

Detailed Course Scheme
Bachelor of Science (B. Sc.)
(Physics, Chemistry & Maths)

Semester-I
(2020-2021)

DOC202002260002



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. (PCM) Program along with examination pattern is as follows.

Course Scheme

Semester -I

S. No	Course Code	Course Name	L	T	P	Credits
1.	13000301	Mechanics	4	0	0	4
2.	13001000	Mechanics Lab	0	0	4	2
3.	13000401	Chemistry- I	4	0	0	4
4.	13000900	Chemistry- I Lab	0	0	4	2
5.	13000500	Differential Calculus	5	1	0	6
6.	99002200	Business Communication	4	0	0	4
7.	13002700	Ability & Skill Enhancement - I	2	0	0	2
8.	99002800	Workshops & Seminars	-	-	-	1
9.	99002700	Human Values & Social Service/NCC/NSS	-	-	-	1
Total			19	1	8	26

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

Type	Details	Marks
Mid Term	One Mid-term Sessional	25
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	20
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: Mechanics

Course Code: 13000301

Objectives:

- To describe static equilibrium of particles and rigid bodies in two and three dimensions.
- To analyse the properties of surfaces & solids in relation to moment of inertia.
- To illustrate the laws of motion, kinematics of motion and their interrelationship.
- To analyse the hydrostatic and viscous properties of liquid.

Course Outline

Unit I: Vectors

Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter
Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd order homogeneous differential equations with constant coefficients.

Unit II: Laws of Motion

Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.

Unit III: Gravitation

Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Unit IV: Oscillations

Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q , η and by Searles method. Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity.Length contraction. Time dilation. Relativistic addition of velocities.

Suggested Readings:

1. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press.
2. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
3. University Physics. FW Sears, MW Zemansky and HD Young13/e, 1986. Addison Wesley.
4. Mechanics Berkeley Physics course,1: Charles Kittel, et. Al. 2007, Tata McGraw Hill. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley.

Course Name: Mechanics Lab

Course Code: 13001000

List of Experiments

1. Measurements of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To determine g and velocity for a freely falling body using Digital Timing Technique
10. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g

Suggested Readings:

1. Advanced Practical Physics for students, B.L.Flint and H.T.Worsnop, 1971, Asia Publishing House.
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
3. Engineering Practical Physics, S.Panigrahi & B.Mallick, 2015, Cengage Learning India Pvt. Ltd.
4. A Text Book of Practical Physics, Indu Prakash and Ramakrishna, 11th Edition, 2011, Kitab Mahal, New Delhi.

Course Name: Chemistry- I

Course Code: 13000401

Objectives:

The objective of this paper is to facilitate the students with basics of chemistry that are required for his understanding of chemistry.

Course Outline

Unit I

Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de-Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure Nature and path of Electron, Heisenberg uncertainty principle, Atomic orbital's, Shapes of s, p, d orbital's. Quantum number, Aufbau and Pauli Exclusion principles, Hund's multiplicity rule, Electronic configurations of the elements; radial and

angular functions and distribution curves, Variation of orbital energies with atomic number. Electronic energy level diagram and electronic configurations of hydrogen-like and poly electronic atoms and ions. Term symbols of atoms and ions for atomic numbers < 30.

Unit II

(i) Ionic Bond - Types of ionic solids, radius ratio effect and coordination number, limitations of radius ratio, lattice and lattice defects, lattice energy and Born-Haber cycle, Statement of Born-Landé equation for calculation of lattice energy, solvation energy and solubility of ionic solids, polarizing power and polarizability, Fajan's rules. (ii) Covalent Bond: Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions such as NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- , and H_2O by valence shell electron pair repulsion (VSEPR) theory, linear combination of atomic orbitals (LCAO), bonding, nonbonding and antibonding molecular orbitals. Applications of MO theory to explain the stability of homo and hetero dinuclear diatomic molecules, multi-centre bonding in electron-deficient molecules. (iii) Bond Energy: Dissociation and average bond energies – determination, periodic trends and Applications. Metallic Bond: Free electron, valence bond and band theories. Weak Interactions: Hydrogen Bond – experimental evidence, van der Waal's forces.

Unit III

Electronic Displacements: Inductive, electrometric, resonance and mesomeric effects, hyper conjugation and their applications; Organic acids and bases; their relative strength. Comparative study with emphasis on factors affecting pK values, Homolytic and heterolytic bond Fission. Types of reagents electrophiles and nucleophiles. Types of organic reaction Addition, Elimination and Substitution reactions, Energy considerations. Reactive intermediates – carbocation, Carbanion, free radicals, carbenes, arynes and nitrenes. Curly arrow rules and Assigning formal charges on intermediates and other ionic species.

Unit IV

Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis-trans and, syn-anti isomerism E/Z notations with C.I.P rules. Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

Unit V

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation: Elimination

reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO_4) and trans-addition (bromine), Addition of HX (Markownikoff's and anti Markownikoff's addition), Hydration, Ozonolysis, oxymercuration-demercuration, Hydroboration-oxidation. Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC_2 and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO_4 , ozonolysis and oxidation with hot alk. KMnO_4 .

Suggested Readings:

1. Concise Inorganic Chemistry, J. D. Lee, 5th Edition (1996), Chapman & Hall, London.
2. Modern Inorganic Chemistry, R. C. Aggarwal, 1st Edition (1987), Kitab Mahal, Allahabad.
3. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson, and Paul L. Gaus, 3rd Edition (1995).
4. Organic Chemistry, R. T. Morrison and R. N. Boyd, 6th Edition (1992), Prentice-Hall of India (P) Ltd., New Delhi.
5. Organic Chemistry, S. M. Mukherjee, S. P. Singh, and R. P. Kapoor, 1st Edition (1985), New Age International (P) Ltd. Publishers, New Delhi.
6. Organic Chemistry – Structure and Reactivity, Seyhan N. Ege, 3rd Edition (1998), AITBS Publishers and Distributors, Delhi.
7. Organic Chemistry, Paula Y. Bruice, 2nd Edition, Prentice-Hall, International Edition.
8. Advanced Organic Chemistry, Arun Bahl and B. S. Bahl: S. Chand.

Course Name: Chemistry- I Lab

Course Code: 13000900

Objectives :

To facilitate the students, learn the various experiments related to Inorganic and Organic chemistry.

List of Experiments

Section A: Inorganic Chemistry - Volumetric Analysis

1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
2. Estimation of oxalic acid by titrating it with KMnO_4 .
3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO_4 .
4. Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator.

5. Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$.

Section B: Organic Chemistry

1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)
2. Separation of mixtures by Chromatography: Measure the R_f value in each case (combination of two compounds to be given)
 - a. Identify and separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography.
 - b. Identify and separate the sugars present in the given mixture by paper chromatography.

Suggested Readings:

1. Svehla, G. Vogel's Qualitative Inorganic Analysis, Pearson Education, 2012.
2. Mendham, J. Vogel's Quantitative Chemical Analysis, Pearson, 2009.
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: Differential Calculus

Code: 13000500

Objectives

- Solve problems using expansion of functions
- Familiar with curve tracing
- Apply integral calculus in solving problems
- Have a clear understanding of analytical geometry
- Have a thorough knowledge of conics

Course Outline

Unit I

Limit and Continuity (ϵ and δ definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem, Partial differentiation, Euler's theorem on homogeneous functions.

Unit II

Tangents and normals, Curvature, Asymptotes, Singular points, Tracing of curves. Parametric representation of curves and tracing of parametric curves, Polar coordinates and tracing of curves in polar coordinates.

Unit III

Rolle's theorem, Mean Value theorems, Taylor's theorem with Lagrange's and Cauchy's forms of remainder, Taylor's series, Maclaurin's series of $\sin x$, $\cos x$, e^x , $\log(1+x)$, $(1+x)^m$, Maxima and Minima, Indeterminate forms.

Suggested Readings:

1. Gorakh Prasad: Differential Calculus. Pothishasla Pvt. Ltd., Allahabad.
2. Differential and Integral Calculus: Shanti Narayan.
3. Murray R. Spiegel: Theory and Problems of Advanced Calculus. Schaun's Outline series. Schaum Publishing Co., New York.
4. N. Piskunov: Differential and integral Calculus. Peace Publishers, Moscow.
5. Gorakh Prasad: Integral Calculus. Pothishala Pvt. Ltd., Allahabad.
6. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.

Course Name: Business Communication

Course Code: 99002200

Objectives

- To equip students of the BBA course effectively to acquire skills in reading, writing, comprehension and communication, as also to use electronic media for business communication.
- To provide an overview of the various business communication skills and groom students professionally.

Course Outline

Unit I

Introduction: Theory of Communication, Types and modes of Communication Fundamentals of Communication: Communication defined, Models of Communication, barriers in communication, perception and communication, essentials of good communication.

Unit II

Language of Communication: Verbal and Non-verbal (Spoken and Written) Personal, Social and Business Barriers and Strategies Intra-personal, Inter-personal and Group communication Modes of human communication: Basic differences in the principal modes of human communication – reading, writing, listening, speaking and non-verbal communication. Spoken communication: Importance of spoken communication, designing receiver-oriented messages, comprehending cultural dimension. Speaking Skills Monologue Dialogue Group Discussion Effective Communication/ Mis- communication Interview Public Speech.

Unit III

Making Oral presentations: Functions of presentations, defining objective, audience analysis, collection of materials, organization of materials, body language, effective delivery techniques. Written communication: Fundamentals of sentence structure, writing as a process. Reading and Understanding Close Reading Comprehension Summary Paraphrasing Analysis and Interpretation Translation (from Indian language to English and vice-versa) Literary/Knowledge Texts Writing Skills Documenting Report Writing Making notes Letter writing.

Unit IV

Fundamental of technical writing: Special features of technical writing, the word choice, developing clarity and conciseness, Report writing, Business letters, Applications and resumes. Transactional Analysis: Three human ego states, 4 life positions, different types of transactions.

Unit V

The significance of communication in a business organization: Channels of communication – Downwards, Upwards, Horizontal, Consensus, and Grapevine. Literary discussions: Analysis and discussion of the novel The Funda of Mix-ology and short stories from the books Under the banyan tree and other stories and Popular short stories.

Laboratory work: Audio-visual aids for effective communication: The role of technology in communication, the role of audio-visuals, designing transparencies, computer-aided presentation software, Software-aided activities in developing communication skills: Proper pronunciation, Learning to use the correct tense, Business writing, Report writing, Connected speech, Building up vocabulary, Awareness about the common errors in the usage of English, etc. Case studies, group discussions, presentations.

Suggested Readings:

1. Sen, L., Communication Skills. Prentice Hall of India (2004).

2. Dhar, M., The Funda of Mixology: What bartending teaches that IIM does not, Srishti Publications (2008).
3. Narayan, R. K., under the banyan tree and other stories. Penguin Classics. (2007).

Course Name: Ability & Skill Enhancement I

Course Code: 13002700

Objectives:

To make students understand the usage of Grammar in day to day life and improve their fluency and confidence while speaking English.

Course Outline - Final Assessment - Written Paper

Unit I: Ice Breaking Session & Recap of Language Skills

Ice Breaking Session, Phrase, Clause, Sentence, Word Classes (Parts of Speech).

Unit II: Recap of Language Skills

Tenses (Present, Past Future), Modals, Articles (a, an, the).

Unit III: Reading Skills & Fluency Building

Reading Process, Importance & Types of Reading, Techniques of Reading, and Strategies to Improve Reading Abilities, Comprehension, Reading Aloud, Reading News.

Unit IV: Writing Skills

Generating ideas/gathering data, organizing ideas, Note taking, Outlining, drafting, Editing, and Proof Reading, Story Writing (through pictures/videos), Dialogue Writing, Email Writing.

Unit V: Listening & Speaking Skills

Types and Essentials of good listening, Listening Process, Barriers to Listening and Strategies to improve Listening, Listening to Inspirational Movies/Clips, Listening News Techniques of Effective Speaking, Introducing Oneself and others, Extempore, Situational Conversations (Practicing Short Dialogues).

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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