Detailed Course Scheme

Bachelor of Science (B.Sc.)

(Physics, Mathematics, Chemistry)

Semester- VI

(2017-2020)

DOC201906170031

RNB GLOBAL UNIVERSITY
Educating stars for tomorrow

RNB GLOBAL UNIVERSITY
RNB Global City, Ganganagar Road,
Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows Semester System along with Choice Based Credit System as per latest guidelines of University Grants Commission (UGC). Accordingly, each academic year is divided into two semesters, **Odd (July-December) and Even (January-June).** Also, the university follows a system of continuous evaluation along with regular updating in course curricula and teaching pedagogy.

The curriculum for B.Sc. Program for (January-June) Even Semester, 2020 along with examination pattern is as follows:

Course Scheme

Semester – VI

S. No	Course Code	Course Name	L	T	P	Credits
1.	-	Discipline Specific Core Course-I Elective II	4	0	0	4
2.	-	Discipline Specific Core Course-I Elective II Lab	0	0	4	2
3.	-	Discipline Specific Core Course-II Elective II	4	0	0	4
4.	-	Discipline Specific Core Course-II Elective II Lab	0	0	4	2
5.	-	Discipline Specific Core Course-III Elective II	6	0	0	6
6.	13015600	Intellectual Property Rights	2	0	0	2
7.	13003200	Ability & Skill Enhancement - VI	2	0	0	2
8.	99002800	Workshops & Seminars	-	-	-	1
9.	99002700	Human Values & Social Service/NCC/NSS	-	-	-	1
Total			**18**	**0**	**8**	**24**

Discipline Specific Core Course Papers

Subject	Course Code	Course Name
Physics	13009500	Solid State Physics
	13009600	Solid State Physics Lab
Chemistry	13009700	Organometallics, Bioinorganic chemistry, Polynuclear, hydrocarbons and UV, IR Spectroscopy
	13009800	Organometallics, Bioinorganic chemistry, Polynuclear, hydrocarbons and UV, IR Spectroscopy Lab
Mathematics	13007200	Matrices

- Lab would be same as per theory elective paper opted by the student.

EVALUATION SCHEME - THEORY

The evaluation of the theory paper of B.Sc. program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

The distribution of Internal Assessment Marks is as follows:

Type	Details	Marks
Mid Term	Two Mid-term Sessional of 15 marks each (15+15)	30
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	15
Attendance	75%+ : 5 marks	5
TOTAL	**50**	

External Assessment

Type	Marks
Theory	50

EVALUATION SCHEME - PRACTICAL

The evaluation of the practical paper of B.Sc. program would be based on Internal and External Assessments. Internal Assessment would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks). Detailed scheme of Internal and External Assessment is as follows:

Internal Assessment

Type	Details	Marks
Marks obtained in various manuals, practical file, participation, any model prepared, output of practical	Average of marks obtained	45
Attendance	75%+ : 5 marks	5
TOTAL	**50**	

External Assessment

Type	Marks
Practical	50

EVALUATION SCHEME- WORKSHOPS & SEMINARS AND HUMAN VALUES & SOCIAL SERVICE/NCC/NSS

1. The evaluation of Workshops & Seminar and Human Values & Social Service/NCC/NSS will be completed from Semester I – Semester VI. It will be evaluated internally by the various Forums & Schools Concerned. The credit for this will be given at the end of each Semester.

2. The students have to join club/clubs/Forums with the active participation in different activities of club. The students would be continuously assessed from Semester-I to Semester-IV and credits and marks would be given after the end of each Semester.

CURRICULUM

Course Name: Solid State Physics

Course Code: 13009500

Objectives

- Basic understanding of symmetry, electronic and thermodynamic properties of solid state systems and their technological applications.

- To impart knowledge of basic theories of the electronic structure of materials.
- Students should learn how to understand physical behavior of solids and electronic devices.
- Students will be able to learn about the crystal structures of solid and amorphous materials, elementary lattice dynamics and lattice vibrations, Magnetic properties of matter, dielectric properties of materials, elementary band theory and superconductors. The pedagogy of teaching includes lectures, seminars webinars, class room assignments, presentations and quiz.

Course Outline

Unit I: Crystal Structure Solids
Amorphous and Crystalline Materials. Lattice Translation Vectors. Lattice with a Basis – Central and Non-Central Elements. Unit Cell. Miller Indices. Reciprocal Lattice. Types of Lattices. Brillouin Zones. Diffraction of X-rays by Crystals .Bragg's Law. Atomic and Geometrical Factor

Unit II: Elementary Lattice Dynamics
Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solid. Dulong and Petit's Law, Einstein and Debye theories of specific heat of solids T3 law

Unit III: Magnetic Properties of Matter
Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia – and Paramagnetic Domains. Quantum Mechanical Treatment of Paramagnetism. Curie's law, Weiss's Theory of Ferromagnetism and Ferromagnetic Domains. Discussion of B-H Curve. Hysteresis and Energy Loss.

Unit IV : **Dielectric Properties of Materials**
Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation. Classical Theory of Electric Polarizability. Normal and Anomalous Dispersion. Cauchy and Sellmeir relations. Langevin-Debye equation. Complex Dielectric Constant. Optical Phenomena. Application: Plasma Oscillations, Plasma Frequency, Plasmons
Elementary band theory: Kronig Penny model. Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect, Hall coefficient.

Superconductivity: Experimental Results. Critical Temperature. Critical magnetic field. Meissner effect. Type I and type II Superconductors, London's Equation and Penetration Depth. Isotope effect.

Suggested Readings:

1. Introduction to Solid State Physics, Charles Kittel, 8th Ed., 2004, Wiley India Pvt. Ltd.
2. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India
3. Introduction to Solids, Leonid V. Azaroff, 2004, Tata McGraw Hill
4. Solid State Physics, Neil W. Ashcroft and N. David Mermin, 1976, Cengage Learning
5. Solid State Physics, Rita John, 2014, McGraw Hill
6. Solid-state Physics, H. I bach and H Luth, 2009, Springer
7. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India • Solid State Physics, M.A. Wahab, 2011, Narosa Publications

Course Name: Solid State Physics Lab

Course Code: 13009600

Objectives

Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method), To measure the Magnetic susceptibility of Solids, To determine the Coupling Coefficient of a Piezoelectric crystal, To measure the Dielectric Constant of a dielectric Materials with frequency, To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR), To determine the refractive index of a dielectric layer using SPR, To study the PE Hysteresis loop of a Ferroelectric Crystal, To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four probe method (from room temperature to 150 o C) and to determine its band gap, To determine the Hall coefficient of a semiconductor sample.

Course Outline

1. Measurement of susceptibility of paramagnetic solution (Quinck`s Tube Method)
2. To measure the Magnetic susceptibility of Solids.
3. To determine the Coupling Coefficient of a Piezoelectric crystal
4. To measure the Dielectric Constant of a dielectric Materials with frequency
5. To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR)
6. To determine the refractive index of a dielectric layer using SPR
7. To study the PE Hysteresis loop of a Ferroelectric Crystal.
8. To draw the BH curve of iron using a Solenoid and determine the energy loss from Hysteresis.

9. To measure the resistivity of a semiconductor (Ge) crystal with temperature by four probe method (from room temperature to 150 o C) and to determine its band gap.
10. To determine the Hall coefficient of a semiconductor sample.

Suggested Readings

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worksnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Ed., 2011, KitabMahal, New Delhi
4. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India

Course Name: Organometallics, Bioinorganic Chemistry, Polynuclear, Hydrocarbons and UV, IR Spectroscopy

Course Code: 13009700

Objectives

The whole curriculum deals with the core inorganic chemistry. The syllabus coverage includes 46 hardcore lectures, clarification class, presentations by students, seminar, guest lecture by some speakers having expertise in a particular field and brainstorming quiz session. The main objectives of this teaching includes:

- The 'chemistry of 3d element' segment includes the study of some particular compounds of 3d transition elements having use in analysis of ions, as a powerful oxidizing agent etc.
  Organometallics' includes the study of the concept of the preparation, structure and bonding in organometallic compounds.
  Bioinorganic chemistry' helps in the understanding of the function of various ions like sodium, potassium, magnesium and calcium in our body.
- Polynuclear hydrocarbons and
- Active methylene section includes the understanding of the mechanism of the electrophilic substitution reactions in various polynuclear and hetrocyclic compounds and the
- Chapter includes the concept of uv-visible and infra red spectroscopy with the help of which we can determine the structure of the unknown organic compounds

Course Outline

Section A:

Unit I

Chemistry of 3d metals Oxidation states displayed by Cr, Fe, Co, Ni and Co. A study of the following compounds (including preparation and important properties); Peroxo compounds of Cr, K2Cr2O7, KMnO4, K4[Fe(CN)6], sodium nitroprusside, [Co(NH3)6]Cl3, Na3[Co(NO2)6].

Unit II

Organometallic Compounds Definition and Classification with appropriate examples based on nature of metal carbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals p-acceptor behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).

Unit III

Bio-Inorganic Chemistry A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na+ , K+ and Mg2+ ions: Na/K pump; Role of Mg2+ ions in energy production and chlorophyll. Role of Ca2+ in blood clotting, stabilization of protein structures and structural role (bones).

Section B:

Unit IV

Polynuclear and heteronuclear aromatic compounds: 95 Properties of the following compounds with reference to electrophilic and nucleophilic substitution: Naphthalene, Anthracene , Furan, Pyrrole, Thiophene, and Pyridine.

Unit V

Active methylene compounds: Preparation: Claisen ester condensation. Keto-enoltautomerism. Reactions: Synthetic uses of ethylacetoacetate (preparation of non-heteromolecules having upto 6 carbon).

Unit VI

Application of Spectroscopy to Simple Organic Molecules Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Electromagnetic radiations, electronic transitions, λmax&εmax, chromophore, auxochrome, bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating l max of conjugated dienes and α,β – unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).

Suggested Readings

1. James E. Huheey, Ellen Keiter& Richard Keiter: Inorganic Chemistry: Principles of Structure and Reactivity, Pearson Publication.
2. G.L. Miessler & Donald A. Tarr: Inorganic Chemistry, Pearson Publication.
3. J.D. Lee: A New Concise Inorganic Chemistry, E.L.B.S.
4. F.A. Cotton & G. Wilkinson: Basic Inorganic Chemistry, John Wiley & Sons.
5. I.L. Finar: Organic Chemistry (Vol. I & II), E.L.B.S.
6. John R. Dyer: Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall.
7. R.M. Silverstein, G.C. Bassler& T.C. Morrill: Spectroscopic Identification of Organic Compounds, John Wiley & Sons.
8. R.T. Morrison & R.N. Boyd: Organic Chemistry, Prentice Hall.
9. Peter Sykes: A Guide Book to Mechanism in Organic Chemistry, Orient Longman.
10. ArunBahl and B. S. Bahl: Advanced Organic Chemistry, S. Chand.

Course Name: Organometallics, Bioinorganic Chemistry, Polynuclear, Hydrocarbons and UV, IR Spectroscopy Lab

Course Code: 13009800

Objectives

Syllabus deals with the practical aspects of the inorganic chemistry and organic chemistry . Inorganic chemistry the synthesis of metal complexes and their conductivity measurements and chromatographic separation of some metal ions. Organic chemistry includes the analysis of various functional group in unknown organic compounds.

Course Outline

Section A: Inorganic Chemistry

1. Separation of mixtures by chromatography: Measure the Rf value in each case. (Combination of two ions to be given) Paper chromatographic separation of Fe3+, A13+ and Cr3+ or Paper chromatographic separation of Ni2+, Co2+, Mn2+ and Zn2+
2. Preparation of any two of the following complexes and measurement of their conductivity: (i) tetra ammine carbonato cobalt (III) nitrate (ii) tetraam mine copper (II) sulphate (iii) potassium trioxalatoferrate (III) trihydrate Compare the conductance of the complexes with that of M/1000 solution of NaCl, MgCl2 and LiCl3.

Section B: Organic Chemistry

Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

Suggested Readings

1. A.I. Vogel: Qualitative Inorganic Analysis, Prentice Hall, 7th Edn.
2. A.I. Vogel: Quantitative Chemical Analysis, Prentice Hall, 6th Edn.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
4. Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.

Course Name: Matrices

Course Code:13007200

Objectives

Important application of Matrices is to solve system linear equations which are required by physists, engineers & scientists to model and solve physical systems in the areas of electronics networks, airplane, spacecraft, and chemical manufacturing. Operations & supply chain modeling requires lots of optimization and mathematical programming, which extensively uses large matrices.

Course Outline:

Unit I

R, R2 , R3 as vector spaces over R. Standard basis for each of them. Concept of Linear Independence and examples of different bases. Subspaces of R2 , R3.

Unit II

Translation, Dilation, Rotation, Reflection in a point, line and plane. Matrix form of basic geometric transformations. Interpretation of eigen values and eigen vectors for such transformations and eigen spaces as invariant subspaces.

Unit III

Types of matrices. Rank of a matrix. Invariance of rank under elementary transformations. Reduction to normal form, Solutions of linear homogeneous and non-homogeneous equations with number of equations and unknowns upto four.

Unit IV

Matrices in diagonal form. Reduction to diagonal form up to matrices of order 3.Computation of matrix inverses using elementary row operations. Rank of matrix. Solutions of a system of

linear equations using matrices. Illustrative examples of above concepts from Geometry, Physics, Chemistry, Combinatorics and Statistics.

Suggested Readings

1. A.I. Kostrikin, Introduction to Algebra, Springer Verlag, 1984
2. S. H. Friedberg, A. L. Insel and L. E. Spence, Linear Algebra, Prentice Hall of India Pvt. Ltd., New Delhi, 2004
3. Richard Bronson, Theory and Problems of Matrix Operations, Tata McGraw Hill, 1989

Course Name: Intellectual Property Rights

Course Code: 13015600

Objectives:

This course aims to empower students with knowledge and capacities to understand and analyze the meaning and nature of the Intellectual Property Rights besides being conversant with the actual operation and enforcement of different laws dealing with the Patents, Copyrights, Trade- marks, Industrial designs and the Geographical indications etc. In addition to this, . Lectures will cover the theory mainly supported by a few case- studies to as to improve their deep understanding and memorization so that their involvement and working- capacities become efficiently skillful and dynamic enough. Highlighting the role of judiciary sufficiently, target will be focussed on certain vital issues like the Word Trade Organization (WTO), the General Agreement on Tariffs & Trade (GATT), the Trade Related Intellectual Property Rights (TRIPS) agreement, the General Agreement on Trade related Services (GATS) besides commenting duly on the Madrid Protocol, the Berne Convention, the Budapest Treaty and the Paris Convention dealing with WIPO and TRIPS along with discussion on the ongoing Police, Customs etc. within the Indian Context besides the existing Indian laws on Licensing and Technology transfer.

Course Outline

Introduction to Intellectual Property:
Historical Perspective, Different Types of IP, Importance of protecting IP.

Copyrights
Introduction, How to obtain, Differences from Patents.

Trade Marks
Introduction, How to obtain, Different types of marks – Collective marks, certification marks, service marks, Trade names, etc. Differences from Designs.

Patents
Historical Perspective, Basic and associated right, WIPO, PCT system, Traditional Knowledge, Patents and Healthcare – balancing promoting innovation with public health, Software patents and their importance for India.

Geographical Indications
Definition, rules for registration, prevention of illegal exploitation, importance to India.

Industrial Designs
Definition, How to obtain, features, International design registration.

Layout design of integrated circuits
Circuit Boards, Integrated Chips, Importance for electronic industry.

Trade Secrets
Introduction and Historical Perspectives, Scope of Protection, Risks involved andlegal aspects of Trade Secret Protection.

Different International agreements

(a) Word Trade Organization (WTO):

i. General Agreement on Tariffs & Trade (GATT), TradeRelated Intellectual Property Rights (TRIPS) agreement
ii. General Agreement on Trade related Services (GATS)
iii. Madrid Protocol
iv. Berne Convention
v. Budapest Treaty

(b) Paris Convention

WIPO and **TRIPS, IPR** and Plant Breeders Rights, IPR and Biodiversity
IP Infringement issue and enforcement – Role of Judiciary, Role of law enforcement agencies – Police, Customs etc Economic Value of Intellectual Property– Intangible assets and their valuation, Intellectual Property in the Indian Context –Various laws in India Licensing and technology transfer.

Suggested Readings:

1. N.K. Acharya: *Textbook on intellectual property rights*, Asia Law House(2001).
2. Manjula Guru & M.B. Rao, *Understanding Trips: Managing Knowledge in Developing Countries*, Sage Publications (2003).
3. P. Ganguli, Intellectual Property Rights: *Unleashing the Knowledge Economy,* Tata McGraw-Hill (2001).

4. Arthur Raphael Miller, Micheal H.Davis; *Intellectual Property: Patents, Trademarks and Copyright in a Nutshell,* West Group Publishers (2000).
5. Jayashree Watal, *Intellectual property rights in the WTO and developing countries,* Oxford University Press, Oxford.

Course Name: Ability and Skill Enhancement - VI

Course Code: 13003200

Objectives:

- To enhance the aptitude and Verbal Communication of the students.

Course Outline – Final Assessment – Report/Presentation

Unit I: Verbal Reasoning & English Aptitude
Logical Sequence of Words, Verbal Analogy, Classification, Blood Relation Test, Syllogism, Reading Comprehension.

Unit II: Winning Attitude
Attitude is the most important thing for success, how to develop a winning attitude, what is it, when we need it, what is mindset, how to have a winning and positive mindset, how to win in difficult situations, Positive thinking, passion, dedication, confidence, well preparation, focus, hard work, planning, never give up, etc - some traits that help in developing winning attitude.

Unit III: Understanding the News
Reading Current News, Comparing & Analysing the news, Write an editorial, News Vocabulary, Presentation on any major news (political/social/sports/economics).

Unit IV: Be a Journalist
Chat Show, Panel Discussion, Parliamentary debate, News Inspired Theatrical Performance.

Unit V: Report
Preparing a report on major National/International News – Insights/ review of major news papers and news channels.

Note: The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

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