be required to give Equation, requirements & short procedure in the first 10 minutes. Note Books are not allowed during writing.

Books Suggested (Laboratory Courses)

1 Denny, R.C. Vogel's Quantitative Inorganic Analysis; 4th edition, Pubs: English Language Book Society, 1985.

2 Harwoor, L.M., Moody, J., Experimental Organic Chemistry; 1st edition, Pubs: Blackwell Scientific Publicaitons, 1989.

3 Palmer, W.G., Jamer, C., Swinehart, S., Experimental Inorganic Chemistry; 1st edition, Pubs: Perlkin-Elmer Corporation, 1969.

4 Forniss, B.S., Rogers, V., Vogel's Text Book of Practical Organic Chemistry; Pubs: Dorling Kindhsky Pvt. Ltd., 1989.

5 Garland, C.W., Experiments in Physical Chemistry; 1st edition, Pubs: McGraw Hill Book Company, 1989.

6 Bansal, R.K., Laboratory Manual of Organic Chemistry; 3rd edition, Pubs: Wiley Eastern Limited, 1994.

7 Furniss, B.S., Hannaford, A.J., Rogers, V., Smith, P.W.G., Tatchell, A.R., Vogel's Text Book of Practical Organic Chemistry; 4th edition, Pubs: Longman group, 1978.

8 Khosla, B.D., Garg, V.C., Gulati, A., Senior Practical Physical Chemistry; 11th edition, Pubs: R.Chand & Co., New Delhi, 2002.

9 Das, R.C., Behra, B. Experimental Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd., 1983.

10 Levitt, B.P., Findlays Practical Physical Chemistry; 8th edition, Pubs: Longman group Ltd. London & New York, 1978.
