

FACULTY OF SCIENCES

SYLLABUS

FOR

M.Sc. CHEMISTRY
(FIVE YEARS INTEGRATED COURSE)
(UNDER THE SCHEME OF HONOURS SCHOOL)
(Credit Based Evaluation & Grading System)
(Semester : I-II)

Examinations: 2019-20



GURU NANAK DEV UNIVERSITY
AMRITSAR

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- (ii) Subject to change in the syllabi at any time.
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M.Sc. (Chemistry) (Five Years Integrated Course) (CBEGS) (Semester System)
(UNDER THE SCHEME OF HONOURS SCHOOL)

SCHEME

SEMESTER-I

SEM	CORE COURSE	Compulsory Course Ability Enhancement	Elective Course Ability Enhancement	Discipline Specific Elective DSE	Generic Elective
I	CHL 101: Inorganic Chemistry-I: Atomic Structure & Chemical Bonding (4) CHL 102: Organic Chemistry-I: Chemistry of Hydrocarbons and Alkyl halides (4) CHP 101: Inorganic Chemistry-I Lab Volumetric Analysis-I (2) CHP 102: Organic Chemistry-I Lab Simple Techniques in Synthesis Lab (2)	ENL-101 Communicative English-I PBL-121 Punjabi Compulsory OR PBL-122 *ਮੁੱਢਲੀ ਪੰਜਾਬੀ OR HSL-101 **Punjab History & Culture SOA-101 ***Drug Abuse: Problem, Management and Prevention (Compulsory ID)			GE-1 Physics PHL 191: Optics (4) PHP 191: Optics (2) MTL-143: Mathematics I (3 + 1)

Note :

- *Special Paper in lieu of Punjabi Compulsory.**
- **For those students who are not domicile of Punjab.**
- ***Students can opt this Paper whether in 1st or 2nd Semester.**

M.Sc. (Chemistry) (Five Years Integrated Course) (CBEGS) (Semester System)
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SEMESTER-II

II	<p>CHL 110: Inorganic Chemistry-II: Chemistry of s, p, d and f Block Elements (4)</p> <p>CHL 111: Physical Chemistry-I: States of Matter and Ionic Equilibria (4)</p> <p>CHP 110: Inorganic Chemistry-II Lab Qualitative Analysis (2)</p> <p>CHP 111: Physical Chemistry-I: Lab (2)</p>	<p>ENL-151 Communicative English-II</p> <p>PBL-131 Punjabi Compulsory</p> <p>OR</p> <p>PBL-132 *ਮੁੱਢਲੀ ਪੰਜਾਬੀ</p> <p>OR</p> <p>HSL-102 **Punjab History & Culture</p> <p>SOA-101 ***Drug Abuse: Problem, Management and Prevention (Compulsory ID)</p>			<p>GE-2 Physics</p> <p>PHL-196 :Modern Physics-I (4)</p> <p>PHP 196: Electgricity & Magnetism Lab(2)</p> <p>MTL-144: Mathematics II (3 + 1)</p>
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#Only limited seats available in each optional course. Any of the mentioned optional courses may be withdrawn at any given time without prior information.

Note:

1. *Special Paper in lieu of Punjabi Compulsory.
2. **For those students who are not domicile of Punjab.
3. ***Student can opt this Paper whether in 1st or 2nd Semester.

*Note : PSL-053 ID Course Human Rights & Constitutional Duties (Compulsory ID Paper). Students can opt. this paper in any semester except the 1st Semester. This ID Paper is one of the total ID Papers of this course.

CHL 101: INORGANIC CHEMISTRY-I
Atomic Structure and Chemical Bonding

Time: 3 Hours

Credit: 4-0-0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objectives:

- Develop understanding for the concepts of structure and bonding
- Appreciate the variation in the different types of structure and bonding exhibited by inorganic compounds
- Enrich their factual knowledge of chemistry related to ionic and covalent compounds

Section-A

(15 Lectures)

Atomic Structure and Chemical Periodicity: The origin and distribution of the elements, The structure of the periodic table, The de Broglie relationship, The uncertainty principle, Schrodinger wave equation and its derivation, Energy quantization, Significance of wave function. The Born interpretation, Quantum numbers, Normal and orthogonal wave functions, Radial and angular probability distribution curves, The building up principle in many electron atoms, Penetration and shielding (The Slater's rules), Atomic parameters and their variation in periodic table, Electronegativity and various scales, Variation of electronegativity with partial charges and hybridization, Electroneutrality principle, Hardness and softness, Perturbation theory.

Section-B

(15 Lectures)

Ionic Compounds-I: Properties of ionic substances, Occurrence of ionic bonding, The radius ratio rules, 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.

Section-C(15 Lectures)

Ionic Compounds-II: Lattice energy, Born-Haber cycle, The calculations of the lattice energy on the basis of Born-Lande equation, The predictive power of thermochemical calculations on ionic compounds, Covalent character in predominantly ionic compounds, Imperfections of crystals, Conductivity in ionic solids, Band theory, Intrinsic and photoexcited semiconductors, Transistors, High temperature superconductors.

M.Sc. (Chemistry) (Five Years Integrated Course) (CBEGS) (Semester-I)
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Section-D

(15 Lectures)

The Covalent Bond: The Lewis theory, Valence bond theory - A mathematical approach, Resonance, Valence Shell Electron Pair Repulsion Model (VSEPR theory), Prediction of structures and variation of bond angles on the basis of VSEPR theory, Shortcomings of VSEPR theory, Concept of hybridization, Rules for obtaining hybrid orbitals, Extent of d-orbital participation in molecular bonding (SO_2 , PCl_5 , SO_3), Molecular orbital theory (LCAO method), Symmetry of molecular orbitals, Applications of MOT to homo- and hetero-nuclear diatomic molecules, Molecular orbital energy level diagrams (Be_2 , N_2 , O_2 , F_2 , LiH , NO , CO , HCl , NO_2 , BeH_2 , NO_2^-).

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 Ed, Pearson Education, Singapore, 1999.
3. J. D. Lee, Concise Inorganic Chemistry, ELBS, Oxford 1994.

CHL 102: ORGANIC CHEMISTRY- I
Chemistry of Hydrocarbons and Alkyl Halides

Credit: 4-0-0

Time: 3 Hours

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objectives:

- The objective of this course is to familiarize the students with the basic chemistry of aliphatic, aromatic hydrocarbons and stereochemistry of organic compounds.
- The course content will provide basic knowledge of organic reaction mechanisms, reactive intermediates, methods of formation and reactions of alkanes, cycloalkanes, alkenes, alkynes, aromatic compounds, alkyl halides and their derivatives.

Section-A

(15 Lectures)

Basics of Organic Chemistry

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties.

Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment; Organic acids and bases; their relative strength.

Homolytic and Heterolytic fission with suitable examples. Curly arrow rules, formal charges; Electrophiles and Nucleophiles; Nucleophilicity and basicity; Types, shape and their relative stability of Carbocations, Carbanions, Free radicals and Carbenes.

Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions.

Stereochemistry

Fischer Projection, Newmann and Sawhorse Projection formulae and their interconversions; Geometrical isomerism: cis-trans and, syn-anti isomerism E/Z notations with C.I.P rules.

Optical Isomerism: Optical Activity, Specific Rotation, Chirality/Asymmetry, Enantiomers, Molecules with two or more chiral-centres, Distereoisomers, meso structures, Racemic mixture and resolution. Relative and absolute configuration: D/L and R/S designations.

Section-B

(15 Lectures)

Chemistry of Aliphatic Hydrocarbons

Carbon-Carbon sigma bonds: Chemistry of alkanes: Formation of alkanes, Wurtz Reaction, Wurtz-Fittig Reactions, Free radical substitutions: Halogenation -relative reactivity and selectivity.

Cycloalkanes and Conformational Analysis: Types of cycloalkanes and their relative stability, Baeyer strain theory, Conformation analysis of alkanes: Relative stability: Energy diagrams of cyclohexane: Chair, Boat and Twist boat forms; Relative stability with energy diagrams.

Carbon-Carbon pi bonds: Formation of alkenes and alkynes by elimination reactions, Mechanism of E1, E2, E1cb reactions. Saytzeff and Hofmann eliminations.

Reactions of alkenes: Electrophilic additions their mechanisms (Markownikoff/AntiMarkownikoff addition), mechanism of oxymercuration-demercuration, hydroboration-oxidation, ozonolysis, reduction (catalytic and chemical), syn and anti-hydroxylation (oxidation). 1,2-and 1,4-addition reactions in conjugated dienes and, Diels-Alder reaction; Allylic and benzylic bromination and mechanism, e.g. propene, 1-butene, toluene, ethyl benzene.

Reactions of alkynes: Acidity, Electrophilic and Nucleophilic additions. Hydration to form carbonyl compounds, Alkylation of terminal alkynes.

Section-C

(15 Lectures)

Chemistry of Aromatic Hydrocarbons

Aromaticity: Hückel's rule, aromatic character of arenes, cyclic carbocations/carbanions and heterocyclic compounds with suitable examples. Electrophilic aromatic substitution: halogenation, nitration, sulphonation and Friedel-Craft's alkylation/acylation with their mechanism. Directing effects of the groups.

Polynuclear Hydrocarbons: Reactions of naphthalene phenanthrene and anthracene Structure, Preparation and structure elucidation and important derivatives of naphthalene and anthracene; Polynuclear hydrocarbons.

Section-D

(15 Lectures)

Chemistry of Halogenated Hydrocarbons

Alkyl halides: Methods of preparation, nucleophilic substitution reactions – S_N1, S_N2 and S_Ni mechanisms with stereochemical aspects and effect of solvent etc.; nucleophilic substitution vs. elimination.

Aryl halides: Preparation, including preparation from diazonium salts. nucleophilic aromatic substitution; S_NAr, Benzyne mechanism.

Relative reactivity of alkyl, allyl/benzyl, vinyl and aryl halides towards nucleophilic substitution reactions.

Organometallic compounds of Mg and Li – Use in synthesis of organic compounds.

Reference Books:

1. Morrison, R. N. & Boyd, R. N. *Organic Chemistry*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. *Organic Chemistry (Volume 1)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. *Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products)*, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. *Stereochemistry of Organic Compounds*, Wiley: London, 1994.
5. Kalsi, P. S. *Stereochemistry Conformation and Mechanism*, New Age International, 2005.
6. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.

CHP 101: Inorganic Chemistry-I Lab
Volumetric analysis-I

Credit 0-0-2

Objectives:

- Provide a positive, enjoyable learning experience, soundly based on scientific principles and practice
- Foster good laboratory practice and develop technical skills relevant to quantitative analysis
- Provide an environment which encourage an inquiring, investigate approach, developing competence and confidence
- Supplement and reinforce chemical principles taught in the theory units

(A) Titrimetric Analysis

- (i) Calibration and use of apparatus
- (ii) Preparation of solutions of different Molarity/Normality of titrants

(B) Acid-Base Titrations

- (i) Estimation of carbonate and hydroxide present together in mixture.
- (ii) Estimation of carbonate and bicarbonate present together in a mixture.
- (iii) Estimation of free alkali present in different soaps/detergents

(C) Oxidation-Reduction Titrimetry

- (i) Estimation of Fe(II) and oxalic acid using standardized KMnO_4 solution.
- (ii) Estimation of oxalic acid and sodium oxalate in a given mixture.
- (iii) Estimation of Fe(II) with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal (diphenylamine, anthranilic acid) and external indicator.

(D) Iodo / Iodimetric Titrations

- (i) Estimation of Cu(II) and $\text{K}_2\text{Cr}_2\text{O}_7$ using sodium thiosulphate solution (Iodimetrically).
- (ii) Estimation of (a) arsenite and (b) antimony in tartar-emeti iodimetrically
- (iii) Estimation of available chlorine in bleaching powder iodometrically.

Reference text:

1. Mendham, J., A. I. Vogel's *Quantitative Chemical Analysis 6th Ed.*, Pearson, 2009.

CHP 102: Organic Chemistry-I Lab
Simple Techniques in Synthesis Lab

Credit: 0-0-2

Objectives:

- The objective of this course is to familiarize the students with the basic techniques like m.p., boiling point, purification of compounds by crystallization, distillation and chromatographic techniques.
 - Student will also learn to determine the presence of nitrogen, halogens and sulfur in organic compounds.
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)
 6. Chromatography
 - a. Separation of a mixture of two amino acids by ascending and horizontal paper chromatography
 - b. Separation of a mixture of two sugars by ascending paper chromatography
 - c. Separation of a mixture of o-and p-nitrophenol or o-and p-aminophenol by thin layer chromatography (TLC) and column chromatography.
 7. Detection of nitrogen, halogens and sulphur in organic compounds

Reference Books

1. Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry*, Pearson Education (2009)
2. Furniss, B.S.; Hannaford, A.J.; Smith, P.W.G.; Tatchell, A.R. *Practical Organic Chemistry*, 5th Ed., Pearson (2012)

ENL-101 : COMMUNICATIVE ENGLISH-I**Credits: 02 (L= 2, T=0, U=0)****Time: 3 Hours****Max. Marks: 100****Mid Semester Marks : 20****End Semester Marks : 80****Mid Semester Examination: 20% weightage****End Semester Examination: 80% weightage****Instructions for the Paper Setters:**

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objective: To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

Prescribed Text books:

- *The Written Word* by Vandana R. Singh, Oxford University Press, New Delhi.
- *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

Section-A

“Word List”, “Correct Usage of Commonly used words and Phrases” from the chapter “Vocabulary” given in *The Written Word* by Vandana R. Singh.

Section-B

Letter- writing as prescribed in *The Written Word* by Vandana R. Singh.
Report writing as prescribed in *The Written Word* by Vandana R. Singh.

Section-C

Section 1 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

Section-D

Section 2 from *Making Connections: A Strategic Approach to Academic Reading* by Kenneth J. Pakenham, Second Edition.

PBL 121 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - I

Credit : 2-0-0

Time: 3 Hours

Max. Marks: 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇੱਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਸੈਕਸ਼ਨ-ਦੇ

1. **ਦੋ ਰੰਗ** (ਸੰਖਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਭਾਈ ਵੀਰ ਸਿੰਘ
(ਅ) ਧਨੀ ਰਾਮ ਚਾੜ੍ਹਕ
(ੲ) ਪ੍ਰੋ. ਪੂਰਨ ਸਿੰਘ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਗੁਰਮੁਖੀ ਔਰਥੋਗਰਾਫੀ ਦੀ ਜੁਗਤ (ਪੈਂਤੀ, ਮੁਹਾਰਨੀ, ਬਿੰਦੀ, ਟਿੱਪੀ ਤੇ ਅੱਧਕ); ਵਿਸਰਾਮ ਚਿੰਨ੍ਹ, ਸ਼ਬਦ ਜੋੜ (ਸੁਧ-ਅਸੁਧ)

ਸੈਕਸ਼ਨ-ਬੀ

1. **ਦੋ ਰੰਗ** (ਸੰਖਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਫਿਰੋਜ਼ਦੀਨ ਸ਼ਰਫ
(ਅ) ਪ੍ਰੋ. ਮੋਹਨ ਸਿੰਘ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਲੇਖ ਰਚਨਾ (ਜੀਵਨੀ-ਪਰਕ, ਸਮਾਜਕ ਅਤੇ ਚਲੰਤ ਵਿਸ਼ਿਆਂ ਉੱਤੇ) : 10 ਲੇਖ ਲਿਖਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਅਤੇ ਘਰ ਲਈ ਅਭਿਆਸ)

M.Sc. (Chemistry) (Five Years Integrated Course) (CBEGS) (Semester-I)
(UNDER THE SCHEME OF HONOURS SCHOOL)

ਸੈਕਸ਼ਨ-ਸੀ

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਨੰਦ ਲਾਲ ਨੂਰਪੁਰੀ
(ਅ) ਅਮ੍ਰਿਤਾ ਪ੍ਰੀਤਮ
(ੲ) ਡਾ. ਹਰਿਭਜਨ ਸਿੰਘ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਸ਼ੁੱਧ, ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿੱਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦਾਂ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ
(15 ਪੈਰ੍ਹਿਆਂ ਦੇ ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ ਅਭਿਆਸ ਕਰਵਾਉਣੇ)

ਸੈਕਸ਼ਨ-ਡੀ

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਵੀ :
(ੳ) ਸ਼ਿਵ ਕੁਮਾਰ ਬਟਾਲਵੀ
(ਅ) ਸੁਰਜੀਤ ਪਾਤਰ
(ਕਵੀ ਦਾ ਜੀਵਨ, ਕਵਿਤਾ-ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਾਵਿ-ਕਲਾ)
- II. ਅਖਬਾਰੀ ਇਸ਼ਤਿਹਾਰ : ਨਿੱਜੀ, ਦਫ਼ਤਰੀ ਤੇ ਸਮਾਜਕ ਗਤੀਵਿਧੀਆਂ ਨਾਲ ਸੰਬੰਧਤ

PBL-122: ਮੁੱਢਲੀ ਪੰਜਾਬੀ
(In lieu of Punjabi Compulsory)

Credits: 2-0-0

Time: 3 Hours

Max. Marks: 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ

ਸੈਕਸ਼ਨ-ਦੇ

ਪੈਂਤੀ ਅੱਖਰੀ, ਅੱਖਰ ਕ੍ਰਮ,
ਮਾਤ੍ਰਾਵਾਂ (ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ)
ਲਗਾਖਰ (ਬਿੰਦੀ, ਟਿੱਪੀ, ਅੱਧਕ) : ਪਛਾਣ ਤੇ ਵਰਤੋਂ

ਸੈਕਸ਼ਨ-ਬੀ

ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਮੁੱਢਲੀ ਜਾਣ-ਪਛਾਣ
ਸਾਧਾਰਨ ਸ਼ਬਦ, ਸੰਯੁਕਤ ਸ਼ਬਦ, ਮਿਸ਼ਰਤ ਸ਼ਬਦ
ਮੂਲ ਸ਼ਬਦ, ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ

ਸੈਕਸ਼ਨ-ਸੀ

ਸ਼ੁੱਧ ਅਸ਼ੁੱਧ : ਦਿੱਤੇ ਪੈਰ੍ਹੇ ਵਿੱਚੋਂ ਅਸ਼ੁੱਧ ਸ਼ਬਦ ਨੂੰ ਸ਼ੁੱਧ ਕਰਨਾ।
ਸਮਾਨਾਰਥਕ ਤੇ ਵਿਰੋਧਾਰਥਕ ਸ਼ਬਦ

ਸੈਕਸ਼ਨ-ਡੀ

ਹਫਤੇ ਦੇ ਸੱਤ ਦਿਨਾਂ ਦੇ ਨਾਂ, ਬਾਰਾਂ ਮਹੀਨਿਆਂ ਦੇ ਨਾਂ, ਰੁੱਤਾਂ ਦੇ ਨਾਮ, ਇਕ ਤੋਂ ਸੌ ਤੱਕ ਗਿਣਤੀ ਸ਼ਬਦਾਂ ਵਿੱਚ।

M.Sc. (Chemistry) (Five Years Integrated Course) (CBEGS) (Semester-I)
(UNDER THE SCHEME OF HONOURS SCHOOL)

HSL-101 : Punjab History & Culture (1450-1716)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Credits: 2-0-0

Time: 3 Hours

Max. Marks: 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

1. Land and the People.
2. Bhakti Movement

Section-B

3. Life and Teaching of Guru Nanak Dev.
4. Contribution of Guru Angad Dev, Guru Arjun Dev , Guru Amar Das and Guru Ram Das.

Section-C

5. Guru Hargobind.
6. Martyrdom of Guru Teg Bahadur

Section-D

7. Guru Gobind Singh and the Khalsa.
8. Banda Singh Bahadur: Conquests and Execution.

Suggested Reading

1. Kirpal Singh(ed.), *History and Culture of the Punjab, Part-ii, Punjabi University, Patiala, 1990.*
2. Fauja Singh (ed.), *History of Punjab, Vol, III Punjabi University, Patiala, 1987.*
3. J.S. Grewal, *The Sikhs of the Punjab, Cup, Cambridge, 1991.*
4. Khushwant Singh, *A History of the Sikhs, Vol. I, OUP, New Delhi, 1990*

**SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
(COMPULSORY ID PAPER)**

(Students can opt. this paper whether in 1st or 2nd semester)

PROBLEM OF DRUG ABUSE

Time: 3 Hours

Credit 3-0-0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A

Meaning of Drug Abuse:

- 1) Meaning, Nature and Extent of Drug Abuse in India and Punjab.
- 2) Consequences of Drug Abuse for:

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

Section – B

Management of Drug Abuse:

- (i) Medical Management: Medication for treatment and to reduce withdrawal effects.
- (ii) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- (iii) Social Management: Family, Group therapy and Environmental Intervention.

Section – C

Prevention of Drug abuse:

- (i) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- (ii) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Section – D

Controlling Drug Abuse:

- (i) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- (ii) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

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

PHL-191:OPTICS

Time: 3 Hours

Credit 3-1-0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Interference: Young's experiment, Coherent Source, Phase and Path differences, Theory of interference fringes, Fresnel's biprism, thickness of thin transparent sheet, interference in thin film due to reflected and transmitted light colour of thin film, Newtons rings and their application, Michelson & Febry-Perot Interferometer, Anti reflection coatings, Holography.

15 Lectures

SECTION-B

Diffraction: Introduction, Fraunhofer diffraction at a single slit and its discussion, Fraunhofer diffraction at double slit, missing orders in a double slit, Diffraction of N slits and its discussion, Diffraction grating, Missing orders, dispersive power, Rayleigh Criterion for resolving power, resolving power of a diffraction grating.

15 Lectures

SECTION-C

Polarization: Transverse nature of light, Polarization by reflection and refraction, Brewster's Law, Malus Law, Double refraction, Nicol Prism, Elliptically and circularly polarized light, Quarter-wave and half-wave plates, production and detection of polarized light, Optical activity, specific rotation. Half shade polarimeter.

15 Lectures

SECTION-D

Laser principle and action, Einstein theory of radiation, population inversion, Laser types, He- Ne Laser, Ruby Laser, CO₂ lasers, Semiconductor Laser. Applications of Lasers in medicine and chemistry.

15 Lectures

Reference Books:

1. Text book of Optics: N. Subramanayam, B. Lal and M. N. Avadhamulu
2. Fundamentals of Optics: Jenkins and White
3. Optics : A. K. Ghatak

PHP 191: Physics (Optics Lab)

Credit: 0-0-2

1. Find the refractive index of the glass of the given prism using spectrometer.
2. Find the refractive index of water using hollow prism.
3. Calibrate the prism spectrometer using mercury lamp.
4. Find the wavelength of sodium light using a plane diffraction grating.
5. Find the wavelength of sodium light using Newton's rings method.
6. Find the height of the accessible object using Sextant.
7. Find the height of the inaccessible object using Sextant.

MTL-143: MATHEMATICS – I

Credits: 3-1-0

Time: 3 Hours

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

Functions and Derivatives: Limits, continuity and derivative of function. Differentiation of standard functions, Successive differentiation. Geometrical significance of derivative. Maxima and Minima of a function of single variable. Partial differentiation. Chain rule of differentiation.

15 Lectures

Section-B

Differential Calculus: Statement of Rolle's theorem and Mean value theorem, Taylor's and Maclaurin's theorems and their applications to formal expansion of functions. Tangents and normals. Asymptotes and graphs of simple curves in Cartesian co-ordinates.

15 Lectures

Section-C

Integral Calculus: Integration as inverse of differentiation. Indefinite integrals of standard forms. Method of substitution. Integration using partial fractions. Integration by parts. Reduction formulae. Definite integrals. Definite integral as limit of a sum and geometrical interpretation as an area. Formal double and triple integrals and their uses in the determination of C. G. and Moments of inertia.

15 Lectures

Section-D

Differential Equations: Definition & formation of differential equations. Linear differential equation of first order and first degree. Linear homogenous and inhomogeneous differential equation of second order. Linear differential equations with constant coefficients.

15 Lectures

Text and Reference Books:

- 1 Differential Calculus: Shanti Narayan, New Delhi, Shyam Lal, 1983.
- 2 Integral Calculus: Shanti Narayan, Delhi, S. Chand, 1968.
- 3 Mathematical Hand Book: M. Vygodsky, Mir, Moscow, 1975.
- 4 Higher Engineering Mathematics: B.S. Grewal, Delhi, Khanna, 1995.

CHL 110: Inorganic Chemistry-II
(Chemistry of s, p, d & f block elements)

Time: 3 Hours

Credit: 4-0-0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objectives:

- Develop understanding for the concepts of periodic table
- To develop understanding of periodic properties and their variation in groups and periods
- Enrich their factual knowledge of chemistry related to inorganic compounds

Section-A

(15 Lectures)

Periodicity of Elements: Introduction of s, p, d, f block elements, the long form of periodic table. Detailed discussion of periodic properties of the elements

Comparative Study of s and p Block Elements: IA-VII A and Zero Groups: General remarks about each group, trends in electronic configuration, structure of elements, atomic and ionic, Radii, ionization potential, electron affinity, electronegativity, oxidation states, inert pair effect, catenation and heterocatenation, first and second row anomalies, the use of d orbitals by non-metals, the use of p orbitals in bonding. Important classes of Compounds of s and p block

Section-B

(15 Lectures)

Alkali Metals: Oxides, hydroxides, peroxides and super oxides, halides, hydrides, solutions of metals in liquid ammonia, complexes crowns and cryptands and podands.

Alkaline Earth Metals: Solutions of the metals in liquid ammonia, hydroxides, oxides, sulfates, hydrides, halides, carbides, structures of calcium carbide, structures of basic beryllium acetate $\text{Be}_4\text{O}(\text{CH}_3\text{COO})_6$, beryllium oxalate complexes $\text{Be}(\text{OX})_2$. Structure of chlorophyll 'a'.

Section-C**(15 Lectures)**

Group III (Boron Group): Oxides, halides and hydrides of group III elements, boron sesquioxide and borates structure of borates, trihalides and lower halides of boron, preparation of boron hydrides reactions and structures of boranes.

Group IV (Carbon Group): Structure and allotropy of the elements, types and structure of carbides, oxides of carbon and silicon, types and structures of silicates, Organo-silicon compounds and the silicones, halides of IV group elements.

Group V (Nitrogen Group): Hydrides, properties and structure of ammonia, hydrazine, hydroxylamine, trihalides and Pentahalides of V groups elements, oxides of nitrogen, structure of N_2O , NO , N_2O_3 , N_2O_4 and N_2O_5 , oxo acids of nitrogen and phosphorous, phosphazenes and cyclophosphazenes.

Section-D**(15 Lectures)**

Group VI (Oxygen Group): Structure and allotropy of the elements. Oxides of sulfur (structure of SO_2 and SO_3) oxoacids of sulfur halides of sulfur, selenium and tellurium, compounds of Sulfur and nitrogen (S_4N_4).

Group VII: Oxides of halogens (OF_2 , O_2F_2 , Cl_2O , ClO_2 , Cl_2O_6 , BrO_2 , I_2O_5) (structures), Preparation, reaction and structure interhalogen compounds. (ClF_3 , BrF_3 , I_2 , Cl_5 , IF_5 , IF_7) Polyhalides, basic properties of halogens.

Zero Group: Clathrate compounds, preparation, structure and bonding of noble gas compounds (XeF_2 , XeF_4 , XeF_6 , XeO_3 , XeO_2F_2 , XeO_4).

Books Recommended:

1. J.D. Lee, Concise Inorganic Chemistry, 4th Ed.
2. J.E. Huheey, Inorganic Chemistry, Harper & Row.
3. F.A.Cotton and G. Wilinon, Advanced Inorganic Chemistry, Interscience Publishers.
4. N.N. Greenwood and A. Earnshaw, Chemistry of Elements, Pergamon Press.

CHL 111: PHYSICAL CHEMISTRY-I
(States of Matter and Ionic Equilibria)

Credit: 4-0-0

Time: 3 Hours

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objectives:

- To teach the fundamental concepts and their applications of basic concepts related to three states of matter. The syllabus has been upgraded as per provision of UGC module and demand of academic environment.
- The syllabus contents are arranged unit wise and are placed in such a manner so that due importance is given to requisite intellectual knowledge.

Section-A

(15 Lectures)

Gaseous States: Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of State.

Critical Phenomena: PV isotherms of real gases, continuity 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).

Section-B

(15 Lectures)

Liquid State: Qualitative treatment of the structure of the liquid state; physical properties of liquids; vapour pressure, surface tension and coefficient of viscosity. Effect of various solutes, on surface tension and viscosity. Variation of viscosity of liquids with temperature and comparison with that of gases.

Solid State-I: 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.

Section-C**(17 Lectures)**

Solid State-II: 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. Glasses and liquid crystals.(Laue's method and powder method).

Ionic equilibria-I: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect; dissociation constants of mono-, di-and triprotic acids (exact treatment).

Section-D**(13 Lectures)**

Ionic equilibria-II: Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions; derivation of Henderson equation and its applications; buffer capacity, buffer range, buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. Qualitative treatment of acid – base titration curves (calculation of pH at various stages). Theory of acid–base indicators; selection of indicators and their limitations.

Books Suggested:

1. Principles of physical chemistry **Author:** S. H. Maron & C. F. Prutton.
Publisher: Collier Macmillan Ltd; 4th Revised edition (1 December 1965) **ISBN-10:** 0023762306
2. Physical Chemistry **Author:** K. J. Laidler.
Publisher: Houghton Mifflin; 4th Revised ed. edition (May 1, 2002) **ISBN-10:** 061815292X
3. Physical Chemistry Vol-1
Author: K. L. Kapoor. **Publisher:** Laxmi Publications; Fourth edition (2011) **ISBN-10:** 0230332757
4. Physical chemistry **Author:** W. J. Moore.
Publisher: Longman; 1st Revised edition (24 July 1972) **ISBN-10:** 0582442346

CHP 110: Inorganic Chemistry-II Lab
Qualitative Analysis

Credit 0-0-2

Objectives:

- Provide a positive, enjoyable learning experience, soundly based on scientific principles and practice
- Foster good laboratory practice and develop technical skills relevant to qualitative analysis
- Provide an environment which encourage an inquiring, investigate approach, developing competence and confidence
- Supplement and reinforce chemical principles taught in the theory units

Identification of cations and anions in a mixture which may contain combinations of acid ions. These must contain interfering acid anions and one, the insoluble.

I) Special Tests for Mixture of Anions (do any 8)

- a. Carbonate in the presence of sulphate.
- b. Nitrate in the presence of nitrite
- c. Nitrate in the presence of bromide and iodide.
- d. Nitrate in the presence of chlorate.
- e. Chloride in the presence of bromide and iodide.
- f. Chloride in the presence of bromide.
- g. Chloride in the presence of iodide.
- h. Bromide and iodide in the presence of each other and of chloride.
- i. Iodate and iodide in the presence of each other.
- j. Phosphate, arsenate and arsenite in the presence of each other.
- k. Sulphide, sulphite, thiosulphate and sulphate in the presence of each other.
- l. Borate in the presence of copper and barium salts.
- m. Oxalate in the presence of fluoride.
- n. Oxalate, tartrate, acetate, citrate in the presence of each other.

II) Separation and Identification of Cations in Mixtures

- a. Separation of cations in groups.
- b. Separation and identification of Group I, Group II (Group IIA and IIB), Group III, Group IV, Group V and Group VI cations.
- c. Identification of Cations including Less Familiar Elements by Spot Tests Assisted by Group Analysis (3 cations).

Book:

Vogel's book on Inorganic Qualitative Analysis

CHP 111: Physical Chemistry-I Lab**Credit 0-0-2****Objective:**

- The objective of this lab is to provide hand on experience the properties of matter and correlate with the theory learnt.

1. Preparation of solutions:

Basic concepts and standardization

2. Surface tension measurements.

a. Determine the surface tension by

(i) drop number (ii) drop weight method (iii) capillary rise method.

b. Study the variation of surface tension of detergent solutions with concentration and hence the CMC value.

3. Viscosity measurement using Ostwald's viscometer.

a. Determination of viscosity of aqueous solutions of

(i) polymer (ii) ethanol and (iii) sugar at room temperature.

b. Study the variation of viscosity of sucrose solution with the concentration of solute.

c. Study effect of temperature on viscosity of water.

4. Indexing of a given powder diffraction pattern of a cubic crystalline system.**5. pHmetry**

a. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.

b. Preparation of buffer solutions of different pH

i. Sodium acetate-acetic acid

ii. Ammonium chloride-ammonium hydroxide

c. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.

d. Determination of dissociation constant of a weak acid.

Reference Books

1. Khosla, B. D.; Garg, V. C. & Gulati, A. *Senior Practical Physical Chemistry*, R. Chand & Co.: New Delhi (2011).
2. Garland, C. W.; Nibler, J. W. & Shoemaker, D. P. *Experiments in Physical Chemistry 8th Ed.*; McGraw-Hill: New York (2003).
3. Halpern, A. M. & McBane, G. C. *Experimental Physical Chemistry 3rd Ed.*; W.H. Freeman & Co.: New York (2003).

ENL-151: COMMUNICATIVE ENGLISH-II

Time: 3 Hours

Credits: 02 (L= 2, T=0, U=0)

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objective: To introduce students to the skills and strategies of reading and writing by identifying organizational patterns, spotting classification systems and understanding associations between ideas. This course will prepare students to read a variety of texts and also to communicate more effectively through writing. The course will also pay special attention to vocabulary building.

SECTION-A

Practical question on Note Making, Summarizing and Abstracting as given in The Written Word by Vandana R. Singh

SECTION-B

Practical question on Paragraph writing as prescribed in The Written Word by Vandana R. Singh

SECTION-C

Theoretical questions based on ABC of Good Notes as prescribed in The Written Word by Vandana R. Singh.

Section C from Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition.

SECTION-D

Practical question on Essay writing from The Written Word by Vandana R. Singh Section 4 from Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition.

Prescribed Text books:

- The Written Word by Vandana R. Singh, Oxford University Press, New Delhi.
- Making Connections: A Strategic Approach to Academic Reading by Kenneth J. Pakenham, Second Edition.

PBL 131 : ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ - II

Credit : 2-0-0

Time: 3 Hours

Max. Marks: 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿਚ ਕਰ ਸਕਦਾ ਹੈ।

ਸੈਕਸ਼ਨ-ਏ

- i. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਨਾਨਕ ਸਿੰਘ : **ਭੂਆ**
(ਅ) ਗੁਰਮੁਖ ਸਿੰਘ ਮੁਸਾਫਿਰ : **ਬਾਗੀ ਦੀ ਧੀ**
(ੳ) ਸੰਤ ਸਿੰਘ ਸੇਖੋਂ : **ਪੇਮੀ ਦੇ ਨਿਆਣੇ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- ii. ਪੰਜਾਬੀ ਸ਼ਬਦ ਬਣਤਰ : ਧਾਤੂ/ਮੂਲ, ਵਧੇਤਰ (ਅਗੇਤਰ, ਪਿਛੇਤਰ, ਵਿਉਂਤਪਤ ਅਤੇ ਰੁਪਾਂਤਰੀ), ਸਮਾਸ।

ਸੈਕਸ਼ਨ-ਬੀ

- i. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਸੁਜਾਨ ਸਿੰਘ : **ਬਾਗਾਂ ਦਾ ਰਾਖਾ**
(ਅ) ਕਰਤਾਰ ਸਿੰਘ ਦੁੱਗਲ : **ਤੈਂ ਕੀ ਦਰਦ ਨਾ ਆਇਆ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- ii. ਪੈਰ੍ਹਾ ਰਚਨਾ : ਕਲਾਸ ਵਿਚ 10 ਵਿਸ਼ਿਆਂ (ਸਭਿਆਚਾਰ, ਧਾਰਮਕ ਅਤੇ ਰਾਜਨੀਤਕ) 'ਤੇ ਪੈਰ੍ਹਾ ਰਚਨਾ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ।

M.Sc. (Chemistry) (Five Years Integrated Course) (CBEGS) (Semester-II)
(UNDER THE SCHEME OF HONOURS SCHOOL)

ਸੈਕਸ਼ਨ-ਸੀ

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਕੁਲਵੰਤ ਸਿੰਘ ਵਿਰਕ : **ਧਰਤੀ ਹੇਠਲਾ ਬੋਲਦ**
(ਅ) ਨਵਤੇਜ ਸਿੰਘ : **ਦੂਜੀ ਵਾਰ ਜੇਬ ਕੱਟੀ ਗਈ**
(ੳ) ਪ੍ਰੇਮ ਪ੍ਰਕਾਸ਼ : **ਲੱਛਮੀ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਮੁਹਾਵਰੇ ਤੇ ਅਖਾਣ (ਅਖਾਣ ਤੇ ਮੁਹਾਵਰਾ ਕੋਸ਼ ਵਿਚ) 200 ਮੁਹਾਵਰਿਆਂ ਅਤੇ 100 ਅਖਾਣਾਂ ਨੂੰ ਵਾਕਾਂ ਵਿਚ ਵਰਤਣ ਦੇ ਅਭਿਆਸ ਕਰਵਾਉਣੇ (ਕਲਾਸ ਵਿਚ ਤੇ ਘਰ ਲਈ)।

ਸੈਕਸ਼ਨ-ਡੀ

- I. **ਦੋ ਰੰਗ** (ਸੰਪਾ. ਹਰਜਿੰਦਰ ਸਿੰਘ ਢਿੱਲੋਂ, ਪ੍ਰੀਤਮ ਸਿੰਘ ਸਰਗੋਧੀਆ)
ਗੁਰੂ ਨਾਨਕ ਦੇਵ ਯੂਨੀਵਰਸਿਟੀ, ਅੰਮ੍ਰਿਤਸਰ ਵਿੱਚੋਂ ਹੇਠ ਲਿਖੇ ਕਹਾਣੀਕਾਰ :
(ੳ) ਅਜੀਤ ਕੌਰ : **ਬੁੱਤ ਸ਼ਿਕਨ**
(ਅ) ਦਲੀਪ ਕੌਰ ਟਿਵਾਣਾ : **ਬੱਸ ਕੰਡਕਟਰ**
(ਕਹਾਣੀਕਾਰ ਦਾ ਜੀਵਨ, ਕਹਾਣੀ ਸਾਰ, ਵਿਸ਼ਾ-ਵਸਤੂ, ਕਹਾਣੀ ਕਲਾ)
- II. ਸ਼ਬਦ ਸ਼੍ਰੇਣੀਆਂ : ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ

PBL-132: ਮੁੱਢਲੀ ਪੰਜਾਬੀ
(In lieu of Punjabi Compulsory)

Credits: 2-0-0

Time: 3 Hours

Max. Marks: 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

ਅੰਕ-ਵੰਡ ਅਤੇ ਪਰੀਖਿਅਕ ਲਈ ਹਦਾਇਤਾਂ

1. ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਦੇ ਚਾਰ ਭਾਗ ਹੋਣਗੇ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਵਿਦਿਆਰਥੀ ਨੇ ਕੁੱਲ ਪੰਜ ਪ੍ਰਸ਼ਨ ਕਰਨੇ ਹਨ। ਹਰ ਭਾਗ ਵਿੱਚੋਂ ਇਕ ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹੈ। ਪੰਜਵਾਂ ਪ੍ਰਸ਼ਨ ਕਿਸੇ ਵੀ ਭਾਗ ਵਿੱਚੋਂ ਕੀਤਾ ਜਾ ਸਕਦਾ ਹੈ।
3. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ ਬਰਾਬਰ ਅੰਕ ਹਨ।
4. ਪੇਪਰ ਸੈੱਟ ਕਰਨ ਵਾਲਾ ਜੇਕਰ ਚਾਹੇ ਤਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਵੰਡ ਅੱਗੋਂ ਵੱਧ ਤੋਂ ਵੱਧ ਚਾਰ ਉਪ-ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚ ਕਰ ਸਕਦਾ ਹੈ।

ਪਾਠ-ਕ੍ਰਮ

ਸੈਕਸ਼ਨ-ਏ

ਸਬਦ ਸ੍ਰਣਾਅ : ਪਛਾਣ ਅਤੇ ਵਰਤ

(ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਾਰਆ | ਵਸ਼ਸ਼ਣ)

ਸੈਕਸ਼ਨ-ਬੀ

ਨਤ ਵਰਤ ਦਾ ਪਜਾਬਾ ਸ਼ਬਦਾਵਲਾ : ਬਾਜ਼ਾਰ, ਵਪਾਰ, ਰਸਤ-ਨਾਤੇ, ਖੇਤੀ ਅਤੇ ਹੋਰ ਧੰਦਿਆਂ ਨਾਲ ਸਬੰਧਤ ।

ਸੈਕਸ਼ਨ-ਸੀ

ਪੰਜਾਬੀ ਵਾਕ-ਬਣਤਰ

ਸਾਧਾਰਨ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤ)

ਸੰਯੁਕਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਮਿਸ਼ਰਤ-ਵਾਕ (ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ)

ਸੈਕਸ਼ਨ-ਡੀ

ਪਰ੍ਹਾ ਰਚਨਾ

ਸੰਖੇਪ ਰਚਨਾ

HSL-102 : Punjab History & Culture (1717-1947)
(Special paper in lieu of Punjabi Compulsory)
(For those students who are not domicile of Punjab)

Credits: 2-0-0

Time: 3 Hours

Max. Marks: 100
Mid Semester Marks : 20
End Semester Marks : 80

Mid Semester Examination: 20% weightage
End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section-A

1. Sikh Struggle for Sovereignty.
2. Ranjit Singh : Conquests, Administration and the Anglo-Sikh Relations.

Section-B

3. Anglo-Sikh Wars and the Annexation.
4. The Punjab under the British: New Administration, Education and social Change.

Section-C

5. Economic Changes: Agricultural
6. Socio-Religious Reform Movements.

Section-D

7. Role of Punjab in the Freedom Struggle.
8. Fairs and Festivals.

Suggested Reading

1. Kirpal Singh (ed.), *History and Culture of the Punjab*, Part-II, Punjabi University, Patiala, 1990.
2. Fauja Singh (ed.), *History of Punjab*, Vol, III, Punjabi University, Patiala, 1987.
3. J.S. Grewal, *The Sikhs of the Punjab, Cup, Cambridge, 1991.*
4. Khushwant Singh, *A History of the Sikhs*, Vol. I, OUP, New Delhi, 1990

**SOA-101 : DRUG ABUSE: PROBLEM, MANAGEMENT AND PREVENTION
(COMPULSORY ID PAPER)**

(Student can opt. this paper whether in 1st or 2nd semester)

PROBLEM OF DRUG ABUSE

Time: 3 Hours

Credit 3-0-0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Section – A

Meaning of Drug Abuse:

1. Meaning, Nature and Extent of Drug Abuse in India and Punjab.
2. Consequences of Drug Abuse for:

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

Section – B

Management of Drug Abuse:

- (iv) Medical Management: Medication for treatment and to reduce withdrawal effects.
- (v) Psychiatric Management: Counselling, Behavioural and Cognitive therapy.
- (vi) Social Management: Family, Group therapy and Environmental Intervention.

Section – C

Prevention of Drug abuse:

- (iii) Role of family: Parent child relationship, Family support, Supervision, Shaping values, Active Scrutiny.
- (iv) School: Counselling, Teacher as role-model. Parent-teacher-Health Professional Coordination, Random testing on students.

Section – D

Controlling Drug Abuse:

- (iii) Media: Restraint on advertisements of drugs, advertisements on bad effects of drugs, Publicity and media, Campaigns against drug abuse, Educational and awareness program
- (iv) Legislation: NDPs act, Statutory warnings, Policing of Borders, Checking Supply/Smuggling of Drugs, Strict enforcement of laws, Time bound trials.

References:

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

PHL-196: MODERN PHYSICS I

Time: 3 Hours

Credit: 3 1 0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

SECTION-A

Dual Nature of Matter and Radiation: De Broglie's hypothesis, electron diffraction experiments of Davission and Germer, Wave group and particle velocities, Heisenberg's uncertainty principle, principle of the electron microscope, Diffraction of X-rays from crystals, Planck's quantum hypothesis, Bragg's law of determination of structure of simple crystals.

15 Lectures

SECTION-B

Radioisotopes and their Application: Radioactive decay laws, Uranium and Carbon dating, introduction to α , β and γ decays, Radioisotopes, their production and separation, mass spectrograph, uses of radioisotopes in medicine, agriculture and geology Radiation doses and their units, Biological effects of radiation.

15 Lectures

SECTION-C

Nuclear detection, Ionization detector, proportional counter, Geiger Muller detector, Cloud chamber, Scintillation counter and photographic emulsions as detectors.

15 Lectures

SECTION-D

Elementary particles and cosmic rays, Classification of elementary particles and their properties, conservation laws. Antiparticles, Origin and general characterization of cosmic rays (Primary and Secondary)

15 Lectures

Reference Books:

1. Concepts of Modern Physics: A. Beiser.
2. Essentials of Modern Physics: V. Acota and C. L. Grown
3. Fundamentals of Modern Physics: B.D. Duggal and C. L. Chhabra

PHP-196: ELECTRICITY & MAGNETISM LAB

(4 hrs/ week) Credit: 0-0-2

1. To find the impedance of a AC circuit containing R, L and C in series.
2. To determine the capacitance of a capacitor by discharging through voltmeter.
3. To convert a Weston type galvanometer into a volt meter of range 0-3 volts.
4. To convert a Weston type galvanometer into an ammeter of a given range.
5. Find the internal resistance of a cell using a Voltmeter.
6. To determine the capacitance of a capacitor using flashing & quenching of a neon la

MTL-144 : MATHEMATICS – II

Time: 3 Hours

Credits: 3-1-0

Max. Marks: 100

Mid Semester Marks : 20

End Semester Marks : 80

Mid Semester Examination: 20% weightage

End Semester Examination: 80% weightage

Instructions for the Paper Setters:

Eight questions of equal marks (Specified in the syllabus) are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Objectives- To make the students learn about Differential equations, Laplace and Fourier transforms so that these concepts may be used by them in Chemistry.

Section-A

Second order Differential Equations: Linear differential equations with variable coefficients. Series Solution of Bessel, Legendre, Hermite, Laguerre and Hypergeometric differential equations by Frobenius method. Recurrence relations and orthogonality properties.

15 Lectures

Section-B

Partial Differential Equations: Definition and formation of first and second order partial differential equations, Laplace, Wave and diffusion equation in one and two dimensions, Solutions of these equations by separation of variables.

15 Lectures

Section-C

Laplace Transforms: Definition, elementary Laplace transforms, transforms of derivatives, integration of transforms, Laplace transform of periodic functions, solution of differential equations with constant coefficients using Laplace transforms.

15 Lectures

Section-D

Fourier series and Transforms: Periodic functions, Dirichlet's conditions, Fourier coefficients, Sine and Cosine series, half range expansions, exponential series, differentiation and integration of Fourier transform, Fourier Sine and Cosine transforms, Inversion formulae, Fourier transforms of derivatives.

15 Lectures

Reference Books:

- Mathematics Hand book: M. Vygodsky, Mir, Moscow, 1975.
- Higher Engineering Mathematics: B.S. Grewal, Delhi, Khanna, 1995.
- Applied Mathematics for Engineers and Physicists: Pipes & Harvill, London, McGraw Hill, 1970.
- Mathematics of Physics and Modern Engineering: Sokolnikoff & Recheffer, 1984.
- Mathematical Methods for Physicists: George Arfken, New York, Academic Press, 1970.