Sophia Girls’ College, Ajmer (Autonomous)

SCHEME OF EXAMINATION AND COURSE OF STUDY
SYLLABUS
Batch 2015-16
Bachelor of Science (Maths)
Semester IV
<table>
<thead>
<tr>
<th>Paper Name</th>
<th>Internal</th>
<th>End Semester</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY-401 Optics</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>PHY-402 Electronics-II</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>PHY-403 Practical</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>CHE-401 Physical Chemistry</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>CHE-402 Organic Chemistry II</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>CHE-403 Practical</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>MATH-401 Real analysis</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>MATH-402 Mechanics</td>
<td>30</td>
<td>70</td>
<td>100</td>
</tr>
<tr>
<td>VCA – 401 C++ Programming - II</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>VCA – 402 Data Structure - II</td>
<td>25</td>
<td>50</td>
<td>75</td>
</tr>
<tr>
<td>VCA – 403 C++ Programming &amp; Data Structure - Laboratory</td>
<td>10</td>
<td>40</td>
<td>50</td>
</tr>
</tbody>
</table>
**Examination Scheme For Non Practical Subjects**

Maximum Marks : 70  
Duration: 2 :30hrs.

Minimum Marks : 28

**Section A**

Contains 10 Questions of 1 mark each & all are compulsory to do. (10 X 1=10 marks)

Three questions from each unit (but 4 questions from one unit)

3 + 3 + 4 = 10 Questions

**Section B**

Contains 6 questions of 5 marks each ( two questions from each unit). Student has to do 3 questions and at least one question from each unit (3 X 5 = 15 marks)

**Section C**

Contains 6 questions of 15 marks each ( two questions from each unit). Student has to do 3 questions and at least one question from each unit. (3 X 15 = 45 marks)
Examination Scheme For Practical Subjects

Maximum Marks : 50  Duration: 2 :30hrs.
Minimum Marks : 20

Section A
Contains 10 Questions of 1 mark each & all are compulsory to do. (10 * 1 =10 marks)
Three questions from each unit (but 4 questions from one unit)
3 + 3 + 4 = 10 Questions

Section B
Contains 6 questions two questions from each unit. Student has to do 3 questions and at least one question from each unit. (2 Questions of 3 marks & 1 Question of 4 marks)
(3+3+4 = 10 marks)

Section C
Contains 6 questions two questions from each unit. Student has to do 3 questions and at least one question from each unit. Each Question carries 10 marks. ( 3 * 10 = 30 marks)


**PHY-401: OPTICS**

**Unit I**

Interference of a light : The principle of superposition, two slit interference, coherence requirements of the sources. Interference by division of amplitude; thin films, Newton’s ring.

Haidinger fringes : Fringes of equal inclination. Michelson interferometer it’s application for precision determination of wavelength, Wavelength difference and the width of spectral lines. Fabry Perot interferometer.

**Unit II**

Polarization of light : Meaning of polarization, polarization by reflection: Brewster law, polarization by refraction through “Pile of plates”, Laws of Malus, Phenomenon of double refraction, uniaxial and biaxial crystals, Huygenstheory of double refraction, the ordinary and extra ordinary refractive indices.

Production and Analysis of Polarized Light : production of plane polarized light, the Polaroid, Nicol prism, analyser and polarizer, double image prisms, quarter and half wave plates, production of circularly and elliptically polarized light, rotation of plane of polarization.

**Unit III**

Fresnel diffraction : Half periods zones, circular aperture, Circular disc, straight edge, zone plate, phase reversible zone plate.

Fraunhofer diffraction : Single slit, double slit, n slit, Intensity distribution, Plane diffraction grating, Dispersive power of a grating, Resolving power, Reyleigh criterion, resolving power : telescope, grating, prism.

**References:**

1. Principle of Optics by B K Mathur
2. Optics by D P Khandelwal
3. Introduction to modern optics by A K Ghatak (Tata McGraw Hill)
4. Optics by Brij Lal and Subramaniam.
5. An Introduction to Modern Optics by G R Fowels
6. Optics Physics by Lipson and Lipson.
PHY-402: ELECTRONICS-2

Unit I

Unit II
Logic Circuits: Transistor as a switch, logic fundamentals, AND, OR, NOT, NOR, NAND, XOR gates. Boolean algebra, De Morgan’s theorem, positive and negative logic, logic gates circuits realization using DTL and TTL logic, Simplification of Boolean expressions.

Unit III
Circuit analysis: Networks some important definitions, loop and node equations based on DC and AC circuits (Kirchhoff’s Laws).

Four terminal networks: current voltage conventions open, close and hybrid parameters of any four terminal network, Input, output and mutual independence for an active four terminal network.

Various circuits theorems: Superposition, Thevenin, Norton, reciprocity, maximum power transfer and Miller Theorems.

References:
1. Introduction to modern optics by A K Ghatak (Tata McGraw Hill)
2. Optics by Brij Lal and Subramanium.
List of Experiments:

1. To determine the ratio of two capacitances by De Sauty’s bridge.
2. To determine self-inductance of a coil by Anderson’s bridge using AC.
4. Electronic Voltmeter measurement of peak, average & R.M.S. value of signal.
5. Study of voltage doubler and Tripler circuits.
6. Use of diffraction grating, find ‘l’ and its resolving power.
8. Study of laser as a monochromatic source with reference to diffraction
9. Determination of dispersive power of prism material with the help of spectrometer.

References:

1 Worshnop and Flint, Advanced Practical Physics
2 Nelkon M and Ogborn, Advanced Level Practical Physics, Heinemann Education Bookd Ltd, New Delhi
3 Srivastava S S and Gupta M K, Experiments in Electronics, Atma Ram& Sons, Delhi
4 Gupta S L and Kumar V, Practical Physics, PragatiPrakashan, Meerut.
CHE-401 : PHYSICAL CHEMISTRY

Unit I

A. Thermodynamics-I


B. 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, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases. 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 function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change.

Unit II

A. 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, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald’s dilution law its uses and limitations. Debye-Huckel-Onsagar’s equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids, determination of solubility product of a sparingly soluble salt, ionic product of water, hydrolysis constant of a salt, conductometric titrations.

B. Electrochemistry-II


References:

4. A text book of physical chemistry by Puri, Sharma, Pathania
CHE-402: ORGANIC CHEMISTRY II

Unit I

A. Aldehydes and Ketones

Unit II

Organic Compounds of Nitrogen

Unit III

Carboxylic Acids


References:

4. I.L. Finar, Organic Chemistry (Vols. I & II), E.L.B.S.
Organic Chemistry
(A) Chromatography (Any Three)
(i) Separation, Rf values and identification of organic compounds.
(ii) Preparation and separation of 2,4-dinitrophenylhydrozone of acetone, 2- butanone, hexan-2- and 3- one using toluene and light petroleum (40:60:).
(iii) Separation of a mixture of dyes using cyclohexane and ethyl acetate (8.5:1.5).
(iv) Separation of a mixture of phenylalanine and glycine. Alanine and aspartic acid. Leucine and glutamic acid. Spray reagent-ninhydrin.

(B) Qualitative Analysis
Identification of an organic compound through the functional group analysis, determination of melting point and preparation of suitable derivatives.

Physical Chemistry (Any Four)
1. Determination of the transition temperature of the given substance by thermometric/dialometric method (e.g. MnCl$_2$·4H$_2$O/SrBr$_2$· 2H$_2$O)
2. To study the effect of a solute(e.g. NaCl, succinic acid) on the critical solution temperature of two partially miscible liquids (e.g. phenol-water system) and to determine the concentration of that solute in the given phenol-water system.
3. To construct the phase diagram of two component (e.g. diphenylaminebenzophenone) system by cooling curve method.
4. To determine the solubility of benzoic acid at different temperatures and to determine DH of the dissolution process.
5. 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.
6. To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber cycle.

References:
MATH 401: REAL ANALYSIS

Unit I
Real number system as a complete ordered field: Field and its properties, ordered field, lower bound, upper bound, supremum and infimum of sets, the completeness property of Real number system, the Archimedean property, Definition of sequence theorems on limits of sequences, bounded and monotonic sequences, Cauchy’s convergence criterion.

Unit-II
Infinite series of non-negative terms, different tests of convergence of infinite series comparison test, ratio test, Logarithmic, Morgen and Bertrand test (without proof). Alternating series, Leignitz’ theorem Absolute and conditional convergence, Pointwise convergence of sequence of functions, uniform convergence.

Unit-III
Limit, continuity, differentiability of two variable functions, mean value theorems: Rolle’s theorem, Lagrange’s mean value theorem, Cauchy’s mean value theorem. Riemann integral, Fundamental theorem of integral calculus.

References:
1. T.M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985
4. Shanti Narayan: A Course of Mathematical Analysis, S. Chand & Co., New Delhi
MATH-402: MECHANICS

Unit I
General Conditions of equilibrium of coplanar forces: Reduction of coplanar forces into a force with couple, Equilibrium of a rigid body under three forces, Equilibrium of rigid body under more than three forces. Friction, Common Catenary.

Unit-II

Unit-III
Constrained motion in vertical and horizontal circles, central orbit, inverse square law (Planetary motion). Impact (Direct and Oblique).

References:
1. F. Chorlton: Dynamics, CBS Publishers, New Delhi
2. Dynamics: S.J. Publication, Meerut by Dr. P.K. Mittal
VCA – 401: C++ PROGRAMMING – II

Unit I

Evolution of OOP, Advantages of OOP, comparison between functional programming and OOP approach, characteristics of object oriented language-objects, classes, inheritance, reusability, user defined data types, polymorphism, overloading.

Unit - II

Classes, member functions, objects, arrays of class objects, pointers and classes, constructors, destructors, Function overloading, Static Class Member, friend functions, dynamic memory allocation.

Unit - III

Inheritance, types of inheritance, member access control. Function overloading, operator overloading, polymorphism, virtual functions & Function overriding

References:

3. OOPS with C++, N P Bhave,
4. OOPS with ANSI C++, A N Kamthane,
VCA – 402 DATA STRUCTURE & ALGORITHM - II

Unit I

Stacks and Queues :- Introduction to stacks, Representation of stacks, Implementation of stacks using Array & Link List, Uses of stacks, Introduction to queues, Implementation of queues with algorithm, De-queues.

Unit II

Trees: - Concept of Trees, Concept of representation of :Binary tree & Binary search trees Traversing (Pre order, Post order and Inorder), Searching, inserting and deleting Binary Trees, binary search trees.

Unit III

Graph and Table: - Introduction to graphs, types of graphs, Breadth first search, Depth first search, adjacent matrix, Searching Sequential Table.

Applications: - Recursion, Fibonacci, Tower of Hanoi, Divide & Conquer

References:

2. Data Structures and algorithms in C++- Adam Drozdex, Vikas Publications
4. An introduction to data structures with applications -Jean-Paul Tremblay, P. G. Sorenson, TMH
5. Data Structures in C/C++-Tanenbaum, PHI