

**Maharaja Ranjit Singh Punjab Technical University
Bathinda-151001**



FACULTY OF SCIENCES

SYLLABUS

FOR

INTEGRATED/DUAL DEGREE B.SC.-M.SC. (FORENSIC SCIENCE)

2023 BATCH ONWARDS

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**MRSPTU INTEGRATED/DUAL DEGREE B.SC.-M.SC.
(FORENSIC SCIENCE) SYLLABUS 2023 BATCH ONWARDS**

SCHEME

1 st Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int.	Ext	Total	
BHSMC0-042	English	2	0	0	40	60	100	2
BMFSS1-101	General Forensic Science and Criminal Law	3	0	0	40	60	100	3
BMFSS1-102	Elements of Questioned Document Examination	3	0	0	40	60	100	3
BSNMS1-103	Inorganic Chemistry-I	3	0	0	40	60	100	3
BSNMS1-104	Organic Chemistry-I	3	0	0	40	60	100	3
BSNMS1-108	Chemistry Lab- I	0	0	4	60	40	100	2
Group - I								
BMFSS1-103	Biodiversity (Microbes, Algae, Fungi &Archegoniate)	4	0	0	40	60	100	4
BMFSS1-104	Botany Lab. I	0	0	4	60	40	100	2
BMFSS1-105	Diversity of Animals-I	4	0	0	40	60	100	4
BMFSS1-106	Zoology Lab. I	0	0	4	60	40	100	2
Group - II								
BSNMS1-105	Differential Calculus-I	3	0	0	40	60	100	3
BSNMS1-106	Differential Calculus-II	3	0	0	40	60	100	3
BSNMS1-102	Mechanics	4	0	0	40	60	100	4
BSNMS1-107	Mechanics Lab	0	0	4	60	40	100	2
Total		22/24	0	12/8	460/440	540/560	1000	28

Type of Courses: Ability Enhancement Compulsory Course (AECC), Core Course (CC), Skill Enhancement Course (SEC), Discipline Specific Elective (DSE)

* Students can choose group of subjects among Group I and Group II.

Note: Exit policy is available as per UGC norms

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2 nd Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int.	Ext	Total	
BMNCC0-041	Drug abuse: problem, management and prevention	2	0	0	100	00	100	0
BSNMS1-203	Physical Chemistry-I	3	0	0	40	60	100	3
BSNMS1-204	Organic Chemistry-II	3	0	0	40	60	100	3
BMFSS1-201	Fingerprints Examination and Forensic Photography	3	0	0	40	60	100	3
BMFSS1-202	Questioned Document and Fingerprint Laboratory	0	0	2	60	40	100	1
BSNMS1-208	Chemistry Lab-II	0	0	4	60	40	100	2
Group - I								
BMFSS1-203	Plant Ecology & Taxonomy	4	0	0	40	60	100	4
BMFSS1-204	Botany Lab. II	0	0	4	60	40	100	2
BMFSS1-205	Diversity of Animals-II	4	0	0	40	60	100	4
BMFSS1-206	Zoology Lab. II	0	0	4	60	40	100	2
Group - II								
BSNMS1-202	Electricity, Magnetism and EMT	4	0	0	40	60	100	4
BSNMS1-205	Differential Equations-I	3	0	0	40	60	100	3
BSNMS1-206	Differential Equations-II	3	0	0	40	60	100	3
BSNMS1-207	Electricity, Magnetism and EMT Lab	0	0	4	60	40	100	2
Total		19/21	0	14/10	540/520	460/480	1000	24

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3 rd Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int.	Ext	Total	
BSNMS1-303	Inorganic Chemistry-II	3	0	0	40	60	100	3
BSNMS1-304	Physical Chemistry-II	3	0	0	40	60	100	3
BMFSS1-301	Criminalistics	3	0	0	40	60	100	3
BMFSS1-302	Criminalistics Laboratory	0	0	2	60	40	100	1
BSNMS1-305	Chemistry Lab III	0	0	4	60	40	100	2
Group - I								
BMFSS1-303	Plant Anatomy & Embryology	4	0	0	40	60	100	4
BMFSS1-304	Botany Lab. III	0	0	4	60	40	100	2
BMFSS1-305	Physiology & Biochemistry	4	0	0	40	60	100	4
BMFSS1-306	Zoology Lab. III	0	0	4	60	40	100	2
Group - II								
BSNMS1-306	Real Analysis-I	3	0	0	40	60	100	3
BSNMS1-307	Real Analysis-II	3	0	0	40	60	100	3
BSNMS1-301	Thermal Physics and Statistical Mechanics	4	0	0	40	60	100	4
BSNMS1-302	Thermal Physics and Statistical Mechanics Lab	0	0	4	60	40	100	2
Total		17/19	0	14/10	440/420	460/480	900	24

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4 th Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int.	Ext	Total	
BHSMC0-041	Environmental Science	3	0	0	40	60	100	3
BSNMS1-403	Organic Chemistry-III	3	0	0	40	60	100	3
BSNMS1-404	Physical Chemistry-III	3	0	0	40	60	100	3
BSNMS1-405	Chemistry Lab-IV	0	0	4	60	40	100	2
BMFSS1-401	Forensic Psychology	3	0	0	60	40	100	3
Group - I								
BMFSS1-402	Plant Physiology & Metabolism	4	0	0	40	60	100	4
BMFSS1-403	Botany Lab. IV	0	0	4	60	40	100	2
BMFSS1-404	Genetics & Evolutionary Biology	4	0	0	40	60	100	4
BMFSS1-405	Zoology Lab. IV	0	0	4	60	40	100	2
Group - II								
BSNMS1-401	Waves and Optics	4	0	0	40	60	100	4
BSNMS1-402	Waves and Optics Lab	0	0	4	60	40	100	2
BSNMS1-406	Algebra-I	3	0	0	40	60	100	3
BSNMS1-407	Algebra-II	3	0	0	40	60	100	3
Total		20/22	0	12/8	440/420	460/480	900	26

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5 th Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int.	Ext	Total	
BSNMD1-521	Chemistry of Main group elements	4	0	0	40	60	100	4
BSNMD1-522	Chemistry of Main group elements Lab	0	0	4	60	40	100	2
BMFSS1-501	Fundamentals of Computer Forensics	3	0	0	40	60	100	3
BMFSS1-502	Computer Forensics Laboratory	0	0	2	60	40	100	1
Group - I								
BMFSS1-503	Botany-I Cell and Molecular Biology	4	0	0	40	60	100	4
BMFSS1-504	Botany Lab. V	0	0	4	60	40	100	2
BMFSS1-505	Comparative Anatomy & Vertebrates	4	0	0	40	60	100	4
BMFSS1-506	Zoology Lab. V	0	0	4	60	40	100	2
Group - II								
BSNMD1-531	Matrices	3	0	0	40	60	100	3
BSNMD1-532	Linear Algebra	3	0	0	40	60	100	3
BSNMD1-511	Digital Analog and Instrumentation	4	0	0	40	60	100	4
BSNMD1-512	Digital Analog and Instrumentation Lab	0	0	4	60	40	100	2
Total		15/17	0	14/10	400/380	400/420	800	22

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6 th Semester		Contact Hrs.			Marks			Credits
Subject Code	Subject	L	T	P	Int.	Ext	Total	
BSNMD1-621	Comprehensive Chemistry	4	0	0	40	60	100	4
BSNMD1-622	Comprehensive Chemistry Lab	0	0	4	60	40	100	2
BMFSS1-601	Forensic Audio Video Examination	3	0	0	40	60	100	3
BMFSS1-602	Forensic Audio Video Examination Laboratory	0	0	2	60	40	100	1
Group - I								
BMFSS1-603	Economic Botany and Biotechnology	4	0	0	40	60	100	4
BMFSS1-604	Developmental Biology	0	0	4	40	60	100	2
BMFSS1-605	Botany Lab. VI	4	0	0	60	40	100	4
BMFSS1-606	Zoology Lab.VI	0	0	4	60	40	100	2
Group - II								
BSNMD1-611	Elements of Modern Physics	4	0	0	40	60	100	4
BSNMD1-612	Elements of Modern Physics Lab	0	0	4	60	40	100	2
BSNMD1-631	Numerical Methods	3	0	0	40	60	100	3
BSNMD1-632	Complex Analysis	3	0	0	40	60	100	3
Total		15/17	0	14/10	400/380	400/420	800	22

FIRST SEMESTER

ENGLISH

Subject Code: BHSMC0-042

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

Duration:30 Hrs.

Course Objective: To improve the communication skills of students.

Course Outcome: To make student capable for attending interviews and for presenting their research in conferences.

UNIT-I (8 Hours)

Communication Skills: Introduction, Definition, the Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

UNIT-II (7 Hours)

Perspectives in Communication: Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

Elements of Communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

UNIT-III (7 Hours)

Communication Styles: Introduction, The Communication Styles Matrix with example for each Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.

Basic Listening Skills: Introduction, Self-Awareness, Active Listening, becoming an Active Listener, Listening in Difficult Situations

UNIT-IV (8 Hours)

Interview Skills: Purpose of an interview, Do's and Don'ts of an interview

Giving Presentations: Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

Group Discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

Recommended Books:

1. Ruther Ford A. J., 'Basic Communication Skills for Technology', 2nd Edition, Pearson Education, 2011.
2. Kumar S. and Pushplata, 'Communication Skills', 1st Edition, Oxford Press, 2011.
3. Stephen P. Robbins, 'Organizational Behaviour', 1st Edition, Pearson, 2013.
4. Gill H., 'Brilliant-Communication Skills', 1st Edition, Pearson Life, 2011.
5. Gopalawamy R., 'The Ace of Soft Skills: Attitude, Communication and Etiquette for Success', 5th Edition, Pearson, 2013.
6. Dalley D., Burton L. and Margaret G., 'Developing your Influencing Skills', Green Hall, 1st Edition, Universe of Learning LTD,2010.
7. Konarnira, 'Communication Skills for Professionals', 2nd Edition, PHI, 2011.
8. Mitra B. K., 'Personality Development and Soft Skills', 1st Edition, Oxford Press, 2011.
9. 'Soft Skill for Everyone', Butter Field, 1stEdition, Cengage Learning India Pvt. Ltd., 2011.
- Francis Peters S.J., 'Soft Skills and Professional Communication', 1st Edition, McGraw Hill Education, 2011.
10. John A., 'Effective Communication', 4th Edition, Pan MacMillan, 2009.
11. Aubrey D., 'Bringing out the Best in People', 2nd Edition, McGraw Hill, 1999.

GENERAL FORENSIC SCIENCE AND CRIMINAL LAW

Subject Code: BMFSS1-101

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

Duration: 45Hrs.

Course Objective:

1. To familiarize with history of Forensic Science.
2. To understand the importance of Forensic Science
3. To understand the working of Forensic Science labs and Police administration in India.
4. To understand various criminal laws and its importance in Forensic Science.

Course Outcome (CO): After the completion of the course, student will be able to:

CO1: Understand the concept of Forensic Science.

CO2: Learn the present scenario of Forensic Science in India and its scope

CO3: Gain knowledge about the various types of crimes.

CO4: Understand Criminal Law.

UNIT-I (15 Hrs)

Basic concepts of Forensic Science-I: Definition of Forensic Science by different authors, History of Forensic Science, Seven principles of Forensic Science, Nature, need, scope and functions of Forensic Science, Tools and techniques in forensic science, Ethics in Forensic Science, Subjective and objective observation, Qualitative and quantitative analysis, Preliminary and confirmatory tests, Positive control, negative control and blank samples.

Basic concepts of Forensic Science-II: Modus operandi and its role in crime records, Corpus delicti, Prima facie, Admissibility of scientific evidence in the courtroom, Frye and Daubert standards.

UNIT-II (10Hrs)

Forensic Science Laboratories in India: Forensic science laboratories (FSLs) in India and its types- Central, State, Regional and Mobile FSLs, Branches of FSLs, Setup of FSLs, Hierarchy of experts in Forensic Science Laboratories, Services provided by FSLs, Functioning of FSLs, roles and responsibilities of forensic scientist, the Laboratory Information Management System(LIMS).

Report writing and Court testimony: FIR, Report writing and evidence evaluation, Components of report, Report format in respect of crime scene and laboratory findings, Court trial and testimony, Pre- Court Preparation and Court appearance

UNIT-III (13Hrs)

Criminal Law:

Definitions: Actus reus, Mens rea and its types, Bailable/non-bailable offences, Cognizable/non-cognizable, Summon cases and warrant cases.

Special Forms of Crime: Organized Crime: Gangs/Criminal Networks, Socio-Economic Crime, Custodial Crime, White-Collar Crime, Crime against Women/Children, Sex Offences.

Correctional Therapy: Probation, Parole, Furlough, Remission and Pardon

Code of Criminal Procedure (CrPC): Sections- 291,292,293.

Indian Evidence Act (IEA): Sections-32, 45, 46, 47, 57, 58, 60, 73, 135,136, 137, 138,141.

Indian Penal Code (IPC): Sections (Offences against the person) -299,300,302,304B, 307, 309, 319, 320,324,326,351,354,359,362,375,376,377 and Sections (Offences against property)-378, 383,390,391,420, 463, 497,499, 503and 511.

UNIT-IV (07 Hrs)

Indian Constitution: Article 20 and 21.

Recent amendments in above mentioned sections of all laws.

Police Administration: History and development of police administration, Duties, roles, responsibilities and power of Police, Organizational structure of police, Relationship between police and forensic scientist with respect to crime investigation

People and society: Custodial deaths, Police and Human Rights.

Recommended Books:

1. Siegel J. A. and Mirakovits K: Forensic Science: The Basics, CRC Press, 3rd Edition, 2016.
2. Siegel J. A. and Saukko P. J.: Encyclopedia of Forensic Sciences, Academic Press, 2nd Edition, 2013.
3. Saferstein R: Forensic Science Hand Book, Vol I, CRC Press, 3rd Edition.2020.
4. Saferstein R: Forensic Science Hand Book, Vol II, Pearson, 2nd Edition.2005.
5. Saferstein R: Forensic Science Hand Book, Vol III, Pearson, 2nd Edition.2010.
6. Saferstein, R: Criminalistics: An Introduction to Forensic Science, Pearson, 12th Edition, 2018.
7. Sharma B.R.: Forensic Science in Criminal Investigation & Trials, Universal Law Publishing, 6th Edition, 2020.
8. The Constitution of India by Legislative Department, Ministry of Law and Justice, Govt. of India.
9. The Indian Evidence Act, 1872 by Legislative Department, Ministry of Law and Justice, Govt. of India.

ELEMENTS OF QUESTIONED DOCUMENT EXAMINATION

Subject Code: BMFSS1-102

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

Duration: 45Hrs.

Course Objectives:

1. To understand the importance of Questioned Document as an evidence.
2. To understand the principles of handwriting.
3. To acquire the knowledge of comparison of type written and printed matter.
4. To acquire knowledge of Standards for comparison.

Course Outcome (CO): After the completion of the course, student will be able to:

CO1: Understand the concept of Questioned Documents.

CO2: Gain knowledge regarding forgery, its type and examination.

CO3: Gain knowledge of cases which fall under purview of digital crimes.

CO4: Understand the elements involved in investigation of digital crimes.

UNIT-I (15 Hrs)

Documents in general: Importance, Classification and Preliminary Examination. **Elements of Handwriting:** Elements of Execution and Style Development of Individuality in Handwriting and Principles of handwriting identification.

UNIT-II (10Hrs)

Natural Variations in handwriting: Definition and nature, Determination of range of variations (consistency) and its importance. **Fundamental divergence sin handwriting:** Its interpretation in relation to identification of handwriting, consideration of various writing instruments used in writing.

UNIT-III (12Hrs)

Standards for comparison: Requested and Collected Standards **Alterations in the document:** Erasures, Additions, Overwriting and Obliterations: their examination **Forgery:** Definitions, types and characteristics **Disguise:** Definition and Characteristics **Indented and Invisible Writings:** Introduction and Methods of examination.

UNIT-IV (08Hrs)

Comparison of typewritten and Printed matter: Working and Types, Printing and Machine Defects, alterations in Printed and typed text. Photostat Machines and Fax machines: Examination of printouts from them. Working and Principle of Projectina /video- spectral comparator (VSC), ESDA, Docucenter Examination of Currency. Comparison of digitally manipulated documents.

Recommended Books:

1. Huber, A. R. and Headrike, A.M. (1999), Handwriting identification: facts and fundamental, CRC LLC.
2. Ellen, D (Edition 2nd) (1997), The scientific examination of Documents, Methods and techniques, Taylor & Francis Ltd.
3. Morris (Edition 1st) (2000), Forensic Handwriting Identification (fundamental concepts and Principals), Academic Press Inc.
4. Harrison, W.R (1966), Suspect Documents & their Scientific Examination, Sweet & Maxwell Ltd., London.
5. Hilton, O (1982), The Scientific Examination of Questioned Document, Elsevier North Holland Inc., New York.
6. Sulner, H.F. (1966), Disputed Document, Oceana Publications Inc., New York.

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7. Saxena B.L. (1968), Saxena's Law & Techniques Relating to Finger Prints, Foot Prints & Detection of Forgery, Central Law Agency, Allahabad (Ed. A.K. Singla).
8. Quirke, A.J. (1930), Forged, Anonymous & Suspect Documents, George Rontledge & Sons Ltd., London.
9. Osborn, A. S. (1929), Questioned Documents, Boyd Printing Co., Chicago.
10. Levinson, J (2000), Questioned Documents, Academic Press, Tokyo.
11. Kelly, J.S and Lindblom, B.S (2006), Scientific Examination of Questioned Documents, Taylor & Francis, New York.
12. Brunelle, R.L. and Reed, R.W. (1984), Forensic Examination of Ink and Paper, Charles C Thomas Publisher, U.S.A.
13. Baker, J.N. (1955), Law of Disputed and Forged Documents, The Michie Company, Virginia

INORGANIC CHEMISTRY-I

Subject Code: BSNMS1-103

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

Duration: 45Hrs.

Course Objectives

1. To familiarize with atomic structure, quantum numbers and shapes of orbitals
2. To understand periodic table and periodic properties of elements
3. To understand the concept of crystal structure of molecules
4. To understand the concept of various bonding theories

Course Outcomes: The completion of this course will make student to acquire the knowledge of:

CO1: Wave mechanics, atomic theories and shapes of orbitals

CO2: Periodic table and various periodic properties

CO3: Ionic bond and crystal structure of molecules

CO4: Covalent bond, metallic bond and various weak chemical forces

UNIT-I (8 Hrs.)

Atomic Structure:

De-Broglie equation, Heisenberg's Uncertainty Principle and its significance. Schrödinger's wave equation and its derivation, significance of ψ and ψ^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 (7 Hrs.)

Chemical Periodicity:

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 (15 Hrs.)

Chemical Bonding-I:

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, 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 (15 Hrs.)

Chemical Bonding-II:

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 (Be₂, N₂, O₂, F₂, LiH, NO, CO, HCl, NO₂,

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BeH₂, NO₂⁻), 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:

Latest edition of:

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

MRSPTU

ORGANIC CHEMISTRY-I

Subject Code: BSNMS1-104

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

Duration: 45Hrs.

Course Objectives:

1. To familiarize with the concepts of basics of organic chemistry
2. To understand the concept of mechanisms of organic reactions
3. To familiarize with the chemistry of alkanes and cycloalkanes
4. To understand chemistry of alkenes and alkynes
5. To know the chemistry behind aromatic hydrocarbons

Course outcomes: After the completion of course students will acquire the knowledge of:

CO1: Concepts of basics of structure and bonding

CO2: Mechanisms of organic reactions

CO3: Chemistry of aliphatic hydrocarbons

CO4: Chemistry behind aromatic hydrocarbons

UNIT-I (15 Hrs.)

Structure and Bonding:

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:

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, 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 stereo chemical studies).

UNIT-II (10 Hrs.)

Alkanes and Cycloalkanes:

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 (14 Hrs.)

Alkenes, Cycloalkenes, Dienes and Alkynes:

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 KMnO₄, Polymerization of alkenes. Substitution at the allylic and vinylic positions of alkenes. Industrial applications of ethylene and propene.

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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 (6 Hrs.)

Aromatic hydrocarbons:

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:

Latest edition of:

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.

Course Objectives:

1. To develop basic understanding of various lab practices including safety measures.
2. To understand qualitative semi micro analysis of mixtures.
3. To analyze unknown functional group in organic molecules.
4. To understand various chromatographic techniques used for separation of dyes.

Course Outcomes: The students will acquire knowledge of

CO1: Different safety measures in lab

CO2: Analysis of mixture for cations and anions

CO3: Analysis of unknown functional group in organic molecules

CO4: chromatographic techniques used for separation of dyes

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:

Latest edition of:

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

GROUP-1

BIODIVERSITY (MICROBES, ALGAE, FUNGI & ARCHEGONIATE)

Subject Code: BMFSS1-103

L T P C

Duration: 60Hrs.

4 0 0 4

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of biodiversity of microbes, algae, fungi and archegoniate.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes (CO): The completion of the course will make student to acquire the knowledge of:

CO1: Microbes, algae, Fungi.

CO2: Archegoniate, Bryophytes.

CO3: Pteridophytes and Gymnosperms.

UNIT-I (15 Hours)

Microbes: Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria– Discovery, General characteristics and cell structure; Reproduction–vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Algae: General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Economic importance of algae

UNIT-II (15 Hours)

Fungi: Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of Rhizopus (Zygomycota), Puccinia, Agaricus (Basidiomycota); Symbiotic Associations-

Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance, Fungi like organisms Albugo, Phytophthora and slime molds

UNIT-III (15 Hours)

Introduction to Archegoniate: Unifying features of archegoniates, Transition to land habit, Alternation of generations

Bryophytes: General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (upto family), morphology, anatomy and reproduction of Marchantia and Funaria. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of Sphagnum.

UNIT-IV (15 Hours)

Pteridophytes: General characteristics, classification, Early land plants (Cooksonia and Rhynia). Classification (upto family), morphology, anatomy and reproduction of Selaginella, Equisetum and Pteris (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

Gymnosperms: General characteristics, classification. Classification (upto family), morphology, anatomy and reproduction of Cycas and Pinus. (Developmental details not to be included). Ecological and economical importance.

**MRSPTU INTEGRATED/DUAL DEGREE B.SC.-M.SC.
(FORENSIC SCIENCE) SYLLABUS 2023 BATCH ONWARDS**

Recommended Books:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. B.R. Vashishta, (2016) Botany For Degree Students Fungi. S Chand & Company.
5. Geeta Sumbali, (2011) The Fungi. Alpha science Intl Ltd Second Edition.
6. K.R. Anuja & R.S. Mehrotra (2015) An Introduction to Mycology. New Age International Publishers Second Edition.

MRSPTU

BOTANY LAB-1

Subject Code: BMFSS1-104

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

Duration: 60Hrs.

Course Objectives:

1. To understand basic understanding of lab practices including safety measures.
2. To analyse the vegetative and reproductive structures of Nostoc, Chlamydomonas, Oedogonium, Vaucheria, Fucus.
3. To analyse the type of bacteria from slides.

Course Outcomes (CO): The completion of the practical will make student to acquire the knowledge of:

CO1: Different Safety measures in lab.

CO2: Analysis of the vegetative and reproductive structures.

CO3: Analysis of Pteridophytes and Gymnosperms

1. EMs/Models of viruses– T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic cycle.
2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
3. Gram staining
4. Study of vegetative and reproductive structures of Nostoc, Chlamydomonas (electron Micrographs), Oedogonium, Vaucheria, Fucus*and Polysiphonia through permanent slides.
5. Rhizopus and Penicillium: Asexual stage from temporary mounts and sexual structures through permanent slides.
6. Alternaria: Specimens/photographs and tease mounts.
7. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and in fected Barberry leaves
8. Agaricus: Specimens of button stage and full grown mushroom
9. Lichens: Study of growth forms of lichens(crustose, foliose and fruticose)
10. Mycorrhiza: ectomycorrhiza and endomycorrhiza (Photographs)
11. Marchantia- morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).
12. Funaria- morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing anther dial and archegonialheads, l.s. capsule and protonema.
13. Selaginella-morphology, w.m. leafwithligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
14. Equisetum-morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry) (temporary slides); t. srhizome (permanent slide).
15. Pteris- morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
16. Cycas- morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
17. Pinus- morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, l.s./t.s. malecone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. femalecone, t.l.s. & r.l.s. stem (permanent slide).

**MRSPTU INTEGRATED/DUAL DEGREE B.SC.-M.SC.
(FORENSIC SCIENCE) SYLLABUS 2023 BATCH ONWARDS**

Recommended Books:

1. Kumar, H.D. (1999). Introductory Phycology. Affiliated East-West. Press Pvt. Ltd. Delhi. 2nd edition.
2. Tortora, G.J., Funke, B.R., Case, C.L. (2010). Microbiology: An Introduction, Pearson Benjamin Cummings, U.S.A. 10th edition.
3. Sethi, I.K. and Walia, S.K. (2011). Textbook of Fungi & Their Allies, MacMillan Publishers Pvt. Ltd., Delhi.
4. B.R. Vashishta, (2016) Botany For Degree Students Fungi. S Chand & Company.
5. Geeta Sumbali, (2011) The Fungi. Alpha Science Intl Ltd Second Edition.
6. KR Aneja & RS Mehrotra (2015) An Introduction to Mycology. New Age International Publishers Second Edition.

MRSPTU

DIVERSITY OF ANIMALS-1

Subject Code: BMFSS1-105

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

Duration: 60Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of biodiversity of animals.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes (CO): The completion of the course will make student to acquire the knowledge of:

CO1: Kingdom Protista

CO2: Importance of Arthropodain in Forensic Sciences.

CO3: Importance of knowledge of Diversity of Animals in Forensic Science.

UNIT-I (15 Hours)

Kingdom Protista

General characters and classification upto classes; Locomotory Organelles and locomotion in Protozoa-Ameoba, Paramecium, Euglena

UNIT-II (15 Hours)

Phylum Porifera

General characters and classification up to classes; Canal System in Sycon

Phylum Cnidaria

General characters and classification up to classes; Polymorphism in Hydrozoa, coral & coral reefs

UNIT-III (15Hours)

Phylum Platyhelminthes

General characters and classification up to classes; Life history of Taeniasolium and Fasciola Hepatica

Phylum Ashelminthes

General characters and classification up to class, Life Cycle of Ascaris, Parasitic adaptation in Helminthes

Phylum Annelida

General characters and classification up to classes; Metamerism in Annelida

UNIT-IV (15 Hours)

Phylum Arthropoda

General characters and classification upto classes; Vision in Arthropoda, Metamorphosis in Insects, Importance of Arthropoda in Forensic Sciences

Phylum Mollusca

General characters and classification upto classes; Torsion in gastropods

Recommended Books:

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).
3. Invertebrates: A New Synthesis, III Edition, Blackwell Science Young, J. Z. (2004).
4. The Life of Vertebrates. III Edition. Oxford university press.
5. Pough H. Vertebrate life, VIII Edition, Pearson International.
6. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

ZOOLOGY LAB-1

Subject Code: BMFSS1-106

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

Duration: 60Hrs.

Course Objectives

1. To understand basic understanding of lab practices including safety measures.
2. To analyse pond water collected from different places.
3. To analyze the Obelia, Physalia, Millepora etc.

Course Outcomes (CO): The completion of the practical will make student to acquire the knowledge of:

CO1: Different Safety measures in lab.

CO2: Analysis of the Ascarislumbricoides and its life stages (Slides/micro-photographs)

CO3: Analysis of Sycon (T.S. and L.S.), Hyalonema, Euplectella, Spongilla

Experiments:

1. Study of whole mount of Euglena, Amoeba and Paramecium, Binary fission and Conjugation in Paramecium
2. Examination of pond water collected from different places for diversity in protista
3. Study of Sycon (T.S. and L.S.), Hyalonema, Euplectella, Spongilla
4. Study of Obelia, Physalia, Millepora, Aurelia, Tubipora, Corallium, Alcyonium, Gorgonia, Metridium, Pennatulula, Fungia, Meandrina, Madrepora
5. One specimen/ slide of any ctenophore
6. Study of adult Fasciola hepatica, Taenia solium and their life cycles (Slides/ microphotographs)
7. Study of adult Ascarislumbricoides and its life stages (Slides/micro-photographs)
8. To submit a Project Report on any related topic on life cycles/coral/ coral reefs.

Recommended Books:

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3. Young, J.Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
4. Pough H. Vertebrate life, VIII Edition, Pearson International.
5. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

GROUP-2

DIFFERENTIAL CALCULUS-I

Subject Code: BSNMS1-105

L T P C

Duration: 45 Hrs.

3 0 0 3

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of differential calculus.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes:

1. Understand the concept of Continuity and Differentiability.
2. Extend the knowledge to the different type of series, Roll's Theorem and Lagrange Mean Value Theorem
3. Develop the skill to sketch the curves in a plane using its mathematical properties in the different coordinate systems of reference.
4. Understand the concept of Partial Differential Equation.

UNIT-I (12Hrs.)

Limit and Continuity (ϵ and δ 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 , $\log_{10}(1+x)$, $(1+x)^m$, 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.

Recommended Books:

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, Prentice Hall 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.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of Differential Calculus.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes:

1. Apply the knowledge of advanced concepts of calculus in order to study theoretical development of different mathematical techniques and their applications.
2. Develop the knowledge of computing arc length, area and volume by using integration.
3. Understand the concept of integration and different kind of functions.
4. Expand the knowledge of multiple integrals and vector surface integrals.

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.

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, Prentice Hall 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

MECHANICS

Subject Code: BSNMS1-102

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

Duration: 60Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of mechanics.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcome (CO): After the completion of the course, student will be able to:

1. Understand the concepts of vector calculus and basic laws of motion
2. Gain the knowledge about gravitational motion, and global positioning system
3. Understand the concepts of harmonic oscillations.
4. Learn the concept of theory of Relativity.

UNIT-I (15Hrs)

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 (15Hrs)

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-III (15Hrs)

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 σ by Searles method.

UNIT-IV (15 Hrs)

Special Theory of Relativity: 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 McGraw Hill.
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
0 0 4 2**

Duration: 60Hrs.

Course Objectives:

1. To understand basic understanding of lab practices including safety measures.
2. To determine the modulus of elasticity.
3. To use basic measurement tools.

Course Outcomes (COs): After the completion of the course, Student will be able to

1. Use basic measurements tools like Vernier caliper, screw gauge etc.
2. Find the Moment of Inertia of a Flywheel.
3. Determine the Modulus of elasticity
4. Learn about motion of Bar Pendulum and Kater's Pendulum.

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 Fly wheel.
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 Practical's, 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.

SECOND SEMESTER

**MRSPTU INTEGRATED/DUAL DEGREE B.SC.-M.SC.
(FORENSIC SCIENCE) SYLLABUS 2023 BATCH ONWARDS**

DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION

Subject Code: BMNCC0-041

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

Duration: 30Hrs.

Course Objective: To make students aware about drug abuse and its effect on their financial and health status.

Course Outcome: To make students aware about treatment and control of drug abuse.

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. Bhim Sain, '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, 201

PHYSICAL CHEMISTRY-I

Subject Code: BSNMS1-203

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

Duration: 45 Hrs.

Course Objectives:

1. To develop basic understanding of different states of matter.
2. To understand concept of chemical kinetics.
3. To understand underlying processes associated with various states of matter.
4. To familiarize with relevance of matter properties for realistic applications.

Course Outcomes: Students will be able to acquire the knowledge of

CO1: Basic understanding of different states of matter

CO2: Rate of chemical reactions and related theories.

CO3: Underlying processes associated with various states of matter

CO4: Relevance of matter properties for realistic applications

Unit-I (15 Hrs.)

Gaseous State:

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, Liquefaction of gases (based on Joule-Thomson effect).

Unit-II (8 Hrs.)

Liquid State:

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 cholesteric phases. Thermography and seven segment cell.

Unit-III (12Hrs.)

Solid state:

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.

Unit-IV (10 Hrs.)

Basics of Chemical Kinetics:

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half-life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

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Recommended Books:

Latest edition of:

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; Pubs: Oxford University Press.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; Pubs: Vishal Publishing Co.
3. Barrow, G.M., Physical Chemistry; Pubs: McGraw Hill Inc.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; Pubs: Oxford University Press.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; Pubs: John Wiley & Sons Inc.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs: Wiley Eastern Limited.
8. Levine, I.N., Physical Chemistry; Pubs: Tata McGraw Hill Publishing Co. Ltd.
9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd.
10. Metz, C.R., Theory and Problems of Physical Chemistry; Schaum's outline series, 2nd edition, Pubs: McGraw-Hall Book company.

ORGANIC CHEMISTRY-II

Subject Code: BSNMS1-204

**L T PC
3 0 0 3**

Duration: 45 Hrs.

Course Objectives:

1. To understand the concepts of stereochemistry of organic compounds
2. To understand concepts behind aromaticity
3. To understand the concept of mechanisms of organic reactions
4. To familiarize with the aromatic electrophilic substitution reactions
5. To familiarize with the chemistry of alkyl and aryl halides

Course Outcomes: After the completion of course students will acquire the knowledge of

- CO1: Concepts of stereochemistry of organic compounds
- CO2: Concepts behind aromaticity
- CO3: Mechanisms of organic reactions
- CO4: Aromatic electrophilic substitution reactions
- CO5: Chemistry of alkyl and aryl halides

Unit-I (15Hrs.)

Stereochemistry of Organic Compounds:

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 (7 Hrs.)

Arenes and Aromaticity:

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 (11Hrs.)

Aromatic Electrophilic Substitution:

Aromatic electrophilic substitution-general pattern of the mechanism, role of σ and π 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 and alkenylbenzenes.

Unit-IV (12 Hrs.)

Alkyl and aryl halides:

Nomenclature and classes of alkyl halides, methods of formation chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides, SN^2 and SN^1 reactions with energy profile diagrams. Methods of formation of aryl halides, nuclear and side chain reactions. The addition elimination and the elimination-additional mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.

Recommended Books:

Latest edition of:

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).

FINGERPRINTS EXAMINATION AND FORENSIC PHOTOGRAPHY

Subject Code: BMFSS1-201

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

Duration: 45 Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of fingerprints and forensic photography.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcome (CO): After the completion of the course, student will be able to:

CO1: Understand the concept of Fingerprints.

CO2: Understand the importance of fingerprint evidence in solving crimes.

CO3: Gain knowledge regarding classification of fingerprints.

CO4: Understand the concept of development of prints.

Unit-I (15Hrs.)

History and development of finger prints as a science for personal, identification, Finger Prints Bureau.

Classification of finger Prints: Pattern types, pattern area, Henry system of classification (Primary to tertiary and key classification) extension of Henry system searching of finger prints, classification system, single digit classification system.

Palm prints, Sole prints: Importance, classification and examination.

Unit-II (12 Hrs.)

Chance Finger Prints: Latent prints, plastic prints, causes, composition of sweat. Development of latent fingerprints: Conventional methods as fluorescent powder, magnetic powder. Fuming–methods: Iodine and cyanoacrylate methods. Chemical methods: Ninhydrin and its analogue silver nitrate, enhancement of latent prints, application of laser technologies, metal deposition method. Biological methods of development of latent prints on skin.

Unit-III (10 Hrs.)

Systematic approach to latent print processing, preserving and lifting of fingerprints. Photography of Finger Prints, comparison of fingerprints: basis of comparison, class characteristics, individual characteristics, various types of ridge characteristics.

Automatic Finger Print Identification system (AFIS) and its variants, digital Image processing of fingerprints and their enhancement.

Unit-IV (08 Hrs.)

Photography: Basic principles and techniques, Exposing, Developing and Printing, Modern Developments in Photography, Digital Photography, Videography/ High speed Photography. Crime Scene and Laboratory Photography.

Recommended Books:

- 1) David R. Ashbaugh (1999), **Quantitative and Qualitative Friction Ridge Analysis**, CRC Press.
- 2) E. Roland Menzel (Second Edition) (1999), **Fingerprint Detection with Loseres**, Marcel Dekker, Inc.
- 3) Cowger and James F. (1993), **Friction Ridge skin: Comparison and Identification of Fingerprints**, Elsevier New York, CRC Press London.
- 4) Cummins and Midlo (1943), **Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics**, The Blakiston office London.
- 5) Cherril, F.R. (1954), **The Finger Prints. Systemat Scotland Yard**, Her Majesty's office, London.
- 6) Wentworth and Wilder (1957), **Personal Identification**, Richard. G. Badger. Boston.
- 7) Mehta, M.K. (1980), **Identification of Thumb Impression & Cross Examination of Finger Prints**, N. M. Tripathi (P) Ltd. Bombay.
- 8) Moenssens (1975), **Finger Prints Techniques**, Chitton Book Co., Philadelphia, New York.
- 9) Allison H.C. (1stEdition) (1973) **Personal Identification**, Holbrook Press.
- 10) Chatterjee S.K. and Hague R.V. (1988), **Fingerprints or Dactyloscopy and Ridgeoscopy**.
- 11) E. Ronald Menzel (1997), **Amanual of Fingerprint Identification: Finger Print Detection with Lasers**.
- 12) H.C. Lee, R.E. Gaensslen and S.R. Ramotowski (3rd Edition) (2013), **Advances in Fingerprint Technology**, CRC Press, Boca Raton.
- 13) C. Champod, C. Lennard, P. Margot, M. Stoilovic (2004), **Fingerprints and Other Ridge Skin Impression (International Forensic Science and Investigation Series)**, CRC Press, Boca Raton.
- 14) B.C. Bridges, Vollmer A. and M. Monir (2002), **Criminal Investigation Practical Finger Printing, Thumb Impressions, Hand Writing, Expert Testimony, Opinion Evidence**, Allahabad University Book Agency.
- 15) David R. Ashbaugh (1999), **Quantitative and Qualitative Friction Ridge Analysis**, CRC Press.
- 16) E. Rol and Menzel (Second Edition) (1999), **Fingerprint Detection with Loseres**, Marcel Dekker, Inc.
- 17) Cowger and James F. (1993), **Friction Ridge skin: Comparison and**

- Identification of Fingerprints**, Elsevier New York, CRC Press London.
- 18) Cummins and Midlo (1943), **Finger Prints, Palms and Soles: An Introduction to Dermatoglyphics**, The Blakiston office London.
 - 19) Cherril, F.R. (1954), **The Finger Prints. Systemat Scotland Yard**, Her Majesty's office, London.
 - 20) Wentworth and Wilder (1957), **Personal Identification**, Richard. G. Badger. Boston.
 - 21) Mehta, M.K. (1980), **Identification of Thumb Impression & Cross Examination of Finger Prints**, N. M. Tripathi (P) Ltd. Bombay.
 - 22) Moenssens (1975), **Finger Prints Techniques**, Chitton Book Co., Philadelphia, New York.
 - 23) Allison H.C. (1st Edition) (1973) **Personal Identification**, Holbrook Press.
 - 24) Chatterjee S.K. and Hague R.V. (1988), **Fingerprints or Dactyloscopy and Ridgeoscopy**.
 - 25) E. Ronald Menzel (1997), **Amanual of Fingerprint Identification: Finger Print Detection with Lasers**.
 - 26) H.C. Lee, R.E. Gaensslen and S.R. Ramotowski (3rd Edition) (2013), **Advances in Fingerprint Technology**, CRC Press, Boca Raton.
 - 27) C. Champod, C. Lennard, P. Margot, M. Stoilovic (2004), **Fingerprints and Other Ridge Skin Impression (International Forensic Science and Investigation Series)**, CRC Press, Boca Raton.
 - 28) B.C. Bridges, Vollmer A. and M. Monir (2002), **Criminal Investigation Practical Finger Printing, Thumb Impressions, Hand Writing, Expert Testimony, Opinion Evidence**, Allahabad University Book Agency.
 - 29) Daluz H.M (2015), **Fingerprint Analysis Laboratory Workbook**, CRC Press.

QUESTIONED DOCUMENT AND FINGERPRINT LABORATORY

Subject Code: BMFSS1-202

**L T P C
0 0 2 1**

Duration: 30 Hrs.

Course Objectives:

1. To understand basic understanding of lab practices including safety measures.
2. To develop and analyse the different fingerprint patterns.
3. To identify core, delta and to do ridge counting and ridge tracing.
4. To use physical and chemical methods to develop latent prints

Course Outcomes (CO): The completion of the practical will make student to acquire the knowledge of:

CO1: Different Safety measures in lab.

CO2: Analysing the fingerprint evidence.

CO3: Development of latent print from crime scene.

1. How to procure fingerprints & method of taking fingerprints manually (rolled & plain).
2. To carry out ten digit classification of fingerprints.
3. To identify different fingerprint patterns.
4. To identify core and delta.
5. To carry out ridge tracing and ridge counting.
6. To investigate physical methods of fingerprint detection.
7. To investigate chemical methods of fingerprint detection.
8. Sole prints comparison and their lifting from the scene of crime.
9. Palm prints comparison and their lifting from the scene of crime.
10. Evaluation of Crime scene and photographs.

Recommended Books:

1. J.E. Cowger, Friction Ridge Skin, CRC Press, Boca Raton (1983).
2. D.A. Ashbaugh, Quantitative-Qualitative Friction Ridge Analysis, CRC Press, Boca Raton (2000).
3. C. Champod, C. Lennard, P. Margot an M. Stoilovic, Fingerprints and other Ridge Skin Impressions, CRC Press, Boca Raton (2004).
4. Lee and Gaensleen's, Advances in Fingerprint Technology, 3rd Edition, R.S. Ramotowski (Ed.), CRC Press, Boca Raton (2013).

CHEMISTRY LAB-II

Subject Code: BSNMS1-208

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

Duration: 60 Hrs.

Course Objectives:

1. To understand the concepts behind crystallization
2. To understand the determination of melting points and effect of impurities on m.p.
3. To understand various purification techniques used for purification.
4. To make students familiar with the determination of physical properties i.e; Viscosity, surface tension, rate of reaction and enthalpy of reaction.

Course Outcomes: After completion of course students will acquire the knowledge and practical hands on training of

CO1: Purification of organic compound using various solvent combinations

CO2: Determination of melting and boiling points of various organic compound

CO3: Chromatographic techniques

CO4: Calculation of physical properties i.e; Viscosity, surface tension, rate of reaction and enthalpy of reaction.

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: Experimental 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 C₂H₅OH and glycerine solution in water
4. Calculation of the enthalpy of ionization of ethanoic acid.

Recommended Books:

Latest edition of:

1. H. Denny, W. Roesky, 'Chemical Curiosities', WILEY VCH.
2. J. Mendham, R.C. Denney, J.D. Barnes, M.Thomas, 'Vogel's Textbook of Quantitative Analysis', Pearson Education.
3. G. Svehla, 'Vogel's Textbook of Quantitative Analysis', Pearson Education.

GROUP-1

PLANT ECOLOGY & TAXONOMY

Subject Code: BMFSS1-203

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

Duration: 60 Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of plant ecology & Taxonomy.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes (CO): The completion of the course will make student to acquire the knowledge of:

CO1: Plant communities and their characteristics.

CO2: Ecosystem and its structure.

CO3: Pollution and ecological footprints

Unit-1 (15 Hours)

Introduction Ecological factors: Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes.

Plant communities: Characters; Ecotone and edge effect; Succession; Processes and types.

Ecosystem: Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; biogeochemical cycling; Cycling of carbon, nitrogen and Phosphorous

Pollution: Types, control and prevention

Ecological Footprints: Carbon footprint, Carbon dating

Unit-2 (15 Hours)

Introduction to plant taxonomy: Identification, Classification, Nomenclature.

Identification: Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access

Botanical nomenclature: Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Unit-3 (15 Hours)

Classification: Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (up to series).

Unit-4 (15 Hours)

Complete description of families: Brassicaceae (Brassica, Iberis), Asteraceae (Sonchus, Ageratum), Solanaceae (Solanum, Withania), Lamiaceae (Salvia, Ocimum), Liliaceae, (Asphodelus), Ranunculus (Ranunculus), Gramineae (Triticum, Oryza)

Suggested Readings:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi.
5. J.S. Singh, S.P. Singh, S.R. Gupta (2015) Ecology, Environmental Science & Conservation S. Chand Publisher.

MRSPTU

BOTANY LAB-II

Subject Code: BMFSS1-204

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

Duration: 60 Hrs.

Course Objectives:

1. To understand basic understanding of lab practices including safety measures.
2. To analyse soil samples
3. To analyse the morphological adaptations of hydrophytes and xerophytes.

Course Outcomes (CO): The completion of the practical will make student to acquire the knowledge of:

CO1: Different Safety measures in lab.

CO2: Analysis of the soil

CO3: Analysis of microclimatic variables

1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter
2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.
3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each).
(b) Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobancha*), Epiphytes, Predation (Insectivorous plants)
5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method (Species to be listed).
6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae -*Brassica*, Alyssum / *Iberis*; Asteraceae -*Sonchus/Launaea*, *Vernonia/Ageratum*, *Eclipta/Tridax*; Solanaceae -*Solanum nigrum*, *Withania*; Lamiaceae -*Salvia*, *Ocimum*; Liliaceae -*Asphodelus / Lilium / Allium*.
8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Suggested Readings:

1. Kormondy, E.J. (1996). Concepts of Ecology. Prentice Hall, U.S.A. 4th edition
2. Sharma, P.D. (2010) Ecology and Environment. Rastogi Publications, Meerut, India. 8th edition.
3. Simpson, M.G. (2006). Plant Systematics. Elsevier Academic Press, San Diego, CA, U.S.A.
4. Singh, G. (2012). Plant Systematics: Theory and Practice. Oxford & IBH Pvt. Ltd., New Delhi.
5. J.S. Singh, S.P. Singh, S.R. Gupta (2015) Ecology, Environmental Science & Conservation S. Chand Publisher.

DIVERSITY OF ANIMALS-II

Subject Code: BMFSS1-205

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

Duration: 60 Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of diversity of animals.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes (CO): The completion of the course will make student to acquire the knowledge of:

CO1: General characteristics and classification of chordates.

CO2: Agnatha, Pisces, Aves.

CO3: Reptilia, Mammals and Zoogeography.

Unit 1 (15 Hours)

Introduction to Chordates General characteristics and outline classification

Protochordata General Characteristics of Hemichordata, Urochordata and Cephalochordata; Study of larval forms in protochordates; Retrogressive metamorphosis in Urochordata

Unit-2 (15 Hours)

Origin of Chordata Dipleurula concept and the Echinoderm theory of origin of chordates
Advanced features of vertebrates over Protochordata

Agnatha General characteristics and classification of cyclostomes up to class

Unit-3 (15 Hours)

Pisces General Characteristics of Chondrichthyes and Osteichthyes, classification up to order
Migration, Osmoregulation and Parental care in fishes

Amphibia Origin of Tetrapoda (Evolution of terrestrial ectotherms); General characteristics and classification up to order; Parental care in Amphibians.

Unit-4 (15 Hours)

Reptilia General characteristics and classification up to order; Affinities of Sphenodon; Poison apparatus and Biting mechanism in snakes.

Aves General characteristics and classification up to order Archaeopteryx-- a connecting link; Principles and aerodynamics of flight, Flight adaptations and Migration in birds

Mammals General characters and classification up to order; Affinities of Prototheria; Adaptive radiation with reference to locomotory appendages

Zoogeography Zoogeographical realms, Theories pertaining to distribution of animals, Plate tectonic and Continental drift theory, distribution of vertebrates in different.

Recommended Books:

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.

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2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002).
3. Invertebrates: A New Synthesis, III Edition, Blackwell Science Young, J. Z. (2004).
4. The Life of Vertebrates. III Edition. Oxford university press.
5. Pough H. Vertebrate life, VIII Edition, Pearson International.
6. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

MRSPTU

ZOOLOGY LAB-II

Subject Code: BMFSS1-206

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

Duration: 60 Hrs.

Course Objectives:

1. To understand basic understanding of lab practices including safety measures.
2. To analyse the slides prepared
3. To analyse the photographs of various fishes.

Course Outcomes (CO): The completion of the practical will make student to acquire the knowledge of:

CO1: Different Safety measures in lab.

CO2: Analysis of the identification marks of poisonous and non-poisonous snakes.

CO3: Analysis of Amphibia.

1. Protochordata Balanoglossus, Herdmania, Branchiostoma, Colonial Urochordata Sections of Balanoglossus through proboscis and branchiogenital regions, Sections of Amphioxus through pharyngeal, intestinal and caudal regions. Permanent slide of Herdmania spicules
2. Agnatha, Petromyzon, Myxine
3. Fishes: Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetrodon/ Diodon, Anabas, Flat fish
4. Amphibia: Ichthyophis/Ureotyphlus, Necturus, Bufo, Hyla, Alytes, Salamandra
5. Reptilia: Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus Key for Identification of poisonous and non-poisonous snakes
6. Aves: Study of six common birds from different orders. Types of beaks and claws
7. Mammalia: Sorex, Bat (Insectivorous and Frugivorous), Funambulus, Loris, Herpestes, Erinaceus.

SUGGESTED READINGS

1. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press.
2. Pough H. Vertebrate life, VIII Edition, Pearson International.
3. Darlington P.J. The Geographical Distribution of Animals, R.E. Krieger Pub Co.
4. Hall B.K. and Hallgrimsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

GROUP-2

ELECTRICITY, MAGNETISM AND EMT

Subject Code: BSNMS1-202

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

Duration: 60 Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of electricity, magnetism and emt.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcome (CO): After the completion of the course, Student will be able to

CO1: Understand the concepts of vector Algebra.

CO2: Understand the basic concepts of electrostatics

CO3: Gain the knowledge about the basic concepts of magneto-statics

CO4: Learn the concept of Maxwell equation and electromagnetic waves.

UNIT-I (13 Hrs)

Vector Analysis: 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 (16 Hrs)

Electrostatics: 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, Polarization, Displacement vector. Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

UNIT-III (16 Hrs)

Magnetism: 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 (15 Hrs)

Maxwell's equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in

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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 McGraw Hill.
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.

MRSPTU

DIFFERENTIAL EQUATIONS-I

Subject Code: BSNMS1-205

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

Duration: 45 Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of differential equations.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes:

CO1: Understand the concept of ordinary differential equation, its formation, order and degree.

CO2: Apply various methods to solve first order non-linear differential equation.

CO3: Solve linear differential equations of higher order by using various methods.

CO4: Apply differential equations to significant applied and theoretical problems.

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.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of differential equations.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcomes:

- CO1: Understand the concept of first order and linear partial differential equation.
CO2: Apply various power series methods to find series solution of differential equation.
CO3: Recognize the major classification of PDEs and the qualitative differences between the classes of equations.
CO4: Understand the formation and solution of some significant PDEs like wave and heat equation.

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, Sturm 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.

ELECTRICITY, MAGNETISM AND EMT LAB

Subject Code: BSNMS1-207

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

Duration: 60 Hrs.

Course Objectives:

1. To ensure students can achieve an up-to-date level of understanding of electricity, magnetism and emt.
2. To provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
3. To provide knowledge of latest published findings.

Course Outcome (CO): After the completion of the course, Student will be able to

CO1: Take measurements by using Multimeter.

CO2: Learn the measurement of charge, current and resistance using Method.

CO3: Determine resonance in LCR circuit.

CO4: Verify the Thevenin, Norton theorem and Maximum Power Transfer Theorem

List of Experiments:

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 (Determined B/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 Nortonththeorem
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