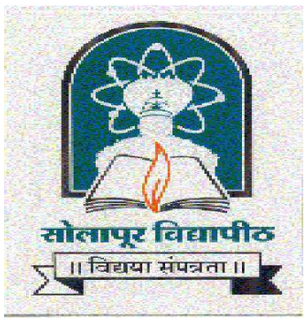

Solapur University, Solapur

B . Sc.- III (Chemistry)
CBCS Syllabus
2018-2019

General Structure

Theory Examination:

- Structure of B.Sc. course under faculty of science has total 06 semesters for 3 years.
- B.Sc.-III comprises of total two semesters (Sem-V and Sem-VI).
  Each semester will have Five theory papers (one compulsory English and four Chemistry papers) of 70 marks each (University external examination) and 30 marks for each paper (Internal examination)
  The duration of each University theory paper examination will be of 2 hr. and 30 min.
  Each theory paper has 30 marks for internal examination. There will be 15 marks unit test and 15 marks home assignment
- At the end of academic year i.e. semester - VI the practical examination will be conducted.

The Weightage of practical is of 280 marks for University external practical examination and 120 i.e (30*4) marks for internal practical examination.

There will be Four theory papers in chemistry of 70 marks for each semester. There titles and marks distribution are as under (Excluding English).

Semester	Paper No.	Title of Paper	Lectures/ Practicals per week	Total Marks			Total Credit
				Univ. Exam	Internal Exam	Total	
Semester -V	IX	Physical Chemistry	3	70	30	100	3
	X	Inorganic Chemistry	3	70	30	100	3
	XI	Organic Chemistry	3	70	30	100	3
	XII DSE-1	Analytical And Industrial Physical Chemistry	3	70	30	100	3
	XII DSE-2	Methodology and materials of industrial importance					
Semester -VI	XIII	Physical Chemistry	3	70	30	100	3
	XIV	Inorganic Chemistry	3	70	30	100	3
	XV	Organic Chemistry	3	70	30	100	3
	XVI DSE-1	Analytical and Industrial Organic Chemistry	3	70	30	100	3
	XVI DSE-2	Applied Organic Chemistry					
Theory				560	240	800	24
Practicals			20	280	120	400	20
Total B.Sc.-III				**840**	**360**	**1200**	**44**

Practical Course

Practical Examination will be held at the end of the year.

A) Distribution of marks :

- **Continuous Internal Assessment for chemistry**:

1) Practical paper has 30*4=120 marks for internal examination.
2) Practical paper has 280 marks for external university practical examination.
   There will be three practicals, one from each Physical, Inorganic and Organic practical work.
3) The mark distribution of 280 marks for external university practical examination is as follows.

Q. 1 Physical Chemistry experiment : 90 marks
Q. 2 Inorganic Chemistry experiment : 100 marks
Q. 3 Organic Chemistry experiment : 90 marks

Total marks: 280 marks

Duration of practical examination is three days, six and half hours per day
All answer sheets should be collected at the end of examination.

Practical Marks Distribution

- **Physical Chemistry experiment: 90 marks**

a) **Instrumental : 40**
b) **Non-instrumental** : 30
c) **Journal : 10**
d) **Oral : 10**

- **Inorganic Chemistry experiment: 100 marks**

a) **Gravimetric analysis : 35**
b) **Volumetric analysis : 25**
c) **Preparation : 20**
d) **Journal : 10**
e) **Oral : 10**

- **Organic Chemistry experiment: 90 marks**

a) **Organic Mixture Separation and analysis: 35**

b) **Volumetric analysis : 25**

OR

b) **Preparation :25**
0c) **Derivative : 10**
d) **Journal :10**
e) **Oral : 10**

Theory

N. B.

i.) Figures shown in bracket indicates the total number of contact hours required for the respective topics

ii) The question paper should cover the entire syllabus. Marks allotted should be in proportion to the number of contact hours allotted to respective topics.

iii) All topics should be dealt with S.I units.

iv) Use of scientific calculator is allowed.

v) Industrial tour is prescribed.

vi) Values required for spectral problems should be provided in the question paper.

SEMESTER –V

PAPER-IX : PHYSICAL CHEMISTRY

Total Credits: 3
Contact hrs: 45

1. Phase Equilibria. **[10]**

1.1 Introduction

1.2 Gibbs phase rule : Phase rule equation and explanation of terms involved in the equation.

1.3 Phase diagram, true and metastable equilibria.

1.4 One component systems : (i) Water system (ii) Sulphur system with explanation for polymorphism.

1.5 Two component systems : (i) Eutectic system : (Ag - Pb system); Desilverisation of lead (ii) Formation of compound with congruent melting point ($FeCl_3$ - H_2O)

2. Electromotive force. **[23]**

(Convention : Reduction potentials to be used)

2.1 Introduction

2.2 Thermodynamics of electrode potentials, Nernst equation for electrode and cell potentials in terms of activities.

2.3 Types of electrodes : Description in terms of construction, representation, half cell reaction and emf equation for,

i) Metal - metal ion electrode. ii) Amalgam electrode.

iii) Metal - insoluble salt electrode. iv) Gas - electrode.

v) Oxidation - Reduction electrode.

2.4 i) Reversible and Irreversible cells.

ii) Chemical cells without transference.

iii) Concentration cells

a. Electrode concentration cell

I) Reversible to cation

II) Reversible to anion

b. Electrolyte concentration cells without transference

2.5 Equilibrium constant from cell emf, determination of the thermodynamic parameters such as ΔG, ΔH and ΔS.

2.6 Applications of emf measurements :

i) Determination of pH of solution using Hydrogen electrode.

ii) Solubility and solubility product of sparingly soluble salts (based on concentration cell).

2.7 Numerical problems.

3. Photochemistry. **[12]**

3.1 Introduction

3.2 Difference between thermal and photochemical processes.

3.3 Laws of photochemistry : Grotthus - Draper law, Lambert law, Lambert - Beer's law (with derivation), Stark - Einstein law.

3.4 Quantum yield, Reasons for high quantum yield (e.g. H_2 - Cl_2) and low quantum yield. (e.g. Decomposition of HI and HBr).

3.5 Photosensitized reactions - Dissociation of H_2, Photosynthesis.

3.6 Photodimerisation of anthracene.

3.7 Jablonski diagram depicting various processes occurring in the excited state : Qualitative description of fluorescence and phosphorescence.

3.8 Chemiluminescence.

3.9 Numerical problems.

Reference Books:

1. Physical Chemistry by G. M. Barrow, International student Edition, Mc Graw Hill.
2. University General Chemistry by C.N.R. Rao, Macmillan.
3. Physical Chemistry by, R. A. Alberty, Wiley Eastern Ltd.
4. The Elements of Physical Chemistry by P. W. Atkins, Oxford.
5. Principles of Physical Chemistry by S. H. Maron, C. H. Prutton, 4th Edition.
6. Fundamentals of Photochemistry by K.K. Rohatgi-Mukerjee.
7. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
8. Text Book of Physical Chemistry by S. Glasstone, Macmillan India Ltd.
9. Elements of Physical Chemistry by D. Lewis and S. Glassture (Macmillan).
10. Principles of Physical Chemistry by Maron and Lando (Amerind).
11. An Introduction to Electrochemistry by S. Glasstone.
12. Physical Chemistry by W. J. Moore.
13. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).

PAPER -X: INORGANIC CHEMISTRY

Total Credits: 3
Contact hrs: 45

1. Metal Ligand Bonding in Transition Metal Complexes : [13]

A) **Crystal Field Theory (CFT).**

1.A.1) Introduction - What is CFT?

1.A.2) Basic concept of CFT.

1.A.3) Formation of complexes with Crystal field splitting of 'd' orbitals

i. Shapes of d orbitals and their electron density region

ii. Formation of octahedral Complex with Crystal field splitting of 'd' orbitals, e.g. High spin and low spin octahedral complexes of Co(III): [CoF6] $^{3-}$, $[Co(NH_3)_6]^{3+}$.

iii. Formation of tetrahedral Complex with Crystal field splitting of 'd' orbitals, e.g. $[CoCl_4]^{2-}$

iv. Formation of square planer Complex with Crystal field splitting of 'd' orbitals e.g. $[Co(CN)_4]^{2-}$

1.A.4. Jahn - Tellar distortion.

1.A.5. Factors affecting the Crystal - field splitting.

1.A.6. Crystal field stabilization energy (Δ): Calculation for octahedral complexes only.

1.A.7. Applications and limitations of CFT.

B) Molecular Orbital Theory (MOT).

1.B.1. Introduction.

1.B.2. Basic concept

1.B.3. Symmetry classes of atomic orbitals

1.B.4. Formation of octahedral complex a) Assumptions b) M.O. energy level diagram for hypothetical octahedral complex.

1.B.5. Examples: octahedral complexes with sigma bonding only such as- e.g.$[Ti(H_2O)_6]^{3+}$, $[FeF_6]^{3-}$, $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$, $[Co(NH_3)_6]^{3+}$, $[Ni(NH_3)_6]^{2+}$

1.B.6. Applications and limitations of MOT.

1.B.7. Comparison between CFT and MOT.

2. Nuclear Chemistry: [12]

2.1. Nuclear reaction and energetics of nuclear reactions.

2.2. Classification of nuclear reactions and Types of nuclear reactions:

i) Artificial transmutation.

ii) Artificial radioactivity.

iii) Projectile capture reaction.

iv) Projectile capture - particle emission reaction.

v) Nuclear fission.

vi) Nuclear fusion.

2.3. Use of Uranium, Thorium and Plutonium for: a. Nuclear reactor b. Atomic Bomb.

2.4. Applications of radioisotopes as tracers.

i) Chemical investigation - Esterification.

ii) Structural determination - Phosphorus pentachloride.

iii) Analytical Chemistry - isotopic dilution method for determination of volume of blood.

iv) Age determination - Dating by ^{14}C.

3. Bioinorganic Chemistry: [08]

3.1. Essential and trace elements in biological process.

i) Essential elements a) Macro / major elements b) Micro/trace/minor elements

ii) Non-essential elements

3.2. Metalloporphyrins with special reference to haemoglobin and myoglobin.

i) Structure of Haemoglobin (Hb)

ii) Structure of Myoglobin (Mb)

iii) Function of Haemoglobin (Hb) and Myoglobin (Mb) as Oxygen transport from lungs to tissues

iv) Function of Haemoglobin as Carry back CO_2 to lungs

v) Co-operativity

vi) Oxygen binding curve

vii) Difference between Haemoglobin (Hb) and Myoglobin (Mb)

3.3. Role of alkali and alkaline earth metal ions with special reference to Na^+ , K^+ and $Ca^{2+.}$

i) Role of Na^+ and K^+

ii) Role of Ca^{2+} .

4. Catalysis [06]

4.1. Introduction

4.2. Classification of catalytic reactions : Homogeneous & Heterogeneous

4.3. Types of catalysis

4.4. Characteristics of catalytic reactions

4.5. Mechanism of catalysis :

i) Intermediate compound theory

ii) Adsorption theory.

4.6. Industrial Applications of Catalysis.

5. Fertilizers [06]

5.1. Nutrient Functions in plant growth :

Nitrogen, Phosphorous, Potassium, Calcium, Magnesium, Sulphur, Boron, Iron, Zinc, Manganese, Copper, Molybdenum, Chlorine, Role of these nutrients as : Functions, Excess supply and Deficiency.

5.2. Definition and qualities of an ideal fertilizers:

5.3. Classification or types of fertilizers:

5.4. Manufacture of fertilizers, eg. Urea, Ammonium sulphate, Superphosphate, Triple superphosphate, Ammonium phosphate.

5.5. Mixed fertilizers, Compound or complex fertilizers.

5.6. Pollution caused by fertilizers:

(Reference Material : Industrial Chemistry, By – B K Sharma, Goel Publishing House 16th Edition: Topic No 26, Page No. 762 to 808)

Reference Books:

1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D. Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford,Oxford University Press, 2nd Edition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper and Row.
4. Basic Inorganic Chemistry : Cotton and Wilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton and Wilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wiley publication.
7. Fundamental concepts of Inorganic Chemistry by E. S. Gilreath.
8. Structural principles in inorganic compounds. W. E. Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S. Manku.
11. Theoretical Inorganic Chemistry by Day and Selbine.
12. Co-ordination compounds S F A Kettle.
13. Modern Aspects of Inorganic Chemistry. E. Sharpe.
14. New guide to Modern Valence Theory by G. I. Brown.
15. Essentials of Nuclear Chemistry by H. J. Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman - Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. Pitampur Delhi.
19. Text book of Inorganic Chemistry by K. N. Upadhyaya Vikas Publishing House – New Delhi.
20. Progress in inorganic polymer by Laport and Leigh.
21. Co-ordination compounds by Baselo and Pearson.
22. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan (S Chand)
23. Selected Topics in inorganic chemistry by W U Malic, G. D. Tuli, R. D. Madan. (S. Chand)
24. Industial chemistry part I and II by A. K. De
25. Industrial chemistry by B. K. Sharma

Paper – XI: Organic Chemistry

Total Credits: 3
Contact hrs: 45

1 Spectroscopic Methods. **[20]**

1.1. Infrared Spectroscopy :

1.1.1 Introduction.
1.1.2 Principle of IR spectroscopy.
1.1.3 Double beam IR spectrophotometer- Schematic diagram.
1.1.4 Fundamental modes of vibrations.
1.1.5 Types of vibrations.
1.1.6 Hooke's law.
1.1.7 Factors affecting values of vibrational frequencies.
1.1.8 Conditions for absorption of radiation and selection rule.
1.1.9 Fundamental group regions of IR spectrum.
1.1.10 Functional group region, Finger print region, Aromatic region.
1.1.11 Characteristic absorption of various functional groups.
1.1.12 Applications of IR spectroscopy – Determination of structure, Identification of functional groups, spectral problems based on IR.

1.2 NMR Spectroscopy.

1.2.1 Introduction.
1.2.2. Proton magnetic resonance (^{1}H) spectroscopy (PMR).
1.2.3 Principles of PMR spectroscopy.
1.2.4 Magnetic and non-magnetic nuclei.
1.2.5. Theory of PMR spectroscopy - spinning nuclei, magnetic moment and magnetic field, processional motion of nuclei without mathematical details, nuclear resonance.
1.2.6 NMR - Instrument. Schematic diagram.
1.2.7. Shielding and deshielding effect.
1.2.8. Chemical shift, measurement of chemical shift by delta scale and tau scale.
1.2.9. TMS as reference. Advantages of TMS.
1.2.10. Peak area (integration).
1.2.11. Spin - spin splitting (n + 1 rule).
1.2.12. Definition of coupling constant (J value) of first order coupling.
1.2.13. PMR spectra of ethanol, ethyl bromide, acetaldehyde, 1, 1, 2 - tribromoethane, ethyl acetate, acetophenone, benzaldehyde, propanoic acid and benzoic acid.
1.2.14. Problems pertaining to the structure elucidation of simple organic compounds using PMR spectroscopic data (supporting IR and UV data to be given).

1.3 Mass spectroscopy.

1.3.1 Introduction.
1.3.2 Theory of mass spectroscopy
1.3.3 Mass spectrometer - schematic diagram
1.3.4 Formation of ions by ionization
1.3.5 Types of ions with examples.
1.3.6. Applications of mass spectroscopy.
i) Determination of molecular weight.
ii) Determination of molecular formula.

2. Stereochemistry. **[07]**

2.1 Introduction.
2.2 Baeyer's strain theory.
2.3 Theory of strainless rings.
2.4 Conformation and stability of cyclohexane and monosubstituted cyclohexanes - methyl cyclohexane.
2.5 Locking of conformation in t-butyl cyclohexane.
2.6 Stereoselective and stereospecific reactions :
i) Stereochemistry of addition of halogens to alkenes : syn and anti addition. Example - Addition of bromine to 2-butene. (mechanism not expected)
ii) Alkaline hydrolysis of 2-chlorobutane to 2-butanol (Example of SN^2 reaction)

3. Name reactions. **[10]**

Mechanism and applications of following reactions :
3.1 Stobbe condensation.
3.2 Oppenauer oxidation.
3.3 Meerwein Ponndorf Verley reduction.
3.4 Reformatsky reaction.
3.5 Wagner - Meerwein Rearrangement.
3.6 Hofmann rearrangement reaction.
3.7 Wittig reaction.
3.8 Related problems.

4. Organic synthesis via Enolates **[08]**

4.1 Introduction - Reactive methylene group.
4.2 Ethyl acetoacetate - synthesis by Claisen condensation, acidity of methylene hydrogen (salt formation), Keto-enol tautomerism, synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic and α- β- unsaturated acid, heterocyclic compound.
4.3 Diethyl malonate - Synthesis, acidity of methylene hydrogen (salt formation). Synthetic applications - Synthesis of alkyl and dialkyl derivatives, monobasic, dibasic acid, α- β- unsaturated acid, α-amino acid and heterocyclic compound.

Reference Books :

1) Organic Chemistry : D. J. Cram and G. S. Hammond, McGraw Hill book Company, New York.
2) Organic Chemistry : I. L. Finar, The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry : Peter Sykes, Longman Green and Co. Ltd. London 6th Edition.
4) Organic Chemistry : R. T. Morrison and R. N. Boyd, Prentice Hall of India Private Limited, New Delhi. 6th Edition.
5) Text book of organic Chemistry : L. N. Ferguson, N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. New Delhi.
6) Organic Chemistry Vol. I, II and III: S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Eastern, Limited, New Delhi.
7) A text book of organic Chemistry : K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi Vikas Publishing House Private Ltd. New Delhi.
8) A text book of Organic Chemistry : Arun Bahl and B. S. Bahl , S. Chand and Company Ltd. 6th Edition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism : Raj K. Bansal , Wiley Easter Ltd., New Delhi.
10) Reaction Mechanism and Reagents in Organic Chemistry: G. R. Chatwal, Himalaya Publishing House, New Delhi.
11) Stereochemistry conformation and mechanism: P. S. Kalsi, New Age International Publishers, 4th Edition.
12) Organic Chemistry Volume I and II : I. L. Finar ELBS with Longman 6th Edition.
13) Organic Chemistry Volume I and II : William Kemp, ELBS with Mc. Million 3rd Edition.
14) Advanced Organic Chemistry: Jerry March, Wiley Eastern Ltd.
15) Spectroscopy of Organic compounds: P. S. Kalsi.

16) Modern Methods of Organic Synthesis, W Carruthers, Iaon Coldhalm, Cambridge University Press
17) Organic Chemistry : Fieser and Fieser.
18) Principles of Organic Chemistry : English and Cassidy.
19) Elementary Organic Absorption Spectroscopy : Y. R. Sharma.
20) Spectroscopy : V. M. Parikh.
21) Stereochemistry of Carbon Chemistry : Eliel.
22) Principles of Organic Chemistry : M. K. Jain.
23) Organic Chemistry by Clayden, Greeves, Warren and Wothers Oxford press.
24) Organic Chemistry : A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical Science Series.
25) Reactions, Rearrangements and reagents : S.N.Sanyl, Bharati Bhawan publishers and Distributors Patna.

PAPER-XII : (DSE-1)
ANALYTICAL AND INDUSTRIAL PHYSICAL CHEMISTRY

Total Credits: 3
Contact hrs: 45

1. Colorimetry. **[08]**

1.1 Introduction

1.2 General discussion of theory of colorimetry : Lambert law, Beer's law (Derivation not expected), Terms used in Colorimetry, Application of Beer's law, Deviation from Beer's law.

1.3 Classification of methods of color measurement or comparison, Photoelectric photometer method - single cell photo-electric colorimeter.

2. Potentiometry **[10]**

2.1 Introduction.

2.2 Detail study of calomel, quinhydrone and glass electrodes and their use in determination of pH.

2.3 Basic circuit diagram of direct reading potentiometer

2.4 Potentiometric titrations : Classical and analytical methods for locating end points,

i) Acid - Base titrations.

ii) Redox - titrations.

iii) Precipitation titrations.

2.5 Advantages of potentiometric titrations.

3 Electroplating **[08]**

3.1 Introduction.

3.2 Electrolysis, Faraday's laws, Cathode current efficiency.

3.3 Basic principles of electroplating, cleaning of articles.

3.4 Electroplating of Nickel and Chromium.

3.5 Anodising.

4 Flame photometry **[09]**

4.1 General principles.

4.2 Instrumentation : Block diagram,
Burners: Total consumption burner, premix or laminar-flow burner and Lundergraph burner,
Mirrors,
Slits,
Monochromators,
Filters
Detectors.

4.3 Applications in qualitative and quantitative analysis.

4.4 Limitations of flame photometry.

5. Conductometry: **[10]**

5.1 Basic circuit of D.C. Wheatstone bridge, Measurement of conductance by Wheatstone bridge, use of alternating current, conductivity water, Different types of conductivity cells, cell constant and its determination. Experimental determination of specific, equivalent and molar conductance.

5.2 Conductometric acid-base titrations

i. Strong acid against strong base

ii. Strong acid against weak base

iii. Weak acid against strong base.

iv. Weak acid against weak base.

5.3 Advantages of conductometric titrations

Reference Books :

1. Text book of Quantitative Inorganic Analysis - By A. I. Vogel (ELBS and Longman 3rd Edition).
2. Instrumental methods of Chemical analysis by Willard, Merit and Dean.
3. Instrumental methods of Chemical analysis by Chatwal and Anand (Himalaya Publication).
4. Principles of electroplating and eletroforming by Blum and Hogaboom, Mac Graw - Hill Book Co. 3rd Edn.
5. Vogel's text book of Quantitative Inorganic Analysis by Basssett and Denny etc. ELBS and Longman 4th Edition.
6. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
7. Text Book of Physical Chemistry by S. Glasstone, McMillan India Ltd.
8. Elements of Physical Chemistry by D. Lewis and S. Glasstone (McMillan).
9. Principles of Physical Chemistry by Maron and Lando (Amerind).
10. An Introduction to Electrochemistry by S. Glasstone.
11. Physical Chemistry by W. J. Moore.
12. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).

PAPER-XII : (DSE-2)
METHODOLOGY AND MATERIALS OF INDUSTRIAL IMPORTANCE

Total Credits: 3
Contact hrs: 45

1. Data Analysis (13 Lectures)

1.1 The Investigative Approach: Making and Recording Measurements. SI Units and their use. Scientific method and design of experiments.
1.2 Analysis and Presentation of Data: Descriptive statistics. Choosing and using statistical tests.
1.3 Chemometrics. Analysis of variance (ANOVA), Correlation and regression, Curve fitting, fitting of linear equations, simple linear cases, weighted linear case, analysis of residuals,
1.4 General polynomial fitting, linearizing transformations, exponential function fit, 'r' and its abuse.
1.5 Basic aspects of multiple linear regression analysis.

2. Chemical Safety and Ethical Handling of Chemicals: (12 Lectures)

2.1 Safe working procedure and protective environment, protective apparel, emergency procedure and first aid, laboratory ventilation.
2.2 Safe storage and use of hazardous chemicals,
2.3 Procedure for working with substances that pose hazards, flammable or explosive hazards,
2.4 Procedures for working with gases at pressures above or below atmospheric – safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals,
2.5 Procedure for laboratory disposal of explosives, identification, verification and segregation of laboratory waste, disposal of chemicals in the sanitary sewer system.
2.6 Incineration and transportation of hazardous chemicals.

3. Nanomaterials: (10 Lectures)

3.1 Overview of nanostructures and nanomaterials: classification.
3.2 Preparation of gold and silver metallic nanoparticles, self-assembled nanostructures-control of nanoarchitecture-one dimensional control.
3.3 Carbon nanotubes and inorganic nanowires.
3.4 Bio-inorganic nanomaterials, DNA and nanomaterials, natural and antisical nanomaterials,
3.5 Bionano composites.

4. Composite materials: (10 Lectures)

4.1 Introduction, limitations of conventional engineering materials, role of matrix in composites,
4.2 Classification, matrix materials, reinforcements, metal-matrix composites, polymer-matrix composites, fibre-reinforced composites.
4.3 Environmental effects on composites.
4.4 Applications of composites.

Reference Books

1) Practical skills in chemistry, Dean, J. R., Jones, A. M., Holmes, D., Reed, R., Weyers, J. & Jones, A. (2011) 2nd Ed. Prentice-Hall, Harlow.
2) Data analysis for chemistry, Hibbert, D. B. & Gooding, J. J. (2006) Oxford University Press.
3) Errors of observation and their treatment, Topping, J. (1984). Fourth Ed., Chapman Hall, London.
4) Quantitative chemical analysis, Harris, D. C. 6th Ed., Freeman (2007) Chapters 3-5.
5) How to use Excel in analytical chemistry and in general scientific data Analysis, Levie, R. de, Cambridge Univ. Press (2001) 487 pages.
6) Chemical safety matters – IUPAC – IPCS, Cambridge University Press, 1992.
7) Inorganic Solids: An introduction to concepts in solid-state structural Chemistry, Adam, D.M. John Wiley & Sons, 1974.
8) Introduction to Nanotechnology, Poole, C.P. & Owens, F.J. John Wiley & Sons, 2003.

SEMESTER-VI

PAPER- XIII: PHYSICAL CHEMISTRY

Total Credits: 3
Contact hrs: 45

1. Spectroscopy. **[10]**

1.1 Introduction
1.2 Electromagnetic radiation.
1.3 Electromagnetic spectrum, Energy level diagram.
1.4 Rotational spectra of diatomic molecules : Rigid rotor model; moment of inertia (derivation not expected); energy levels of rigid rotor, selection rule; spectral intensity; distribution using population distribution (Maxwell - Boltzmann distribution), determination of bond length; isotope effect. Interaction of radiation with rotating molecule.
1.5 Vibrational spectra of diatomic molecules : Simple Harmonic oscillator model, Vibrational energies of diatomic molecules, Determination of force constant, overtones. Interaction of radiation with vibrating molecules.
1.6 Numerical problems.

2. Solutions. **[09]**

2.1 Introduction
2.2 Ideal solutions, Raoult's law, vapour pressure of ideal and non ideal solutions of miscible liquids.
2.3 Vapour pressure and boiling point diagrams of miscible liquids.
Type I : Systems with intermediate total vapour pressure.
(i.e. System in which B.P. increases regularly - Zeotropic)
Type II : Systems with a maximum in the total vapour pressure.
(i.e. System with a B.P. minimum - Azeotropic)
Type III :Systems with a minimum in the total vapour pressure.
(i.e. System with a B.P. Maximum - Azeotropic)
Distillation of miscible liquid pairs.
2.4 Solubility of partially miscible liquids.
(i) Maximum solution temperature type : Phenol - water system.
(ii) Minimum solution temperature type : Triethyl amine - water system.
(iii) Maximum and minimum solution temperature type : Nicotine - water system.

3. Thermodynamics. **[13]**

3.1 Introduction
3.2 Free energy : Gibbs function (G) and Helmholtz function (A), Criteria for thermodynamic equilibrium and spontaneity.
3.3 Relation between G and H : Gibbs Helmholtz equation.
3.4 Phase equilibria : Clapeyron - Clausius equation.
3.5 Thermodynamic derivation of law of mass action, van't Hoff isotherm and isochore.
3.6 Fugacity and activity concepts.
3.7 Numerical problems.

4. Chemical Kinetics **[13]**

4.1 Introduction, simultaneous reactions such as opposing reactions, side reactions, consecutive reactions and chain reactions. [Derivations of rate Equations for these reactions are not expected.]

4.2 Effect of temperature on the rate of reaction.
1. Temperature coefficient
2. Arrhenius equation
3. Energy of activation

4.3 Theories of reaction rate :
1. Collision theory and
2. Transition state theory

4.4 Third order reaction with equal concentration of all reactants, their characteristics and examples
4.5 Numerical problems.

Reference Books :

1. Principles of Physical Chemistry by Maron and Pruton 4th edition.
2. Principles of Physical Chemistry by Puri, Sharma, Pathania, Shobhanlal Naginchand and Company, Jalandar.
3. Text Book of Physical Chemistry by S. Glasstone, McMillan India Ltd.
4. Elements of Physical Chemistry by D. Lewis and S. Glasstone (McMillan).
5. Principles of Physical Chemistry by Maron and Lando (Amerind).
6. Thermodynamics for chemists by S Glasstone.
7. Physical Chemistry by W. J. Moore.
8. Essentials of Physical Chemistry, Bahl and Tuli (S. Chand).
9. Basic Chemical Thermodynamics by V V Rao (McMillan)
10. An introduction to chemical thermodynamics by R. R. Mishra and R. P. Rastogi.
11. Fundamentals of molecular spectroscopy by C. N. Banwell and McCash- Tata McGraw Hill

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PAPER-XIV: INORGANIC CHEMISTRY

Total Credits: 3
Contact hrs: 45

1) Study of F-block Elements [11]

1.1 Lanthanides :-

I) Introduction
II) Electronic configuration
III) Occurrence
IV) Separation of Lanthanides
  i) Bulk separation methods
  ii) Individual separation of lanthanides- Mention names of methods only(Ion exchange method in detail)

1.2 Actinides :-

I) Introduction
II) Electronic configuration
III) General Methods of preparation –
  a. Neutron-capture followed by β-decay
  b. Accelerated projectile bombardment method
  c. Heavy-ion bombardment method

1.3 IUPAC Nomenclature of the Super Heavy Elements with atomic numbers (Z) greater than 100.

2) Metals and Semiconductors. [11]

2.1 Introduction.
2.2 Properties of metallic solids.
2.3 Theories of bonding in metal.
  a) Free electron theory.
  b) Molecular orbital theory (Band theory).
2.4 Classification of solids as conductor, insulators and semiconductors on the basis of band theory.
2.5 Semiconductors:
  a) Types of semiconductors - intrinsic and extrinsic semiconductors.
  b) Applications of semiconductors.
2.6 Superconductors :
  a) Ceramic superconductors - Preparation and structures of mixed oxide $YBa_2Cu_3O_{7-x}$
  b) Applications of superconductors.

3) Structural Chemistry. [11]

3.1 Structural study of following compounds.
  i) Diborane.
  ii) Borazine.
  iii) Xenon compounds → XeF_2, XeF_6, XeO_4 (w.r.t. VBT only.)
3.2 Structural study of Oxides of Sulphur and Phosphorous:
  i) Oxides of Sulphur : SO_2 and SO_3
  ii) Oxides of Phosphorous : P_4O_6 and P_4O_{10}

4) Corrosion and Passivity. [07]

4.1 Corrosion :-

I. Introduction
II. Types of corrosion
III. Electrochemical theory of corrosion
IV. Factors affecting the corrosion
  i) Position of metal in emf series.
  ii) Purity of metal.
  iii) Effect of moisture.
  iv) Effect of oxygen.
  v) Hydrogen over voltage.
V. Methods of protection of metals from corrosion.

4.2 Passivity :-

I. Definition.
II. Types of passivity.
III. Oxide film theory.
IV. Application of passivity.

5. Organometallic Chemistry. [05]

5.1 Introduction - Definition,
5.2 Nomenclature of organometallic compounds.
5.3 Synthesis and structural study of alkyl and aryl compounds of Li, Be and Al.
5.4 Mononuclear carbonyl and nature of bonding in simple metal carbonyls.

Reference Books :

1. Concise Inorganic Chemistry (ELBS, 5th Edition) - J. D. Lee.
2. Inorganic Chemistry (ELBS, 3rd Edition) D. F. Shriver, P. W. Atkins, C. H. Lang Ford, Oxford University Press, 2nd Edition.
3. Inorganic Chemistry (Harper International, 3rd edition) J. E. Huheey Harper and Row.
4. Basic Inorganic Chemistry : Cotton and Wilkinson.
5. Advanced Inorganic Chemistry (4th Edn.) Cotton and Wilkinson.
6. Concepts and Models of Inorganic Chemistry : Douglas and Mc. Daniel. 3rd Edition. John Wiley publication.
7. Fundamental concepts of Inorganic Chemistry by E. S. Gilreath.
8. Structural principles in inorganic compounds. W. E. Addison.
9. T. B. of Inorganic analysis - A. I. Vogel.
10. Theoretical principles of Inorganic Chemistry - G. S. Manku.
11. Theoretical Inorganic Chemistry by Day and Selbine.
12. Co-ordination compounds S F A Kettle.
13. Modern Aspects of Inorganic Chemistry. E. Sharpe.
14. New guide to Modern Valence Theory by G. I. Brown.
15. Essentials of Nuclear Chemistry by H. J. Arnikar.
16. Organometallic Chemistry by R. C. Mahrotra A. Sing, Wiley Eastern Ltd. New Delhi.
17. Inorganic Chemistry by A. G. Sharpe, Addision - Wisley Longman - Inc.
18. Principles of Inorganic Chemistry by Puri, Sharma and Kalia, Vallabh Publication. Pitampur Delhi.
19. Text book of Inorganic Chemistry by K. N. Upadhyaya Vikas Publishing House – New Delhi.
20. Progress in inorganic polymer by Laport and Leigh.
21. Co-ordination compounds by Baselo and Pearson.
22. Organometallic Chemistry by P. L. Pauson.
23. Advanced inorganic chemistry, Vol. I and II Satyaprakash, G. D. Tuli, S. K. Basu and Madan
24. Selected Topics in inorganic chemistry by W U Malik, G. D. Tuli, R. D. Madan. (S. Chand)
25. Industrial chemistry part I and II by A. K. De
26. Industrial chemistry by B. K. Sharma

Paper - XV : Organic Chemistry

Total Credits: 3
Contact hrs: 45

1 Heterocyclic compounds **[09]**

1.1 Introduction and classification
1.2 Pyrrole
1.2.1 Methods of synthesis
i) From acetylene
ii) From furan
iii) From succinamide
1.2.2 Physical properties
1.2.3 Reactivity of pyrrole
i) Basic character
ii) Acidic character
iii) Electrophilic substitution with general mechanism
1.2.4 Chemical reactions
i) Reduction
ii) Oxidation
iii) Nitration
iv) Sulphonation
v) Halogenation
vi) Friedel Craft's reaction
vii) Coupling reaction

1.3 Pyridine
1.3.1 Methods of synthesis
i) From acetylene and hydrogen cyanide
ii) From piperidine
1.3.2 Physical properties
1.3.3 Chemical reactions
i) Basic character
ii) Electrophilic substitution reactions : Nitration, Sulphonation and Bromination
iii) Nucleophilic substitution - General mechanism, Reactions with sodamide, sodium hydroxide and n-Butyl lithium.
1.4 Quinoline
1.4.1 Synthesis - Skraup's synthesis
1.4.2 Physical properties.
1.4.3 Reactions of quinoline
i) Electrophilic substitution reactions - Nitration and sulphonation.
ii) Nucleophilic substitution reactions – Reactions with sodamide, alkyl lithium and aryl lithium
iii) Reduction

2. Carbohydrates **[11]**

2.1 Introduction
2.2 Classification and nomenclature
2.3 Monosaccharide D-glucose - Open chain structure
2.4 Chain lengthening of Aldoses - Kiliani synthesis
2.5 Chain shortening of Aldoses - Weerman's reaction
2.6 Interconversion of glucose and fructose
2.7 Configuration of D-glucose from D-arabinose
2.8 Objections against open chain structure of D-glucose.
2.9 Mutarotation with mechanism.
2.10 Ring structure of D-glucose - Determination of size of ring by
i) Methylation method.
ii) Periodic acid oxidation method.
2.11 Disaccharides - Introduction, sucrose and lactose - sources, structural formulae and uses.
2.12 Polysaccharides – Introduction, Starch and Cellulose - sources, structural formulae and uses

3. Vitamins and Hormones **[07]**

3.1 General idea of vitamins, structure and synthesis of vitamin A
3.2 General idea of hormones, structure and synthesis of Adrenaline and Thyroxin

4. Pharmaceuticals **[07]**

4.1 Introduction
4.2 Qualities of ideal drug
4.3 Methods of classification of drugs - Classification based on the therapeutical action
4.4 Brief idea of pencillin-G (constitution, synthesis not expected)
4.5 Synthesis and uses of the following drugs :

i) Antimalerials - Paludrin
ii) Antituberculars - Isoniazide and Ethambutol
iii) C. N. S. drugs - Phenobarbitone
iv) Antidiabetics - Tolbutamide
v) Anti-inflammatory drugs - Ibuprofen
vi) Antibiotics - Chloromycetin
vii)Anticancer drugs : Chlorambucil (Leukeran)

5 Synthetic dyes. **[07]**

5.1 Introduction, Qualities of good dye
5.2. Classification based on constitution and methods of applications
5.3 Witt's theory - Colour and constitution
5.4 Synthesis of Orange IV, Malechite green, phenolphthalein

6 Agrochemicals. **[04]**

6.1 General idea of agrochemicals including pyrethroides.
6.2 Synthesis and uses of the following agrochemicals :

i) Indole-3-acetic acid.
ii) Monocrotophos
iii) Methoxychlor
iv) Ethophan
v) Carbaryl
vi) Baygon

Reference Books :

1) Organic Chemistry - Cram D. J. and Hammond G.S. McGraw Hill book Company New York.
2) Organic Chemistry - Finar I. L. The English Language Book Society, London.
3) A Guide Book to mechanism in Organic Chemistry - Peter Sykes Longman Green and Co. Ltd. London 6th Edition.
4) Organic Chemistry - R. T. Morrison and R. N. Boyd Prentice Hall of India private limited New Delhi. 6th Edition.
5) Text book of organic Chemistry - Ferguson L. N. D. Van Nostrand Company Indian Edition, Affiliated East West press private Ltd. New Delhi.
6) Organic Chemistry Vol. I, II and III - S. M. Mukharji, S. P. Singh, R. P. Kapoor Wiley Estern, Limited, New Delhi.
7) A text book of organic Chemistry - K. S. Tewari, S. N. Mehrotra, N. K. Vishnoi Vikas Publishing House Private Ltd. New Delhi.
8) A text book of Organic Chemistry - Arun Bahl and B. S. Bahl S. Chand and Company Ltd. 6th Edition.
9) Heterocyclic Chemistry Synthesis, Reactions and Mechanism - Raj K. Bansal Wiley Easter Ltd. New Delhi.
10) Reaction Mechanism and reagents in Organic Chemistry - G. R. Chatwal Himalaya Publishing House New Delhi.
11) Organic Chemistry Volume I and II - I. L. Finar ELBS with Longman 6th Edition.
12) Organic Chemistry Volume I and II - William Kemp ELBS with Macmillion 3rd Edition.
13) Advanced Organic Chemistry - Jerry March Wiley Eastern Ltd.

14) Organic Chemistry - Fieser and Fieser.
15) Principles of Organic Chemistry - English and Cassidy.
16) Chemicals for crop improvement and pest management - Green, Hartly and West.
17) Chemistry of pesticides - K. H. Buchel (T. W.).
18) Medical Chemistry - Burger.
19) Principles of Organic Chemistry - M. K. Jain.
20) Organic Chemistry by Clayden, Greeves, Warren and Wothers Oxford press.
21) Organic Chemistry - A Comprehensive degree text and source book by Hanes Baeyers and Wolfgang Walter Albion Chemical Science Series.
22) Reactions, Rearrangements and reagents - S.N. Sanyl, Bharati Bhawan publishers and Distributors Patna.
23) Synthetic Organic Chemistry-Kamlesh Bansal.
24) Synthetic Organic Chemistry-Gurudeep Chatwal.
25) Chemistry of Insecticides – U.S. Sree Ramulu.
26) Medicinal Chemistry- Ashitosh Kar.

Paper-XVI:(DSE-1)
Analytical and Industrial Organic Chemistry

Total Credits: 3
Contact hrs: 45

1. Soaps and Detergents. **[08]**

1.1 Soaps
i) Raw materials
ii) Types of soaps
iii) Manufacture of soap - Hot process
iv) Cleansing action of soaps
1.2 Detergents
i) Raw materials
ii) Types of detergents - Cationic, anionic, amphoteric, neutral detergents
iii) Preparation of teepol and deriphat
1.3 Comparison between soaps and detergents

2. Synthetic Polymers. **[08]**

2.1 Introduction
2.2 Classification :
i) According to origin, composition, method of preparation and general physical properties
ii) Classification based upon structure
2.3 Process of addition polymerisation - free radical polymerisation of alkenes and Dienes
2.4 Ionic polymerisation
2.5 Ziegler - Natta polymerisation
2.6 Methods of preparation and uses of :
i) Polystyrene ii) PVC iii) Phenol formaldehyde resin iv) Polyurethane
2.7 Natural rubber : General idea and vulcanisation
2.8 Synthetic rubbers : Synthesis and uses of :
i) Polychloroprene ii) Buna rubber - Buna N and Buna S

3. Sugar and Alcohol Industry **[09]**

3.1 Manufacture of raw cane sugar
3.2 Refining of raw sugar
3.3 White sugar
3.4 By-products of sugar industry
3.4.1 Manufacture of ethyl alcohol from molasses
3.4.2 Rectified spirit, Denatured spirit absolute alcohol and power alcohol
3.4.3 By-products of alcohol industry

4. Synthetic Reagents **[07]**

4.1 Sodium borohydride: Use in reduction of aldehydes and ketones
4.2 Lithium aluminium hydride: Use in reduction of aldehydes, ketones, acids, amides and esters
4.3 Osmium tetroxide **:** Hydroxylation of alkenes
4.4 1,3-dithiane : Umpolung concept, reactions with alkyl halide and acyl halide
4.5 Selenium dioxide : Oxidation of carbonyl compounds and allylic oxidation

5. Green Chemistry. **[04]**

5.1 Introduction - Twelve principles of green chemistry
5.2 PTC: Introduction, Role in organic reactions catalysis
5.3 Biocatalytic reactions - Hydroxylation and oxidation using enzymes
5.4 Introduction to microwave assisted reactions
5.5 Ionic liquids – Introduction and examples of ionic liquids

6 Chromatography. **[09]**

6.1 Introduction
6.2 General principles
6.3 Classification
6.4 Study of following chromatographic techniques with reference to principle, methodology and applications
i) Paper chromatography
ii) Column chromatography
iii) Thin layer chromatography
iv) Gas chromatography

Reference) Books :

1. Basic Concepts of Analytical Chemistry - S. M. Khopkar, Wiley Eastern Ltd., Bombay.
2. Industrial Chemistry - R. K. Das, Asia Publishing, Mumbai.
3. Text Book of Quantitative Organic Analysis - A. I. Vogel, Pearson Edn. Delhi.
4. Quantitative Organic Chemistry - A. I. Vogel, Pearson Edn. Delhi.
5. Hand Book of Organic Analysis - H. T. Clarke, Arnold Heinemann Pub. Delhi.
6. Advanced Organic Chemistry - B. S. Bahl and Arun Bahl, S. Chand Comp. Delhi.
7. Riegel's Handbook of Industrial Chemistry - J. A. Kent, Van. Nostrard, Londan.
8. Chemical Process Industries - Shreve and Brinic - Ostin, Magraw Hill, New York.
9. Analytical Chemistry- Walton.
10. Biotechnology and Applied Microbiology - Alani and Moo-Young.
11. Immobilize Biocatalysis - Joy Wleser.
12. Introduction to Polymer Chemistry - Raymond B. Seymour.
13. Polymer Science - V. R. Gowarikar, N. V. Viswanathan and Jayadev Sreedhar Willey Eastern Limited.
14. Advances in Green Chemistry : Chemical synthesis using MW-irradiation by R. S. Varma.
15. Green Chemistry : Environment Friendly alternatives - Rashmi Sanghi and M. M. Srivastava (Eds) (c) 2003 Narosa Publishing House, New Delhi, India.
16. Reactions, rearrangements and reagents : S. N. Sanyal
17. Organic reaction mechanism : V. K. Ahluwalia and K.R.K Parashar
18. Environment friendly synthesis using ionic liquids: Jairton Dupont, Toshiyuki Itoh and Sanjay V. Malhotra (CRC Press)

Paper-XVI:(DSE-2)
Applied Organic Chemistry

Total Credits: 3
Contact hrs: 45

1. Theory of binary mixture analysis 05

1.1 Types of organic compounds, nature and types of binary mixtures.
1.2 Reactions of acid, base, phenol and neutrals with sodium bicarbonate, sodium hydroxide and hydrochloric acid
1.3 Principle of binary mixture separation.
1.4 Determination of type of the mixture
1.5 Separation of mixture- using aqueous medium and ether.

2. Green Chemistry 04

2.1 Introduction
2.2 Twelve principles of green chemistry
2.3 Zeolites as green catalysts
2.4 Ultrasound assisted reactions
2.5 Reactions in ionic liquids
2.6 Solvent free reactions

3. Chemistry of cosmetics 12

3.1 A general study including preparation and uses of- Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, cold creams, vanishing creams and shaving creams

4. Chemistry of perfumes 12

4.1 A general study including preparation and uses of- antiperspirants, and artificial flavours
4.2 Essential oils and their importance in cosmetic industry with reference to Eugenol, geraniol, sandalwood oil, eucalyptus oil, rose oil, 2-phenyl ethyl alcohol, jasmone, civetone and muscone

5. Fermentation 05

5.1 Aerobic and anaerobic fermentation
5.2 Production of antibiotics- streptomycin
5.3 Production of vitamins-Vit. B12

6. Textile Chemistry 07

6.1 Introduction, classification of fibers
6.2 Sizing: object of sizing, sizing ingredients and their functions
6.3 General idea of processes : singeing, desizing, scouring
6.4 Bleaching: Brief study of the outline of the process of bleaching cotton and synthetic material.
6.5 Dyeing : Study of dyeing of cellulosic material and synthetic fibers with dyes like direct, vat, reactive and disperse dyes.

Reference Books

1. Industrial chemistry : B. K. Sharma(Goel Publishing House, Meerut)
2. Engineering Chemistry: P. C. Jain and M. Jain(Dhanpatrai and sons, Delhi)
3. Practical Organic Chemistry: A. I. Vogel
4. Advances in green chemistry-Chemical synthesis using Microwave irradiation: R. S. Verma
5. A book of textile chemistry: A. J. Hall
6. Bleaching and Dyeing : Dr. V. Shenai
7. Sizing : D. B. Ajgaonkar
8. Chemical process industries : Shreve and Brinik (Ostin McGrawHill Publication, New York)
9. Medicinal and Pharmaceutical Chemistry: Hakishan, V. K. Kapoor (Vallabh Prakashan Pimpura New Delhi)
10. Industrial Chemistry, Vol. I:E. Stocchi (Ellis Horwood Ltd, UK)

PRACTICALS

N. B. i. Use of Electronic balance with 0.001g accuracy is mandatory.
ii. Use of Scientific calculator is allowed.

Physical Chemistry

I) Non instrumental Experiments(Any Five) :

1. To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by the distribution method.
2. To determine the partition coefficient of CH_3COOH between H_2O and CCl_4.
3. Critical Solution Temperature.
To determine the CST for phenol – water system.
4. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N HCl.
5. The study of energy of activation of first order reaction i.e. hydrolysis of methyl acetate in presence of 0.5 N H_2SO_4.
6. The study of energy of activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Equal concentrations).
7. The study of energy of activation of second order reaction i.e. reaction between $K_2S_2O_8$ and KI (Unequal concentrations).
8. To study the hydrolysis of methyl acetate by using its two concentrations in presence of 0.5 N HCl and hence find velocity constant of the reaction.
9. To study the effect of addition of electrolyte (KCl) on the reaction between $K_2S_2O_8$ and KI (Equal concentrations).

II. Instrumental experiments

A. Potentiometry (Any Three).

1. Titration of strong acid with strong alkali.
2. Preparation of buffer solution and determination of their pH (Any five buffer solutions), - Theoretical calculation of pH values by using Henderson's equation.
3. Determination of standard electrode potential of Zn/Zn^{++} , Cu/Cu^{++} , Ag/Ag^{+} (Any two).
4. Determination of solubility and solubility product of AgCl.
5. Titration of ferrous ammonium sulphate using $K_2Cr_2O_7$ solution and to calculate redox potential of Fe^{++} , Fe^{+++} system

B. Conductometry (any three).

1. Titration of weak acid with strong alkali.
2. Titration of a mixture of weak acid and strong acid with strong alkali.
3. To study the effect of substituent on dissociation constant of weak acid with respect to acetic acid and monochloroacetic acid (cell constant to be given).
4. To determine the velocity constant of hydrolysis of ethyl acetate by NaOH solution by conductometric method.

C. Refractometry.

1. To determine the percentage composition of unknown mixture by (i) graphical method and (ii) by composition law (Densities of pure liquids A & B be given).
2. To determine the molar refractivity of methyl acetate, ethyl acetate, n-hexane and carbon tetrachloride and calculate the refraction equivalents of C, H and Cl atoms.

D. Colorimetry (Any Two).

1. To verify Lambert - Beer's law using $CuSO_4$ solution.
2. To estimate Fe^{+++} ions by thiocynate method.
3. To estimate Fe^{+++} ions using salicylic acid by colorimetric titration.

E. pH - metry (Any One).

1. To determine the dissociation constant of monobasic acid (Acetic acid).
2. To determine the dissociation constant of dibasic acid (Malonic acid).

Reference Books :

1. Findlay's Practical Physical Chemistry (Longman)
2. Advanced Practical Physical Chemistry by J. B. Yadav, Goel publishing house.
3. Practical Physical Chemistry by B. D. Khosla, V. C. Garg (R. Chand and Co.)
4. Systematic experimental Physical Chemistry by Rajbhoj, Chandekar (Anjali Publicaiton)
5. Practical Physical Chemistry : Nandkumari, Kothari and Lavande.
6. Practical Physical Chemistry by Gurtu (S. Chand).

Inorganic Chemistry

I. Gravimetric Estimations (G).

N. B. : Any two experiments from G1 to G3 and any two experiments from G4 to G7

G1. Gravimetric estimation of iron as ferric oxide from the given solution containing ferrous ammonium sulphate, copper sulphate and free sulphuric acid.

G2. Gravimetric estimation of zinc as zinc pyrophosphate from the given solution containing zinc sulphate, ferrous ammonium sulphate and free sulphuric acid.

G3. Gravimetric estimation of barium as barium sulphate from the given solution containing barium chloride, ferric chloride and free hydrochloric acid.

G4. Gravimetric estimation of manganese as manganese ammonium phosphate from the given solution containing manganese sulphate, copper sulphate and free sulphuric acid.

G5. Gravimetric estimation of barium as barium chromate from the given solution containing barium chloride, ferric chloride and free hydrochloride acid.

G6. Gravimetric estimation of Aluminium as Aluminium oxinate i.e.
tris (8-hydroxyquinolinato) aluminate (III) from a given solution containing potash alum, copper sulphate and free sulphuric acid.

G7. Gravimetric estimation of nickel as bis (dimethylglyoximato) nickel (II) from the given solution containing nickel sulphate, ferrous ammonium sulphate and free sulphuric acid.

[For the gravimetric experiments, stock solution should be given in the range of 10 to 15 cm and asked to dilute to 100 cm (or the stock solution should be given in the range of 20 to 30 cm and asked to dilute to 250 cm). Use 50 cm of this diluted solution for estimation.]

II. Inorganic Preparations (P) : (any five).

N. B. – 1. Calculations of % yield is expected.

2. After preparation, physico-chemical characterization is expected with 5(Five) marks weightage in terms of:

a) Name of central metal ion
b) Oxidation number of metal ion
c) Nature of ligand
d) Nature of bonding
e) Type of hybridization
f) Inner orbital or outer orbital complex
g) Geometry of the complex with structure
h) Magnetic property of the compound
i) Color of the compound
j) Nature :Crystalline /Amorphous

P1. Preparation of potassium trioxalatoferrate (III)

P2. Preparation of potassium trioxalatoaluminate (III)

P3. Preparation of tris(ethylenediamine)nickel (II) thiosulphate

P4. Preparation of sodium hexanitrocobaltate (III)

P5. Preparation of ammonium diamminetetrathiocynatochromate(III) (Reineck's salt)

P6. Preparation of cholropentaamminecobalt (III) chloride

P7. Preparation of hexamminenickel (II) chloride

P8. Preparation of tris(thiourea)cuprous(I) sulphate

III) Titrimetric Estimations :

A) Percentage Purity (any three)

V1. Determination of percentage purity of ferrous ammonium sulpahte.

V2. Determination of percentage purity of tetramminecopper (II) sulphate.

V3. Determination of percentage purity of potassium trioxalatoaluminate(III).

V4. Determination of percentage purity of potassium trioxalatoferrate (III).

B) Analysis of Commercial Sample (any three).

V5. Determination of percentage of magnesium in the given sample of talcum powder.

V6. Determination of amount of aluminium in the given solution of potash alum.

V7. Determination of titrable acidity in the given sample of milk or lassi.

V8. Determination of Chemical Oxygen Demand of the given sample of industrial effluent by dichromate method.

V9. Determination of percentage purity of boric acid using supplied sodium hydroxide (Standard succinic or oxalic acid solution to be prepared for standardization of the given sodium hydroxide solution.)

C) Ion exchange method

V10. Determination of amount of sodium present in the given solution of common salt using cation exchange resin (By Acid Base titration).

V11. Determination of amount of magnesium and zinc in the given solution containing (Mg^{++} and Zn^{++}) using anion exchange resin and standard solution of EDTA.

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Reference Books:

1. A text book of quantitative Inorganic Analysis - A. I. Vogel.
2. Text book of Quantitative Inorganic Analysis - Kolthoff and Sandell.
3. Experimental Inorganic Chemistry - Palmer W. G.
4. Advanced Practical Inorganic Chemistry - Adams and Raynor.
5. Handbook of Preparation Inorganic Chemistry. Vol. 1 and 11 - Brauer.
6. Manual in Dairy Chemistry - I.C.A.R. Sub-Committee on Dairy Education.
7. Chemical methods for environmental analysis - R. Ramesh and M. Anbu.

Organic Chemistry

I) Qualitative analysis

Separation of binary mixture and Identification of its components. 5g of mixture is to be given for separation. At least **08 mixtures** are to be separated.

Nature 1) Solid - Solid : 4 mixtures

2) Solid - Liquid : 2 mixtures

3) Liquid - Liquid : 2 mixtures

1) Solid - Solid Mixtures :

One mixture from each of the following types should be given :

i) Acid + Phenol ii) Acid + Base

iii) Acid + Neutral iv) Phenol + Base

v) Phenol + Neutral vi) Base + Neutral

2) Solid - Liquid Mixtures

One mixture of type Neutral + Neutral and One mixture of type Acid + Neutral should be given.

3) Liquid - Liquid Mixtures

One mixture of type Neutral + Neutral and One mixture of type Base + Neutral should be given.

Following compounds should be used for preparation of mixtures:

Acids : Benzoic acid, Phthalic acid, Salicylic acid, Cinnamic acid, Aspirin, Oxalic acid.

Phenols: α-naphthol, β-naphthol

Bases : o -nitroaniline, m-nitroaniline, p-nitroaniline, aniline, o-toluidine and N, N-dimethyl aniline.

Neutrals : Naphthalene, acetanilide, m-dinitrobenzene, chloroform, carbon tetrachloride, acetone, nitrobenzene, ethyl acetate, ethyl benzoate, acetophenone, bromobenzene, urea and thiourea.

II) Quantitative analysis : (Any four)

Organic estimations :

1) Estimation of sucrose

2) Estimation of nitro group

3) Saponification value of oil.

4) Estimation of formaldehyde from given formalin solution.

5) Estimation of acid and ester present in the given mixture of acid and ester.

6) Estimation of acid and amide from the mixture of acid and amide.

III) Organic Preparations : (any four)

N.B.: a) Calculation of percentage practical yield.

b) Recrystallisation of crude product and its melting point.

c) The purity of the product may be confirmed by TLC.

1) Preparation of m-nitroaniline from m-dinitrobenzene.

2) Preparation of aspirin from salicylic acid.

3) Preparation of nerolin from β-naphthol.

4) Preparation of p-iodonitrobenzene from p-nitroaniline.

5) Preparation of benzene azo - β - naphthol.

6) Preparation of benzoic acid from cinnamic acid.

IV Preparation of Derivatives :

N.B.:During practical course, name of the organic compound should not to be given.

1) Bromo derivative of aniline and cinnamic acid.

2) Nitro derivative of salicylic acid and nitrobenzene.

3) Benzoyl derivative of β-naphthol and aniline.

4) Picrate derivative of anthracene and β-naphthol.

5) Oxalate and nitro derivatives of urea.

6) Anhydride derivative of phthalic acid.

7) Oxime derivatives of Ketones : Acetone and acetophenone.

8) 2 : 4 DNP of acetophenone.

***Reference Books** :*

1. Practical Organic Chemistry by A. I. Vogel.

2. Hand book of Organic qualitative analysis by H. T. Clarke.

3. A laboratory Hand Book of Organic qualitative analysis and separation by V. S. Kulkarni. Dastane Ramchandra & Co.

4. Practical Organic Chemistry by F. G. Mann and B. C. Saunders. Low - priced Text Book. ELBS. Longman.

5. Experiments in General Chemistry by C. N. R. Rao. Affiliated East-West Press Pvt. Ltd. Delhi.

6. Advanced Practical Organic Chemistry by N. K. Vishnoi. Vikas Publishing House Private Limited.
7. Comprehensive Practical Organic Chemistry Qualitative Analysis by V. K. Ahluwalia, Sunita Dhingra. University Press. Distributor - Orient Longman Ltd.
8. Comprehensive Practical Organic Chemistry Preparation and Quantitative Analysis by V.K. Ahluwalia, Renu Agarwal. University Press. Distributor-Orient Longmann Ltd.
9. Practical Chemistry - Physical - Inorganic - Organic and Viva - voce by Balwant Rai Satija. Allied Publishers Private Limited.30
10. College Practical Chemistry by H. N. Patel, S. R. Jakali, H. P. Subhedar, Miss. S. P. Turakhia. Himalaya Publishing House, Mumbai.
11. College Practical Chemistry by Patel, Jakali, Mohandas, Israney Turakhia. Himalaya Publishing House, Mumbai.
12. Practice of thin layer chromatography by Joseph C. Touchstone, Murrell F. Dobbins. A Wiley - Interscience Publication John-Wiley & Sons.

SOLAPUR UNIVERSITY, SOLAPUR

NAAC Accredited-2015
'B' Grade (CGPA 2.62)

Faculty of Science

Choice Based Credit System Syllabus

B.Sc.III (Sem-V&VI)-Mathematics

With effect from June-2018

1) Preamble

B.SC III Mathematics is framed to provide the tools to get the easy and precise outcome to various applications of science and technology.Also logical development of various algebraic statements can be made to develop the innovative approach of various concepts and it can be applied to various abstract things.In the theory courses of Linear algebra ,Complex Analysis, Partial differencial Equation, Integral calculus, Metric Space, Numerical Analysis ,Laplace transform, Programmimg In C

Various deductions of theorems, corollaries and lemmas will be acquired by Students. Change is the Universal truth of the nature .So our aim is that Students should learn various techniques to find solutions . Students who opted T.Y.B.SC Mathematicshave to complete 8 theory courses 4 each semester , four practicals entitled (Numerical Techniques in Laboratory) NTL A,B,C,D Courses (Annual). In the practical course of 400 marks students exercise the problem solving techniques for practical course A,B,C,D . The details are mentioned in the syllabus.

2) Aims

The aim of the course is to generate Intelligent and Skillful human beings with adequate theoretical and practical knowledge of the various mathematical systems. To include conceptual understanding in basic Phenomena , statements,theorems and development of appropriate problem solving skills suitable for applications and sufficient logical connectivity is provided.

3) Objective of the Course

1)To design the syllabus with specific focus on key Learning Areas .
2) To equip student with necessary fundamental concepts and knowledge base
3) To develop specific problem solving skills.
4) To impart training on abstract concepts ,analysis , deductive techniques.
5) To prepare students for demonstrating the acquired knowledge .
6) To encourage student to develop skills for developing innovative ideas .
7) A student be able to apply their skills and knowledge that is translate information presented verbally into mathematical form select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion .
8) A Student should get adequate exposure to global and local concerns that explore them many aspects of mathematical sciences.

Solapur University Solapur
Faculty of Science
Syllabus for B.Sc III –Mathematics Semester System
Choice Based Credit System (CBCS Pattern) (w.e.f .2018-19)
To be implemented from Academic Year 2018-19

Subject/ Core Course	Name and Type of paper		No of Papers/ Practicals	Hrs /Week			Total Marks per Paper	UA	CA	Credit
	Type	Name		L	T	P				
Class :	B.SC –III Semester –V									
	Ability Enhancement Course (AECC)	English		4			100	70	30	4
	Core	Subject	Algebra - II	3	--	--	100	70	30	3
	Core		Complex Analysis	3	--	--	100	70	30	3
	Core		Integral Calculus	3	--	--	100	70	30	3
	DSE-1	Subject	Partial Differential Equations (Elective - A)	3	--	--	100	70	30	3
	DSE-2		Mathematical Analysis (Elective - B)	3	--	--	100	70	30	3
Grand Total				**16**			**500**	**350**	**150**	**12**

Subject/ Core Course	Name and Type of paper		No of Papers/ Practicals	Hrs /Week			Total Marks per Paper	UA	CA	Credit
	Type	**Name**		**L**	**T**	**P**				
Class :	B.SC –III Semester –VI									
	Ability Enhancement Course (AECC)	English		4			100	70	30	4
	Core	Subject	Metric Space	3	--	--	100	70	30	3
	Core		Numrical Analysis	3	--	--	100	70	30	3
	Core		Programming in C	3	--	--	100	70	30	3
	DSE-1	Subject	Integral transform (Elective-A)	3	--	--	100	70	30	3
	DSE-2		Graph Theory & Combinatorics (Elective - B)	3	--	--	100	70	30	3
Total Theory				**16**			**500**	**350**	**150**	**12**

	Core	Subject		--	--	5	100	70	30	5
	Core	Subject		--	--	5	100	70	30	5
	Core	Subject		--	--	5	100	70	30	5
	DSE	Subject		--	--	5	100	70	30	5
Total Practicals				--	--	20	400	280	120	20
Grand Total					**16**	**20**	**900**	**630**	**270**	**44**

Equivalent Subject for Old Syllabus

Sem-V

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper-VII: Algebra – II	Paper-IX : Algebra - II
2)	Paper-VIII : Complex Analysis	Paper-X : Complex Analysis
3)	Paper-IX: Integral Calculus	Paper-XI : Integral Calculus
4)	Paper-X : Partial Differential Equations	Paper-XII : Partial Differential Equations (Elective - A)
		Paper-XII : Mathematical Analysis (Elective - B)

Sem-VI

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper-XI : Metric Spaces	Paper-XIII : Metric Spaces
2)	Paper-XII : Numerical Analysis	Paper-XIV : Numerical Analysis
3)	Paper-XIII : Integral Transform	Paper-XVI : Integral Transform (Elective - A)
4)	Paper-XIV : Programming in C	Paper-XV : Programming in C
		Paper-XVI : Graph Theory and Combinatorics (Elective - B)

SOLAPUR UNIVERSITY, SOLAPUR

Syllabus for

B.SC.-III (MATHEMATICS)

CBCS pattern Syllabus w.e.f. June - 2018

Structure of the revised course :-

SEMESTER - V

(I) Theory Papers :-

Paper	Title of the Paper	Marks
IX	Algebra – II	70 + 30 = 100
X	Complex Analysis	70 + 30 = 100
XI	Integral Calculus	70 + 30 = 100
XII	Partial Differential Equations (Elective - A)	70 + 30 = 100
XII	Mathematical Analysis (Elective - B)	70 + 30 = 100

SEMESTER - VI

1. Theory Papers :-

Paper	Title of the Paper	Marks
XIII	Metric Spaces	70 + 30 = 100
XIV	Numerical Analysis	70 + 30 = 100
XV	Programming in C	70 + 30 = 100
XVI	Integral Transform (Elective-A)	70 + 30 = 100
XVI	Graph Theory and Combinatorics (Elective-B)	70 + 30 = 100

2. Numerical Technique Laboratory (NTL)

NTL No.	Topic	Marks
NTL-III (A)	**S-I : Algebra-II[6]** **S-II : Metric Space [6]+Seminar**	**70 + 30 = 100**
NTL-III (B)	**S-I : Complex Analysis [6]** **S-II : Numerical Analysis [6]+Project**	**70 + 30 = 100**
NTL-III (C)	**S-I : Integral Calculus [6]** **S-II: Programming in C [6]+Study Tour/Book review**	**70 + 30 = 100**
NTL-III (D)	**S-I : Partial Differential Equation(Elective - A) [6]** **or** **S-I : Mathematical Analysis [6] (Elective - B)+ Viva Voce**	**35+ 15=50**
NTL-III (D)	**S-II: Integral Transform[6] (Elective - A)** **or** **S-II : Graph Theory and Combinatorics [6](Elective - B) + Viva Voce**	**35+ 15=50**

Note : [ ] Number inside bracket indicated **number of assignments.**

In Numerical Technique Laboratory : NTL - III(A) - III (D) [Project / Seminar / Study Tour/ Viva-Voce / Book Review]

Project : Biography of One Mathematician or One Mathematics Topic (which is not included in the syllabus up to B.Sc.-III Mathematics) about Five Pages. **05Marks**

Book Reviews : Any Mathematics Book except Text Book **05Marks**

Seminar : Any topic in mathematics. **05Marks**

Book Reviews : Mathematics Book other than text book **05Marks**

Study Tour : Visit to any Industry / Research Institution / Educational Institution. **05Marks**

Viva Voce : Viva voce on Project, Seminar, Book review and Study Tour. **05Marks**

(Free internet should be availed for collection of Material for Project, Seminar.)

Instructions :

1. Each Theory Paper is allotted 45 periods per semester.
2. All **Numerical Technique Laboratory (NTL)** (similar to Practicals) will be conducted in the batch as a whole Class.
3. Total evaluation of B.Sc. III **(1200 Marks.)**

   [Theory papers **(800 Marks)**

   + [Practicals **NT L**-III (A) to III (D) **(400 Marks)**
4. The annual **Numerical Technique Laboratory (NTL -** III (A) to III (D)] will carry **100 Marks** each.
5. **Department of Mathematics should provide FIVE computers per batch of TEN Students.**

Nature of paper of Numerical Technique Laboratory

(For NLT - III (A) to NLT - III (D))

Section - I

I)	Attempt THREE out of SIX (each of 10 marks)	Marks 30
	OR Attempt SIX out of EIGHT (each of 05 marks)	
II)	Attempt THREE out of SIX (each of 10 marks)	Marks 30
	OR Attempt SIX out of EIGHT (each of 05 Marks)	
III)	Seminar/Project/Study Tour/Viva-voce/Book Review	Marks 05
IV)	Journal	Marks 05
		Total Marks 70

SEMESTER-V

Paper - IX: Algebra – II

Unit - 1: Introduction to Rings. **[10]**

1.1 Definitions and Examples

1.2 Integral Domains. Subrings

1.3 Fields

1.4 Isomorphism, Characteristic of rings

Unit - 2: Quotient Rings. **[05]**

4.1 Homomorphism of rings, ideals

4.2 Quotient Rings

Unit - 3: Vector Spaces **[10]**

Vector spaces, subspaces, linear combination and system of linear equation, linear dependence and independence, basis and dimensions.

Unit - 4: Linear transformation and matrices **[15]**

Linear transformation, null spaces and range, matrix representation of linear transformation, composition of linear transformation and matrix multiplication, invertibility and isomorphism.

Unit - 5: Inner product space **[05]**

Inner products and Norms.

Recommended books (Scope of Syllabus):

Modern Algebra-An Introduction, by John R. Durbin, John Wiley & Sons, Inc. Fifth Edition.

Unit - 1: Chapter - VI: Art. 24, 25, 26, 27

Unit - 2: Chapter - IX : Art. 38, 39

Linear Algebra Fourth Edition by Stephen H. Friedberg, Arnold J. Insel Lawrence E. Spence Prentice Hall of India New Delhi (EEE)

Unit 3: Chapter - I (Vector Spaces): Art. 1.2 to 1.6

Unit 4: Chapter-II (Linear transformation and matrices):Art.2.1to2.4

Unit 5: Chapter - VI (Inner product space) Art. 6.1

Reference Books:

1. A First Course in Abstract Algebra by J. B. Fraleigh, Pearson Education 7th edition.
2. University Algebra by N.S. Gopalkrishnan
3. Fundamental of Abstract Algebra by D.S. Malik & N. Mordeson & M.K. Sen, Mc. Graw Hill International Edition.
4. Liner Algebra by Vivek Sahai & Vikas Bist, Narosa Publishing House.
5. Topics in algebra by John Wiley & Sons and by I.N. Herstein
6. Abstract algebra by K.S. Bhambri and Khanna Vijay

Paper – X: Complex Analysis

Unit - 1. Analytic Functions [10]

Complex Differentiation, Limits and Continuity, Differentiability Necessary and sufficient condition of analytic function, Method of constructing a regular function and analytic function, Simple method of constructing analytic function, Polar from of Cauchy-Riemann Equations.

Unit - 2: Complex Integration [20]

Introduction, Some basic definitions, Complex integral, Reduction of complex integrals to real integrals, Some properties of complex Integrals, An estimation of a complex integral, Line integrals as functions of arcs, Cauchy's Fundamental Theorem (Theorem-I), Cauchy Goursat Theorem [Statement Only], Cauchy's Integral formula [Statement only], its consequences and examples, Derivative and higher order derivatives of an analytic function [Statement(s) only] and examples, Expansions of Analytic functions as power series (Taylor's Maclaurin's and Laurent's Series [Statement only]) and its examples, The zeros of an analytic function, Different Types of Singularities, Some Theorems on Poles and other Singularities (Theorem-I to IV only) and its examples, The point at infinity

Unit - 3: Calculus of Residues [15]

Residue at simple pole, Residue at a Pole of order greater than unity, Residue at infinity, Cauchy's Residue Theorem. Evaluation of Definite integrals, Integration round the unit Circle. Evaluation of $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$.

Recommended Book (Scope of Syllabus):

1. Functions of Complex Variable by J.N. Sharma Revised by Dr. Shanti Swarup, (38 Edition) Krishna Prakasha Media Ltd., Meerut.

Chapter - 2 (Analytic Functions): 1 to 7

Chapter - 6 (Complex Integration): 1 to 8, 9 (Statement only),

19 (Theorem-1, Theorem- II (Statements only),

20, 21, 22 [Theorems I to IV only], 23. 24.

Chapter- 7 (Calculus of Residues): 1 to 6.

Reference Books:-

1.Graduate texts in mathematics functions of one complex variable – J.B.Conway.

2.Theory of functions of a complex variables- Shanti Narayan , P.K.Mittal, Chand Publication.

3.A function of complex variable by A.R.Vashishtha.

4.Complex variables and applications by J.W.Brown , J.R.Churchill.

Paper - XI: Integral Calculus

Unit - 1. Improper Integrals:

Convergence of Improper integrals of the first kind, Test of convergence of a (Positive integrands), Necessary and sufficient condition for the convergence of improper integrals, Comparison of two integrals, A practical comparison test, Useful comparison integrals, Two useful tests, f(x) not necessarily positive general test for convergence, Absolute and conditionally convergence, Convergence of improper integrals of the second kind, Convergence at infinity (Integrand being positive), Comparison of two integrals, A useful comparison integrals, General test (for convergence at infinity and f(x) may be positive or negative), Cauchy's test for convergence, Absolute and conditionally convergence of improper integrals of second kind, Test for the absolute convergence of the integral of product, Abel's test, Dirichlet's test. **[20]**

Unit - 2: Beta and Gamma function:

Definition, Properties, Transformations of Gamma function and Beta function and relation between them, Some important deductions, Duplication formula. **[15]**

Unit - 3: Multiple integrals:

Double Integrals, Cartesian and polar, Applications of Double Integration (Area of regions and Volume of a Solid only), Change of order of integration, Change of Variables. **[10]**

Recommended Book:

Unit 1: 16.1 to 16.18

Integral Calculas by Shanti Narayan and P.K. Mittal S.Chand publication Revised Edition - 2005.

Unit 2: 7.1, 7.2, 7.3, 7.4, 7.5

Unit 3: 12.2, 12.3, 12.4, 12.5

Reference books:-

1. N. Pisknov, Differential and Integral Calculus, Peace Publishers, Moscow
2. P.N. Wartikar and J.N. Wartikar, A Text Book of Applied Mathematics, Vol. I, Poona Vidyarthi Griha Prakashan, Poona 30.
3. Tom M.Apostol, Calculus Vol I and II, Wiley Publication.
4. Mathematical Analysis by S.C. Malik and Savita Arora.

Paper-XII: Partial Differential Equations (Elective-A)

Unit - 1: Linear Partial differential equation of order one [15]

1.1 Formation of partial differential equation by eliminating arbitrary constants

1.2 Formation of partial differential equation by eliminating arbitrary functions.

1.3 Types of integrals of partial differential equation

1.4 Lagrange's Method of solving linear partial differential equation of order one namely Pp + Qq = R (Working rule for solving Pp+Qq = R by Lagrange's Method).

1.5 Integral surface passing through a given curve

Unit-2:Non Linear partial differential equation of order one [15]

2.1 Solution of first order partial differential equation by Charpit's Method.

2.2 Special methods of solution applicable to certain standard form I, II, III, IV.

Unit-3: Linear partial differential equation with constant Coefficient [15]

3.1 Homogeneous and Non – Homogeneous linear partial differential equation with constant coefficient working rule for finding complementary function (C.F.), method of finding particular integral (P.I.)

3.2 Short method when f (x, y) is ϕ (ax + by) and $x^m y^n$.

Recommended Book (Scope of syllabus):

1. **Ordinary and partial differential equation by M.D. Raisinghania, S. Chand Co. [PART - III]**

Unit - 1 : Chapter -1 : 1.1, 1.2, 1.2a, 1.2b, 1.3, 1.4, 1.5, 1.5a, 1.5b, 1.5c, 1.5d, 1.6

Unit - 2: Chapter -2 : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10

Unit - 3: Chapter - 3 : 3.1, 3.2, 3.3, 3.4, 3.4A, 3.4B3.5, 3.6, 3.6A, 3.6B, 3.7, 3.8, 3.9, 3.10

Reference Books :

1) Elements of partial differential equations by IAN Sneddon (International students edition by MC Graw Hill Book)
2) Differential equations
   Sharma & Gupta (Krishna Prakashan Media (P) Ltd. Meerut)
3) Introduction to Partial differential equations – K.Sankara Rao, PHI Publication
4) Partial Differential Equations by J.M.Kar.

Paper- XII: Mathematical Analysis (Elective - B)

Unit - 1: Functions of a Single Variable (I) **[15]**

1.1 Limits

1.2 Continuous functions

1.3 Functions continuous on closed intervals

1.4 Uniform continuity

Unit - 2: Functions of a Single Variable (II) **[15]**

2.1 The Derivative

2.2 Continuous functions

2.3 Increasing and decreasing Functions

2.4 Darboux's Theorem

2.5 Rolle's Theorem

2.6 Lagrange's Mean Value Theorem

2.7 Cauchy's Mean Value Theorem

2.8 Higher Order Derivatives

Unit - 3: Functions **[15]**

3.1 Power series

3.2 Exponential functions

3.3 Logarithmic functions

3.4 Trigonometric functions

3.5 Functional fquations

3.6 Functions of bounded variation

3.7 Vector - Valued functions

Recommended Books :

1) Mathematical Analysis by S. C. Malik and Savita Arora by S. New Age International Publishers.
2) Methods of Real Analysis by R.R. Goldberg.

Reference Books:

1) Elements of Real Analysis : Shanti Narayan, Dr. M. D. Raisinghania, S. Chand Publication

2) Principles of Mathematical Analysis - Water Rudin ,McGraw Hill
3) Intraduction to Real Analysis by R.G. Bartle ,Donald R. Sherbert.

SEMESTER - VI

Paper- XIII: Metric Spaces

Unit - 1: Limits and metric Spaces **[15]**

1.5 The Class l^2 (Schwartz, Minkowski inequality)

1.6 Limit of a function on the real line

1.7 Metric Spaces

1.8 Limits in metric spaces

Unit - 2: Continuous functions on metric spaces **[15]**

2.1 Functions continuous at a point on the real line

2.2 Reformulation

2.3 Function continuous on a metric space

2.4 Open Sets

2.5 Closed Sets

Unit - 3: Completeness and Compactness **[15]**

3.1 More about open sets

3.2 Bounded sets and totally bounded sets

3.3 Complete metric spaces

3.4 Compact metric spaces

3.5 Continuous functions on compact metric spaces.

Recommended Book (Scope of Syllabus) :

Scope: Methods of real analysis by R.R. Goldberg John Wiley & Sons 1976.

Metric Spaces

Unit - 1 : Limits and metric spaces Art : 3, 10, 4.1 to 4.3

Unit - 2 : Continuous functions on metric spaces Art : 5.1 to 5.5

Unit - 3 : Completeness and Compactness Art : 6.1, 6.3, 6.4, 6.5, 6.6

Reference books

1. A first course in mathematical analysis by D. Somasundaram & B.Choudhary Narosa Publishing House.
2. Mathematical Analysis second edition by S.C. Malik & Savita Arora.
3. Principles of Mathematical analysis by Rudin W. McGraw-Hill, New York.
4. A Course of Mathematical Analysis by Shanti Nasrayan S. Chand & Company New Delhi.
5. Metric space – Pundir and Pundir.

Paper- XIV: Numerical Analysis

Unit - 1: Finite Differences **[10]**

1.1 Introduction

1.2 Finite differences,

1.3 Differences of Polynomial

1.4 Relation between the operators

Unit - 2: Interpolation **[15]**

2.1 Introduction

2.2 Newton's forward interpolation formula

2.3 Newton's backward interpolation formula

2.4 Central difference interpolation formula

2.5 Gauss's forward interpolation formula

2.6 Gauss's backward interpolation formula

2.7 Stirling's formula

2.8 Interpolation with unequal Intervals

2.9 Lagrange's Interpolation Formula

Unit - 3: Numerical Differentiation and Integration **[10]**

3.1 Numerical differentiation

3.2 Formula for derivatives

3.3 Maxima and minima of a tabulated function

3.4 Numerical Integration

3.5 Quadrature formulae (Trapezoidal rule, Simpson's 1/3 Rule and Simpson's 3/8 th rule)

Unit - 4: Difference Equations **[10]**

4.1 Introduction

4.2 Definitions

4.3 Formation of difference equations

4.4 Linear difference equation

4.5 Rules for finding the Complementary function

4.6 Rules for finding the Particular Integral

4.7 Difference equations reducible to linear form

Recommended Book (Scope of Syllabus) :

Numerical Methods in Engineering & Science with Programs in C and **C++** Nineth Edition by B.S. Grewal Khanna Publishers New Delhi.

Chapter - 6 (Finite differences) Art. 1, 2, 3, 7

Chapter - 7 (Interpolation) : Art 1, 2, 3, 4, 5, 6, 7, 11, 12

Chapter - 8 (Numerical Diffentiation and Integration) Art. 1, 2, 3, 4, 5 (except IV and V)

Chapter - 9 (Difference Equations) Art. 1 to 7.

Reference books

1. Numerical Analysis and Programming in C by Pundir and Pundir (Pragati Prakashan)
2. Numerical Analysis by P.Kandasamy , K.Thilagavathy,K Gunavathi , S,Chand Publications
3. Introductory Methods of Numerical Analysis by S.S.Sastry and by PHI

Paper - XV : Programming in C

Unit 1 : Overview of C. **[4]**

1.1 Introduction
1.2 Importance of C
1.3 Sample C programs
1.4 Basic structure of C programs
1.5 Programming style
1.6 Executing a C program
1.7 Points to remember

Unit - 2 : Constants, Variables and Data Types **[6]**

2.1 Introduction
2.2 Character Set
2.3 C Token
2.4 Constants
2.5 Keywords and Identifiers
2.6 Variables
2.7 Data Types
2.8 Declaration of variables
2.9 Assigning values to variables
2.10 Defining symbolic constants

Unit - 3 : Operators and Expressions **[9]**

3.1 Introduction
3.2 Arthmetic Operators
3.3 Relational Operators
3.4 Logical Operators
3.5 Assignment Operators
3.6 Increments and decrement operators
3.7 Conditional operators
3.8 Bit-wise operators
3.9 Special operators
3.10 Arithmetic expressions

3.11 Evaluation of expressions

3.12 Precedence of arithmetic operators

3.13 Some computational problems

3.14 Type conversions in expressions

3.15 Operators precedence and associativity

3.16 Mathematical functions

Unit - 4 : Managing Input and Output Operators [4]

4.1 Introduction

4.2 Reading a character

4.3 Writing a character

4.4 Formatted input

4.5 Formatted output

Unit - 5 : Decision Making and Branching [6]

5.1 Introduction

5.2 Decision making with IF statement

5.3 Simple IF statement

5.4 The IF…ELSE Statement

5.5 Nesting of If….ELSE Statement

5.6 The ELSE…. IF ladder

5.7 The SWITCH Statement

5.8 The ? : operator

5.9 The GOTO statement

Unit - 6 : Decision Making and Looping [4]

6.1 Introduction

6.2 The WHILE Statement

6.3 The DO Statement

6.4 The FOR Statement

6.5 Jumps in loops

Unit - 7 : Arrays **[5]**

7.1 Introduction

7.2 One dimensional arrays

7.3 Two dimensional arrays

7.4 Initialising two dimensional arrays

7.5 Multidimensional arrays

Unit - 8 : User - defined Functions **[7]**

8.1 Introduction

8.2 Need for user - defined functions

8.3 A multifunction program

8.4 The form of C Functions

8.5 Return values and their types

Recommended Book (Scope of Syllabus) :

[I] Programs in C by E. Balgurusamy, MeGraw Hill, New-Delhi

Unit 1 : 1.1- 1.7 **Unit - 2 :** 2.1- 2.10 **Unit - 3 :** 3.1- 3.16 **Unit 4 :** 4.1-4.5

Unit 5 : 5.1 - 5.9 **Unit - 6 :** 6.1 - 6.5 **Unit - 7 :** 7.1- 7.5 **Unit 8 :** 8.1 - 8.5

Reference Books :

1. Numerical Methods in Engineering & Science with Programs in C and C++ Nineth Edition by B.S. Grewal Khanna publishers New Delhi.
2. Numerical Analysis and Programming in C by Pundir and Pundir (Pragati Prakashan)
3. A Book on C, Macmillan, by Berry, R.E. and Meekings.
4. C Programming Language : An applied perspective, John Wiley & Sons
5. The C Programming Tutor, Prentice-Hall, by Wortman, L.A. and Sidebottom.
6. C made Easy, Osbone MeGraw-Hill by Schildt, H.C.
7. Let us C by Yashwant Kanetkar BPB Publications, New-Delhi.
8. Programming in C by Schaum's Outline Series, Tata McGraw Hill, EEE.

Paper - XVI : Integral Transforms (Elective - A)

Unit 1 : Laplace Transform. **[15]**

Integral Tansform (Definition), Laplace Transform (Definition), Linearity property of Laplace Transform, Piecewise continuous functions, Existence of Laplace Transform, Functions of exponential order functions of Class A, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Laplace Transform of the derivatives of F(t), Laplace Transform of the n^{th} order derivatives of F(t), Initial value theorem, Final value theorem, Laplace Transform of Integrals, Multiplication by t, Multiplication by t^n, Division by t, Evalution of Integrals, periodic functions.

Unit 2 : The Inverse Laplace Transform. **[15]**

Inverse Laplace Transform, Null Function, Linearity Property, Table of Inverse Laplace Transform, First Translation or Shifting Theorem, Second Translation or Shifting Theorem, Change of Scale Property, Use of Partial function, Inverse Laplace Transform of the derivatives, Inverse Laplace Transform of Integrals, Multiplication by powers of p, Division by powers of p, Convolution (definition), Convolution theorem, Heaviside's expansion formula, Beta function.

Unit 3 : Application of Laplace Transforms. **[15]**

Ordinary Differential equations with constant coefficients, Ordinary Differential equations with variable coefficients, Simultaneous ordinary differential equations, Partial differential equations.

Recommended Books for Paper - XIII (Integral Transform) :

Integral Transform by *Vasistha* A.R. Gupta, R.K.Krishna Prakashan *Media Pvt. Ltd. 11. Shivaji Road, Meerut India.*

Unit 1 : 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.19, 1.20, 1.21.

Unit 2 : 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17

Unit 3 : 3.1, 3.2, 3.3, 3.4

Reference Books :

1. The Laplace Transform by Rainville E.D.
2. Integral Transform byDr. J.R. Goyal and K.P. Gupta, Pragati Prakashan Meerut.
3. Differential equation by Sharma and Gupta, Krishna Prakashan Media Co.Meerut
4. Integral Transform and their Applications by Lokenath Debnath, CRC Press.
5. An introduction to Lapace Tranforms and Fourier series by Phill Dyke , Springer publication.

Paper XVI: Graph Theory and Combinatorics (Elective-B)

Unit 1: Graph **[5]**

Introduction,Basic terminology,Simple graph,Multigraph and Psuedograph, Degree of a vertex, types of graph.

Unit 2: Colorings of graph **[10]**

Vertex Coloring - evaluation of vertex chromatic number of some standard graphs, critical graph. Upper and lower bounds of Vertex chromatic Number - Statement of Brooks theorem. Edge coloring - Evaluation of edge chromatic number of standard graphs such as complete graph, complete bipartite graph, cycle, Statements of Vizing Theorem. Chromatic polynomial of graphs - Recurrence Relation and properties of Chromatic polynomials. Vertex and Edge cuts vertex and edge connectivity and the relation between vertex and edge connectivity. Equality of vertex and edge connectivity of cubic graphs. Whitney's theorem on 2 - vertex connected graphs.

Unit - 3 : Planar graph **[15]**

Definition of planar graph. Euler formula and its consequences. Non-planarity of K_5, K(3,3). Dual of a graph. Polyhedran in R and existence of exactly five regular polyhedral- (Platonic solids) Colorability of planar graphs - 5 color theorem for planar graphs, statement of 4 color theorem. Networks and flow and cut in a network - value of a flow and the capacity of cut in a network, relation between flow and cut. Maximal flow and minimal cut in a network and Ford-Fulkerson theorem.

Unit - 4 : Combinatorics **[15]**

Applications of Inclusion Exclusion Principle - Rook Polynomial, Forbidden position problems Introduction to partial franctions and using Newton's binomial theorem for real power find series, expansion of some standard functions. Forming recurrence relation and getting a generating function. Solving a recurrence relation using ordinary generating functions. System of Distinct Representatives

and Hall's theorem of SDR. Introduction to matching, M alternating and M augmenting path, Berge theorem. Bipartite graphs.

Recommended Books

A first look at Graph theory- John Clark and Derek Holton, World Scientific Publishing Company.

Reference Books :

1. A text book of Discrete Mathematics by Dr.Swapan Kumar Sarkar S.Chand Publication.

   Scope of syllabus: Unit 1. Art 13.1, 13.2, 13.3, 13.4, 13.5
2. Grapgh Theory with Applications by Bondy and Murty
3. Graph theory and applications by Balkrishnan and Ranganathan
4. Graph theory by West D. G.
5. Introduction to Combinatorics by Richard Brualdi
6. Graph theory by Behzad and Chartrand
7. Instroductory Graph theory by Choudam S.A
8. Combinatorics by Cohen
9. Graph Theory by Harrary
10. Graph Theory by Narsingh Deo

Numerical Technique Laboratory [NTL-III(A) to III(D)]

Note : Each assignment is of 1.5 periods [50+25 = 75 minutes]

NTL-III(A) (Algbra - II + Metric Spaces)

(Problems on the following topics)

Section - I : Algebra - II

Assignment-1 : Rings and subrings, Integral domains and Fields

Assignment-2 : Isomorphism and Characteristic.

Assignment-3 : Homomorphisms of Rings. Ideals, Quotient Rings

Assignment-4 : Subspaces, Liner Dependence, independence and basis

Assignment-5 : Linear transformation and matrices, Kernel and range

Assignment-6 : Inverse and Composite, Inner Product Space

Section - II : Metric Spaces

Assignment-7 : Metric Space-I (Examples on Metric spaces, open set, closed set, boundary set in Metric spaces)

Assignment-8: Metric Space-II (Examples on bounded set, Totally bounded set and Diameter of set in Metric spaces)

Assignment-9: Metric Space-III (Examples on Limit of metric space, Cauchy sequence in Metric spaces)

Assignment-10:MetricSpace-IV

(Contraction,Isometry,homeomorphism in Metric spaces)

Assignment-11: Metric Space-V (Examples on cover, open cover, Dense in Metric spaces)

Assignment-12: Metric Space-VI (Examples on completeness and compactness in Metric Spaces)

NTL-III(B) (Complex Analysis + Numerical Analysis)

(Problems on the following topics)

Section - I : Complex Analysis

Assignment-1 : Find the regular (analytic) function of which function (real, Imaginary, u+v, u-v type.)

Assignment-2 : Solving the complex integration Circle, Line and Parabola.

Assignment-3 : Obtain the Taylor's and Laurent's series.

Assignment-4 : Calculus of residue.

Assignment-5 : Integration round the unit circle.

Assignment-6 : Evaluation of integral $S_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$.

Section- II : Numerical Analysis

Assignment-7 : Finite Differences

Example on Forward, Backward and Central difference formulae, Differences of a Polynomial, Relation between operators, (Forward (Δ), Backward (∇), Central δ, Shift (E))

Assignment-8: Interpolation-I

Examples on Newton's forwards, Newton's backward difference formulae, Central difference formulae

Assignment-9: Interpolation-II

Examples on Gauss's forward and backward difference formulae, Stirling's formula, Lagrange's interpolation formula

Assignment-10: Numerical Differentiation

Examples on Numerical differentiation, formula for derivatives and maxima and minima of tabulated function

Assignment-11: Numerical Integration

Examples on Numerical integration, Trapezoidal rule, Simpson's 1/3 Rule and Simpson's 3/8 th rule.

Assignment-12: Difference Equations

Examples on Formation of difference equations, Linear difference equation, finding to Complementary function, finding the Particular Integral, Difference equations reducible to linear form.

NTL-III(C) (Integral Calculus + Programming in C)

Section - I : Integral Calculus

Assignment-1 : Improper Integral - I

Assignment-2 : Improper Integral - II

Assignment-3 : Beta and Gamma function - I

Assignment-4 : Beta and Gamma function - II

Assignment-5 : Multiple integrals - I (change of order Change of Variable)

Assignment-6 : Multiple integrals - II (Area and Volume)

Section- II : Programming in C

(Run and write following C programs only)

Assignment No.7 : Sample Programms - I

Addition, subtraction, multiplication and division. Area, Volume of a sphere, Temperature Conversion, Simple Interest Calculation, Compound Interest Calculation, Salary Calculation, Bonus and Commission.

Assignment No.8: Sample Programms - II

Star pattern, Reverse of a given number, Fibbonacci sequence, Factorial ${}^{n}C_{r}$, ${}^{n}P_{r}$, Roots of the quadratic equation.

Assignment No.9: Sample Programms - III

Maximum and Minimum, Sum of the series $1+2+3+\ldots..+n$, $1^2+2^2+3^2+\ldots.+n^2$, $1^2+2^3+3^2+..n^3$, $1^2+3^2+\ldots.+(n-1)^2$, $2^2+4^2+6^2+\ldots+(2n)^2$

Assignment No.10: Sample Programms - IV

Sine, Cosine, Exponential series

Assignment No.11: Sample Programs - V

Ascending and descending data. Matrix addition/Subtraction, Matrix multiplication.

Assignment No.12: Sample Programs - VI

Trapezoidal Rule, Simpon's 1/3 Rule, Simpsons's 3/8 th Rule.

NTL-III(D) (Partial Differential Equation or Mathematical Analysis)

Section - I Partial Differential Equations (Elective-A)

Assignment-1 : Solve Linear differential equation of first order by arbitrary constant and arbitrary function, Lagrange's method.

Assignment-2 : Non linear partial differential equation of order one by Charpit method.

Assignment-3 : Non linear partial differential equation of standerd from I, II, III & IV.

Assignment-4 : Find C.F. and P.I. for Homogeneous linear partial differential equation with constant coefficient.

Assignment-5 : Find C.F. and P.I. for Non-Homogeneous linear partial differential equation with constant coefficient.

Assignment-6 : Find C.F. and P.I. for equation reducible to linear differential equation with constant coefficient.

OR

Section- I : Mathematical Analysis (Elective-B)

Assignment-1 : Limits, Continuous Functions.

Assignment-2: Functions Continuous on closed Intervals, Uniform continuity.

Assignment-3: Increasing and decreasing functions, continuous functions.

Assignment-4: Rolle's theorm, Lagrange's MVT & Cauchy's MVT, High Order derivatives.

Assignment-5: Exponential Functions, logarithmic functions, Trigonometric functions.

Assignment-6: Functional Equations, Functions of Bounded Variations, Vector - valued functions.

Section- II : Integral Transform (Elective-A)

Assignment-7 : Laplace Transforms (Numerical examples)

Assignment-8: Inverse Laplace Transform (Numerical Examples)

Assignment-9: Applications of Laplace Transform Ordinary Differential equations with constant coefficients,

Assignment-10: Applications of Laplace Transform Ordinary Differential equations with variable coefficients,

Assignment-11: Applications of Laplace Transform Simultaneous Ordinary Differential equations.

Assignment-12: Applications of Laplace Transform Partial Differential equations.

OR

(Graph Theory & Combinatorics)

Section- II : Graph Theory & Combinatorics (Elective-B)

Assignment-7 : Coloring of Graphs

Assignment-8: Chromatic polynomials and connectivity.

Assignment-9: Planar graphs

Assignment-10: Flow theory

Assignment-11: Inclusion Exclusion Principle and Recurrence relation.

Assignment-12: SDR and Mathching.

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Solapur University, Solapur

B.Sc. Part III PHYSICS

New CGPA Syllabus with effect from June 2016

(Theory Course)

SEMESTER – V

Paper VII: Mathematical Physics & Statistical Physics

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Paper VIII Solid state Physics

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Paper IX: Classical Mechanics

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Paper X: Nuclear Physics

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Total (A)……400 Marks
12 Credits

Solapur University, Solapur

B.Sc. Part III PHYSICS

New CGPA Syllabus with effect from June 2016

(Theory Course)

SEMESTER - VI

Paper XI: Electrodynamics

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Paper XII: Materials Science

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Paper XIII: Atomic, Molecular Physics and Quantum Mechanics

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Paper XIV: Electronics & Instrumentation

100 Marks (3 Credits)
(UA-70, CA-30 Marks)

Total (B)……400 Marks
12 Credits

-

Solapur University, Solapur

B.Sc. Part III PHYSICS

New CGPA Syllabus with effect from June 2016

Practical Course of Semester – V & VI – (C)

ANNUAL - (AT THE END OF SIXTH SEMESTER)
400 Marks 20 Credits
(UA – 280 Marks + CA – 120 Marks)

Group (I to VI) experiments UA (30 * 6) + CA (20 * 6) = 180 + 120=300 Marks
5*3=15 Credits

Scale down of 20 Marks for CA per Group: -
(15 Marks for experimental performance and 03 Marks for attendance 02 Marks for Oral)

Scale down of 30 Marks for UA per Group: As per given in the practical slips

Assessment Part of Practical Course…..……100 Marks (5 Credits)

1. **Journal ……..…….……20 Marks**
   Certified Journal…….10 Marks
   Neatness & Punctuality (5+5)...…….....10 Marks
2. **Seminar report & Seminar report….....15 Marks**
3. **Tour report …….……...15 Marks**
   (Tour of minimum 2-3 Days / Two different industrial visits)

4. **Project of at least 4 – 5 experiments length ..……...50 Marks**
   Theme of the project.....05 Marks
   Data collection……....05 Marks
   Workout / Success….....15 Marks
   Applicability……..10 Marks
   Report writing……...15 Marks

Total (C) ……400 Marks
20 Credits

Grand total of B Sc. III Physics: (A) + (B) + (C) = 400 + 400 + 400 =1200 Marks. Whose C redits are (12 + 12 + 20 = 44 Credits)

NB:

During University Practical examination one practical examiner will assess the first three assessment events of the students along with their assessment of experiment from Group I

And anther examiner will assess the third assessment event of the student along with assessment of experiment from Group V

NATURE FOR COLLEGE ASSESSMENT (CA) OF 30 MARKS

CGPA SEMESTER PATTERN (w e f June 2016)

Time: - 1 hrs **Total marks: - 20**

Q.No.1) Select the correct answer from the given alternatives. (05)

1) ----------

a) ……b)……..c)…….d)……

2) ……. ..Do …….

3) …… Do …….

4) …… Do …….

5) …… Do …….

Q.No.2) Answer any one of the following (05)

1)

2)

Q.No.3) A) Answer any one of the following (10)

1)

2)

AND ASSIGNMENT OF 10 MARKS FOR EACH PAPER

Semester V

Physics Paper VII

Mathematical physics and Statistical physics

1. Vector theorems and introduction to partial differential equation. (6)

1.1 Gauss's theorem.

1.2 Green's theorem

1.3 Stoke's theorem

1.4 Partial differential equation

1.4.1 Degree

1.4.2 Order

1.4.3 Linearity

1.4.4 Homogeneity

1.5 Frobenius method for power series solution of

1.5.1 Legendre differential equation (without solution)

1.5.2 Bessel differential equation (without solution)

1.5.3 Hermite differential equation (withsolution)

2. Orthogonal Curvilinear Coordinates (8)

2.1 Introduction to Cartesian, Spherical polar and Cylindrical Coordinate system

2.2 Concept of Orthogonal Coordinate system

2.3 Gradient in Orthogonal Coordinate system

2.4 Divergence in Orthogonal Coordinate system

2.5 Curl in Orthogonal Coordinate system

2.6 Laplacian Operator in Orthogonal Coordinate system

2.7 Extension of Orthogonal Coordinate system in Cartesian, Spherical polar and Cylindrical Coordinate system

3. Basic Concept in Statistical Physics (8)

3.1 Micro and Macro States

3.2 Micro canonical and Canonical Ensemble

3.3 Phase Space

3.4 Accessible microstates

3.5 A Priory Probability

3.6 Thermodynamic Probability

3.7 Probability Distribution

3.8 Entropy and Probability

4. Maxwell Boltzman Statistics (7)

4.1 Maxwell Boltzman Distribution Law

4.2 Evaluation of constants α and β

4.3 Molecular Speeds

4.4 Thermodynamic functions in terms of partition function

5. Quantum statistics - I (9)

5.1 Bose Einstein Statistics

5.2 Bose Einstein Distribution Law

5.3 Experimental study of black body radiation

5.4 Derivation of Plank's radiation formula

5.6 Deduction of Wein's Formula from Plank's radiation formula

5.7 Deduction of Rayleigh's Jeans Law from Plank's radiation formula

5.8 Deduction of Wein's Displacement Law from Plank's radiation formula

5.9 Stefan's Law from Plank's radiation formula

6. Quantum Statistics - II **(7)**

6.1 Fermi Dirac Distribution Law

6.2 Application to free electrons in metals

6.3 Electron energy Distribution

6.4 Fermi Energy

6.5 Electronic Specific heat of metals

6.6 Comparison of M.B., F.D. and B.E. statistics

Reference Books: -

1. Theory and problems of vector analysis- Schaum outline series- Murray R, Spiegel
2. Mathematical methods for physics – George Arfken
3. Thermodynamics and statistical physics – Sharma, Sarkar
4. Statistical Mechanics –B.B. Laud
5. Statistical and thermal physics – S. Loknathan
6. Statistical Mechanics – Satya Prakash, J.P. Agrawal
7. Elementary Statistical Mechanics – Kumar, Gupta
8. An approach to Statistical Physics – Debi Prasad Ray

Semester V

Physics Paper VIII

Solid state Physics

1. Crystallography: **(09)**

1.1Lattice and Basic

1.2 Unit cell

1.3 Bravis lattices (2-D, 3-D),

1.4 Inter-planer spacing,

1.5 Miller indices,

1.6 Packing fraction and co-ordination number for BCC, SC, FCC & HCP structures.

2. X- ray Diffraction by Crystals: **(07)**

2.1 Reciprocal Lattice and its properties,

2.2 Bragg's Law in reciprocal lattice,

2.3 Powder method of X-ray diffraction for crystal structure,

3. Free electron Theory: **(8)**

3.1 Free electron model (Drude & Lorentz model).

3.2 Sommerfield's theory.

3.3 Fermi-Dirac distribution.

3.4 Fermi energy, degeneracy and non-degeneracy of metals.

4. Band theory of solids: **(08)**

4.1 Origin of energy bands,

4.2 One electron approximation,

4.3 Motion of electron in one dimensional periodic potential (Kronig Penny model),

4.4 Effective mass of electron,

4.5 Difference between metals semiconductors and insulators,

4.6 Hall Effect. And its applications

5. Magnetic materials: **(7)**

5.1classification of magnetic materials,

5.1.1Dimagnetic material

5.1.2 Paramagnetic material

5.1.3 Ferromagnetic material

5.1.4 Anti-ferromagnetic material

5.1.5 Ferri-magnetic and ferrites,

5.2 Energy loss in the hysteresis,

6. Superconductivity: **(6)**

6.1 Superconductor

6.2 Type I and Type II superconductors

6.3 Critical temperature,

6.4 Effect of magnetic field

6.5 Meissner effect,

6.6 Application of superconductor

Reference Books: -

Solid State Physics – S.O. Pillai (wiley easten Ltd)

Solid State Physics - A. J. Dekker

Solid State Physics - Charles Kittel

Solid State Physics - R.L. Singhal

Solid State Physics – Saxena and Gupta

Semester V

Physics Paper – IX

Classical Mechanics

1. Mechanics of a particle and system of particles: (7)

1.1 Mechanics of a particle using vector algebra and vector calculus.

1.2 Conservation theorems for linear momentum, angular momentum and energy of a particle.

1.3 Mechanics of a system of particles, concept of centre of mass.

1.4 Conservation theorems for linear momentum, angular momentum and energy of a system of particles.

1.5 Application of Newton's law of motion - Projectile motion in resistive medium

2. Lagrangian Formulation: (10)

2.1 Limitations of Newtonian Formulation

2.2 Introduction of Lagrangian Formulation

2.3 Constraints

2.4 Degrees of freedom

2.5 Generalised coordinates 2.6 Principle of virtual work

2.7 D'Alembert's Principle

2.8 Lagrange's equation from D'Alembert's Principle.

2.9 Application of Lagrange's equation to

i) A particle in space (Cartesian coordinates)

ii) Atwood's Machine and

iii) A bead sliding on uniformly rotating wire

iv) Simple pendulum

v) Simple harmonic Oscillator.

3. Moving Coordinate systems: (8)

3.1 Moving origin of coordinates

3.2 Pseudo forces 8

3.3 Rotating coordinate systems

3.4 Coriolis force

3.5 Foucault's pendulum

3.6 Effects of Coriolis force in nature

3.7 Effect of Coriolis force on freely falling body.

4. Techniques of Calculus of Variation: (6)

4.1 Hamilton's principle

4.2 Deduction of Lagrange's equations from Hamilton's principle

4.3 Applications:

i) Shortest distance between two points in a plane

ii) Brachistochrone problem

iii) Minimum surface of revolution.

5. Coupled Oscillations: (6)

5.1 Frequencies of coupled oscillatory system

5.2 Normal modes and normal coordinates

5.3 Energy of coupled oscillations

5.4 Energy transfer in coupled oscillatory system.

6. Motion of rigid body: (8)

6.1 Motion of rigid body in space

6.2 Euler's theorem

6.3 Angular momentum and energy

6.4 Euler's equations of motion

6.5 Motion of a symmetric top (without nutation).

References:

1. Classical Mechanics: Herbert Goldstein

2. Classical Mechanics: N. C. Rana and P.S.Joag

3. Introduction to classical Mechanics: R. G. Takawale and P.S. Puranic

4. Clasical Mechanical: Gupta, Kumar and Sharma

5. Classical Mechanics: P.V.Panat

Semester - V

Physics Paper X
Nuclear Physics

1. Nuclear structure and properties **(10)**

1.1 Composition of nucleus

1.2 Nuclear radius

1.3 Nuclear spin

1.4 Nuclear magnetic moment

1.5 Electric quodrupole moment

1.6 Mass defect

1.7 Binding energy

1.8 Packing fraction

1.9 Liquid drop model of nucleus

1.10 Semi-empirical mass formula

2. Nuclear reactions **(6)**

2.1 General scheme of nuclear reactions

2.2 Q value of nuclear reactions

2.3 Threshold energy

2.4 Cross section of nuclear reactions (qualitative)

2.5 Stripping reactions

2.6 Pick-up reactions

3. Particle Accelerators: **(8)**

3.1 Need of accelerator

3.2 Cyclotron

3.3 Limitations of cyclotron

3.4 Phase stable orbit

3.5 Synchrocyclotron

3.6 Betatron

4. Nuclear radiation detectors **(7)**

4.1 Classification of detectors

4.2 Geiger Muller counter

i. Construction and working

ii. Dead time, recovery time and resolving time

iii. Self quenching mechanism

4.3 Bubble chamber

4.4 Scintillation counter

4.4 Cloud chamber

5. Nuclear Energy levels **(8)**

5.1 Alpha decay- α disintegration energy

5.2 α particle spectra

5.3 Nuclear energy levels

5.4 Beta decay –Experimental study of β decay 5 .5 Continuous β ray spectrum

5.6 Pauli's neutrino hypothesis

5.7 Nuclear energy levels from β decay

6. Elementary Particles **(6)**

6.1 Types of interactions

6.2 Classification of elementary particles

6.3 Properties of particles

Reference Books:

1. Nuclear Physics : Irving Kaplan (Addison Wesley)

2. Nuclear Physics : S.N. Ghoshal (S.Chand Publising Co.)

3. Nuclear Physics : D.C.Tayal (Himalayan Publishing House)

4. Nuclear Physics : J.B.Rajam (S.Chand Publising Co.)

5. Concepts of Modern Physics : Arthur Beiser (Tata McGraw Hill Publishing)

6. Atomic and Nuclear Physics : N. Subhramanyam & Brijlal(S.Chand Pub. Co.)

7. Concepts of Nuclear Physics : B.L.Cohen (Tata McGraw Hill Publishing)

8. Nuclear Physics an introduction: W E Barcham

Semester VI
Physics Paper XI
Electrodynamics

1. Electrostatics and Charged particle dynamics: (8)

1.1 Coulomb's law
1.2 Gauss law in differential form
1.3 Poisson's and Laplace's equations
1.4 Applications of Poisson's and Laplace's equation to spherical systems
1.5 Motion of charged particles in constant electric field
1.6 Motion of charged particles in constant magnetic field
1.7 Motion of charged particles in constant crossed uniform electric and magnetic fields.

2. Time varying fields: (7)

2.1 Electromotive force
2.2 Electromagnetic induction-Faraday's law
2.3 Lenz's law
2.4 Faraday's laws-Integral & Differential forms
2.5 Self inductance
2.6 Application to - solenoid
2.7 Mutual inductance
2.8 Application to transformer

3. Maxwell's equations: (9)

3.1 Magnetic Susceptibility and Permeability
3.2 Biot - Savart law

3.3 Derivation of $\nabla . \vec{B} = 0$

3.4 Ampere's law

3.5 Derivation of $\nabla \times \vec{B} = \mu_0 \vec{j}$ OR Differential form of Ampere's law.

3.6 Displacement current density

3.7 Equation of continuity

3.8 Maxwell's correction to Ampere's law

3.9 Maxwell's equations for time dependent electric and magnetic fields in vacuum

3.10 Maxwell's equations for time dependent electric and magnetic fields in material medium.

3.11 Physical significance (Integral form)of Maxwell's Equation

4. Electromagnetic waves: (9)

4.1 Conservation of energy in electromagnetic field and Poynting's theorem.

4.2 Conservation of momentum in electromagnetic fields.

4.3 Wave equations for electric and magnetic fields in vacuum

4.4 Plane wave solutions, orthogonality of $\vec{E}$, $\vec{B}$ and propagation vector $\vec{k}$

4.5 Plane E. M. waves in Dielectrics

4.6 Plane E. M. waves in conductors, Attenuation of wave in metal (skin depth)

5. Reflection and Refraction of E.M. waves: (7)

5.1 Boundary conditions for E. M. field vectors ($\vec{D}$, $\vec{B}$, $\vec{E}$ & $\vec{H}$)

5.2 Reflection and refraction of E. M. waves at a boundary of two dielectrics (Normal incidence only)

5.3 Total internal reflection.

6. Radiation from Electric Dipole: (5)

6.1 Electric dipole

6.2 Retarded time and retarded potential

6.3 Electric dipole radiation

6.4 Radiation reaction for Electric dipole

Reference Books:

1. Introduction to Electrodynamics (second edition) – David J. Griffiths
2. Introduction to Electrodynamics (third edition) – David J. Griffiths
3. Classical Electrodynamics – J. D. Jackson
4. Classical Electrodynamics – S. P. Puri
5. Electrodynamics – B. B. Laud
6. Foundations of Electromagnetic theory – Reitz and Milford

Semester VI

Physics Paper XII (Materials Science)

1. **Materials and their properties:** (8)
   - 1.1 Classification of materials
   - 1.2 Organic, inorganic and biological materials
   - 1.3 Properties of materials

1.3.1 Mechanical properties

1.3.2 Thermal properties

1.3.3 Optical properties

1.3.4 Electrical properties

1.3.5 Magnetic properties

2. **Polymer materials:** (12)

2.1 Polymers

2.2 Polymerization mechanism

2.2.1 Additional polymerization

2.2.2 Condensation polymerization

2.2.3 Homo-polymer

2.2.4 Co-polymer

2.3 Degree of polymerization

2.4 Defects in the polymers

2.5 Mechanical properties of polymers, deformation, reinforced polymers

2.6 Applications of polymers.

3. **Ceramic Materials:** (6)

3.1 Classification of ceramic materials

3.2 Structure of ceramics

3.3 Ceramic possessing

3.4 Properties of Ceramics

3.5 Applications of Ceramics

4. **Composite Materials:** (6)

4.1 Fabrication of composites

4.2 Mechanical properties of composites

4.3 Particle-Reinforced Composites

4.4 Fiber-Reinforced composites

4.5 Applications of composites

5. **Nano-structured Materials:** (7)

5.1 Synthesis of nano-structured materials (Different Types with advantages and disadvantages)

5.1.1 Chemical Bath Deposition method (CBD)

5.1.2 Laser Ablation

5.2 Properties of nano-structured materials

5.3 Characterization of nano-structured materials

5.4 Carbon nano tubes (CNT)

5.5 Applications of nano-structured materials

6. **Biomaterials:** (6)

6.1 Bio-mechanism

6.2 Classification of biomaterials

6.3 Processing of biomaterials

6.4 Properties of biomaterials

6.5 Applications of biomaterials

References:

1. Material science by S.L. Kakani, Amit Kakani, New age international publishers.
2. Materials science and engineering, V. Raghavan, 5th edition, PHI
3. Materials science by R.S. Khurmi, S. Chand
4. Materials science, G.K. Narula, K.S. Narula, V.K. Gupta, Tata McGraw-Hill.
5. Semiconductor physics and devices by S.S. Islam, Oxford university press, 1st edition
6. Nanotechnology: An Introduction to Synthesis, Properties and Applications of Nanomaterials, by Thomas Varghese & K.M. Balakrishna, Atlantic publication
7. Introduction to nanoscience and nanotechnology, by Chattopadhyay K.K., Banerjee A.N., PHI
8. Materials science – V. Rajendran & A. Marikani (TMHl).
9. Elements of material Science & engineering.- I.H.Van Vlack (4th Edition.).

Semester VI

Physics Paper XIII

Atomic Physics, Molecular Physics and Quantum Mechanics

1. Atomic Spectra (6)

1.1 Review of quantum numbers

1.2 Electronic configuration of alkali metals

1.3 Spectral notations

1.4 Optical spectral series

1.5 Doublet fine structure of alkali metals

1.6 Spectrum of Sodium

1.7 Selection rules

1.8 Intensity rules

2. Effects of Magnetic and Electric fields on Atomic Spectra (6)

2.1 Anomalous Zeeman effect and its explanation from vector atom model

2.2 Paschen Back effect

2.3 Paschen Back effect in principal series doublet

2.4 Selection rules for Paschen Back effect

2.5 The Stark effect of hydrogen

2.6 Weak field Stark effect in hydrogen

2.7 Strong field Stark effect in hydrogen

3. Molecular Spectra and Raman Effect (10)

3.1 Molecular bond

3.2 Rotational energy levels and Rotational spectra

3.3 Vibrational energy levels and Vibrational spectra

3.4 Vibration-Rotation spectra

3.5 Electronic spectra of a diatomic molecule

3.6 Franck-Condon principle

3.7 Raman effect

3.8 Characteristic properties of Raman lines

3.9 Classical theory of Raman effect

4. Quantum Mechanics (5)

4.1 Heisenberg's uncertainty principle (Statement) and its similarity with concept of matter waves

4.2 Physical significance of ψ

4.3 Time dependent and time independent Schrödinger wave equations

4.4 Eigen values and Eigen functions

4.5 Probability current density

5. Application of Schrodinger's time independent wave equation (10)

5.1 Particle in a Box (one and three dimensional cases), its Eigen values and Eigen functions.

5.2 Step Potential (Statement, boundary conditions, Schrodinger's equations in different regions and Discussion of results)

5.3 Potential Barrier (Statement, boundary conditions, Schrodinger's equations in different regions and Discussion of results)

5.4 Potential Well (Statement, boundary conditions, Schrodinger's equations in different regions and Discussion of results)

5.5 Linear Harmonics Oscillator – Eigen values and Eigen functions

5.6 Zero point energy

6. Operators (8)

6.1 Operators in quantum mechanics

6.2 Expectation values and properties

6.3 Angular momentum operators

6.4 Commutation properties for components L_x, L_y , L_z

6.5 Commutation for L^2 and L_z operators and their Eigen values

6.6 Schrodinger's equation for hydrogen atom

6.7 Separation of radial and angular parts

References:

1. Atomic Spectra – H.E. White
2. Molecular Spectroscopy - Banwell
3. Molecular Spectroscopy – Hertzberg
4. Quantum Mechanics - J. Powell and B. Creassman
5. Introduction to Quantum Mechanics - Pauling and Wilson
6. Elements of Quantum Mechanics - Kamal Singh and S.P. Singh.
7. Perspectives of Modern Physics – Arther Beiser
8. Quantum Mechanics – Chatwal Anand

Semester VI

Physics Paper XIV

Electronics & Instrumentation

1. Operational Amplifier: - **(9)**

1.1 Block diagram of OP-AMP

1.2 Characteristics of OP-AMP

1.3 OP-AMP parameters

1.4 OP-AMP as inverting amplifier

1.5 OP- AMP as non- inverting amplifier

1.6 Applications of OP-AMP

1.6.1 Adder

1.6.2 Substractor

1.6.3 Differentiator

1.6.4 Integrator

1.6.5 Comparator

1.6.6 Schmitt's trigger

2. Timer: - **(6)**

2.1 Functional Block diagram of IC 555, its Pin connections

2.2 Operating modes

2.2.1 Monostable

2.2.2 Astable

2.3 Applications of timer IC 555 as

2.3.1 Linear ramp generator

2.3.2 Square wave generator

2.3.3 Voltages to frequency converter

3. Power Electronics: - **(10)**

3.1 Four layer PNPN device

3.2 SCR construction and working

3.3 Characteristics of SCR,

3.4 Turn ON and Turn OFF methods of SCR,

3.5 Applications of SCR to control the speed of DC motor,

3.6 Construction, working and characteristics of Diac.

3.7 Construction, working and characteristics of Triac

3.8 Applications of Diac and Triac.

4. Display Devices **(7)**

4.1 Classification of Displays

4.2 Light Emitting Diodes

4.3 Liquid Crystal Display and its Important Features

4.4 Gas discharge plasma displays

4.5 Segmented gas discharge displays

4.6 Segmental displays using LEDs

5:-Transducers and Sensors **(7)**

5.1 Classifications of Transducers

5.2 Characteristics of transducers

5.3 Selection criteria for transducer

5.4 Temperature Transducers- Resistance temperature detector

5.5 Optical transducer- Photo conductors (LDR), Photodiode

5.6 Sensor- Dry reed relay

5.7 Servomotor sensors

6. Characterization techniques **(6)**

6.1 Resolution and Magnification of Electron microscope

6.2 Construction, working of SEM

6.3 Application of SEM

6.4 Construction and working of TEM

6.5 Application of TEM

6.6. UV-Visible spectroscopy

6. Construction and working of ultra-visible (UV) spectroscopy

6.8 Applications of ultra-visible (UV) Spectroscopy

References:

1. Electronic principles – Malvino & Leech

2. Basic Electronic – Grob

3. Electronic Circuits and devices – Allan Mottershed

4. Linear Op – Amp – Ramakanth Gaikwad

5. Electronic principles – V.K.Mehta

6. Electronic Instrumentation by H.S. Kalsi

7. Nanotechnology Principles & Practices– Sulbha K. Kulkarni

8. Spectroscopy - Y. R. Sharma

Group I
General Physics

01. Resonance Pendulum

02. S.T. of a Soap film

03. S.T. by Ferguson's modified method

04. Y and η using Flat Spiral Spring

05. Y by Koenig's method

06. Stefan's fourth power law

07. Y by Cornu's method

08. Logarithmic decrement to determine viscosity of a given liquid

09. Temperature of flame.

10. Motion of Spring and calculate (a) Spring Constant and (b) Value of G

11. Modulus of Rigidity of a Wire by Maxwell's needle.

12. Determine the Young's Modulus of a Wire by Optical Lever Method.

Group II
Optics

01. Cardinal points by turn table

02. Cardinal points by Newton's method

03. Diffraction due to cylindrical obstacle

04. Lloyd's single mirror

05. Diameter of a Lycopodium powder

06. Resolving power of prism

07. μ by total internal reflection

08. Elliptically and circularly polarized light

09. Transverse and Spherical aberration of thick lens

10) Dispersive Power of a Plane Diffraction Grating.

11) Intensity Measurement by using Photo sensor and Laser in diffraction patterns of single and double slits.

12) Diameter of a thin wire by studying the diffraction produced by it

Group III

Electricity and Magnetism

1. Self inductance by Owen's bridge.
2. Earth inductor: Measurement of B_H, B_V and angle of deep (θ).
3. Hysteresis of ferromagnetic material by magnetometer method.
4. High resistance by leakage method
5. Absolute capacitance of condenser by B.G. method
6. Calibration of bridge wire carry fosters bridge method
7. Equivalent conductivity of solution at it's infinite dilution..
8. Resistance of moving coil galvanometer by kelvin's method.
9. Charge sensitivity of ballistic galvanometer
10. Magnetic flux density between pole pieces of an electromagnet with the help of search coil and ballistic galvanometer.

11. Measure the magnetic susceptibility of paramagnetic solution ($FeCl_3$) by Quincke;s method.
12. Hysteresis by BG Metod.

Group IV

Electronics and Instrumentation

1. Astable multi vibrator using IC 555
2. OP-AMP as inverting amplifier
3. OP-AMP as comparator –Schmitt's trigger
4. OP-AMP as adder and subs tractor
5. SCR firing by UJT
6. RS and JK flip flop
7. FET as VVR
8. Seven Segment Display
9. Study of mono-stable operation of IC 555
10. Characteristics of SCR
11. Build a regulated power supply of 6V by using IC 7805

12. Build a dual power supply by using IC 7805 and 7905..

Group –V

Use of computer and internet

1. To create resume by MS word.
2. Create worksheet of student mark sheet in Excel
3. Create an e-mail address, mail the documents, download the received documents and take its print..
4. Search any research paper or book and download from search engine
5. Create photo album with animations by power point presentation
6. Create mail merge letter (Application letter)
7. Draw graph or chart
8. Create poster of your seminar presentation by power point presentation
9. To make student presentee (Catlog) sheet using MS word.
10. From origin plot graph, calculate slope and make calculations.
11. Word to PDF conversion.

12. Create documents in IEEE format by using mathematical model, mathematical functions, various signs and symbols.

Group – VI
Applied Physics

1. Velocity of sound using CRO and microphone
2. Estimation of efficiency of GM counter
3. Determination of Beta particle range and maximum energy
4. Hall effect
5. Resistivity of semi conducting material by four probe method.
6. Themo-electric power of thin film
7. Band gap/temperature sensor suing semiconductor diode.
8. Study the Seebeck effect and Peltier effect with the help of thermocouple..
9. Temperature sensor (PTCR & NTCR)
10. Determination of yield point and the braking point of elastic material.
11. Thin film preparation by any chemical method with different preparative parameters.

12. Thin film characterization by XRD technique.

NATURE OF THEORY QUESTION PAPER FOR UA OF

CGPA SEMESTER PATTERN (w e f June 2016)

Time: - 2 hrs 30 min. **Total marks: - 70**

Q.No.1) Select the correct answer from the given alternatives. (14)

1) ----------

a) ……b)……..c)…….d)……

2) ……. ..Do …….

3) …… Do …….

4) …… Do …….

5) …… Do …….

6) …… Do …….

7) ……. ..Do …….

8) ……...Do ……

9) ……...Do …….

10) ……. Do ……

11) ……. Do ……

12) ……. Do …….

13) ……. Do …….

14) ……. Do …….

Q.No.2) Answer any seven of the following (14)

1)

2)

3)

4)

5)

6)

7)

8)

Q.No.3) A) Answer any two of the following (10)

1)

2)

3)

B) Write the answer (04)

Q.No.4 Solve any two of the following (14)

1)

2)

3)

Q.No.5) Solve any one of the following

1) Essay type long answer question / Derive an expression (10)

Example (04)

2) ……. Do …….

NB:

1. **At least two numerical based questions should be asked in Question No. 1**
2. **Question No. 2, 3A and 4 must be included one example to solve.**