

## B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS

1 <sup>st</sup> Semester		Contact Hrs.			Marks			Credits
Sub. Code	Subject	L	T	P	Int.	Ext.	Total	
BSNMS1-101	English (Ability Enhancement Compulsory Course –I)*	2	0	0	40	60	100	2
BSNMS1-102	Mechanics (Core Course-I)*	4	0	0	40	60	100	4
BSNMS1-103	Inorganic Chemistry-I (Core Course-II A)*	3	0	0	40	60	100	3
BSNMS1-104	Organic Chemistry-I (Core Course-II B)*	3	0	0	40	60	100	3
BSNMS1-105	Differential Calculus-I (Core Course-III A)*	3	0	0	40	60	100	3
BSNMS1-106	Differential Calculus-II (Core Course-III B)*	3	0	0	40	60	100	3
BSNMS1-107	Mechanics Lab (Core Course-I Practical)*	0	0	4	60	40	100	2
BSNMS1-108	Chemistry Lab- I (Core Course-II Practical)*	0	0	4	60	40	100	2
<b>Total</b>		<b>18</b>	<b>0</b>	<b>8</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>22</b>

2 <sup>nd</sup> Semester		Contact Hrs.			Marks			Credits
Sub. Code	Subject	L	T	P	Int	Ext	Total	
BMNCC0-041	Drug abuse: problem, management and prevention (Ability Enhancement Compulsory Course –II)*	2	0	0	40	60	100	0
BSNMS1-202	Electricity, Magnetism and EMT (Core Course-IV)*	4	0	0	40	60	100	4
BSNMS1-203	Physical Chemistry-I (Core Course-V A)*	3	0	0	40	60	100	3
BSNMS1-204	Organic Chemistry-II (Core Course-V B)*	3	0	0	40	60	100	3
BSNMS1-205	Differential Equations-I (Core Course-VI A)*	3	0	0	40	60	100	3
BSNMS1-206	Differential Equations-II (Core Course-VI B)*	3	0	0	40	60	100	3
BSNMS1-207	Electricity, Magnetism and EMT Lab (Core Course-IV Practical)*	0	0	4	60	40	100	2
BSNMS1-208	Chemistry Lab-II (Core Course-V Practical)*	0	0	4	60	40	100	2
<b>Total</b>		<b>18</b>	<b>0</b>	<b>08</b>	<b>360</b>	<b>440</b>	<b>800</b>	<b>20</b>

## B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS

3 <sup>rd</sup> Semester		Contact Hrs.			Marks			Credits
Sub. Code	Subject	L	T	P	Int.	Ext.	Total	
BSNMS1-301	Thermal Physics and Statistical Mechanics (Core Course-VII)*	4	0	0	40	60	100	4
BSNMS1-302	Thermal Physics and Statistical Mechanics Lab (Core Course-VII Practical)*	0	0	4	60	40	100	2
BSNMS1-303	Inorganic Chemistry-II (Core Course-VIII A)*	3	0	0	40	60	100	3
BSNMS1-304	Physical Chemistry-II (Core Course-VIII B)*	3	0	0	40	60	100	3
BSNMS1-305	Chemistry Lab III (Core Course-VIII Practical)*	0	0	4	60	40	100	2
BSNMS1-306	Real Analysis-I (Core Course IX A)*	3	0	0	40	60	100	3
BSNMS1-307	Real Analysis-II (Core Course IX B)*	3	0	0	40	60	100	3
BSNMS1-308	Computational Physics Skills (Skill Enhancement Course-1)*	0	0	4	60	40	100	2
<b>Total</b>		<b>16</b>	<b>0</b>	<b>12</b>	<b>380</b>	<b>420</b>	<b>800</b>	<b>22</b>

4 <sup>th</sup> Semester		Contact Hrs.			Marks			Credits
Sub. Code	Subject	L	T	P	Int	Ext	Total	
BHSMC0-041	Environmental Science (Ability Enhancement Compulsory Course –III) *	3	0	0	40	60	100	3
BSNMS1-401	Waves and Optics (Core Course-X)*	4	0	0	40	60	100	4
BSNMS1-402	Waves and Optics Lab (Course-X Practical)*	0	0	4	60	40	100	2
BSNMS1-403	Organic Chemistry-III (Core Course-XI A)*	3	0	0	40	60	100	3
BSNMS1-404	Physical Chemistry-III (Core Course-XI B)*	3	0	0	40	60	100	3
BSNMS1-405	Chemistry Lab-IV (Core Course-XI Practical)*	0	0	4	60	40	100	2
BSNMS1-406	Algebra-I (Core Course-XII A)*	3	0	0	40	60	100	3
BSNMS1-407	Algebra-II (Core Course-XII B)*	3	0	0	40	60	100	3
BSNMS1-408	Basic Analytical Chemistry (Skill Enhancement Course-II)*	0	0	4	60	40	100	2
<b>Total</b>		<b>19</b>	<b>0</b>	<b>12</b>	<b>420</b>	<b>480</b>	<b>900</b>	<b>25</b>

## B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS

5 <sup>th</sup> Semester		Contact Hrs.			Marks			Credits
Sub. Code	Subject	L	T	P	Int	Ext	Total	
BSNMD1-511	Digital Analog and Instrumentation (Discipline Specific Elective-I)*	4	0	0	40	60	100	4
BSNMD1-521	Chemistry of Main group elements (Discipline Specific Elective-II)*	4	0	0	40	60	100	4
BSNMD1-531	Matrices (Discipline Specific Elective-III A)*	3	0	0	40	60	100	3
BSNMD1-532	Linear Algebra (Discipline Specific Elective-III B)*	3	0	0	40	60	100	3
BSNMD1-512	Digital Analog and Instrumentation Lab (Discipline Specific Elective Lab-I)*	0	0	4	60	40	100	2
BSNMD1-522	Chemistry of Main group elements Lab (Discipline Specific Elective Lab-II)*	0	0	4	60	40	100	2
BSNMS1-533	Computer Programming Lab (Skill Enhancement Course-3)*	0	0	4	60	40	100	2
<b>Total</b>		<b>14</b>	<b>0</b>	<b>12</b>	<b>340</b>	<b>360</b>	<b>700</b>	<b>20</b>

6 <sup>th</sup> Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int	Ext	Total	
BSNMD1- 611	Elements of Modern Physics (Discipline Specific Elective-4)*	4	0	0	40	60	100	4
BSNMD1-612	Elements of Modern Physics Lab (Discipline Specific Elective Lab-4)*	0	0	4	60	40	100	2
BSNMD1-621	Comprehensive Chemistry (Discipline Specific Elective-V)*	4	0	0	40	60	100	4
BSNMD1-622	Comprehensive Chemistry Lab (Discipline Specific Elective Lab-V)*	0	0	4	60	40	100	2
BSNMD1-631	Numerical Methods (Discipline Specific Elective-VI A)*	3	0	0	40	60	100	3
BSNMD1-632	Complex Analysis (Discipline Specific Elective-VI B)*	3	0	0	40	60	100	3
BSNMS1-633	Numerical Analysis Lab (Skill Enhancement Course-4)*	0	0	4	60	40	100	2
<b>Total</b>		<b>14</b>	<b>0</b>	<b>12</b>	<b>340</b>	<b>360</b>	<b>700</b>	<b>20</b>

**ENGLISH**

**Subject Code: BSNMS1-101**

**L T P C**  
**2 0 0 2**

**Duration:30 Hrs.**

**UNIT-I**

**Introduction:**

Theory of Communication, Types and modes of Communication

**Language of Communication:**

Verbal and Non-verbal, (Spoken and Written), Personal, Social and Business, Barriers and Strategies  
Intra-personal, Inter-personal and Group communication

**UNIT-II**

**Speaking Skills:**

Monologue, Dialogue, Group Discussion, Effective Communication/ Mis- Communication, Interview, Public Speech

**UNIT-III**

**Reading and Understanding**

Close Reading, Comprehension, Summary Paraphrasing, Analysis and Interpretation, Translation (from Indian language to English and vice-versa), Literary/Knowledge Texts.

**UNIT-IV**

**Writing Skills**

Documenting, Report Writing, Making notes, Letter writing

**Recommended Books:**

1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr. Ranjana Kaul, Dr Brati Biswas

**MECHANICS**

**Subject Code: BSNMS1- 102**

**L T P C**  
**4 0 0 4**

**Duration: 60 Hrs.**

**UNIT-I**

**Vector Calculus and Laws of Motion**

**(15 Hrs)**

Vector algebra. Scalar and vector products. Derivatives of a vector with respect to a parameter. 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-II****Gravitation****(15 Hrs)**

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-III****Oscillations****(15 Hrs)**

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,  $\eta$  and  $\sigma$  by Searles method.

**UNIT-IV****Special Theory of Relativity****(15 Hrs)**

Concept of Inertial and non-inertial frames, Concept of ether, Constancy of speed of light, Michelson-Morley Experiment, Galilean transformation, Postulates of Special Theory of Relativity, Lorentz transformation, Length contraction. Time dilation, Relativistic addition of velocities.

**Recommended Books:**

1. University Physics. FW Sears, MW Zemansky and HD Young 13/e, 1986. AddisonWesley
2. Mechanics Berkeley Physics course, volume.1: Charles Kittel, et. Al. 2007, Tata McGrawHill.
3. Physics – Resnick, Halliday & Walker 9/e, 2010, Wiley.
4. Engineering Mechanics, Basudeb Bhattacharya, 2nd edn., 2015, Oxford University Press.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

---

**MECHANICS LAB**

---

**Subject Code: BSNMS1- 107****L T P C****Duration: 60 Hrs.****0 0 4 2**

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

**Recommended Books:**

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.

---

## **INORGANIC CHEMISTRY-I**

**Subject Code: BSNMS1- 103**

**L T P C  
3 0 0 3**

**Duration: 45Hrs.**

### **Unit-I**

**Atomic Structure:**

**(8 Hrs.)**

de Broglie equation, Heisenberg's Uncertainty Principle and its significance. Schrödinger's wave equation and its derivation, significance of  $\psi$  and  $\psi^2$ . Quantum numbers. Normalized and orthogonal wave functions. Sign of wave functions. Radial and angular wave functions and distribution curves. Shapes of s, p, d and f orbitals.

Pauli's Exclusion Principle, Hund's rule of maximum multiplicity, Aufbau principle and its limitations.

### **Unit-II**

**Chemical Periodicity:**

**(7 Hrs.)**

Effective nuclear charge, shielding or screening effect (Slater rules), variation of effective nuclear charge in periodic table.

Atomic and ionic radii, Ionization enthalpy, Electron gain enthalpy and their trend in groups and periods.

Electronegativity and various scales. Variation of electronegativity with bond order, partial charge, hybridization, group electro negativity.

### **Unit-III**

**Chemical Bonding-I:**

**(15 Hrs.)**

**Ionic bond:** General characteristics of ionic compounds, size effects, radius ratio rule and its limitations. Efficiency of packing, Hexagonal close packing, Cubic close packing. Structures of different crystal lattices, Sodium chloride, Cesium chloride, Wurtzite, Zinc blende, Fluorite, Rutile,

## **B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS**

---

Cristobalite, Nickel arsenide, Pervoskite, Rhenium oxide, Calcium carbide, The calcite and aragonite structures.

Born-Landé equation with derivation and importance of Kapustinskii expression for lattice energy. Madelung constant, Born-Haber cycle and its application, Solvation energy.

### **Unit-IV**

#### **Chemical Bonding-II:**

**(15 Hrs.)**

**Covalent bond:** Lewis structure, Valence Bond theory, VSEPR theory (Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory), Hybridization, Molecular orbital theory (LCAO method). Molecular orbital diagrams of diatomic and simple polyatomic molecules ( $\text{Be}_2$ ,  $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{F}_2$ ,  $\text{LiH}$ ,  $\text{NO}$ ,  $\text{CO}$ ,  $\text{HCl}$ ,  $\text{NO}_2$ ,  $\text{BeH}_2$ ,  $\text{NO}_2^-$ ), Formal charge, Covalent character in ionic compounds, polarizing power and polarizability. Fajan's rules and consequences of polarization. Ionic character in covalent compounds (Bond moment, dipole moment, Percentage ionic character)

**Metallic Bond:** Valence bond and band theories. Semiconductors and insulators, defects in solids.

**Weak Interactions:** van der Waals forces, ion-dipole forces, dipole-dipole interactions, induced dipole interaction, Hydrogen bonding.

#### **Recommended Books:**

1. D.F.C. Shriver, P.W. Atkins and C.H. Langford, 'Inorganic Chemistry', ELBS Oxford, **1991**.
2. J.E. Huheey, E.A. Keiter, R.L. Keiter, 'Inorganic Chemistry', 4th Edn., Pearson Education, Singapore, **1999**.
3. J.D. Lee, 'Concise Inorganic Chemistry', ELBS, Oxford, **1994**.

## **ORGANIC CHEMISTRY-I**

**Subject Code: BSNMS1-104**

**L T P C**  
**3 0 0 3**

**Duration: 45Hrs.**

### **Unit-I**

#### **Structure and Bonding:**

**(5 Hrs.)**

Hybridization, bond lengths, bond angles, bond energy, localized and delocalized chemical bond, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes resonance, hyperconjugation, aromaticity, inductive and field effects, hydrogen bonding.

#### **Mechanism of Organic Reactions:**

**(10 Hrs.)**

Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents- electrophiles and nucleophiles. Types of organic reactions. Energy considerations. Reactive intermediates (carbocations, carbanions,

## **B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS**

---

free radicals, carbenes, arynes and nitrenes). Assigning formal charges on intermediates and other ionic species.

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

### **Unit-II**

#### **Alkanes and Cycloalkanes:**

**(10 Hrs.)**

Introduction, IUPAC nomenclature, Isomerism and classification of carbon atoms of alkanes.

Sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids). Physical properties and chemical reactions of alkanes.

Mechanism of free radical halogenation of alkanes: orientation, reactivity and selectivity.

Cycloalkanes - nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring; banana bonds.

### **Unit-III**

#### **Alkenes, Cycloalkenes, Dienes and Alkynes:**

**(14 Hrs.)**

*Alkenes* Nomenclature, methods of synthesis (mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration. Saytzeff rule, Hofmann elimination), physical properties and relative stabilities of alkenes. Chemical reactions of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ , Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

*Cycloalkenes* Methods of formation, conformation and Chemical reactions of cycloalkenes.

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

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

### **Unit-IV**

#### **Aromatic hydrocarbons**

**(6 Hrs.)**

*Preparation* (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid.

*Reactions:* (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation.

Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

**Recommended Books:**

1. Morrison and Boyd, 'Organic Chemistry', Prentice Hall.
2. Solomons, 'Fundamentals of Organic Chemistry', John Wiley.
3. F.A. Carey, 'Organic Chemistry', McGraw Hill, Inc.
4. L.G. Wade Jr., 'Organic Chemistry', Prentice Hall.
5. S.M. Mukherji, S.P. Singh and R.P. Kapoor, 'Organic Chemistry', Vol.-I, II & III, Wiley Eastern Ltd. (New Age International).

**CHEMISTRY LAB-I**

**Subject Code: BSNMS1-108**

**L T P C  
0 0 4 2**

**Duration: 60Hrs.**

**Inorganic Chemistry:**

Semi Micro analysis. Cation analysis, Separation and identification of ions from groups I, II, III, IV, V, and VI. Anionic analysis. Four ions with no interference.

**Organic Chemistry Laboratory Techniques:**

Detection of various functional groups in organic compounds (containing upto two extra elements)

Separation of mixtures by Chromatography: Measure the  $R_f$  value in each case (combination of two compounds to be given)

Identify and separate the components of a given mixture of two dyes (red and blue ink, fluorescent and methylene blue) by paper chromatography

**Recommended Books:**

- 1.H. Denny, W. Roesky, 'Chemical Curiosities', WILEY VCH,1996.
- 2.G. Marr and B.W. Rocket,'Practical Inorganic Chemistry', University Science Books,1999.
- 3.G. Pass and H. Sutcliffe, 'Practical Inorganic Chemistry', 2ndEdn., Chapman and Hall, London, 1974.
- 4.J. Mendham, R.C. Denney, J.D. Barnes, M.Thomas, 'Vogel's Textbook of Quantitative Analysis', 5thEdn., Pearson Education,2006.
- 5.G. Svehla, 'Vogel's Textbook of Quantitative Analysis', Pearson Education, 2006.

**DIFFERENTIAL CALCULUS-I**

**Subject Code: BSNMS1-105**

**L T PC  
3 0 0 3**

**Duration: 45 Hrs.**

**Unit-I (12Hrs.)**

Limit and Continuity ( $\epsilon$  and  $\delta$  definition), Types of discontinuities, Differentiability of functions, Successive differentiation, Leibnitz's theorem.

**Unit-II(11Hrs.)**

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.

**Unit-III(14 Hrs.)**

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-IV (8 Hrs.)**

Partial differentiation –Function of two variables, Partial derivatives of higher order, Homogeneous functions, Euler's theorem and its extension (with proof), Composite functions, Total derivative,

Differentiation of implicit functions and composite functions, Jacobians and its properties.

**RecommendedBooks:**

1. H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002.
2. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007.
3. Zafar Ahsan: Differential Equations and Their Applications, Second Edition, PrenticeHall of India Private Limited, New Delhi.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Erwin Kreyszig: Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

**DIFFERENTIAL CALCULUS-II**

**Subject Code: BSNMS1-106**

**L T P C  
3 0 0 3**

**Duration: 45 Hrs.**

**Unit-I (12Hrs.)**

Tangent plane and normal to a surface, Maxima and Minima of functions of two variables, Working rule to find the extreme values of a function  $z = f(x, y)$ , Lagrange's method of undetermined multipliers.

## **B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS**

---

### **Unit-II (10Hrs.)**

Arc formula for the Cartesian equation  $y=f(x)$ , other expressions for lengths of arcs, Areas under curves, Area formulas for parametric, Polar equation, Area of the closed curve, Volume and surfaces of revolution of curves.

### **Unit-III (12Hrs.)**

Integration by partial fractions, Integration of rational and irrational functions, Properties of definite integral, Reduction formulae for integrals of rational, Trigonometric, Exponential and Logarithmic function and of their combinations.

### **Unit-IV(11Hrs.)**

Double integrals (Cartesian), Change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: Areas and volumes, Centre of mass and gravity, Triple integrals (Cartesian), Simple applications involving cubes, Sphere and rectangular parallelepipeds.

### **Recommended Books:**

1. G. B. Thomas, M. D. Weir, J. Hass: Thomas' Calculus (Twelfth Edition), Pearson Education.
2. Gorakh Prasad: Integral Calculus, Fourteenth Edition, Reprint 2007, Pothishala Private Limited, Allahabad.
3. Zafar Ahsan: Differential Equations and Their Applications, Second Edition, PrenticeHall of India Private Limited, New Delhi.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
5. Erwin Kreyszig: Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

## **DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION**

**Subject Code: BMNCC0-041**

**L T P C**  
**2 0 0 0**

**Duration: 30 Hrs.**

### **Course Objectives**

The main aim of this course is:

1. To aware students about Consequences of Drug Abuse
2. To aware students about preventions of Drug Abuse
3. To aware various roles of society to prevent drug abuse

### **Course Outcomes**

After completing this course, Students will be able to:

1. Understand the responsibilities of society and family to prevent Drug Abuse
2. Understand the role of educational institutes in controlling Drug Abuse
3. Aware about various Psychological and Social management of Drug abuse
4. Understand the role of Media and Legislation to control the drug abuse.

---

## **B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS**

---

### **UNIT-I**

**(6 Hours)**

Meaning of Drug Abuse: Meaning: Drug abuse, Drug dependence and Drug addiction. Nature and extent of drug abuse in India and Punjab.

### **UNIT-II**

**(8 Hours)**

Consequences of Drug Abuse: Individual: Education, Employment, Income. Family: Violence. Society: Crime. Nation: Law and Order problem.

### **UNIT-III**

**(8 Hours)**

Prevention of Drug Abuse: Role of Family: Parent-child relationship, Family support, supervision, shipping values, active scrutiny. School: Counselling, Teacher as role-model, Parent-teacher-health professional coordination, Random testing on students.

### **UNIT-IV**

**(8 Hours)**

Treatment and Control of Drug Abuse: Medical Management: Medication for treatment and to reduce withdrawal effects. Psychological Management: Counselling, Behavioural and Cognitive therapy. Social Management: Family, Group therapy and Environmental intervention. Treatment: Medical, Psychological and Social Management. Control: Role of Media and Legislation.

#### **Recommended Books:**

1. Ram Ahuja, 'Social Problems in India', Rawat Publications, Jaipur, 2003.
2. 'Extent, Pattern and Trend of Drug Use in India', Ministry of Social Justice and Empowerment, Govt. of India, 2004.
3. J.A. Inciardi, 'The Drug Crime Connection', Sage Publications, Beverly Hills, 1981.
4. T. Kapoor, 'Drug Epidemic among Indian Youth', Mittal Publications, New Delhi, 1985.
5. Kessel, Neil and Henry Walton, 'Alcoholism, Harmond Worth', Penguin Books, 1982.
6. Ishwar Modi and Shalini Modi, 'Addiction and Prevention', Rawat Publications, Jaipur, 1997.
7. 'National Household Survey of Alcohol and Drug Abuse', Clinical Epidemiological Unit, All India Institute of Medical Sciences, New Delhi, 2003 & 2004.
8. Ross Coomber and Others, 'Key Concept in Drugs and Society', Sage Publications, New Delhi, 2013.
9. BhimSain, 'Drug Addiction Alcoholism, Smoking Obscenity', Mittal Publications, New Delhi, 1991.
10. Ranvinder Singh Sandhu, 'Drug Addiction in Punjab: A Sociological Study', Guru Nanak Dev University, Amritsar, 2009.
11. Chandra Paul Singh, 'Alcohol and Dependence among Industrial Workers', Shipra, Delhi, 2000.
12. S. Sussman and S.L. Ames, 'Drug Abuse: Concepts, Prevention and Cessation', Cambridge University Press, 2008.
13. P.S. Verma, 'Punjab's Drug Problem: Contours and Characteristics', Vol. LII, No. 3, P.P. 40-43, Economic and Political Weekly, 2017. 1
14. 'World Drug Report', United Nations Office of Drug and Crime, 2016.
15. 'World Drug Report', United Nations Office of Drug and Crime, 2017.

**ELECTRICITY, MEGNETISM AND EMT**

**Subject Code: BSNMS1- 202**

**L T P C  
4 0 0 4**

**Duration: 60 Hrs.**

**UNIT-I**

**Vector Analysis**

**(13 Hrs)**

Review of vector algebra (Scalar and Vector product), gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only).

**UNIT-II**

**Electrostatics**

**(16 Hrs)**

Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor. Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

**UNIT-III**

**Magnetism**

**(16 Hrs)**

Magnetostatics: Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para- and ferro-magnetic materials. Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field.

**UNIT-IV**

**Maxwell's equations and Electromagnetic wave propagation**

**(15 Hrs)**

Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization.

**Recommended Books:**

1. Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education.
2. Mechanics Berkeley Physics course, volume.1: Charles Kittel, et. Al. 2007, Tata McGrawHill.
3. Electricity and Magnetism, J.H. Fewkes & J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
4. Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
5. University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
6. D.J. Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.

**ELECTRICITY, MEGNETISM AND EMT LAB**

**Subject Code: BSNMS1- 207**

**L T P C  
0 0 4 2**

**Duration: 60 Hrs.**

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer: (i) Measurement of charge and current sensitivity (ii) Measurement of CDR (iii) Determine a high resistance by Leakage Method (iv) To determine Self Inductance of a Coil by Rayleigh's Method.
3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx).
5. To study the Characteristics of a Series RC Circuit.
6. To study the a series LCR circuit and determine its (a) Resonant Frequency, (b) Quality Factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor.
8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorem
10. To verify the Superposition, and Maximum Power Transfer Theorem.

**Recommended Books:**

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

**PHYSICAL CHEMISTRY-I**

**Subject Code: BSNMS1-203**

**L T P C  
3 0 0 3**

**Duration: 45 Hrs.**

**Unit-I****Evaluation of Analytical Data****(10Hrs.)**

Terms of mean and median, precision and accuracy in chemical analysis, determining accuracy of methods, improving accuracy of analysis, data treatment for series involving relatively few measurements, linear least squares curve fitting, types of errors, standard deviation, confidence limits, rejection of measurements (F-test and Q-test) numerical problems related to evaluation of analytical data.

**Unit-II****Liquid State****(8Hrs.)**

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

**Unit-III****Gaseous State****(15Hrs.)**

Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state. Molecular velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter, Liquifacation of gases (based on Joule-Thomson effect).

**Unit-IV****Solid state:****(12 Hrs.)**

Nature of the solid state, law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry, symmetry elements and symmetry operations, qualitative idea of point and space groups, seven crystal systems and fourteen Bravais lattices; X-ray diffraction, Bragg's law, a simple account of rotating crystal method and powder pattern method. Analysis of powder diffraction patterns of NaCl, CsCl and KCl. Defects in crystals.

**Recommended Books:**

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc., 1992.

## B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS

7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 2002.
9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book company, 1989.

### ORGANIC CHEMISTRY-II

**Subject Code: BSNMS1-204**

**L T P C**  
**3 0 0 3**

**Duration: 45 Hrs.**

#### Unit-I

##### Stereochemistry of Organic Compounds

(15 Hrs.)

Concept of isomerism. Types of isomerism Optical isomerism-elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism-determination of configuration of geometric isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds. Conformational isomerism-conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono substituted cyclohexane derivatives. Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

#### Unit-II

##### Arenes and Aromaticity

(7 Hrs.)

Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene: molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO diagram, the Huckel rule, aromatic ions..

#### Unit-III

##### Aromatic Electrophilic Substitution:

(11 Hrs.)

Aromatic electrophilic substitution-general pattern of the mechanism, role of  $\sigma$  and  $\pi$  complexes. Mechanism of nitration, halogenation, sulphonation, mercuration and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reaction of alkylbenzenes.

#### Unit-IV

##### Alkyl and aryl halides

(12 Hrs.)

Nomenclature and classes of alkyl halides, methods of formation chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides,  $S_N2$  and  $S_N1$  reactions with energy profile diagrams. Methods of formation of aryl halides, nuclear and side chain reactions. The addition

## **B.SC. (NON-MEDICAL) SYLLABUS 2022 BATCH ONWARDS**

---

elimination and the elimination-additional mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

### **Recommended Books:**

1. Morrison and Boyd, 'Organic Chemistry', Prentice Hall.
2. Solomons, 'Fundamentals of Organic Chemistry', John Wiley.
3. F.A. Carey, 'Organic Chemistry', McGraw Hill, Inc.
4. L.G. Wade Jr., 'Organic Chemistry', Prentice Hall.
5. S.M. Mukherji, S.P. Singh and R.P. Kapoor, 'Organic Chemistry', Vol.-I, II & III, Wiley Eastern Ltd. (New Age International).

### **CHEMISTRY LAB-II**

**Subject Code: BSNMS1-208**

**L T P C**  
**0 0 4 2**

**Duration: 60 Hrs.**

### **Laboratory Techniques**

1. Checking the calibration of the thermometer
2. Purification of organic compounds by crystallization using the following solvents:
  - a. Water
  - b. Alcohol
  - c. Alcohol-Water
3. Determination of the melting points of above compounds and unknown organic compounds (Kjeldahl method and electrically heated melting point apparatus)
4. Effect of impurities on the melting point – mixed melting point of two unknown organic compounds
5. Determination of boiling point of liquid compounds. (boiling point lower than and more than 100 °C by distillation and capillary method)

### **Physical Chemistry Experiment**

#### **Chemical Kinetics**

1. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
2. To study the effect of acid strength on the hydrolysis of an ester.
3. To determine the viscosity and surface tension of C<sub>2</sub>H<sub>5</sub>OH and glycerine solution in water
4. Calculation of the enthalpy of ionization of ethanoic acid.

### **Recommended Books:**

1. H. Denny, W. Roesky, 'Chemical Curiosities', WILEY VCH, 1996.
2. J. Mendham, R.C. Denney, J.D. Barnes, M. Thomas, 'Vogel's Textbook of Quantitative Analysis', 5<sup>th</sup> Edn., Pearson Education, 2006.
3. G. Svehla, 'Vohel's Textbook of Quantitative Analysis', Pearson Education, 2006.

**DIFFERENTIAL EQUATIONS-I**

**Subject Code: BSNMS1-205**

**L T P C**  
**3 0 0 3**

**Duration: 45 Hrs.**

**Unit-I (12Hrs.)**

First order exact differential equations. Integrating factors, rules to find an integrating factor. First order higher degree equations solvable for x, y, p. Methods for solving higher-order differential equations, Basic theory of linear differential equations, Wronskian and its properties, Solving a differential equation by reducing its order.

**Unit-II(11Hrs.)**

Linear homogenous equations with constant coefficients, Linear non-homogenous equations, The method of variation of parameters, The Cauchy-Euler equation, Simultaneous differential equations, Total differential equations.

**Unit-III(12Hrs.)**

General solution of homogeneous equation of second order, principle of superposition for a homogeneous equation, Wronskian, its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, method of undetermined coefficients, method of variation of parameters, solutions of simultaneous equations.

**Unit-IV (10Hrs.)**

Classification of second order partial differential equations into elliptic, parabolic and hyperbolic through illustrations only.

**Recommended Books:**

1. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.
2. I. Sneddon, Elements of Partial Differential Equations, McGraw-Hill, International Edition, 1967.
3. E.L.Ince: Theory of Ordinary Differential Equations. Dover ,1956.
4. M. Braun, 'Differential Equations and Their Applications', 4th Edn., Springer, 2011.
5. F. Braue and J.A. Nohel, 'The Qualitative Theory of Ordinary Differential Equations', Dover Publications, 1989.
6. E.A. Coddington, 'Ordinary Differential Equations', Tata McGraw Hill, 2002.

**DIFFERENTIAL EQUATIONS-II**

**Subject Code: BSNMS1-206**

**L T P C**  
**3 0 0 3**

**Duration: 45 Hrs.**

**Unit-I (10Hrs.)**

Order and degree of partial differential equations, Concept of linear and non-linear partial differential equations, Formation of first order partial differential equations, Linear partial differential equation of first order, Lagrange's method, Charpit's method.

**Unit-II(13Hrs.)**

Power Series solution about an ordinary point, solutions about singular points, The method of Frobenius, Bessel equation and Legendre equation, its properties and their recurrence relations, Hyper geometric equation, Bessel function and their recurrence relations, Strum liouville boundary values.

**Unit-III(12Hrs.)**

Separation of variables in a PDE, Laplace equation: mean value property, Weak and strong maximum principle, Green's function, Poisson's formula, Dirichlet's principle, Existence of solution using Perron's method (without proof).

**Unit-IV (10Hrs.)**

Heat equation: Initial value problem, Fundamental solution, Weak and strong maximum principle and uniqueness results, Wave equation: uniqueness, D'Alembert's method, method of spherical means and Duhamel's principle.

**Recommended Books:**

1. W.E.Boyce and P.C.Diprima : Elementary Differential Equations and Boundary value problems, John Wiley, **1986**.
2. R. K. Jain and S.R.K.Iyengar: Advanced Engineering Mathematics, 2nd Edition, Narosa Publishing House, **2003**.
3. E.L.Ince: Theory of Ordinary Differential Equations. Dover ,**1956**.
4. M. Braun, 'Differential Equations and Their Applications', 4th Edn., Springer, 2011.
5. F. Braue and J.A. Nohel, 'The Qualitative Theory of Ordinary Differential Equations', Dover Publications, 1989.
6. E.A. Coddington, 'Ordinary Differential Equations', Tata McGraw Hill, 2002.