CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Organometaallics chemistry

Programme : MSc chemistry
Semester: II
Name of the Teacher: Harbinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harbinderchemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students with the knowledge of pi acid ligands , their pi accepter characters. To understand the structure and bonding of metal carbonyl compounds .

Course Content:

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

Learning Outcomes:

- **Knowledge and Understanding):**

Students will **able to understand the meaning of pi accepter ligands.**

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to think critically about the structure and bonding of metal carbonyls

C. Practical Skills

Students will learn to assign the proper structure and recall the reactions involved.

D. Transferable Skills :

Students will be able to think more creatively about the differences in various types of ligands and characterise pi acid ligands more clearly.

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	40%	**Every week**
3. Complete syllabus test	**40%**	**Last Week of march**
End of Semester Exam	**40%**	**Last week of aprilr onwards**

Teaching Outline:

Unit	Teaching Dates
I	**18 january to 2 february**
II	**9 february to 2 march**
III	**8 march to 5 april**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

Notes given by teacher.

References:

- ***J.E Huheey , Inorganic chemistry Principles of structure and reactivity , Harper Interscience.***
- ***F.A Cotton and G. Wilkinnson , Advanced Inorganic Chemistry***

e resources:

https://en.m.wikipedia.org

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Physical Chemistry-Quantum Chemistry

Programme : M.Sc. (Chemistry)
Semester: II
Name of the Teacher: Harjinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: chem.harjinder@gmail.com

Objectives of the Course ;

- This course aims at to accustom the students the principles and applications of quantum mechanics in detail with further introduction of different types of operators later on used in the solution of conjugated systems.
- **Course Content:**

➢ Quantum Theory: Introduction and Principles.
➢ Different types of operators used in the solution of simple as well as complex molecules.
➢ Applications of quantum postulates.
➢ Angular momentum, orbital and spin and their relations.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 4 per week
- Student Seminars: Two per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Participatory and Experiential Learning.
- Quiz

Program Learning Outcomes:

- **The aim is to help the students to revise the basic principles of quantum mechanics. Introduction to new operators such as Hermitian and Hamiltonian and their use in the solution of Hydrogen and Hydrogen like atoms.**

- **Students will also be able to apply quantum postulates in solution of particles in one, two and three dimensional boxes.**

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	**40%**	**Every week**
3. Complete syllabus test	**40%**	**Mid of april**
End of Semester Exam	**40%**	**Last week of april onwards**

Teaching Outline:

Unit	**Teaching Dates**
I	**11 Janaury to 15 February**
II	**16 February to 20 March**
III	**21March to 15 April**
Revision	**16 April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Eresourceshttp://www.phys.spbu.ru/content/File/Library/studentlectures/schlippe/qm07-03.pdf

https://arxiv.org/ftp/physics/papers/0602/0602145.pdf

Notes provided by teacher.

References:

- Quantum Chemistry, Ira N. Levine, Prentice Hall.
- Quantum Chemistry, H. Eyring, Kimball and Walter.
- Fundamentals of Quantum Chemistry, Anantharaman. R.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Course – VIII: ORGANOMETALLICS CHEMISTRY

Programme: M.Sc. (Chemistry)

Semester: II

Name of the Teacher: Dr. Harshveer Arora
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harshchemistrylkc@gmail.com

Objectives of the Course:

- This course aims at acquainting students with the knowledge of various organometallic compounds, its preparation and its properties. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject
- To understand the various applications of these organometallic compounds in synthesis, catalysis, industry and biological medium with mechanisms.

Course Content:

SECTION-B

MO treatment of ferrocene. η6 – ligands: Benzene and its derivatives. Multidecker sandwich compounds.

Reaction at Coordinated ligands

The role of metal ions in the hydrolysis of amino acid esters, peptides, and amides Molecular orbital concept of role of metal ions participation, Modified aldol condensation, Imine formation, Template and Macrocyclic effect in detail.

SECTION-C

Homogeneous hydrogenation of unsaturated compounds, reversible cis-dihydrocatalysis, monohydrido compounds, asymmetrical hydrogenation, hydrosilation of unsaturated compounds, hydrocyanation of alkenes, alkane metathesis, Ziegler-Natta polymerization of ethylene and propylene, water gas shift reaction, acetic acid synthesis by carbonyls, Oxopalladation reactions. Organometallic Reagents in Organic synthesis.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week

- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and experimental Learning
- Quiz

Program Learning Outcomes:

A. Learning Outcomes(Knowledge and Understanding):

Students will understand the fundamentals of vibrational, rotational and Raman spectroscopy, and applications of these techniques for the determination of various Inorganic structures.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to develop the academic and laboratory skills.

C. Practical Skills

Students will learn about Organometallic Reagents commonly used in synthesis.

D. TransferableSkills :

Students will be able to think the application and synthesis of organometallic reagents

What will be the teaching methods:

- Lectures : two per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook of various Indian and foreign authors and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		

1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student seminars	40%	**Every week**
3.Complete syllabus test	**40%**	**Last Week of April**
End of Semester Exam	**40%**	**Last week of April**

Teaching Outline:

Unit I	**Teaching Dates**
MO treatment of ferrocene. η6 – ligands: Benzene and its derivatives. Multidecker sandwich compounds. The role of metal ions in the hydrolysis of amino acid esters, peptides, and amides .	**15th January to 30th January**
Modified aldol condensation, Imine formation, Template and Macrocyclic effect in detail. Homogeneous hydrogenation of unsaturated compounds, reversible cis-dihydrocatalysis, monohydrido compounds, asymmetrical hydrogenation, hydrosilation of unsaturated compounds, hydrocyanation of alkenes, alkane metathesis,	**5th February to 27th Feb**
Ziegler-Natta polymerization of ethylene and propylene, water gas shift reaction, acetic acid synthesis by carbonyls, Oxopalladation reactions. Organometallic Reagents in Organic synthesis.	**4th March to 1st April**
Revision	**8th April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

1. C. Elschenbroich and A. Salzer, Organometallics: A Concise Introduction, 2nd Ed., VCH 1992.

2. J.E. Huheey, Inorganic Chemistry Principles of Structure and Reactivity, Harper Interscience.

3. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Ed. V & VI.WileyInterscience.

4. G. L. Miessler, D. A. Tarr, Inorganic Chemistry, 3rd edition, Pearson Education

Notes provided by teacher.

References:

http://www.chem.ucalgary.ca/courses/350/Carey5th/Ch14/ch14-0.html

https://en.wikipedia.org/wiki/Organometallic_chemistry

Crabtree, Robert H. (2009). *The Organometallic Chemistry of the Transition Metals* (5th ed.). New York, NY: John Wiley and Sons.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XII SPECTROSCOPY – B: TECHNIQUES FOR STRUCTURE ELUCIDATION OF INORGANIC COMPOUNDS

Programme: M.Sc. (Chemistry)
Semester: II
Name of the Teacher: Dr. Harshveer Arora
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harshchemistrylkc@gmail.com

Objectives of the Course:

- This course aims at acquainting students with the basic knowledge of vibrational and rotational spectroscopy, ESR spectroscopy, NQR spectroscopy and various terms related to it. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject
- To understand and to be able to apply all the spectroscopic techniques for the structure elucidation of organic compounds and to know the geometry of compound.

Course Content:

Unit I: Vibration and Rotation Spectroscopy: Infrared, Raman and Microwave: Harmonic and anharmonic oscillators, rotational spectra of rigid, linear and non linear molecules, non-rigid rotators. Theories of Raman Effect, Merits and demerits of Raman spectroscopy. Pure rotational Raman spectra of linear molecules. Use of symmetry considerations to determine the number of active I.R, and Raman lines Applications of Raman and IR selection rules to the determination of Inorganic structures.

Unit II: Electron Spin Resonance Spectroscopy: Features of ESR spectra, hyperfine coupling in isotropic system, Anisotropic splitting, zerofield splitting, Kramer's degeneracy, Double resonance technique ENDOR, ELDOR, etc.

Unit III: Nuclear Quadrupole Resonance Spectroscopy: Introduction, effects of magnetic field on the spectra. Relationship between the electric field gradient and molecular structure. Interpretation of eQ, data, the effect of

crystal lattice on the magnitude of eQ4, double resonance technique, Applications.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 6 per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and experimental Learning
- Quiz

Program Learning Outcomes:

- Students will have basic knowledge of vibrational, rotational and Raman spectroscopy, and applications of these techniques for the determination of various Inorganic structures
- Students will be able to evaluate structure of various inorganic compounds by applying these spectroscopic techniques from the available data, charts, graphs, character table etc.
- Students will able to deduce structure of any species containing unpaired electron using ESR spectroscopy and geometry of compound by NQR spectroscopy.

Program Learning Outcomes:

A. Learning Outcomes(Knowledge and Understanding):

Students will understand the fundamentals of inorganic rings, chains and metal clusters.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to develop the academic and laboratory skills.

C. Practical Skills

Students will learn to develop new approaches to systematic cluster synthesis and isolobal analogy and application of analogy.

D.**TransferableSkills :**

Students will be able to think the application and synthesis of inorganic rings and metal clusters.

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student seminars	40%	**Every week**
3.Complete syllabus test	**40%**	**Last Week of April**
End of Semester Exam	**40%**	**Last week of April**

Teaching Outline:

Unit I	Teaching Dates
Vibration and Rotation Spectroscopy: Infrared, Raman and Microwave: Harmonic and anharmonic oscillators, rotational spectra of rigid, linear and non linear molecules, non-rigid rotators. Theories of Raman Effect, Merits and demerits of Raman spectroscopy. Pure rotational Raman spectra of linear molecules. Use of symmetry considerations to determine the number of active I.R, and Raman lines Applications of Raman and IR selection rules to the determination of Inorganic structures.	**11^{th} january to 20^{th} february**
Unit II Electron Spin Resonance Spectroscopy: Features of ESR spectra, hyperfine coupling in isotropic system, Anisotropic splitting, zerofield splitting, Kramer's degeneracy, Double resonance technique ENDOR, ELDOR, etc	**21^{st} february to 10^{th} march**
Nuclear Quadrupole Resonance Spectroscopy: Introduction, effects of magnetic field on the spectra.	**11^{th} march to 4^{th} april**

Relationship between the electric fieldgradient and molecular structure. Interpretation of eQ, data, the effect of crystal lattice on the magnitude of eQ4, double resonance technique, Applications.	
Revision	**6th April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

1. R.S Drago, Physical Methods for Chemists (Ist and IInd Edition).
2. C.N Banwell, Fundamentals of Molecular Spectroscopy.
3. K. Nakamoto, Infrared Spectra of Inorganic and co-ordination Compounds.
4. E.A.V Ebsworth; W.H Renkin; Cradock, Structure Methods in Inorganic Chemistry.

Notes provided by teacher.

References:

https://en.wikipedia.org/wiki/Electron_paramagnetic_resonance

https://www.photonics.com/EDU/nuclear_quadrupole_resonance_NQR_spectroscopy/d1629

https://en.wikipedia.org/wiki/Rotational%E2%80%93vibrational_spectroscopy

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Reaction Mechanisms and Metal Clusters

Course-XI

Programme : M.Sc (Chemistry)
Semester: II
Name of the Teacher: Dr. Shafali Arora
Availability Timings: 9.00 AM to 3.30 PM
e-mail: shafalilkcchemistry@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of various terms and mechanisms related to inorganic reactions involving electron transfer
- **Course Content:**
  - Electron transfer processes with mechanisms.
  - Transition metal reactions.
  - Thermodynamics of reactions
  - Marcus theory and its kinetics

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: 1 per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Quiz

Program Learning Outcomes:

- **The aim is to teach students to understand the mechanisms involving electron transfer.**

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	**40%**	**Every week**
3. Complete syllabus test	**40%**	**End of March**
End of Semester Exam	**40%**	**Last week of april onwards**

Teaching Outline:

Unit	Teaching Dates
I	**11 January to 18 february**
II	**19 february to 15 March**
III	**15 march to 15 April**
Revision	**15 April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

- **J.E. Huheey: Inorganic Chemistry, 3rd edition, Pearson education**
- **G.L. Miessler and D. A. Tarr, Inorganic Chemistry, 3rd edition, Pearson education**

CURRICULUM PLANNING AND IMPLEMENTATION

Course-X (PHYSICAL CHEMISTRY- QUANTUM CHEMISTRY)

Programm: M.Sc CHEMISTRY (Quantum Chemistry)
Semester: II
Name of the Teacher: Dr. Shafali Arora
Availability Timings: 9.00 AM to 3.30 PM
e-mail: shafalilkcchemistry@gmail.com

Objectives of the Course:

This course aims at imparting knowledge in fundamental aspects of all branches of chemistry. To acquire basic knowledge in the specialized areas of chemistry. To train the students in various quantitative and qualitative analysis.

Course Content:

General orbital theory of conjugated systems (chemical bonding, linear combination of atomic orbitals, overlap integral, coulomb integral, bond order, charge density calculations for ethylene, allyl systems, butadiene, cyclo butadiene, cyclo propenyl system). The approximation methods (perturbation and variation methods and their applications to helium atom)

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Quiz

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

Learning Outcomes:

A. Knowledge and Understanding):

Students will

- Know how to define the various concepts if quantum chemistry.
- Understand and explain the basic concepts associated with the different aspects of quantum chemistry (e.g perturbation and variation methods).
- Students will understand and be able to describe the bonding and properties of conjugated systems.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to

- Identify the phonetic properties of conjugated systems.
- Analyze chemical bonding in conjugated systems, showing their structure , the bond order, the derivation.
- Needs for approximation methods.
- Applications to helium atom.

C. Practical Skills

Students will learn to:

- Describe the various properties of conjugated systems.
- Derive equations for bond order for conjugated systems.
- Assign the appropriate secular equations for these systems.
- Applications of various methods like approximation and variation.

D. Transferable Skills :

Students will be able to

- Form secular equations.
- Learn to think more creatively as well as comparatively, and
- Display better applications for conjugated systems.

Modes of Assessment	Minimum Score Required (to Qualify for the	Schedule

	Next Exam/Class)	
Continuous Internal Evaluation(CIE) 1.Class Tests (Unit wise) 2.Student Seminars 3. In House Exams		
	40%	**After Each Unit**
		Every week
	40%	**Last Week of February**
End of Semester Exam	**40%**	**Last week of March onwards**

Teaching Outline:

Unit	Teaching Dates
IV	**11th January to 28th February**
V	**1st March to 15th April**
Revision	**15th April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

- Quantum chemistry by R. K Prasad,
- Atkin quantum chemistry,
- Physical Chemistry, A Molecular Approach by MacQuarrie and Simon

e- resources

- http://phys.educ.ksu.edu/intex.htm
- https://www.bbc.co.uk/science/space/universe/questions_and_ideas/quantum

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Organic Reaction Mechanism -II

Programme : M.Sc. (Chemistry)
Semester: II
Name of the Teacher: Arunjit Kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: lkcchemistry@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of organic reaction mechanisms of condensation reactions involving enolates. Reaction mechanisms of formation of carbon-carbon bonds taking examples of important name reactions in organic chemistry are to be discussed in detail.
- **Course Content:**
    - Addition to Carbon-Hetero Multiple bonds- Aldol, Kneoevenagel, Claisen, Mannich, Benzoin, Perkin and Stobbe reactions, Reformatski reaction.
    - Formation of Carbon-Carbon Bond- Principle, Disconnections and synthons, Micheal addition, Friedal Crafts reaction, Four centre reactions, Diels Alder reaction etc.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: One per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Participatory and Experiential Learning.
- Quiz

Program Learning Outcomes:

- **The aim is to help the students to study in detail the very important name reactions in organic chemistry. Along with the revision of basic concepts of electrophilic and nucleophillic reactions , further applications in advanced fields of organic chemistry are aimed to be discussed.**

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	**40%**	**Every week**
3. Complete syllabus test	**40%**	**Mid of april**
End of Semester Exam	**40%**	**Last week of april onwards**

Teaching Outline:

Topics	Teaching Dates
Aldol, Kneoevenagel, Claisen, Mannich, Benzoin, Perkin and stobe reactions, Reformatski reaction.	**11 Janaury to 15 February**
Principle, disconnections and synthons, electrophillic and nucleophillic carbon species, base catalysed and aldol condensation, claisen reaction, Perkin reaction, Stobbe condensation	**16 February to 2 March**
Darzen condensation,	**3March to 20 March**

Knoevenegal reaction, use of malonic, acetoacetic and cynoacetic esters, Micheal addition, wittig reaction, use of acetylides.	
Acid-catalyzed condensation, self condensation of olefins, Friedel Crafts reaction, Fries reaction, Mannich reaction, Four centre reactions, diels alder reaction, 1-3 dipolar addition.	**21 March to 11 April**
Revision	**12 April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Notes provided by teacher.

References:

Advanced Organic Chemistry, F. A. Carey, R. J. Sunberg.

Organic Synthetic reactions by William Carruthers.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: ORGANIC REACTION MECHANISM II

Programme : M.Sc. Chemistry
Semester: II
Name of the Teacher: Dr. Bhupinderpal Simgh
Availability Timings: 9.00 AM to 4:00 PM
E-mail: bhupinderchemistrylkc@gmail

Objectives of the Course:

- The aim of the course is to provide the vast knowledge to the Students regarding various topics related to Organic Chemistry such as Free Radical reactions, Elimination Reactions and their Mechanisms, Addition to C-C and C- Hetero Multiple bonds, Oxidation and Reduction etc.

Course Content:

- Free Radical Reactions
- Elimination Reactions
- Addition to C-C Multiple Bonds
- Addition to C- Hetero multiple Bonds
- Oxidation
- Reduction

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 4 per week
- Student Seminars: one per week
- Assignments: Assignments given to the students related to the lectures given.
- Powerpoint Presentations

Program Learning Outcomes:

- The aim is to provide the vast knowledge of Organic Reactions and their mechanisms along with their Stereochemical aspects.

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	**40%**	**Every week**
3. Complete syllabus test	**40%**	**First week of April**
End of Semester Exam	**40%**	**Last week of April**

Teaching Outline:

Unit	Teaching Dates
Free Radical Reactions	**15 Janaury to 5 February**
Elimination Reactions	**6 February to 15 February**
Addition to C-C Multiple bonds	**16 February to 28 February**
Addition to C-Hetero Multiple bonds	**1 March to 15 March**
Oxidation	**16 March to 31 March**
Reduction	**1 April to 15 April**
Revision	**16 April Onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Books Recommended:

1.Principles of Organic Synthesis – Norman and Coxon

2.Advanced Organic Chemistry – Jerry March.

3.Advanced Organic Chemistry, F.A. Carey, R.J. Sunberg.

4.Highlights of Organic Chemistry, W, J.L. Nobel; An Advanced Text Book.

E Resourses

1. https://nptel.ac.in/courses/104103022/download/module9.pdf
2. https://nptel.ac.in/courses/104101005/downloads/LectureNotes/chapter%207.pdf
3. https://proj1.sinica.edu.tw/.../2006-TIGP-Reactions%20of%20C-C%20multiple%20bo...

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: VIII-Organometallics Chemistry

Programme: M.Sc Chemistry

Semester: II

Name of the teacher: Dr Geetanjli Kaushal

Availability Timings: 9.00 AM to 4.00 PM

E-mail: geetanjlichemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students to complete knowledge of catalytic and industrial uses of organometallic compounds.

Course Content

- The course is devised in the manner that the catalytic pathways are studied in detail.
- Vulcanisation of rubber, hydrogenation reactions etc. have wide industrial importance.
- Hydrocynation reactions
- Hydrosilation reactions

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- **Lectures: two per week**
- **Student seminars: Each student to deliver on one topic**
- **Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics**
- **Powerpoint presentations**
- **Participatory and experimental Learning**
- **Quiz or oral examination**

Programme Learning Outcomes:

A. Knowledge and Understanding:

Students will be able to understand the role of coordination number, coordination geometry and oxidation state of metal in catalytic cycles.

B. **Intellectual (Cognitive and Analytical) Skills:**

Students will be able to study the wide variety of organometallic compounds and the choice of hapticity in different conditions.

C. Practical Skills

Students will learn to go through some important emerging compounds especially multi-decker sandwich compounds.

D. Transferable Skills

Students will be able to study the reactions at coordinated ligands.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	40%	After each unit
2. Student Seminars/Powerpoint presentations	40%	Every week and Each student once
3. Complete syllabus test	40%	Last week of April
End of Semester exam	**40%**	**First week of May onwards**

Teaching Outline:

Division of content	**Teaching Dates**
Energy polarity and reactivity of M-C bond, Stability of Main group organometallics: Methods of preparation in perspective- organolithium compounds: structure and bonding & reaction- Energy Polarity and reactivity of M-C Bond, Stability of main group organometallics, Methods of preparation in perspective- Organolithium compounds	11Jan 2020 to 2 Feb 2020
carbolithiatic organometallics of group 2 and 12 e.g. Mg and Zn, Cd and Hg: Preparation and structure of organoaluminium compounds, Technical applications of Tris (alkyl) aluminium compounds. η^2- ligands:	4 Feb 2020 to 23Feb2020

olefenic and acetylenic complexes, chelating olefenic ligands – synthesis and structure. η^2 – ligands: Allylic and η^4– complexes of cyclopentadiene.	25 Feb 2020 to 16Mar 2020
Synthesis and structure. η^4 –ligands: Butadiene, cyclobutadiene, heterocyclic pentadiene (S, Se, Te). Classification, Nomenclature of cyclopentdienyl complex, Preparation of cyclopentadienyl Complexes	18 Mar 2020 to 9Apr 2020
Revision	10Apr till University exams

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams.

References

1. C. Elschenbroich and A. Salzer, Organometallics: A Concise Introduction, 2nd Ed., VCH 1992.
2. J.E. Huheey, Inorganic Chemistry Principles of Structure and Reactivity, Harper Interscience.
3. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry, Ed. V & VI.Wiley Inter-science.
4. G. L. Miessler, D. A. Tarr, Inorganic Chemistry, 3rd edition, Pearson Education

E-resources

www.chem.ucalgary.ca

https://www.nature.com

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XI-Reaction Mechanism and Metal Clusters

Programme: M.Sc Chemistry

Semester: II

Name of the teacher: Dr Geetanjli Kaushal

Availability Timings: 9.00 AM to 4.00 PM

E-mail: geetanjlichemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students to reaction mechanisms of Inorganic complex ions. Inorganic reaction mechanisms are point of study due to variable coordination number and oxidation states of metal ions.

Course Content

- The course is devised in the manner that lability and inertness of complexes is well understood.
- The electronic transfer processes of Octahedral and square planar complexes is major key point.
- Stereochemical non-rigidity

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- **Lectures: two per week**
- **Student seminars: Each student to deliver on one topic**
- **Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics**
- **Powerpoint presentations**
- **Participatory and experimental Learning**
- **Quiz or oral examination**

Programme Learning Outcomes:

E. Knowledge and Understanding:

Students will be able to interpret the different mechanisms of reactions based on rate constant data available.

F. Intellectual (Cognitive and Analytical) Skills:

Students will be able to predict whether reaction follows outer sphere path or inner sphere path in the reaction mechanisms under study.

G. Practical Skills

Students will learn to understand the preference of a metal ion to undergoing a particular pathway of reaction mechanism.

H. Transferable Skills

Students will be able to judge the relative stability of products in variety of reactions.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	40%	After each unit
2. Student Seminars/Powerpoint presentations	40%	Every week and Each student once
3. Complete syllabus test	40%	Last week of April
End of Semester exam	**40%**	**First week of May onwards**

Teaching Outline:

Contents to be covered	**Teaching Dates**
Section-A Inert and labile complexes, mechanisms of substitution (dissociative, associative interchange mechanism, the conjugate mechanism, substitution in *trans* complexes, substitution in *cis* complexes, isomerism of chelate rings), *trans* effect, explanation for *trans* effect,	Jan 14 2020 to Jan 29 2020
Section-A Ligand replacement reactions of square planar and octahedral complexes: their factors and mechanism of substitution, orbital occupation mechanisms.	Jan 30 2020 to Feb 19 2020

Anation reaction, Metal carbonyl reactions species with 17 electrons.	
Section-C Doubly bridged inner sphere transfer and other electron transfer reactions. Two electron transfer, non-complementary reactions.	Feb 20 2020 to Mar 19 2020
Section-C Stereochemical nonrigidity of coordinate and orgonometallic compounds, trigonal bypyramid, system with six or more coordination number. Isomerization and recemization of trischelates, metal carbonyl scrambling.	Mar 20 2020 to Apr 9 2020
Revision	Apr 10 2020 till University Exams

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams

References

1. K.P. Purcell and J. V. Kotz: Inorganic Chemistry W.B. Saunders Co. London, (1977).
2. G. L. Miessler, D. A. Tarr, Inorganic Chemistry, 3rd edition, Pearson Education.
3. F.A. Cotton & Wilkinson: Inorganic Chemistry V & VI Ed. Willy Eastern – (1999).
4. J.E. Huheey: Inorganic Chemistry III & IV Ed. Pearson Education Asia – (2002).

E-resources

www.chem.uwimona.edu.jm

https://www.grc.org

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XI. REACTION MECHANISMS AND METAL CLUSTERS

Programme: M.Sc.(Chemistry)
Semester: II
Name of the Teacher: Dr.NavjotKaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: navjotchemistrylkc@gmail.com

Objectives of the Course:

- This course aims at acquainting students with the knowledge of various concepts and theories related to inorganic chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject.
- To equip students with necessary chemical knowledge concerning the fundamentals in the area of inorganic ring, chains and metal cluster and to bring forth the importance of academic and laboratory skill for the students.
- **Course Content:**
- Borazine
- Phosphazenes
- heterocyclic inorganic ring
- homocyclic inorganic systems,
- cages of P and S
- Higher boranes and carboranes
- isopoly and heteropoly acids and salts
- metal-metal bonds

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Student Seminars: two per week
- Assignments : The students will be asked to read the textbook of various Indian and foreign authors and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

Learning Outcomes(Knowledge and Understanding):

Students will understand the fundamentals of**i**norganic rings, chains and metal clusters.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to develop the academic and laboratory skills.

C. Practical Skills

Students will learn to develop new approaches to systematic cluster synthesis and isolobal analogy and application of analogy.

D.**TransferableSkills :**

Students will be able to think the application and synthesis of inorganic rings and metal clusters.

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student seminars	40%	**Every week**
3.Complete syllabus test	**40%**	**Last Week of April**
End of Semester Exam	**40%**	**Last week of April**

Teaching Outline:

Unit	**Teaching Dates**
Borazines, Phosphazenes and other heterocyclic inorganic ring, systems, homocyclic inorganic systems, cages of P and S, oxides & sulphides,	**11 january to 20february**
Higher boranes and carboranes, methods of classifying boranes, Molecular orbit view of chlorohydroborane ions and	**20 february to 10march**

carboranesmetallocarboranes, isopoly and heteropoly acids and salts	
Metal-metal bonds and bi-, tri-, tetra-, penta-, and hexanuclear clusters, electron counting schemes for HNCC's. Approaches to systematic cluster synthesis; mention of seven, eight and nine atom clusters. Isolobal analogy and examples of application of analogy.	**11march to 10april**
Revision	**11april to 30april**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

References:

1. G. L. Miessler, D. A. Tarr, Inorganic Chemistry, 3rd edition, Pearson Education.
2. F.A. Cotton & Wilkinson: Inorganic Chemistry V & VI Ed. Willy Eastern – (1999).
3. J.E. Huheey: Inorganic Chemistry III & IV Ed. Pearson Education Asia – (2002).

E- resources

https://en.wikipedia.org/wiki/Cluster_chemistry

https://www.britannica.com/science/borane

https://chem.libretexts.org

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Course XXIV: Natural Products

Programme : M.Sc. Chemistry
Semester: IV
Name of the Teacher: Dr. Bhupinderpal Simgh
Availability Timings: 9.00 AM to 4:00 PM
E-mail: bhupinderchemistrylkc@gmail

Objectives of the Course:

- The aim of the course is to provide the vast knowledge to the Students regarding Natural Products, their Structure Elucidation and Synthesis

Course Content:

- Studies on Biosynthetic Pathway of Natural Products
- Terpenoids
- Steroids
- Antibiotics
- Prostaglandins

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 4 per week
- Student Seminars: one per week
- Assignments: Assignments given to the students related to the lectures given.
- Powerpoint Presentations

Program Learning Outcomes:

- The aim is to provide the vast knowledge of Biosynthetic Pathway, Terpenoids, Steroids, Antibiotics, Prostaglandins etc. and their mechanisms along with Structure Elucidation

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	**40%**	**Every week**
3. Complete syllabus test	**40%**	**First week of April**
End of Semester Exam	**40%**	**Last week of April**

Teaching Outline:

Unit	Teaching Dates
Studies on Biosynthetic Pathway of Natural Products and Terpenoids	**15 Janaury to 15 February**
Steroids and Antibiotics	**16 February to 15 March**
Prostaglandins	**1 April to 15 April**
Revision	**16 April Onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Books Recommended:

5. Organic Chenistry: I. L. Finar

6.Natural Products: Chatwal

E Resourses

1. *globalresearchonline.net/journalcontents/v27-2/45.pdf*

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CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XXIII-Advance Inorganic Chemistry

Programme: M.Sc Chemistry

Semester: IV

Name of the teacher: Dr Geetanjli Kaushal

Availability Timings: 9.00 AM to 4.00 PM

E-mail: geetanjlichemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students to concept of photo-inorganic chemistry. Due to ever depleting resources of energy, solar energy is a promising idea of study.

Course Content

- **Basic concepts of photo inorganic chemistry**
- **Theories governing phenomenon of absorption of light.**

- **Different metals behaving differently in the presence of light owing to varying excitation phenomenon.**

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- **Lectures: two per week**
- **Student seminars: Each student to deliver on one topic**
- **Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics**
- **Powerpoint presentations**
- **Participatory and experimental Learning**
- **Quiz or oral examination**

Programme Learning Outcomes:

I. Knowledge and Understanding:

Students will be able to analyse the relation between electronic configuration and absorption of light.

J. **Intellectual (Cognitive and Analytical) Skills:**

Students will be able to understand the use of solar energy in different industrial applications.

K. Practical Skills

Students will learn the use of polypyridyls of different metal ions in solar energy conversions.

L. Transferable Skills

Students will be able to make a correlation between photosynthesis and a chemical reaction causing this using inorganic precursors.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	40%	After each unit
2. Student Seminars/Powerpoint presentations	40%	Every week and Each student once

3. Complete syllabus test	40%	Last week of April
End of Semester exam	**40%**	**First week of May onwards**

Teaching Outline:

Contents to be covererd	**Teaching Dates**
Unit-1 Photo Inorganic Chemistry Basics of photochemistry- Absorption, excitation, photochemical laws, quantum yield, electronically excited states, life times-measurements of the times	14.1.20 to 22.1.20
Unit-1 Photo Inorganic Chemistry Flash photolysis, energy dissipation by radiative and non-radiative processes, absorption spectra, Franck Condon principle, photochemical stages-primary and secondary processes, Kasha's rule, Thexi state	23.1.20 to 12.2.20
Unit-1 Photo Inorganic Chemistry Photo substitution reactions, Adamson's rules, Photo substitution reactions of Cr(III)-Polypyridyls, Rh(III) Ammine Complexes	13.2.20 to 13.3.20
Unit-1 Photo Inorganic Chemistry Ru-Polypyridyl complexes, Ligand photo reactions, photoredox reactions, comparison of Fe(II) and Ru(II) complexes, photolysis of water using Inorganic precursors.	14.3.20 to 3.4.20
Revision	4.4.20 till University exams

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams.

References

1. Concepts of Inorganic Photochemistry, A. W. Adamson and P. D. Fleischauer, Wiley.
2. W.W. Porterfield, Inorganic Chemistry: A Unified Approach..
3. F.A. Cotton and G. Willkinson, Advanced Inorganic Chemistry, 5th ed., John Wiley & Sons, New York.
4. C. Elschenbroich and A. Salzer, Organometalics: A Concise Introduction, 2nd Ed., VCH

1992.

E-resources

https://www.sciencedirect.com

https://www.ncbi.nlm.nih.gov

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XXV- Chemistry of Materials

Programme: M.Sc(Chemistry)
Semester: IV
Name of the Teacher: Dr.NavjotKaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: navjotchemistrylkc@gmail.com

Objectives of the Course:

- This course aims at acquainting students with the knowledge of various concepts and theories related to physical chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject.
- To equip students with necessary chemical knowledge concerning the fundamentals in the area of Solid stateand macromolecules and to bring forth the importance of academic and laboratory skill for the students.
- **Course Content:**

Solid State Chemistry

- band and bond theories
- crystal lattice energy
- point defects in metals
- photochemical reaction

Macromolecules

- types of polymers
- properties of solid polymers
- molecular mass determination
- polymer solutions

- conducting polymers

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : four per week
- Student Seminars: two per week
- Assignments : The students will be asked to read the textbook of various Indian and foreign authors and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

Learning Outcomes(Knowledge and Understanding):

Students will understand the fundamentals of Solid state and Macromolecules and their applications.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to develop the academic and laboratory skills.

C. Practical Skills

Students will learn to develop new applications in solid state materials and polymers.

D.**TransferableSkills :**

Students will be able to think the application and synthesis of polymers and solid state reactions.

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**

2.Student seminars	40%	**Every week**
3.Complete syllabus test	**40%**	**Last Week of april**
End of Semester Exam	**40%**	**Last week of april**

Teaching Outline:

Unit	Teaching Dates
Types of solids, band and bond theories, crystal lattice energy, point defects in metals and ionic compounds, energy and entropy of defects, their concentration, ,	**11 january to 05february**
Diffusion and electrical conduction via defects, non stoichiometry types, colour centres and electrical properties of alkali halides	**06 february to 15 february**
Electron theories for metal conduction in metals , in insulators, impurity semi conductors, reactions in organic solids, photochemical reactions, solid-solid reactions, decomposition and dehydration reaction.	**16february to 28february**
Types of polymers, regular and irregular polymers, synthesis of polymers by chain and step reactions, physical properties of solid polymers(crystallinity, plasticity and elasticity), vulcanization of rubbers,	**01march to 20march**
molecular mass determination by osmometry, viscometry, light scattering and ultracentrifuge methods, number and mass average molecular masses, polymer solutions, factors affecting the solubility of polymers , conducting polymers,doping of polymers,	**21march to 12april**

mechanism of conduction, polarones and bipolarons	
Revision	**13april to 30april**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

References:

4. Principles of polymer chemistry—P J Flory Cornell University Press
5. Physical chemistry of polymers—A J Tager, Mir Publishers
6. Solid state chemistry and its applications—A R West ,Wiley Publishers
7. Chemistry of solid state—W.E.Garner Butterworth
8. Principles of physical chemistry—Puri-Sharma-Pathania, Vishal Publishers
9. Principles of Solid States, H. V. Keer, Wiley Eastern.

E- resources

https://nptel.ac.in/courses/104103019/2

ncert.nic.in/ncerts/l/lech101.pdf

https://onlinelibrary.wiley.com/

https://chem.libretexts.org › ... › Chapters › Chapter 26: Synthetic Polymers

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XXIII-Advance Inorganic Chemistry

Programme: M.Sc Chemistry

Semester: IV

Name of the teacher: Dr Rajnish Moudgil

Availability Timings: 9.00 AM to 4.00 PM

E-mail: rajnishchemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students to the knowledge of transition metal compounds with bonds to hydrogen. Such compounds have wide synthetic applications from study point of view.

Course Content

- **Transition metal compounds with bonds to hydrogen and their chemical properties will be given main attention.**
- **The spectroscopic and X-ray techniques to characterise such compounds is another main focus.**

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- **Lectures: four per week**
- **Student seminars: Each student to deliver on one topic**
- **Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics**
- **Powerpoint presentations**
- **Participatory and experimental Learning**
- **Quiz or oral examination**

Programme Learning Outcomes:

M. Knowledge and Understanding:

Students will be able to characterise theoretically the type of bond of hydrogen with the transition metal.

N. Intellectual (Cognitive and Analytical) Skills:

Students will be able to understand the reducing properties of compounds and the chemical reactions.

O. Practical Skills

Students will learn to make difference of terminal and bridging hydrogen bonds.

P. Transferable Skills

Students will be able to think and devise new synthetic applications of such compounds.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	40%	After each unit
2. Student Seminars/Powerpoint presentations	40%	Every week and Each student once
3. Complete syllabus test	40%	Last week of April
End of Semester exam	**40%**	**First week of May onwards**

Teaching Outline:

Division of content	**Teaching Dates**
Section B Transition Metal Compounds with Bonds to Hydrogen Characteristics of hydride complexes, synthetic methods, chemical behaviour of hydride compounds, Mononuclear polyhydrides, homoleptic polyhydride anions; carbonyl hydrides and anion.	11.1.20 to 31.1.20
Photo Inorganic Chemistry Photo reactions and Solar energy conversions, Photo synthesis in plants and Bacterio chlorophyll photosynthesis	1.2.20 to 21.2.20
Section-D Hydroformylation of unsaturated compounds, Reductive carbonylation of alcohols and other compounds; Carbonylation Reaction: Methanol and methyl acetate, Adipic ester. Synthesis and other carbonylation reactions, decarbonylation reactions. Catalytic addition of molecules to C-C multiple bonds homogeneous hydrogenation,	22.2.20 to 20.3.20

hydrocyanation of unsaturated compounds, hydrosilation of unsaturated compounds, hydrocyanation of alkenes	
Section D Polymerization, Oligomerisation and metathesis reactions of alkenes and alkynes, Ziegler-Natta polymerisation of ethylene and propylene oligomerisation and related reactions, Cluster compounds in catalysis, supported homogeneous and phase transfer catalysis, Oxidation reaction: Oxidative carbonylations, Palladium catalysed oxidation of ethylene, Acrylonitrile synthesis, oxygen transfer from peroxo- and oxo- species, oxygen transfer from NO_2 groups.	21.3.20 to 10.4.20
Revision	11.4.20 till University exams

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams.

References

1. Concepts of Inorganic Photochemistry, A. W. Adamson and P. D. Fleischauer, Wiley.
2. W.W. Porterfield, Inorganic Chemistry: A Unified Approach..
3. F.A. Cotton and G. Willkinson, Advanced Inorganic Chemistry, 5th ed., John Wiley & Sons, New York.
4. C. Elschenbroich and A. Salzer, Organometalics: A Concise Introduction, 2nd Ed., VCH 1992.

E-resources

https://www.sciencedirect.com

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: XXIV NATURAL PRODUCTS

Programme : Msc Chemistry
Semester: IV Semester
Name of the Teacher: Harbinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harbinderchemistrylkc@gmail.com

Objectives of the Course:

- This course aims at acquanting students with the knowledge of haemin and chlorophyll.
- To understand the processes nd mechanism involved in the formation of nicotine , quinine etc.

Course Content:

- **Alkaloids**
- **Haemin and Chlorophyll**

D**etailed Course Contents: Available at** www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

Learning Outcomes:

- **Knowledge and Understanding):**

Students will

- know how to differentiate haemin and chlorophyll .

B. <u>Intellectual(Cognitive/ Analytical) Skills</u>:

Students will be able to understand the mechanisms involved.

C. <u>Practical Skills</u>

Students will learn to use various reagents according to the suitable reaction conditions .

D. <u>Transferable Skills</u> :

Students will be able to think and devise synthetic applications of such compounds.

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	40%	**Every week**
3. Complete syllabus test	**40%**	**First Week of April**
End of Semester Exam	**40%**	**Last week of april**

<u>Teaching Outline:</u>

Unit	**Teaching Dates**
4.	**14 january to 26 February**
5.	**27 February to 2 april**
Revision	**april onwards**

<u>Attendance Policy</u>

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

Notes provided by teacher

References:

- Organic chemistry of natural products by Gurdeep R.Chatwal
- Chemistry of natural products by K.Anand Solomon

e resources:

https://pdfs.semanticscholar.org/177c/4ab652dafedbfcd8bc8c64ca0ad9081cfca8.pdf

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Chemistry of Materials

Programme : M.Sc. (Chemistry)
Semester: IV
Name of the Teacher: Harjinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: chem.harjinder@gmail.com

Objectives of the Course ;

- This course aims at acquainting the students the knowledge of the factors affecting glass formation various thermodynamic, kinetic factors controlling the designing of glass materials, important compositions and different properties.
- A complete packet of knowledge of the preparation of smart materials and their applications as nano drug delivery agents and energy storage materials.
- **Course Content:**

➢ Glasses and Ceramics:compositions, properties and applications.
➢ Smart materials: preparation, equations controlling the functioning.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 4 per week
- Student Seminars: Two per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Participatory and Experiential Learning.
- Quiz

Program Learning Outcomes:

- **The aim is to help the students to understand the basics of glass formation from different materials along with different kinetic and thermodynamic aspects discussing the applications also. Smart materials will be introduced while discussing different electrical and magnetic properties.**

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student Seminars	**40%**	**Every week**
3. Complete syllabus test	**40%**	**Mid of April**
End of Semester Exam	**40%**	**Last week of april onwards**

Teaching Outline:

Unit	**Teaching Dates**
Glasses and Ceramics	**11 Janaury to 20 February**
Smart Materials	**21 February to 15 April**
Revision	**16 April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

E resources:
http://www.rsc.org/Education/Teachers/Resources/Inspirational/resources/4.4.3.pdf

Notes provided by teacher.

References:

- Principles of polymer chemistry-P J Flory Cornell University Press.
- Solid state chemistry and its applications-A R West, Wiley publishers.
- Chemistry of Poymers, Margarison and East.
- Principles of Solid States, H V Keer Wiley Eastern.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: SPECTROSCOPY – B: Techniques for Structure Elucidation of Inorganic Compound

Programme : M.Sc. Chemistry
Semester: IV
Name of the Teacher: Dr. Vikas Kumar
Availability Timings: 9.00 AM to 3.30 PM
E-mail: vikaschemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students with Symmetry and Point Groups , techniques that measure the elemental composition at microscopic level, electronic state, chemical state of matter, binding energy, empirical formula and more of surface region of solids

Course Content:

Topic I :Symmetry and Point Groups

Topic I: Introduction, excitation & ejection of electrons, electronic energy levels in atoms and molecules,

Topic III: Core level photoelectron spectroscopy valence electron photo electron spectroscopy, valence excitation spectroscopy. Symmetry & molecular orbitals, Dissociation, Predissociation, change of shape on excitation.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Student Seminars: two per week
- Assignments : The students will be asked to read the textbook in advance and write assignments on given topics
- Power point Presentations
- Participatory Learning
- Test

Program Learning Outcomes:

(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:

- Students will be familiar with Symmetry and Point Groups

- Students will know how to define the various electronic energy levels in atoms and molecules ,excitations & ejection of electrons, understand and explain the basic concepts associated with Symmetry & molecular orbitals, Dissociation, Predissociation, change of shape on excitation

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE) 1.Class Tests (Unit wise) 2.Student Seminars		
	40%	**After Each Topic**
		Every week
	40%	**Last Week of February**
3. Complete Syllabus Test	**40%**	**Last week of March onwards**

Teaching Outline:

Unit	Teaching Dates
Topic: I	11 January to 10 February
Topic: II	11 February to 10 March
Topic: III	11 March to 25 March
Revision	26 March onwards

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

1. E.A.V Ebsworth; W.H Renkin; Cradock, Structure Methods in Inorganic Chemistry.
2. R.S Drago, Physical Methods for Chemists (I^{st} and II^{nd} Edition).
3. C.N Banwell, Fundamentals of Molecular Spectroscopy

E- resources

- http://www.rsc.org/journals-books-databases/librarians-information/products-prices/ebooks/

CURRICULUM PLANNING AND IMPLEMENTATION

Course-XXIII ADVANCED INORGANIC CHEMISTRY

Programme : M.Sc. Chemistry
Semester: IV
Name of the Teacher: Dr. Vikas Kumar
Availability Timings: 9.00 AM to 4.00 PM
E-mail: vikaschemistrylkc@gmail.com

Objectives of the Course:

To make the students familiar with oxidative addition reactions and their potential in synthesizing the various other important molecules

Course Content:

Topic I: Oxidative-Addition and Migration (Insertion Reactions) (15 Hrs.): Introduction: Acid base behaviour of metal atoms in complexes, Protonation and Lewis Base behaviour, acceptor properties of Lewis acidity of complexes, oxidative addition and reductive elimination,

Topic-II " Addition of specific molecules, Hydrogen addition, HX additions, Organic halides addition of some other molecules productive elimination, migration (Insertion) reaction promotion of alkyl migration, insertion of CO into M-H bonds, other aspects of CO insertion reactions,

Topic-III: Transfer of other molecules, CO_2, SO_2 , NO_2 , RCM, Insertion of alkenes and C-C unsaturated compounds, Cleavage of C-H bonds; alkane activation, Cyclometallation reactions. Reactions of free hydrocarbons.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Assignments : The students will be asked to read the textbook in advance and write assignments on given topics
- Power point Presentations
- Participatory Learning

- Test

Program Learning Outcomes:

(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:

- Students will be able to understand the mechanism of various types of oxidative addition reaction and then applying their expertise in planning and synthesizing new molecules

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE) 1.Class Tests (Unit wise) 2.Student Seminars		
	40%	**After Each Topic**
		Every week
	40%	**Last Week of February**
3. Complete Syllabus Test	**40%**	**Last week of March onwards**

Teaching Outline:

Topic	Teaching Dates
Topic :I	11 January to 10 February
Topic: II	11 February to 10 March
Topic: III	11 March to 25 March
Revision	26 March onwards

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

Cotton Wilkinson 5th addition

E- resources

- http://www.rsc.org/journals-books-databases/librarians-information/products-prices/ebooks/

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: NATURAL PRODUCTS

Programme : M.Sc. Chemistry
Semester: IV
Name of the Teacher: Dr. Vikas Kumar
Availability Timings: 9.00 AM to 4.00 PM
E-mail: vikaschemistrylkc@gmail.com

Objectives of the Course:

- Recognize and draw particular carbohydrate structures
- Know general structural elements of cyclic monosaccharides and disaccharides, and their implications for structure/function
- Predict the products of condensation reactions and hydrolysis.
- Knowledge of Sequence determination of amino acids
- Familiarity with Enzymes, Kinetics, inhibition mechanism.
- Know general structure of Nucleosides, nucleotides, DNA, RNA structure etc.

Course Content:

Unit I- Carbohydrates: Nomenceature and classification, types of naturally occuring sugars, deoxy sugars, sugars, methyl others and acid derivatives of sugars. General methods of structure and ring size determination, structure of maltose, lactose, sucrose, starch and cellulose.

Unit II- Peptides and Proteins: Sequence determination insulin and oxytocin,
Proteins: structure conformation and properties. Enzymes, Kinetics, inhibition mechanism.

Unit I- Nucleic Acids: Nucleosides, nucleotides, DNA, RNA structure and conformation, Replication, transcription

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Assignments : The students will be asked to read the textbook in advance and write assignments on given topics
- Power point Presentations
- Participatory Learning
- Test

Program Learning Outcomes:

(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:

- Students will able to Recognize and draw particular carbohydrate structures, general of cyclic monosaccharides and disaccharides, and their implications for structure/function.
- Students will able to predict the products of condensation reactions and hydrolysis.
- Students will capable of determining the Sequence of amino acids
- Students will be Familiar with Enzymes, Kinetics, inhibition mechanism and structure of Nucleosides, nucleotides, DNA, RNA structure etc.

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
	40%	**After Each Topic**

1.Class Tests (Unit wise) 2.Student Seminars		**Every week**
	40%	**Last Week of February**
3. Complete Syllabus Test	**40%**	**Last week of March onwards**

Teaching Outline:

Unit	Teaching Dates
Unit :I	11 January to 10 February
Unit: II	11 February to 10 March
Unit: III	11 March to 25 March
Revision	26 March onwards

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

Lehninger Principles of Biochemistry

E- resources

- http://www.rsc.org/journals-books-databases/librarians-information/products-prices/ebooks/

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Inorganic chemistry

Programme : BSc Biotechnology
Semester: II
Name of the Teacher: Harbinder Kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harbinderchemistrylkc@gmail.com

Objectives of the Course:

- This course aims at acquainting students with the knowledge of factors affecting the stability of coordination complexes.
- To understand the definition and examples of macrocyclic ligands.

Course Content:

To study

- Acid ligands
- Alkali metal and alkaline earth metal chelators
- Stability of coordination compounds
- Metal ions in biological system

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 4 per week
- Student Seminars: two per week
- Assignments : The students will be asked to read the textbook in advance and make assignments on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).

Learning Outcomes

Students will

- know how to define acid ligands emphasizing on carbon monoxide complexes.
- understand and explain the basic concepts associated with macrocyclic ligands.
- Students will understand and be able to describe the structure of haemoglobin and chlorophyll.

B. Intellectual(Cognitive/ Analytical) Skills:

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE) 1.Class Tests (Unit wise) 2.Student Seminars 3. In House Exams		
	40%	**After Each Unit**
		Every week
	40%	**Last Week of april**
End of Semester Exam	**40%**	**May onwards**

Teaching Outline:

Unit	**Teaching Dates**
I	**15 January to 3 February**
II	**5February to 28 February**
III	**2 March to 2 April**
IV	**3 April to17April**
Revision	**Till 23 April**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

kalyani publications

E- resources

https://eprints.nwisrl.ars.usda.gov/776/1/705.pdf

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: PHYSICAL CHEMISTRY - B

Programme :BSc Biotechnology chemistry
Semester: IV
Name of the Teacher: Harbinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harbinderchemistrylkc@gmail.com

Objectives of the Course:

- **This course aims at acquainting students with the knowledge of different electrochemical cells and electrodes.**
- **to understand the use of potentiometric titrations.**

Course Content:

- **Electrochemical cells**
- **Chemical kinetics**
- **Ionic equilibria**
- **Weak electrolytes**

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : three per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).
Learning Outcomes:

- **Knowledge and Understanding):**

  Students will understand the difference between reversible and irreversible cells, first order and second order rate of reactions.

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to recall different electrochemical cells.

C. Practical Skills

Students will learn to do measurement of EMF of a cell.

D. **Transferable Skills :**

Students will be able to think synthetic application of acid base indicators.

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student seminars	40%	**Every week**
3.Complete syllabus test	**40%**	**First Week of april**
End of Semester Exam	**40%**	**Last week of april**

Teaching Outline:

Unit	**Teaching Dates**
I	**18 january to 8 february**
II	**9 february to 2 march**
III	**3 march to 23 march**
IV	**25 march to 5 april**
Revision	**april onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

notes provided by teacher

References:

Dinesh publications

e resources:

https://www.seminarsonly.com/Engineering-Projects/Chemistry/finding-emf.php

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Organic chemistry - B

Programme : BSc Biotechnology chemistry
Semester: II
Name of the Teacher: Harbinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harbinderchemistrylkc@gmail.com

Objectives of the Course:

- **This course aims at acquainting students with the knowledge of ethers , epoxides, crown ethers.**

Course Content:

- **Conversion of alcohol to ether and esters**
- **Crown ethers**
- **Nucleophilic ring opening reactions of epoxides.**

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : one per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

(Knowledge and Understanding, Intellectual Skills, practical Skills, Transferable skills).
Learning Outcomes:

- **Knowledge and Understanding):**

Students will understand the conversions of alcohols to ethers and esters

B. Intellectual(Cognitive/ Analytical) Skills:

Students will be able to recall different reagents used.

C. Practical Skills

Students will learn to do reactions of crown ethers and esters

D. **Transferable Skills :**

Students will be able to think synthetic application of vicinal halohydrins

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**40%**	**After Each Unit**
2.Student seminars	40%	**Every week**
3.Complete syllabus test	**40%**	**First Week of march**
End of Semester Exam	**40%**	**Last week of april**

Teaching Outline:

Unit	Teaching Dates
Conversion of alcohol to ether and ester	**11 january to 25 february**
crown ethers	**26 february to 11 march**
conversion of vicinal halohydrins	**12 march to 23 march**
nucleophilic ring opening	**24 march to 2 april**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

notes provided by teacher

e resources:

https://en.wikipedia.org/wiki/Epoxide

https://en.wikipedia.org/wiki/Crown_ether

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Physical Chemistry

Programme : B.Sc. (Medical & Non-medical)
Semester: VI
Name of the Teacher: Harjinder kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: chem.harjinder@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of various terms related to physical chemistry.
- To enable the students to grasp the basics of the principles and applications of quantum mechanics.
- **Course Content:**

➢ Study of fundamental laws and postulates of quantum mechanics
➢ Particle in one, two and three dimensional boxes.
➢ Schrodinger wave equation and its importance as well as applications.
➢ Simple harmonic oscillator model, Rigid rotator model of diatomic molecules.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week

- Student Seminars: one per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Participatory and Experiential Learning.
- Quiz

Program Learning Outcomes:

- **The aim is to teach students the basic knowledge of principles of quantum mechanics. How different phenomena such as black body radiations , photoelectric effect and other principles studied in lower classes can be explained on the basis of new concepts of quantum.**

- **Students will be able to revise the basic atomic models and it will be further beneficiary in the study of upper classes also.**

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**35%**	**After Each Unit**
2.Student Seminars	**35%**	**Every week**
3. Complete syllabus test	**35%**	**Mid of april**
End of Semester Exam	**35%**	**Last week of april onwards**

Teaching Outline:

Unit	**Teaching Dates**
I	**11 Janaury to 20 February**

II	**21 February to 15 April**
Revision	**16 April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Eresources:

http://www.phys.spbu.ru/content/File/Library/studentlectures/schlippe/qm07-03.pdf

Text Book(s) : As prescribed by G.N.D.U

Notes provided by teacher.

References:

- Quantum Chemistry, Atkin.
- Fundamentals of Quantum Chemistry, Anantharaman. R.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: ORGANIC CHEMISTRY

Programme : BSc medical and Non medical
Semester: IV
Course: CHEMISTRY (ORGANIC CHEMISTRY–B) (THEORY)
Name of the Teacher: Dr. Harshveer Arora
Availability Timings: 9.00 AM to 3.30 PM
E-mail: harsharora27@gmail.com

Objectives of the Course ;

- This course aims at acquainting the students with knowledge of preparation and various properties of ethers, epoxides, heterocyclic and organometallic compounds.
- To understand the various mechanisms involved in their preparation and properties.
- To study the various applications of these compounds in synthesis, catalysis and industry.

Course Content:

SECTION–B

Unit III. Ethers and Epoxides

Nomenclature of ethers and methods of their formation, physical properties. Chemical reactions cleavage and autoxidation, Ziesel's method. Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.

Unit IV. Heterocyclic Compounds

Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole

SECTION–D

Unit VI. Organometallic Compounds

Organomagnesium Compounds: The Grignard reagentsformation, structure and chemical reactions. Organolithium Compounds: Formation and chemical reactions. Organozinc and Organo copper Compounds: Nomenclature, structural features, Methods of formation and chemical reactions.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 3 per week
- Student Seminars: one per week
- Assignments : The students will be asked to read the textbook in advance and write articles on given topics
- Powerpoint Presentations
- Participatory and experimental Learning
- Quiz

Program Learning Outcomes:

- Students will have knowledge about preparation, physical and chemical properties of ethers, epoxides, heterocyclic and orgamometallic compounds.
- Students will have knowledge of various mechanisms involved in their preparation and their applications.

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**35%**	**After Each Unit**
2.Student Seminars	**35%**	**Every week**
3. Complete syllabus test	**35%**	**starting of april**
End of Semester Exam	**35%**	**Last week of april**

		onwards

Teaching Outline:

Unit	Teaching Dates
Unit III. Ethers and Epoxides Nomenclature of ethers and methods of their formation, physical properties. Chemical reaction cleavage and autoxidation, Ziesel's method. Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.	**11 janaury to 29 january**
Unit IV. Heterocyclic Compounds Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole	**30 january to 28february**
Organometallic Compounds Organomagnesium Compounds: The Grignard reagentsformation, structure and chemical reactions. Organolithium Compounds: Formation and chemical reactions. Organozinc and Organo copper Compounds: Nomenclature, structural features, Methods of formation and chemical reactions.	**1st March to 31st March**
Revision	**1st April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

1. Morrison, R.T., Boyd, R.N., Organic Chemistry; 6th edition, Pubs: Prentice-Hall, 1992
2. Carey, F.A., Organic Chemistry; 4th edition, Pubs: McGraw-Hill, 2000
3. Solomons, T.W., Fryhle, C.B., Organic Chemistry; 9th edition, Pubs: Wiley India, 2007

Notes provided by teacher.

References or E-Resouces:

https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Map%3A_Organic_Chemistry_(McMurry)/Chapter_18%3A_Ethers_and_Epoxides%3B_Thiols_and_Sulfides

https://en.wikipedia.org/wiki/Heterocyclic_compound

http://www.chem.ucalgary.ca/courses/350/Carey5th/Ch14/ch14-0.html

https://www.britannica.com/science/organometallic-compound

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Physical Chemistry-I

Programme: B.Sc Chemistry

Semester: II

Name of the teacher: Dr. Shafali Arora

Availability Timings: 9.00 AM to 4.00 PM

e-mail: shafalilkcchemistry@gmail.com

Objectives of the Course:

This course aims at acquainting students to the knowledge of different types of solutions. It also aims at acquainting students with properties of solutions.

Course Content

- Colloidal solutions have specific applications.
- The discussion of ideal and non ideal solution is taken in full detail.
- Colligative properties are discussed thoroughly.
- Thermodynamic aspects of all content is dealt with mathematically.

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- Lectures: two per week
- Student seminars: Each student to deliver on one topic
- Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics.
- Powerpoint presentations
- Participatory and experimental Learning
- Quiz or oral examination

Programme Learning Outcomes:

Q. Knowledge and Understanding:

- Students will come to know the difference of colloids and emulsions.
- Students will have knowledge of ideal and non ideal solutions and colligative properties.

R. Intellectual (Cognitive and Analytical) Skills:

- Students will be able to practically see the difference of colloids and emulsions.
- Colligative properties have general examples in lab so students will be having better insight of such properties when learnt in theory too.

S. Practical Skills

Students will learn to do the practicals like depression in freezing point and elevation in boiling point.

T. Transferable Skills

Students will be able to observe general chemicals and compounds in the terms of colloids and emulsions.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	35%	After each unit
2. Student Seminars/Powerpoint presentations	35%	Every week and Each student once
3. Complete syllabus test	35%	Last week of April
End of Semester exam	**35%**	**First week of May onwards**

Teaching Outline:

Syllabus Division	**Teaching Dates**
Section- B **Liquid State** Intermolecular forces, structure of liquids (a qualitative description). Structural differences between solids, liquids and gases. Liquid crystals: Difference between liquids crystal, solid and liquid.Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.	11th January to 20th February
Section -D **Solutions, Dilute Solutions and Colligative Properties** Ideal and non–ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law,	21st February to 22nd March

relative lowering of vapour pressure, molecular weight determination.	
Osmosis, Law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.	23rd March to 15th April
Revision	15th April onwards

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams.

Text Books:

Physical Chemistry Vol.1 for B.Sc of GNDU

References

1. Atkins, P., Paula, J.de, Atkins Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Inc, 1996.
4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan India, 1985.
5. Berry, R.S., Rice, S.A., Ross, J., Physical Chemistry; 2nd edition, Pubs: Oxford University Press, 2000.
6. Albert, R.A., Silbey, R.J., Physical Chemistry; 1st edition, Pubs: John Wiley & Sons Inc.,1992.
7. Dogra, S.K., Dogra, S., Physical Chemistry Through Problems; Pubs:Wiley Eastern Limited, 1991.
8. Levine, I.N., Physical Chemistry; 5th edition, Pubs: Tata McGraw Hill Publishing Co. Ltd., 2002.
9. Moore, W. J., Basic Physical Chemistry; Pubs: Prentice Hall of India Pvt. Ltd, 1983.
10. University General Chemistry, C.N.R. Rao, Macmillan.

E-resources

https://www.toppr.com/surface chemistry/colloids

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Organic Chemistry-B

BT-4

Programme : B.Sc. (Bio-Technology)
Semester: II
Name of the Teacher: Dr. Shafali Arora
Availability Timings: 9.00 AM to 3.30 PM
e-mail: shafalilkcchemistry@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of various terms related to organic chemistry.
- To understand the fundamentals of spectroscopy and various nucleophillic reactions related to carbonyl compounds.
- **Course Content:**
  - Alkynes
  - Aldehydes and Ketones
  - Some common Organic reactions

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: one per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Quiz

Program Learning Outcomes:

- **The aim is to teach students the basic knowledge of mechanisms together with reagents and general conditions for the reactions involved in the syllabus**

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**35%**	**After Each Unit**
2.Student Seminars	**35%**	**Every week**
3. Complete syllabus test	**35%**	**End of March**
End of Semester Exam	**35%**	**Last week of april onwards**

Teaching Outline:

Unit	Teaching Dates
I	**11th January to 15th february**
III	**16th february to 10th March**
IV	**1 1th March to 15th April**
Revision	**15th April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

References:

- R. T. Morrison and R. N. Boyd, Organic Chemistry

- F. A. Carey, Organic Chemistry
- J. March, Advanced Organic Chemistry, Reaction mechanisms and Structure
- I. L. Finar, Organic Chemistry, Vol. I, IV Ed.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Physical, Organic and Inorganic Aspects of Spectroscopy-B

(BT-7)

Programme : B.Sc. (Bio-Technology)
Semester: VI
Name of the Teacher: Dr. Shafali Arora
Availability Timings: 9.00 AM to 3.30 PM
e-mail: shafalilkcchemistry@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of various processes related to different types of spectroscopy.
- **Course Content:**
  - Proton Magnetic Resonance Spectroscopy
  - Mass Spectrometry.
  - Applications of mass and NMR spectroscopy

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 3 per week
- Student Seminars: two per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Quiz

Program Learning Outcomes:

- **The aim is to teach students the basic processes involved in NMR and mass spectrometry with different types of techniques.**
- **To enable the students to elucidate the structure of a compound numerically.**

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE) 1.Class Tests (Unit wise) 2.Student Seminars 3. Complete syllabus test		
	35%	**After Each Unit**
	35%	**Every week**
	35%	**End of March**
End of Semester Exam	**35%**	**Last week of april onwards**

Teaching Outline:

Unit	Teaching Dates
I	**11th January to 25th February**
II	**26th February to 30th March**
III	**31st March to 15th April**
Revision	**15th April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

Notes provided by teacher.

References:

- Organic Spectroscopy by W. Kemp; Publisher- Palgrave, New York

- Introduction to spectroscopy- D.L. Pavia, G.M. Lampman and G. S. Kriz
- D. H. Williams and I. Fleming, Spectroscopic Methods in Organic Chemistry

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Organic Chemistry-III

Programme : B.Sc.
Semester: IV
Name of the Teacher: Dr. Vikas Kumar
Availability Timings: 9.00 AM to 4:00 PM
E-mail: vikaschemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students familiar with types of organic reactions, proposing their mechanism and their methods of applications for the synthesis of new organic molecules.

Course Content:

SECTION–A

Topic I. Carboxylic Acids: Nomenclature, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation.

Topic II. Carboxylic Acids Derivatives Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides, Relative stability & reactivity of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Preparation of carboxylic acid derivatives, chemical reactions. Mechanisms of esterification and hydrolysis (acidic and basic).

SECTION–A

Topic -III. Organic Compounds of Nitrogen: Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes, Mechanisms of nucleophilc substitution in nitroarenes and their reduction in acidic, neutral and alkaline media. Reactivity, Structure and nomenclature of amines, Methods of preparation of amines by Reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction and Hofmann bromamide reaction. Physical properties. Stereochemistry of amines. separation of a mixture of primary, secondary and tertiary amines. Structural features effecting basicity of amines. Amine salts as phase-transfer catalysts.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Assignments : The students will be asked to read the textbook in advance and write assignments on given topics
- Power point Presentations
- Participatory Learning
- Test

Program Learning Outcomes:

(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:

Students will

- know the nomenclature rule for the organic compounds, methods of their preparation, Basic understanding of the how to propose and draw the mechanism of reactions.
- Be familiar with the optimum reaction conditions etc.

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE) 1.Class Tests (Unit wise)		
	35%	**After Each Topic**
		Every week
2.Student Seminars	**35%**	**Last Week of February**
Complete Syllabus Test	**35%**	**Last week of March onwards**

Teaching Outline:

Unit	Teaching Dates
Topic: I	11 January to 10 February
Topic: II	11 February to 10 March
Topic: III	11 March to 25 March
Revision	26 March onwards

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

1. Organic Chemistry By Morrison Boyd

E- resources

- http://www.rsc.org/journals-books-databases/librarians-information/products-prices/ebooks/

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Physical Chemistry-B

Programme : B.Sc.
Semester: II
Name of the Teacher: Dr. Vikas Kumar
Availability Timings: 9.00 AM to 4:00 PM
E-mail: vikaschemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students familiar with gaseous state, Nature and types of solutions, their properties and Colligative properties of solutions.

Course Content:

SECTION–A

I. Gaseous States:

Topic I-Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waal's equation of state. Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waal's equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Topic II- 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.

SECTION–D

Solutions, Dilute Solutions and Colligative Properties

Topic III- Ideal and non–ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination. Osmosis, Law of osmotic pressure and its measurement,

determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : two per week
- Assignments : The students will be asked to read the textbook in advance and write assignments on given topics
- Power point Presentations
- Participatory Learning
- Test

Program Learning Outcomes:

(Knowledge and Understanding of the fundamental concepts, Learning Outcomes:

Students will

- know the nomenclature rule for the organic compounds, methods of their preparation, Basic understanding of the how to propose and draw the mechanism of reactions.
- Be familiar with the optimum reaction conditions etc.

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal		

Evaluation(CIE) 1.Class Tests (Unit wise) 2.Student Seminars	**35%**	**After Each Topic**
		Every week
	35%	**Last Week of February**
Complete Syllabus Test	**35%**	**Last week of March onwards**

Teaching Outline:

Unit	Teaching Dates
Topic: I	11 January to 10 February
Topic: II	11 February to 10 March
Topic: III	11 March to 25 March
Revision	26 March onwards

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s):

1. Organic Chemistry By Morrison Boyd

E- resources

- http://www.rsc.org/journals-books-databases/librarians-information/products-prices/ebooks/

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Organic Chemistry

Programme : B.Sc. (Medical&Non Medical)
Semester: VI
Name of the Teacher: Arunjit Kaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: arunjitchemistrylkc@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of various processes related to different types of spectroscopy and organic compounds of biological importance.
- **Course Content:**
  - Carbohydrates
  - Structures of ribose and deoxyribose.
  - Amino Acids, Peptides, Proteins and Nucleic Acids
  - Organic Synthesis via Enolates

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: one per week
- Assignments: The students will be asked to read the textbook in advance and write articles on given topics, group discussions in class.
- PowerPoint Presentations.
- Quiz

Program Learning Outcomes:

- **The aim is to teach students the basic knowledge of mechanisms together with reagents and general conditions for the reactions involved in the syllabus**

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**35%**	**After Each Unit**
2.Student Seminars	**35%**	**Every week**
3. Complete syllabus test	**35%**	**End of March**
End of Semester Exam	**35%**	**Last week of april onwards**

Teaching Outline:

Unit	Teaching Dates
Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation. Structures of ribose and deoxyribose An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.	**11 janaury to 15february**
Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α-	**17 february to 21March**

amino acids. Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and proteins. Levels of protein structure. Protein denaturation/renaturation. Nucleic acids : Introduction. Constituents of nucleic acids.Ribonucleosides and ribonucleotides. The double helical structure of DNA.	
Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes. Alkylation and acylation of enamines.	**23 march to 15 April**
Revision	**16 April onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

Notes provided by teacher.

References:

- Advanced Organic chemistry, F.A. Carey.
- Organic Synthetic reactionsby William Carruthers.

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: ORGANIC CHEMISTRY

Programme : B.Sc. Chemistry
Semester: VI
Name of the Teacher: Dr. Bhupinderpal Simgh
Availability Timings: 9.00 AM to 4:00 PM
E-mail: bhupinderchemistrylkc@gmail

Objectives of the Course:

- The aim of the course is to provide the vast knowledge to the Students regarding various topics such as Organo sulphur Compounds, Synthetic Polymers, UV, IR, NMR Spectroscopy and problems based on Spectroscopy.

Course Content:

- Organosulphur Compounds
- Synthetic Polymers
- UV, IR, NMR Spectroscopy
- Problems based on Spectroscopy

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: one per week
- Assignments: Assignments given to the students related to the lectures given.
- Powerpoint Presentations

Program Learning Outcomes:

- The aim is to provide the vast knowledge of Spectroscopy and their problems, synthetic polymers and organosulphur compounds.

Modes of Assessment	Minimum Score Required (to Qualify for the Next Exam/Class)	Schedule
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**35%**	**After Each Unit**
2.Student Seminars	**35%**	**Every week**
3. Complete syllabus test	**35%**	**First week of April**
End of Semester Exam	**35%**	**Last week of April**

Teaching Outline:

Unit	Teaching Dates
UV and IR Spectroscopy	**15 Janaury to 10 February**
NMR Spectroscopy	**11 February to 28 February**
Problems based on Spectroscopy	**1 March to 15 March**
Organosulphur Compounds	**16 March to 31 March**
Synthetic Polymers	**1 April to 15 April**
Revision	**16 April Onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Books Recommended:

7.Elementary Organic Spectroscopy- Y.R. Sharma

8. Fundamental of molecular Spectroscopy– C.N. Banwell

9.Advanced Organic Chemistry, F.A. Carey, R.J. Sunberg.

E Resourses

https://en.wikipedia.org › wiki › Nuclear_magnetic_resonance_spectroscopy

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Chemistry (Inorganic Chemistry-A)

Programme: B.Sc Chemistry

Semester: II

Name of the teacher: Dr Geetanjli Kaushal

Availability Timings: 9.00 AM to 4.00 PM

E-mail: geetanjlichemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students with the complete knowledge of elements of periodic table and their physical-chemical properties.

Course Content

- The course content is based on s,p and d block elements.
- Full detail of occurrence, properties and applications is taught through this content.
- Inorganic polymers
- Acids and bases according to different concepts

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- **Lectures: four per week**
- **Student seminars: Each student to deliver on one topic**
- **Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics**
- **Powerpoint presentations**
- **Participatory and experimental Learning**
- **Quiz or oral examination**

Programme Learning Outcomes:

U. Knowledge and Understanding:

Students will be able to understand the complete periodic table, i.e. the back bone of study of inorganic chemistry.

V. **Intellectual (Cognitive and Analytical) Skills:**

Students will be able to discuss the stability of different oxidation states of compounds and moreover they can think in terms of existence of compounds in one form or other.

W. Practical Skills

Students will learn to understand the theory behind different practical observations.

X. Transferable Skills

Students will be able to study the new compounds in light of the compounds studied in the curriculum.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	35%	After each unit
2. Student Seminars/Powerpoint presentations	35%	Every week and Each student once
3. Complete syllabus test	35%	Last week of April
End of Semester exam	**35%**	**First week of May onwards**

Teaching Outline:

Division of syllabus	**Teaching Dates**
SECTION–B **s-Block Elements** Comparative studies, diagonal relationship, salient features of hydrides, salvation and complexation tendencies. **Acids and Bases** Arrhenius, Bronsted-Lowry, the Lux-Flood, solvent system and Lewis concepts of acids and bases.	Jan 11, 2020 to Feb 6, 2020
SECTION–A **p–Block Elements–I** Comparative study (including diagonal relationship) of groups 13–17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13–16, hydrides of boron–diborane and higher boranes, Borazine, borohydrides, fullerenes.	Feb 7, 2020 to Feb 28,2020

SECTION–C **p–Block Elements-II** Carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalide**,** Silicones and phosphazenes as examples of inorganic polymers, nature of bonding in triphosphazenes.	March2, 2020 to March 26, 2020
SECTION–D **Chemistry of Transition Elements** Characteristic properties of *d*–block elements. Properties of the elements of the first transition series, their simple compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry. General characteristics of elements of Second and Third Transition Series, comparative treatment with their *3*d analogues in respect of ionic radii, oxidation states, magnetic behaviour.	March 27, 2020 to Apr 9,2020
Revision	April 10,2020 till University exams

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams.

Text Books:

Inorganic Chemistry for semester 2 of GNDU

References

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 2nd edition, Pubs: John Wiley and Sons, 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman & Hall Ltd., 1991.
3. Shriver, D.E., Atkins, P.W., Inorganic Chemistry; 4th edition, Pubs: Oxford University Press, 2006.
4. Douglas, B., Medaniel, D., Atenander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994,
5. Porterfeild, W.W., Wesky, A., Inorganic Chemistry; Pubs: Addison-Wesky Publishing Company, 1984.
6. Miessler, G.L., Tarr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004,

7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: Tata McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B.Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.K., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.
10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
11. Inorganic Chemistry, A.G. Sharpe, ELBS.

E-resources

chemed.chem.purdue.edu

https://youtu.be/Jg7R56V6ujk

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: PHYSICAL CHEMISTRY-IV

Programme : BSc (Medical & Non-medical)
Semester: VI
Name of the Teacher: Dr.Navjotkaur
Availability Timings: 9.00 AM to 3.30 PM
E-mail: navjotchemistrylkc@gmail.com

Objectives of the Course ;

- This course aims at acquainting students with the knowledge of variousconcepts and theoriesrelated to physical chemistry. The present syllabus has been framed as per the latest UGC guidelines and recent research trends in the subject.
- To understand various topics related to Solid state, Quantum and Photochemistry and to bring forth the importance of academic and laboratory skill for the undergraduate students.

Course Content:

- Solid State
- Photochemistry
- Quantum Mechanics

Detailed Course Contents: Available at www.gndu.ac.in

What will be the teaching methods:

- Lectures : 2 per week
- Student Seminars: Two per week
- Assignments : The students will be asked to write articles on given topics
- Multiple choice questions
- Participatory and Experiential Learning
- Quiz

Program Learning Outcomes:

- **The aim is to teach students the basic knowledge concerning the fundamentals in the area of physical chemistry**

- **The students will be able to pursue their carrer objectives in advance education, in scientific research and in teaching carrers following the graduation in the course.**

Modes of Assessment	**Minimum Score Required (to Qualify for the Next Exam/Class)**	**Schedule**
Continuous Internal Evaluation(CIE)		
1.Class Tests (Unit wise)	**35%**	**After Each Unit**
2.Student Seminars	35%	**Every week**
3. Complete syllabus test	**35%**	**Mid of April**
End of Semester Exam	**35%**	**Last week of April onwards**

Teaching Outline:

Unit	**Teaching Dates**
III	**11 janaury to 15february**
IV	**16february to 20march**
II	**21march to 10april**
Revision	**11april onwards**

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, failing which they will be detained from appearing in university exams.

Text Book(s) :

- Physical Chemistry by Modern publications
- Physical Chemistry by Vishal publications
- Physical Chemistry by Pradeep publications

References:

1. Atkins, P., Paula, J.de, Atkins, Physical Chemistry; 8th edition, Pubs: Oxford University Press, 2008.
2. 2. Puri, B.R., Sharma, L.R., Pathania, M.S., Principles of Physical Chemistry; 43rd edition, Pubs: Vishal Publishing Co., 2008.
3. 3. Barrow, G.M., Physical Chemistry; 6th edition, Pubs: McGraw Hill Company Inc., 1996. 4. Rao, C.N.R., University General Chemistry; Pubs: Macmillan of India, 1985.
4. 12. Atkins, P. Friedman, R., Molecular Quantum Mechanics; 4th edition Pubs: Oxford University Press, 2007.
5. Levine, I.N., Quantum Chemistry; 5th edition, Pubs: Prentice Hall International Inc., 2000.
6. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.

E- resources

https://nptel.ac.in/courses/104103019/2

ncert.nic.in/ncerts/l/lech101.pdf

shodhganga.inflipbnet.ac.in

CURRICULUM PLANNING AND IMPLEMENTATION

Course Name: Inorganic Chemistry-A

Programme: B.Sc Chemistry

Semester: IV

Name of the teacher: Dr Rajnish Moudgil

Availability Timings: 9.00 AM to 4.00 PM

E-mail: rajnishchemistrylkc@gmail.com

Objectives of the Course:

This course aims at acquainting students with the knowledge of coordination chemistry. Coordination chemistry, its nomenclature and properties are the main content of the syllabus. The f-block elements are also taught as these have wide applications. Bio-inorganic Chemistry is the very diverse due to medicinal properties of coordination compounds.

Course Content

- The course is formulated in the manner that inner transitions elements and coordination compounds are studied in detail.
- The concept of non aqueous solvents is introduced with examples in detail.
- Oxidation and reduction properties are important for inorganic metals and compounds.
- The biological aspects of metals are included.

Detailed Course Contents: Available at www.gndu.ac.in

Teaching methods employed

- **Lectures: four per week**
- **Student seminars: Each student to deliver on one topic**
- **Assignments: The students will be asked to read the textbooks and study material in advance and to prepare extensive notes as assignments on given topics**
- **Powerpoint presentations**
- **Participatory and experimental Learning**
- **Quiz or oral examination**

Programme Learning Outcomes:

Y. Knowledge and Understanding:

- Students will be able to give IUPAC names to coordination compounds.
- Students will be able to understand the reactions occurring specifically in non aqueous solvents.

Z. Intellectual (Cognitive and Analytical) Skills:

Students will be able to analyse the comparison of stability of different oxidation states of compounds.

AA. Practical Skills

Students will learn to understand the colour of different coordination compounds. The magnetic character of f-block elements will be easy to understand.

BB. Transferable Skills

Students will be able to understand the qualitative analysis of inorganic metal ions done in lab with this theoretical knowledge of subject.

Modes of assessment	**Minimum score required to qualify**	**Schedule**
Continuous Internal evaluation (CIE)		
1. Class Tests (Unit wise)	35%	After each unit
2. Student Seminars/Powerpoint presentations	35%	Every week and Each student once
3. Complete syllabus test	35%	Last week of April
End of Semester exam	**35%**	**First week of May onwards**

Teaching Outline:

Syllabus to be covered	**Teaching Dates**
I. Coordination Compounds	11.1.20 to 28.1.20
II. Non-aqueous Solvents	29.1.20 to 13.2.20
III. Oxidation and Reduction **IV. Chemistry of Lanthanide Elements**	14.2.20 to 6.3.20
V. Chemistry of Actinides **VI. Bioinorganic Chemistry**	7.3.20 to 10.4.20
Revision	11.4.20 till University Exams

Attendance Policy

Lecture attendance is mandatory. Students are expected to maintain 75% attendance of the total lectures delivered, falling which they will be detained from appearing in university exams.

Text Books:

A textbook of Inorganic Chemistry for semester 4 of GNDU

References

1. Cotton, F.A., Wilkinson, G., Gaus, P.L., Basic Inorganic Chemistry; 3rd edition, Pubs: John Wiley Sons. 1995.
2. Lee, J.D., Concise Inorganic Chemistry; 4th edition, Pubs: Chapman Hall Ltd., 1991.
3. Shriver, D.E., Alkins, P.W., Langford, C.H., Inorganic Chemistry; 4th edition, Oxford Publisher: Oxford University Press, 2006.
4. Douglas, B. McDamiel, D., Alexander, J., Concepts and Models of Inorganic Chemistry; 3rd edition, Pubs: John Wiley and Sons Inc., 1994.
5. Porterfield, W.W., Wesley, A., Inorganic Chemistry; Pubs: Addison-Wesley Publishing Company, 1984.
6. Miessler, G.L., Larr, D.A., Inorganic Chemistry; 3rd edition, Pubs: Pearson Education Inc., 2004.
7. Jolly, W.L., Modern Inorganic Chemistry; 2nd edition, Pubs: McGraw-Hill Publishing Company Limited, 1991.
8. Purcell, K.F., Kotz, J.C., Inorganic Chemistry; Pubs: W.B. Saunders Company, 1977.
9. Puri, B.R., Sharma, L.R., Kalia, K.C., Principles of Inorganic Chemistry; 30th edition, Pubs: Milestones Publisher, 2006-07.
10. Inorganic Chemistry, W.W. Porterfield Addison-Wesley.
11. Inorganic Chemistry, A.G. Sharpe, ELBS.
12. University General Chemistry, C.N.R. Rao, Macmillan.

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www.chemistry.wustl.edu

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