Study & Evaluation Scheme

of

Master of Science
(Chemistry)
[Applicable for Academic Session 2017-18]
[Approved by Hon’ble VC dated August 08, 2017]

TEERTHANKER MAHAVEER UNIVERSITY
N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001
Website: www.tmu.ac.in
SUMMARY

Programme: M.Sc. (Chemistry)
Duration: Two-year full time (Four Semesters)
Medium: English
Minimum Required Attendance: 75%
Credit:

<table>
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<th>Maximum Credit</th>
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Minimum credit required for the degree: 82 (Maximum One non-core paper can be audit per year of program)

Assessment:

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Duration of Examination:

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(To qualify the course a student is required to secure a minimum of 45% marks in aggregate in each course including the semester-end examination and the teacher’s continuous evaluation shall be essential for passing the course and earning its assigned credits. A candidate, who secures less than 45% marks in a course, shall be deemed to have failed in that course.)

Question Paper Structure

1. The question paper shall consist of six questions. All six are compulsory. First question shall be of short answer type (not exceeding 50 words). Question No. 1 shall contain 8 parts representing all units of the syllabus and students shall have to answer any five (weightage 2 marks each).
2. Remaining five questions will be one from each unit with internal choice. The student has to answer one of the two in each question. The weightage of Question No. 2 to 6 shall be 10 marks each.
3. Usually each question in the examination should be designed to have a numerical component, where part of syllabus.
Note 1:

Evaluation Scheme for MOOC, Short Term Courses:

University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

Keeping this in mind the Academic Council in its 10th meeting on February 13, 2016, approved the University proposal and allowed a maximum of two credits to be allocated for MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through edX, Coursera, IIRS and NPTEL could be given a maximum credit of two with 1 credit for credit with 30-60 contact hours and 2 credits for courses having more than 60 credit hours.

For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

1. There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.

2. The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalise a list of courses to be offered with credits defined for each course and the mode of credit consideration of the student. The complete process including the approval of the Vice Chancellor shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course the approval will be valid only for the semester on offer.

3. A student can opt for a maximum of two MOOC courses for credit during the complete duration of the course other than offered under SWAYAM.

4. College can offer upto 20% credit through courses offered by SWAYAM. However, if the college is offering courses on other MOOC platforms, the total credit offered under MOOC will not exceed 20% including those offered under SWAYAM.

5. Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Co-ordinator MOOC through the Principal of the College.

6. Where the MOOC course or Add-on on courses are only offering certificate of successful completion, and credit has been assigned to the course, the University examination division will conduct a MCQ examination for the course with 50 MCQ with 100 marks to facilitate inclusion of the courses in CPI computation.
7. College will define whether the credits are regular credits or to be considered only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

8. In case the College wants the additional course to be shown in the mark sheet as additional course completed by the students the same shall also be mentioned by the College and the student will opt for the same at the time of taking admission to the course.
## Study & Evaluation Scheme

### Semester I

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<th>Periods</th>
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Semester-I

Inorganic Chemistry-I

Course Code: MCH111

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Objective:
This syllabus deals with the basic concepts i.e. stereochemistry, bonding & reaction mechanism of transitional metal complexes.

Course Outcomes: The student will able to learn:
Stereochemistry & bonding aspects of main group elements. The students will be able to explain the reaction mechanism of transition metal complexes & factors affecting it & can develop generalized idea of application in the field of medicine, pharmacy, Polymer chemistry & Agriculture etc.

Course Contents:

UNIT I

Stereochmistry and Bonding in Main Group Compounds: VSEPR theory and its application for treating structures of inorganic molecules and ions containing lone pairs of electrons, shortcomings of VSEPR model. MO treatment of polyatomic molecules, e.g., ozone, nitrite, nitrate, hydrazoic acid and benzene.

UNIT II

Metal-Ligand Bonding: Molecular orbital theory. Qualitative aspects of metal-ligand sigma-bonding in octahedral, tetrahedral and square planar complexes. Jahn-Teller Effect
Electronic Spectra and of Transition Metal Complexes. Spectroscopic term, terms and microstates for the p^2 and d^2 configurations, Hund’s rules for ground state terms, the correlation of spectroscopic terms into Mulliken symbols, electronic transition selection rules, Orgel diagrams for transition metal complexes (d^1-d^9 states). Jahn-teller effect and electronic spectra of complexes

UNIT III

Metal-Ligand Equilibria in Solution: Stepwise and overall formation constants and their relationship, trends in stepwise constants, factors affecting the stability of metal complexes with reference to the nature of metal ion and ligand, chelate effect and its thermodynamic origin, determination of binary formation constants by Bjerrum method, Job’s and Mole ratio methods.

UNIT IV

Reaction Mechanisms of Transition Metal Complexes I: Energy profile of a reaction, reactivity of a metal complexes, inert & labile complexes, kinetics of octahedral substitution, acid hydrolysis, factors affecting acid hydrolysis, base hydrolysis, conjugate base mechanism, direct & indirect evidence in favour of conjugate mechanism, anation reaction, reaction without metal ligand bond cleavage. Substitution reaction in square planar complexes, the trans effect, mechanism of the substitution reaction.

UNIT V

Reaction Mechanisms of Transition Metal Complexes II: Redox reaction, Electron transfer reactions, outer and inner sphere electron transfer process, Marcus-hush theory, doubly bridged inner-sphere transfer, other electron transfer reactions; two electron transfers, Non-complementary reaction, Ligand exchange via electron exchange, reductions by hydrated electrons.
**Reference Books:**


* Latest editions of all the suggested books are recommended
Semester-I

Organic Chemistry-I

Course Code: MCH112

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Objective: The present syllabus designed to explain the stereochemistry & reaction mechanism of the organic compounds.

Course Outcomes: Knowledge of basic concept of organic chemistry will help students to develop idea to synthesize new organic molecules which find potential application in the field of drug design, medicine and other molecules of industrial importance

Course Contents:

UNIT I (Lectures 08)

UNIT II (Lectures 08)
Reaction Mechanism. Types of mechanisms, types of reactions, thermodynamic and kinetic requirements, and control. Potential energy diagrams, transition states and intermediates, methods of determining mechanisms, isotope effects. Effect of structure on reactivity -resonance and field effects, steric effect. The Hammett equation and linear free energy relationship, substituent and reaction constants. Taft equation.

UNIT III (Lectures 08)
Aliphatic Nucleophilic Substitution. The S_N2, S_N1, mixed S_N2 and S_N1, and SET mechanisms. The S_Ni mechanism. Reactivity effects of substrate structure, attacking nucleophile, leaving group and reaction medium. The neighbouring group mechanism, neighbouring group participation by Pi and Sigma bonds. Classical and nonclassical carbocations, norbornyl system, carbocation rearrangements. Aromatic Nucleophilic Substitution. The S_NAr, S_N1, benzyne and S_RN1 mechanisms. Reactivity, effect of substrate structure, leaving group and attacking nucleophile. Bucherer reaction, alkylation, and amination. The Bamberger rearrangement. The von Richter rearrangement

UNIT IV (Lectures 08)

UNIT V (Lectures 08)
Reference Books:


* Latest editions of all the suggested books are recommended
Semester-I

Physical Chemistry-I

Course Code: MCH113

Objective: The content of this syllabus will give a precise idea about Schrodinger wave equation, its solution & applications. The student gets familiar with classical thermodynamics & chemical dynamics.

Course Outcomes: The students will be able to find out the solution & applicability of Schrodinger wave equation, classical thermodynamics & chemical dynamics in day to day life.

Course Contents:

UNIT I
Introduction to exact quantum mechanical results. The Schrodinger equation and the postulates of quantum mechanics. Discussion of solutions of the Schrodinger equation to systems such as particle in a box, the harmonic oscillator, the rigid rotor, the hydrogen atom.

UNIT II

UNIT III
Classical Thermodynamics. Brief resume of concepts of laws of thermodynamics, free energy, chemical potential and entropies. Partial molar properties; partial molar free energy, partial molar volume and partial molar heat content and their significance. Determinations of these quantities. Concept of fugacity and determination of fugacity. Derivation of phase rule and its application to three component systems, second order phase transitions.

UNIT IV
Chemical Dynamics (Part I). Methods of determining rate laws, Arrhenius equation, collision theory of reaction rates, steric factor, activated complex theory, ionic reactions, kinetic and thermodynamic control of reactions.

UNIT V
Chemical Dynamics (Part II). Dynamic chain (hydrogen-bromine reaction, pyrolysis of acetaldehyde, decomposition of ethane), photochemical (hydrogen-bromine and hydrogen-chlorine reactions) and oscillatory reactions, homogeneous catalysis, kinetics of enzyme reactions

Reference Books:
1. Atkins, P.W. Physical Chemistry, ELBS.
3. Flory, P.J. Principles of Polymer Chemistry, Asian Book Private Ltd.

* Latest editions of all the suggested books are recommended
Semester-I

Research Methodology

Course Code: MAT115

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Objective:
- Students should understand a general definition of research design
- Students should know why educational research is undertaken, and the audiences that profit from research studies
- Students should be able to identify the overall process of designing a research study from its inception to its report

Course Outcomes: At the end of this course, the students should be able to:
- understand some basic concepts of research and its methodologies
- identify appropriate research topics
- select and define appropriate research problem and parameters
- prepare a project proposal (to undertake a project)
- organize and conduct research (advanced project) in a more appropriate manner
- write a research report and thesis

Course Contents:

UNIT I  (Lectures 08)

UNIT II  (Lectures 08)
Measurement of scaling techniques: Measurement scales, sources of error in measurement, technique of developing measurement tools, Meaning of scaling, its classification, important scaling techniques. Methods of collection, Sampling Techniques

UNIT III  (Lectures 08)
Introduction to statistics: Meaning, Definition, Characteristics, importance of the study of statistics .Tabulation of Data: Basic principles of graphical representation, Types of diagrams histograms, frequency polygons, smooth frequency polygons, cumulative frequency curve. Measures of central Tendency: Mean, Median Mode, Measures of Dispersion: Range, mean deviation and standard deviation.

UNIT IV  (Lectures 08)
Testing of Hypotheses, Level of significance, Degree of freedom, Student t-test, F-test, Chi Square-test, Anova-one way & two way; Correlation & regression: Significance, Types of Correlation, Linear Regression
UNIT V (Lectures 08)

Interpretation and report writing: Meaning, Techniques of interpretation, significance of report writing, steps in writing, layout of the research report, types of report and precautions for writing research report. Use of SPSS in Data Analysis.

Text Books:

1. Dr. J. A Khan: Biostatistics & Research Methodology, APH Publishing.

* Latest editions of all the suggested books are recommended
Semester-I

Inorganic Chemistry-I (Lab)

Course Code: MCH161

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**Objective:** It consists of theoretical principles in qualitative analysis of mixture including basic radicals & acidic radicals, Separation of cations & anions by chromatography & preparation of inorganic complexes.

**Course Outcomes:** After performing this lab students will be able to do qualitative analysis of mixture including basic radicals & acidic radicals, Separation of cations & anions by chromatography & preparation of inorganic complexes & identification of unknown complexes by spectral studies.

**List of Experiment:**

**I- Qualitative analysis:**
To identify the given cation, anion and interfering radicals (total six including one interfering radical) from the given inorganic mixture.

**II- Chromatography**
1. Separation of cations and anions by Paper Chromatography
2. Separation of cations and anions by Column Chromatography; Ion exchange

**III- Synthesis:**
Preparation of selected inorganic compounds and their studies by measurements of decomposition temperature, molar conductance and magnetic susceptibility measurements. (Any five)

1. [Co(NH3)6][Co(NO2)6]
2. cis-[Co(trien) (NO2)2]Cl.H2O
3. Hg[Co(SCN)4]
4. [Co(Py)2Cl2]
5. [Ni(NH3)6]Cl2
6. [Ni(dmg)2]
7. [Cu(NH3)4]SO₄·H₂O
8. aquabis(acetylacetonato) nitrosylchromium (I), [Cr(NO)(acac)2(H2O)]
9. Cis-Bis(glycinato) copper(II) and trans-Bis (glycinato) copper (II)
10. Preparation of Zn, Cd and Hg thiocyanates from their respective chlorides
11. Bis (benzoylacetonato) copper (II)
12. Bis (acetylacetonato) oxovanadium (IV), [VO(acac)2][MoO2(acac)2]
13. Hexaammminenickel (II) tetrafluoroborate, [Ni(NH3)6](BF₄)₂ and determination of nickel content gravimetrically.
14. Potassium tris (oxalato) ferrate, K₃[Fe(C₂O₄)₃] and determination of oxalate using permanganate.
15. Preparation of N, N-bis(salicylaldehyde)ethylenediamine [salenH₂], Co(salen)
Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

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External Evaluation (50 marks)
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.
Semester-I

Physical Chemistry-I (Lab)

Course Code: MCH162

L T P C

Objective: It consists of various principles involved during Lab work. During experiments, students can perform experiments concerning adsorption, phase equilibria, and chemical kinetics etc.

Course Outcomes: After completion of all the experiments students will be able to perform various experiments for example, adsorption, Polarimetry, chemical kinetics etc.

List of Experiment:
1. To study surface tension -concentration relationship for solutions (Gibbs equation).
2. To construct the phase diagram for three component system (e.g., chloroform-acetic acid-water).
3. To calculate specific rotation of sucrose
4. Enzyme kinetics -inversion of sucrose
5. Determine the rate constant of hydrolysis of an ester as methyl acetate catalysed by an acid. Determine also the energy of activation of the reaction
6. Determination of the primary salt effect on the kinetics of ionic reactions and testing of the Bronsted relationship (iodide ion is oxidised by persulphate ion)
7. Determination of the velocity constant of hydrolysis of an ester and to study the effect of change of concentration on it.
8. To study the adsorption of oxalic acid on charcoal and to prove the validity of Freundlich adsorption isotherm.
9. To study the adsorption of oxalic acid on charcoal and to prove the validity of Langmuir’s adsorption isotherm.
10. To study the variation of thermo emf with the temperature for the copper-iron thermocouple.
11. To study forward and reverse characteristics of Si and Ge semiconductor diode

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

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Semester I
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC111

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated.

The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

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Responsible for marks

| Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |}

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M.Sc.(Chemistry) Syllabus Applicable w.e.f. Academic Session 2017-18
Semester-II

Inorganic Chemistry-II

Course Code: MCH211                          L  T  P  C
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Objective: The course content consists of synthesis, reactivity & nature of bonding of transition metal π acid complexes. The wade's rule & the capping rule have been applied to predict the geometry of HNCC. ESR spectroscopy has used for determining the unpaired electron in complexes. X-ray crystallography has been applied for crystallographic studies. Mossbauer spectroscopy has been specially taught to know the nuclear environment of Iron & Tin compounds.

Course Outcomes: The nature of bonding synthesis & reactivity of transition metal π-acid complexes has been studied with a special reference to CO, NO etc. The kinetics & reaction mechanism of inorganic complexes have been studied. ESR & Mossbauer spectroscopy have been applied for the structural determination of the complexes.

Course Contents:
UNIT I                                    (Lectures 08)
Metal π-complexes: Metal carbonyls, structure & bonding, important reactions of metal carbonyls, preparation, bonding, structure & important reactions of transition metal nitrosyls, dinitrogen, dioxygen complexes & tertiary phosphine as ligands.

UNIT II                                    (Lectures 08)
Metal cluster compounds: Introduction, metal carbonyl clusters; Low Nuclearity (M₃ M₄) clusters: isoelectronic and isolobal relationships high nuclearity carbonyl clusters; hetero atoms in metal atom clusters, electron counting schemes for HNCC: HNCC of Fe, Ru, Os, Co, Rh,
a) Lower halide and chalcogenide clusters, octahedral metal halide, chalocogenide clusters, triangular clusters.
b) Compounds with M-M multiple bonds; I) Major structural types; quadrupole bonds Bonding and topology of boranes, 4-digit coding (s, t, y, x) numbers for B₂H₆, B₄H₁₀, B₅H₉, B₅H₁₁ and B₆H₁₀ and their utilities

UNIT III                                     (Lectures 08)
Organic Reagents in Inorganic Chemistry: Chelation, factors determining the stability of chelates (effect of ring size, oxidation state of the metal, coordination number of the metal); Use of the following reagents in analysis:
(a) Dimethylglyoxime (in analytical chemistry)
(b) EDTA (in analytical chemistry)
(c) 8-Hydroxyquinoline (in analytical chemistry)
(d) 1,10-Phenanthroline (in analytical chemistry)
(e) Thiosemicarbazones (in analytical chemistry)
(f) Dithiazone (in analytical chemistry)

UNIT IV                                     (Lectures 08)
Magneto chemistry: Origin of Magnetic moment, factors determining Para magnetism, application of magneto chemistry in co-ordination chemistry (spin only moment, Russell Saundee’s coupling, quenching of orbital angular moment, orbital contribution to a magnetic moment) in spin free and spin paired octahedral and tetrahedral complexes. Magnetic susceptibility (diamagnetic, paramagnetic) and its measurements, Van Vlecks formula for magnetic susceptibility, temperature dependence of magnetic
UNIT V (Lectures 08)
Mossbauer spectroscopy - Mossbauer effect, recoilless emission and absorption, hyperfine interaction, chemical isomer shift, magnetic hyperfine and quadruple interaction. Application of the technique to the studies of (1) bonding and structures of Fe$^{2+}$ and Fe$^{3+}$ compounds including those of intermediate spin, (2) Sn$^{2+}$ and Sn$^{4+}$ compounds and (3) detection of oxidation state

Reference Books:


* Latest editions of all the suggested books are recommended
Objective: The course content consists of scope & mechanism of Elimination reaction, Pericyclic reaction oxidation reactions & reduction reactions.

Course Outcomes: This syllabus will have boon to the students appearing for various competitive exam. A vast knowledge of this paper used in future to solve problem in research & Industries.

Course Contents:
UNIT I (Lectures 08)

UNIT II (Lectures 08)

UNIT III (Lectures 08)

UNIT IV (Lectures 08)

UNIT V (Lectures 08)
Rearrangements
General mechanistic considerations—nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements: Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Backmann, Hofmann, Curtius, Schmidt, Benzidine, Baeyer-Villiger, Shapiro reaction, Witting rearrangement and Stevens rearrangement

Reference Books:

* Latest editions of all the suggested books are recommended
**Semester-II**

**Physical Chemistry-II**

**Course Code:** MCH213  
**L T P C:** 4 0 0 4

**Objective:** Chemical kinetics consists of basic concept of order of the reaction, molecularity, and rate law. The impact of temperature on the rate of reaction & determination of rate constant. The physical & chemical reactions have been explained through collision theory, Activated complex theory & kinetics of complex reaction. The potential energy surface & reaction mechanism are of great interest. The theories of unimolecular gaseous reactions and their applications of state theory to unimolecular decomposition. The statistical & mechanical derivation of rate constant of a gaseous bimolecular reactions have been used using TST.

**Course Outcome:**
Chemical kinetics is of great interest to know the rate of reactions. The rate of complex reaction is determined by slow step of the complex reaction. The rate law has given experimental proof to express the order of the reactions. The reaction rates have been studied by different theories. Potential energy surface & reaction mechanism are used to calculate molecular dynamics. The partition function & chemical equilibrium are very important to understand RRK & RRKM theories. The rate constant of gaseous bimolecular reactions has been determined using TST.

**Course Contents:**

**UNIT I**  
(Lectures 08)
Chemical Dynamics (Part III). General features of fast reactions, study of fast reactions by flow method, relaxation method, flash photolysis and the nuclear magnetic resonance method. Dynamics of molecular motions and of barrier less chemical reactions in solution, probing the transition state. Dynamics of unimolecular reactions; Lindemann-Hinshelwood and Rice-Ramsperger-Kassel-Marcus and Slater theories of unimolecular reactions.

**UNIT II**  
(Lectures 08)

**UNIT III**  
(Lectures 08)

**UNIT IV**  
(Lectures 08)
UNIT V
(Lectures 08)

Reference Books:
3. Atkins, P.W. Physical Chemistry, ELBS.

* Latest editions of all the suggested books are recommended
Semester-II
Spectroscopy-I

Course Code: MCH214

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Objective: The syllabus deals with theory, principal & instrumentation of various spectroscopic techniques like Microwave, rotational, vibrational & electronic spectroscopy.

Course Outcomes: After thorough study of this paper, students get able to explain how & why spectral transition in a molecule can occur.

Course Contents:
UNIT I (Lectures 08)

UNIT II (Lectures 08)
Microwave Spectroscopy. Classification of molecules, rigid rotor model, effect of isotopic substitution on the transition frequencies, intensities, non-rigid rotor. Stark effect, nuclear and electron spin interaction and effect of external field. Applications.

UNIT III (Lectures 08)
Infrared Spectroscopy. Review of linear harmonic oscillator, vibrational energies of diatomic molecules, zero-point energy, force constant and bond strengths; anharmonicity, Morse potential energy diagram, vibration-rotation spectroscopy, P, Q, R branches. Vibrations of polyatomic molecules. Selection rules, normal modes of vibration, group frequencies, overtones, hot bands, factors affecting the band positions and intensities, far IR region.

UNIT IV (Lectures 08)

UNIT V (Lectures 08)
Infrared and Raman Spectroscopy. Instrumentation and sample handling. Calculation of vibrational frequencies. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, carbonyl compounds, alcohols, ethers, amines, phenols and aromatic compounds. Finger-print region. Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. FT-IR.
Resonance Raman effect. Concept and factors that influence group frequencies

Reference Books:

* Latest editions of all the suggested books are recommended
Semester-II

Organic Chemistry-I (Lab)

Course Code: MCH261

**Objective:** The course content consists of design of organic compounds using oxidation reactions, aldol condensation, Sand Meyer reaction & electrophilic substitution.

**Course Outcomes:** After performing these lab experiments student will be able to design the strategy for synthesize organic compounds using various chemical processes & their purification by chromatographic technique.

**List of Experiments:**

**I- Analysis**

Separation, purification and identification of compounds of binary mixture (one solid and one liquid/solid) using chemical separation and sublimation/distillation, etc. Their analysis by semi-micro chemical tests and spot tests.

**II- Organic Synthesis**

Aromatic electrophilic substitutions:

1. Synthesis of m-dinitrobenzene from nitrobenzene
2. Synthesis of 2,4-dinitro-1-chlorobenzene from chlorobenzene
3. Synthesis of 4-bromoaniline from acetonilide

Reduction reaction:

4. Synthesis of m-nitroaniline from m-dinitrobenzene

Oxidation reaction:

5. Synthesis of 9,10-anthraquinone by oxidation of anthracene by chromium trioxide
6. Synthesis of 4-nitrobenzaldehyde by oxidation of 4-nitrotoluene by chromium trioxide

Cannizzaro reaction:

7. Synthesis of benzyl alcohol from benzaldehyde

Claisen-Schmidt reaction:

8. Synthesis of dibenzylidene acetone (1,5-diphenylpenta-1,4-dien-3-one) from acetone and benzaldehyde

Sandmeyer reaction:

9. Synthesis of 2-chlorobenzoic acid from anthranilic acid

Methylation:

10. Synthesis of methyl 2-naphthyl ether (2-methoxynaphthalene, nerolin) by methylation of 2-naphthol by dimethyl sulphate.

**Purification of compounds by TLC and column chromatography.**

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.
Evaluation scheme:

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External Evaluation (50 marks)

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Semester-II

Inorganic Chemistry-II (Lab)

Course Code: MCH262

Objective: This course content consists of gravimetric & volumetric estimation of pairs of metal ions in solutions. Separation & identification of cations & anions by paper chromatography using aqueous & non-aqueous media have been included.

Course Outcomes: The quantitative separation & determination of Silver & Copper, copper & Zinc, Iron & calcium, magnesium & calcium have been done gravimetrically & volumetrically. Separation of cations & anions has been done by paper chromatography using aqueous & non-aqueous media.

List of Experiments:

I. Gravimetric and Volumetric Estimation.

1. Estimate mixture of two metal ions (Copper and Zinc)

II. Spectrophotometric Determination

1. Determination of molecular composition of ferric salicylate /iron-phenanthroline/iron-dipyridyl complex by Job’s method of continuous variation
2. Stability constant of FeSCN$^{2+}$ complex
3. Determination of the pH of a given solution by spectrophotometry using methyl red indicator

III. Synthesis (Any Five)

1. Aquabis(acetylacetonato)nitrosylchromium(I), [Cr(NO)(acac)$_2$(H$_2$O)]
2. cis-Bis(glycinato)copper(II) and trans-Bis(glycinato)copper(II)
3. Preparation of Zn, Cd and Hg thiocyanates from their respective chlorides
4. Bis(benzoylacetonato)copper(II)
5. Bis(acetylacetonato)oxovanadium(IV), [VO(acac)$_2$]
6. [MoO$_2$(acac)$_2$]
7. Hexaammmminenickel(II)tetrafluoroborate, [Ni(NH$_3$)$_6$(BF$_4$)$_2$] and determination of nickel content gravimetrically.
8. Potassium tris(oxalato)ferrate, K$_3$[Fe(C$_2$O$_4$)$_3$] and determination of oxalate using permanganate.
9. Preparation of N, N-bis(salicylaldehyde)ethylenediamine [salenH$_2$], Co(salen)

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:
**External Evaluation (50 marks)**

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Course Code: MSC211

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

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Responsible for marks: Mentor, Mentor, Mentor, Cultural Events Coordinator & Department Club Coordinator, Sports Coordinator, Mentor, Director or Principal.
**Semester-III**

**Spectroscopy-II**

**Course Code:** MCH311

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**Objective:** This course content consists of principles & application of UV & visible spectroscopy, NMR, Mass spectroscopy.

**Course Outcomes:** Methods particularly UV, IR, NMR & X-ray diffractions is helpful in structural elucidation & interpretation structure of unknown Organic compounds which ultimately help in modern technology in Biochemistry, Biotechnology, Nanoscience etc.

**Course Contents:**

**UNIT I**

**UV and Visible Spectroscopy of organic molecules:** Measurement techniques, Beer – Lambert's Law, molar extinction coefficient, oscillator strength and intensity of the electronic transition, Frank Condon Principle, Ground and first excited electronic states of diatomic molecules, relationship of potential energy curves to electronic spectra, Chromophores, auxochromes, blue shift, red shift, hypo and hyperchromic effect, transitions in organic molecules, Woodward rules for conjugated dienes, unsaturated carbonyl groups, Quantitative applications.

**UNIT II**

**Nuclear Magnetic Resonance Spectroscopy:** PMR: The spinning nucleus, effect of external magnetic field, processional motion and frequency, Energy transitions, Chemical shift. Factors influencing chemical shift, anisotropic effect; spin-spin coupling coupling constant, Methods of resolving complex spectra, Applications of PMR in structural elucidation of simple and complex compounds. $^{13}$C NMR, Deuterium, fluorine and phosphorus NMR, Structural applications of $^{13}$C-NMR.

**Electron paramagnetic resonance:** EPR spectroscopy of inorganic and organic compounds with unpaired electrons. Measurement of hyperfine splitting.

**UNIT III**

**Mass Spectroscopy:** Introduction, methods of ionization EI & CI, Ion analysis methods (in brief), isotope abundance, Metastable ions, general rules predicting the fragmentation patterns. Nitrogen rule, determination of molecular ion peak, index of H deficiency, fragmentation patterns for aliphatic compounds, amines, aldehydes, Ketones, esters, amides, nitriles, carboxylic acids ethers, aromatic compounds etc.

**UNIT IV**

**Photoelectron Spectroscopy:** Basic principles; photo-electric effect, ionization process, Koopman's theorem. Photoelectron spectra of simple molecules, ESCA, chemical information from ESCA. Auger electron spectroscopy -basic idea. Photoacoustic Spectroscopy. Basic principles of photoacoustic spectroscopy (PAS), chemical and surface applications

**UNIT V**

**X-ray Diffraction:** Bragg condition, Miller indices, Laue method, Bragg method, Debye-Scherrer method of X-ray structural analysis of crystals, index reflections, identification of Unit cells from systematic absences in diffraction pattern. Structure of simple lattices and X-ray intensities, structure factor and its relation to intensity and electron density. Description of the procedure for an X-ray structure analysis.
Reference Books:


* Latest editions of all the suggested books are recommended
Objective: This course aims to develop the fundamental, critical thinking, problem solving and communication skills of students who will be subsequently working as professional chemists with a specialization in the area of polymer chemistry.

Course Outcomes: On completion of this course students should be able to:
• develop a systematic approach to solving problems in areas related to polymer science;
• apply a range of laboratory techniques to the study of the properties, and to the characterization, of polymers.

Course Contents:
UNIT I

UNIT II

UNIT III
Structure and Properties. Configuration of polymer chains. Crystal structure of polymers. Morphology of crystalline polymers. Polymer structure and physical properties; crystalline melting point Tm, melting points of homogeneous series, effect of chain flexibility and other steric factors, entropy and heat of fusion. The glass transition temperature, Tg relationship between Tm and Tg, effects of molecular weight, diluents, chemical structure, chain topology, branching and cross linking. Property requirements and polymer utilization.

UNIT IV

UNIT V
Reference Books:

2. Gowariker, A text book of Polymer Chemistry Wiley

* Latest editions of all the suggested books are recommended
Semester-III

Chemistry of Nano-materials

Course Code: MCH313

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Objective: This course content consists of classification, processing, Characterization of nano-materials & their application in day to day life.

Course Outcomes: The student will be able to learn the role of Chemistry in designing the material of nanometer scale and the principles behind advanced experimental and computational techniques for studying nonmaterial.

Course Contents:
UNIT I (Lectures 08)
Introduction: Definition, Role of Bottom-up and Top-Down approaches in Nano technology, Challenges in Nano technology, History of Nanomaterials, Causes of interest in nanomaterials, Fundamental issues in nanomaterials, Basic concepts of Nano science and technology, Quantum wire, Quantum well, Quantum dot, Properties and technological advantages of Nano materials.

UNIT II (Lectures 08)
Processing of nanomaterials-I: Material processing by Sol-Gel method, Chemical Vapour deposition and Physical Vapor deposition, Microwave Synthesis of materials, Top-down (Nanolithography, CVD), Bottom-up (Sol-get processing, chemical synthesis). Wet Deposition techniques, Self-assembly (Supramolecular approach).

UNIT III (Lectures 08)
Processing of nanomaterials-II: Use of bacteria, fungi, Actinomycetes for nanoparticle synthesis, Magneto tactic bacteria for natural synthesis of magnetic nanoparticles; Viruses as components for the formation of nanostructured materials; Synthesis process and application, Role of plants in nanoparticle synthesis.

UNIT IV (Lectures 08)

UNIT V (Lectures 08)
Applications: Solar energy conversion and catalysis, Polymers with a special architecture, Liquid crystalline systems, Applications in displays and other devices, Advanced organic materials for data storage, Photonics, Plasmonics, Chemical and biosensors, Nanomedicine and Nanobiotechnology.

Reference Books:
7. Nanotechnology by Mark Ratner and Daniel Ratner, Pearson Education.

* Latest editions of all the suggested books are recommended
Course Code: MCH314

Objective: The course content consists of classification, isolation & biosynthesis of common plant products. A natural product has also been prepared by coenzyme. The compounds & their derivatives have been studied for their applications. Synthesis, application & structural studies of Antibiotics, Terpenoids, and alkaloids have been done. The steroids are the chemical compounds which are widely used to control acute diseases & they are given in specific condition. The biogenesis of pyridine, morphine carbohydrates & protein has been studied.

Course Outcomes: The natural products have been synthesized and their derivatives have been studied in detail as they are industrially important. The antibiotics & their actions have been studied to know more about antibiotics their derivatives. The steroids are the targeted chemical compounds and they are used in sever diseases otherwise their use is not recommended by doctors. The alkaloids, cholesterol & vitamins have been synthesized & their impact has been studied on human physiology.

Course Contents:

UNIT I (Lectures 08)

UNIT II (Lectures 08)
Alkaloids. General methods of structure elucidation. Structure determination, stereochemistry, and synthesis of the following representative molecules: ephedrine, nicotine, atropine, quinine and morphine. Biosynthesis of alkaloids.

UNIT III (Lectures 08)

UNIT IV (Lectures 08)

UNIT V (Lectures 08)
Vitamins and Antibiotics. Vitamins. Structure and synthesis of vitamin B₁ (thiamine), B₂ (riboflavin) and B₆ (pyridoxine). Chemistry of Vitamin B₁₂.
Antibiotics. Structure and synthesis of penicillins and chloramphenicol.

Reference Books:
1. Finar, I.L. Organic Chemistry, ELBS.

* Latest editions of all the suggested books are recommended
Semester-III

Organometallic Chemistry

Course Code: MCH315

Objective: Structure and bonding issues in organometallic compounds are discussed in view of the 18-electron rule. Different reactive ligand types are discussed, including σ-bonded ligands such as alkyl, aryl, hydride, as well as π-bonded ligands such as carbonyl, alkene, diene, alkyne, cyclopentadienyl, and arene. The role of few important organometallic complexes as a catalyst is thoroughly discussed.

Course Outcomes: After learning this paper the student has a good overview of the fundamental principles of organotransition-metal chemistry and know how chemical properties are affected by metals and ligands. The student will be able to use knowledge about structure and bonding issues to understand the stability and reactivity of simple organometallic complexes.

Course Contents:

UNIT I

(Lectures 08)

UNIT II

Transition Metal π-Complexes: Transition metal π-complexes with unsaturated organic molecules, alkenes, alkynes, allyl, dienyl, arene & trienyl complexes, preparation, properties, nature of bonding & structural features.

UNIT III

Applications of Organometallic Complexes to Catalysis: Catalysis, Terminology in Hydrogenation catalysts, classification of hydrogenation catalysts, catalytic cycle of Wilkinson’s catalyst, catalytic cycles of iridium and ruthenium based catalysts, hydrogenation by lanthanide organometallic compounds, catalytic asymmetric synthesis, Hydroformylation: Cobalt catalysts and phosphine modified cobalt catalysts, Rhodium-phosphine catalysts, Methanol Carbonylation and Olefin Oxidation: Monsanto, Cativa and Wacker Processes.; Polymerisation and oligomerisation of olefins and dienes, carboxylation of olefins, carbonylation of methanol, Synthetic gas.

UNIT IV

Fluxional Organometallic Compound: Stereo-chemical non-rigidity & fluxionality, stereo chemically non-rigid coordination compounds, Trigonal bipyramidal molecules, η2-olefins, η3 –allyl & dienyl compounds, isomerization & racemization of tris chelate complexes.

UNIT V

Bioorganometallic Chemistry: Role of organometallics in heavy metal poisoning: Mercury and Arsenic poisoning, organometallic compounds as drugs: ruthenium and ferrocene based drugs; Organometallics as radiopharmaceutical, tracers, ionophores and sensors.

Reference Books:

Science.


* Latest editions of all the suggested books are recommended
Objective: This module will explore the role played by organic chemistry in the discovery and synthesis of important compounds widely used as medicines.

Course Outcomes:
The course describes the overall process of drug discovery, and the role played by medicinal chemistry in this process. It relates the structure and physical properties of drugs to their pharmacological activity. The student demonstrates an understanding of concepts such as drug metabolism, bioavailability and pharmacokinetics and the role of medicinal chemistry in improving these parameters. The student will be able to discuss examples of pharmaceutical drug discovery in detail, and relate patterns and lessons from discovery of these examples to other seen and unseen examples.

Course Contents:
Unit I (Lectures 08)

Unit II (Lectures 08)
Pharmacodynamics. Introduction, elementary treatment of enzymes stimulation, enzyme inhibition, sulfonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation, significance of drug metabolism in medicinal chemistry.

Unit III (Lectures 08)

Unit IV (Lectures 08)

Unit V (Lectures 08)

Reference Books:

* Latest editions of all the suggested books are recommended
Semester-III
Quantum Chemistry and Solid-State Chemistry

Course Code: MCH317

Course Contents:

UNIT I
(Lectures 08)
Term symbols and selection rules, spin –orbit coupling, regular and inverted multiples The variation method, theorem and applications, non-degenerate perturbation method

UNIT II
(Lectures 08)
Application of LCAO-MO theory on the basis of Huckel approximation to conjugated aliphatic molecules and monocyclic conjugated polyenes. Huckel (4n+2) rule, calculation of resonance stabilization energy from Schaad and Hess model, antiaromatic molecules.

UNIT III
(Lectures 08)
Properties of metals and semiconductors: band theory, types of solids, intrinsic and extrinsic semiconductors, p-n junctions, optical properties, photoconductivity of crystals

Imperfections and related phenomenon: Defects in solids: point defects line defects, diffusion in solids- mechanism, elastic and plastic deformations

UNIT IV
(Lectures 08)
Crystal growth techniques: General principles, growth from solution, growth from melts, growth from vapour Solid state reactions: reactions of single solids and their kinetic characteristics, gas -solid, solid -solid, addition and double decomposition reactions, photographic process.

UNIT V
(Lectures 08)
Imperfections and physical properties crystals: Electrical properties, Optical properties: Colour centers in ionic crystals: types, creation, Magnetic properties, Thermal properties and Mechanical properties.

Text Books:

1. Introduction of Solids L.V Azaroff, Tata McGraw Hill.

* Latest editions of all the suggested books are recommended
Semester-III
Industrial Safety & Health Hazards

Course Code: MSC011

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Objective: The course content focuses on industrial safety programs and toxicology, industrial laws, regulations, fire and explosion, preventive methods, relief and its sizing methods. The course helps to analyse industrial hazards and its risk assessment.

Course Outcomes: By the end of the course the students will be able to analyze the effect of release of toxic substances, understand the industrial laws, regulations and source models which helps them to apply the methods of prevention of fire and explosions. This course also helps to understand the methods of hazard identification and preventive measures.

Course Contents:


UNIT II: Occupational Health and Toxicology: Concept and spectrum of health - functional Units and activities of occupational health services, notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax, lead-nickel, chromium and manganese toxicity, gas poisoning (such as CO, ammonia, coal and dust etc) their effects and prevention – cardio pulmonary resuscitation, audiometric tests, eye tests, vital function tests.


Reference Books:

1. L.M Deshmukh Industrial safety management.
2. Ralph king and John magid industrial hazard and safety.

* Latest editions of all the suggested books are recommended
Semester-III

Elementary Biophysics

Course Code: MSC012  
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4  0  0  4

Objective: The Objective of this Course is to provide an idea of various physical process and phenomena which are applicable in bioscience.

Course Outcomes: After Completion of this course student will learn the physical process such as bonding in atom and molecules, spectroscopic techniques, isotopes and radioactivity, radiation and biophysics which are used in understanding the bioscience.

Course Contents:
Unit – I: (Lectures 08)  

Unit – II: (Lectures 08)  

Unit – III: (Lectures 08)  

Unit – IV: (Lectures 08)  
Isotopes and radioactivity: Radioactive decay laws, production of radioisotopes (radio nuclides), allocation of radioactive traces, isotopic tracer method. Assay using radioactive substances, Labelling and detection methods using fluorescent molecules (a few examples).

Unit – V: (Lectures 08)  
Radiation biophysics: Radiation sources, Interaction of radiation with matter (general discussion), energy transfer process, measurement of radiation, Dosimetry, Biological effects of radiation, effect of radiation on living systems, radiation protection and radiation therapy.

Reference Books:
5. Biophysics- Cotterill.

* Latest editions of all the suggested books are recommended
Semester III
Statistical Techniques in Data Mining

Course Code: MSC013

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Unit I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining.

Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

Unit II

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Unit III

Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods.

Unit IV

Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint Based Cluster Analysis, Outlier Analysis - Mining Streams, Time Series and Sequence

Unit V

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

Text Books:

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.
Reference Books:

5. Data Mining Introductory and advanced topics – Margaret H Dunham, Pearson education.

* Latest editions of all the suggested books are recommended
Objective: Introducing the fundamental concepts necessary for designing, using, and implementing database systems and applications. The goal of this course is for students to become well-grounded in basic concepts necessary for understanding DB and their users, DBMS concepts, architecture, the concepts of the Entity Relationship(ER) model, the data abstraction and semantic modeling concepts leading to EER data model, describe the basic relational model, its integrity constraints and update operations, and the operation of relational algebra, describe relational schema design, and it covers the normalization and functional dependency algorithm.

Course Outcomes:

1. Be familiar with a commercial relational database system (Oracle) by writing SQL using the system.
2. Be familiar with the relational database theory, and be able to write relational algebra expressions for queries.
3. Be familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B-tree, and hashing.
4. Be familiar with the basic issues of transaction processing and concurrency control.

Course Contents:

Unit I: (Lectures 08)
Introduction: Scope and purpose of database system, view of data, relational databases, database architecture, transaction management, database system Vs filesystem, Database system concept and architecture, data definitions language, DML.

Data Models: The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction

Unit II: (Lectures 08)
Database design and ER Model: overview, ER-Model, Constraints, ER-Diagrams, ERD Issues, weak entity etc, Codd’s rules, Relational Schemas, Introduction to UML, Relational database model: Logical view of data, keys, integrity rules.
Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF)

Unit III: (Lectures 08)
Introduction on SQL: Characteristics of SQL, advantage of SQL. SQL data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, and Procedures in SQL/PL SQL.

Unit IV:  
(Lectures 08)
Usage of Oracle:
  1. Installing oracle
  2. Creating Entity-Relationship Diagram using case tools.
  3. Writing SQL statements Using ORACLE
  4. MYSQL:
      a) Writing basic SQL SELECT statements.
      b) Restricting and sorting data.
      c) Displaying data from multiple tables.
      d) Aggregating data using group function.
      e) Manipulating data.
      f) Creating and managing tables.
  5. Normalization in ORACLE.
  6. Creating cursor in oracle.
  7. Creating procedure and functions in oracle.
  8. Creating packages and triggers in oracle.

Unit V:  
(Lectures 08)
Transaction management: ACID properties, serializability and concurrency control Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

Text Books:


*Latest editions of all the suggested books are recommended.*
Semester-III

Organic Chemistry-II (Lab)

Course Code: MCH361

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Objective: The course content consists of analysis of biomolecules & multistep synthesis of organic compounds of industrial importance with interpretation using spectroscopic technique.

Course Outcomes: The student will be able to learn the steps involved in multistep organic synthesis & their characterization. The student will get the ability to demonstrate the analysis of various biomolecules.

List of Experiments:

I. Analysis

1. Estimation of protein by Lowry’s method.
2. Estimation of carbohydrate by Anthrone’s method.
3. Isolation of caffeine and alkaloids from tea.
4. To determine the iodine value of the given oil or fat.
5. To determine the Saponification value of the given oil or fat.
6. Estimation of Ascorbic Acid i.e. vitamin C.
7. Estimation of Amino acid by Sorenson’s method.
8. Spectrophotometric estimation of Glucose with the help of Fehling solution.

II. Multi Step Synthesis (Any three)

1. Benzoin- benzal- benzilic acid
2. Benzophenone – benzpinacole- benzpinacolone
3. Ethyl acetoacetate → 3-methyl-1-phenylpyrazol-5-one → antipyrin (phenazine)
4. Benzaldehyde → benzoin → benzil → 5,5-diphenylhydantoin
5. Phenylhydrazine → acetophenone phenylhydrazone → 2-phenylindole
6. Chlorobenzene → 1-chloro-2,4-dinitrobenzene → 2,4-dinitrophenylhydrazine

III. Spectral Analysis

Interpretation of pre-recorded UV-Vis, IR, NMR, Mass, Raman spectrum and characterization of one organic compound.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation Scheme:

<table>
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<tr>
<th>PRACTICAL PERFORMANCE &amp; VIVA DURING THE SEMESTER (35 MARKS)</th>
<th>ON THE DAY OF EXAM (15 MARKS)</th>
<th>TOTAL INTERNAL (50 MARKS)</th>
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<td>EXPERIMENT (5 MARKS)</td>
<td>FILE WORK (10 MARKS)</td>
<td>VIVA (10 MARKS)</td>
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External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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<th>EXPERIMENT (20 MARKS)</th>
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<th>TOTAL EXTERNAL (50 MARKS)</th>
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Semester-III
Physical Chemistry- II (Lab)

Course Code: MCH362

Objective: The course content consists the determination of strength of acids & bases using conductivity meter, potentiometer & validation of Lambert-Beer’s law. The student also learns about various factors affecting the enzyme activity.

Course Outcomes: After performing this lab student will be able to determine the strength of acids & bases using conductivity meter, potentiometer & validation of Lambert-Beer’s law. The student also gets generalized thinking about factors affecting the enzyme activity

List of Experiments:

Conductometry
1. To determine the strength of unknown (given weak) acid conductometrically using standard alkali solution (strong).
2. To determine the strength of unknown (given strong) acid conductometrically using standard alkali solution (weak).
3. To determine the dissociation constant of weak electrolyte and to verify Ostwald’s dilution law.
4. To determine the equivalent conductance of strong electrolyte at the several concentrations and hence verify Onsager equation.

Potentiometry
5. To determine the strength of unknown (given weak) acid potentiometrically using standard alkali solution (strong).
6. To determine the strength of unknown (given strong) acid potentiometrically using standard alkali solution (weak).

Spectrophotometry
7. To verify Lambert-Beer’s law using a spectrophotometer.
8. To determine the basicity of an acid.
9. To study the effect of temperature on invertase enzyme activity and determine its optimum pH
10. To study of the effect of substrate concentration on enzyme activity.
11. Effect of enzyme concentration on enzyme activity.
12. To find the solubility and solubility product of sparingly soluble salt conductometrically.

Evaluation Scheme of Practical Examination:
Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

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**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

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<th>VIVA (20 MARKS)</th>
<th>TOTAL EXTERNAL (50 MARKS)</th>
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Semester III
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC311

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences /Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

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<th>S No</th>
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<th>Student Name</th>
<th>Dress code</th>
<th>Participation in Conferences /Workshops / Seminars</th>
<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
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<td>Responsible for marks</td>
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<td>Head</td>
<td>Head</td>
<td>Mentor</td>
<td>Cultural Events Coordinator &amp; Department Club Coordinator</td>
<td>Sports Coordinator</td>
<td>Mentor</td>
<td>Director or Principal</td>
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M.Sc.(Chemistry) Syllabus Applicable w.e.f. Academic Session 2017-18
Semester-IV
Biochemistry

Course Code: MCH411

Objective: The course consists polymeric biomolecules and their monomeric building blocks, specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action, metabolism of glucose & generation of large quantities of ATP. The course also describe how fats and amino acids are metabolized, and explain how they can be used for fuel. It also focuses on the structure of DNA, and explain how it carries genetic information in its base sequence.

Course Outcomes:
Students will explain/describe the synthesis of proteins, lipids, nucleic acids, and carbohydrates and their role in metabolic pathways along with their regulation at the epigenetic, transcriptional, translational, and post-translational levels including RNA and protein folding, modification, and degradation. Regulation by non-coding RNAs will be tied to the developmental and physiological functioning of the organism.

Course Contents:
UNIT-I (Lectures 08)

UNIT-II (Lectures 08)

UNIT-III (Lectures 08)
Vitamins: A general study, detailed study of chemistry of thiamine (Vitamin B1), Ascorbic acid (Vitamin C), Pantothenic acid, biotin (Vitamin H), α-tocopherol (Vitamin E), Biological importance of vitamins.

UNIT-IV (Lectures 08)
Enzymes: Nomenclature and classification, extraction and purification, Remarkable properties of enzymes like catalytic power, specificity and regulation, Proximity effects and molecular adaptation, Chemical and biological catalysis. Mechanism of enzyme action: Transition state theory, orientation and steric effect, acid base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms (chymotrypsin, ribo nuclease, lysozyme and carboxypeptidase A). Fischer’s lock and key and Koshland’s induced fit hypothesis, concept and identification of active site by the use of inhibitors affinity labeling and enzyme modification by site directed mutagenesis. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots, reversible and irreversible inhibition.

UNIT-V (Lectures 08)
(a) Kinds of reactions catalyzed by Enzymes: Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate addition and elimination reactions, enolic intermediates in isomerization reactions, β-
cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation reactions.


Reference Books:


* Latest editions of all the suggested books are recommended
Semester-IV

Photochemistry

Course Code: MCH412  L  T  P  C
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Objective: The course Unit consists of photochemistry & its photochemical reactions like photo reduction & photo-oxidation. Photo physical phenomenon has been applied to study electronic structure of molecules, molecular orbitals & molecules in excited singlet state. The application of chemiluminescence & fluorescence has been applied to study photo-excited donor & acceptor system.

Course Outcomes: Photochemistry & photochemical laws are of great utility to understand the Beer's lamber's law & its applications. The photochemistry of environment & greenhouse effects is of great applications in plant kingdom. The fluorescence quenching, concentration quenching is of great interest to study photo physical phenomenon.

Course Contents:
Unit-I (Lectures 08)
Photochemical Reactions. Interaction of electromagnetic radiation with matter, types of excitations, fate of excited molecule, quantum yield, transfer of excitation energy, actinometry.

Unit II (Lectures 08)
Determination of Reaction Mechanism. Classification, rate constants and life times of reactive energy state determination of rate constants of reactions. Effect of light intensity on the rate of photochemical reactions. Types of photochemical reactions-photo dissociation, gas-phase photolysis.

Unit III (Lectures 08)
Photochemistry of Alkene. Intramolecular reactions of the olefinic bond-geometrical isomerism, cyclisation reactions, rearrangement of 1,4- and 1,5-dienes.
Photochemistry of Aromatic Compounds. Isomerization, additions and substitutions.

Unit IV (Lectures 08)
Photochemistry of Carbonyl Compounds. Intramolecular reactions of carbonyl compounds-saturated, cyclic and acyclic, unsaturated and α, β-unsaturated compounds, cyclohexadiene’s. Intermolecular cycloaddition reactions-dimerization and oxetane formation.

Unit V (Lectures 08)

Reference Books:

2. Introduction to Organic Photochemistry John D. Coyle, The Open University.

* Latest editions of all the suggested books are recommended
Semester-IV

Bio-Inorganic Chemistry

Course Code: MCH413

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Objective: This course content consists of bio inorganic chemistry of alkali & alkaline earth metal & their importance in biological systems of Plant, animals & human beings. Iron & copper are of great importance in our physiological processes. Iron is the main constituent of haemoglobin & copper catalyse a large number of biological reactions. Nitrogen fixation in nature plays a important role in soil changing ammonia into nitrates which are absorbed by the plants. Trace elements called micronutrients are also important for biodegradation of minerals by bacteria.

Course Outcomes: we hope that with the help of this curriculum students will develop the spices necessary in bioinorganic chemistry of alkali & alkaline earth metal., Photosynthesis, use of ATP & ADP, structure & mechanism of Haemoglobin, myoglobin. Cellular nitrogen fixation in soil will prove very useful.

Course Contents:

UNIT I (Lectures 08)
Bioinorganic Chemistry of Alkali and Alkaline Earth Metals: Essential and trace elements in biological systems; Structure and functions of biological membranes; mechanism of ion transport across membranes; Sodium pump; Ionophores: valinomycin and crown ether complexes of Na+ and K+; ATP and ADP; Photosynthesis: chlorophyll a PS I and PS II; Role of calcium in muscle contraction; Blood clotting mechanism and biological calcification.

UNIT II (Lectures 08)
Bioinorganic Chemistry of Iron and Copper: Iron-sulphur proteins: Rubredoxin and ferredoxins; Metalloporphyrins; Heme proteins: hemoglobin, Structure and Mechanism of hemoglobin, myoglobin and cytochrome c; Non-heme proteins: hemerythrin and hemocyanin.

UNIT III (Lectures 08)
Nitrogen Fixation, Metal poisoning and their treatment: Nitrogen in biosphere; Nitrogen cycle; Role of micro-organisms in nitrification; Nitrogen fixation in soils; Metal poisoning and drug action of Inorganic complexes compounds; Metal poisoning, treatment by using chelating agent, mercury, lead & cadmium poisoning & treatment; Platinum complexes in treatment of cancer. metal deficiency.

UNIT IV (Lectures 08)
Trace Metals in Plant Life: Micronutrients present in soil and role in plant life; Biodegradation of minerals by bacteria and its applications in treatment of soil and water pollution.

UNIT V (Lectures 08)

Reference Books:

3. Williams: An Introduction to Bioinorganic Chemistry, C.C. Thomos Spring III.
5. Williams: Metals in Life.

* Latest editions of all the suggested books are recommended
Semester-IV
Bio-Organic Chemistry

Course Code: MCH414

L T P C
4 0 0 4

Objective: Bioorganic Chemistry is a scientific discipline at the intersection of organic chemistry & biology. The syllabus involves the various type of organic substances viz enzyme, carbohydrate, lipids & nucleic acids for their biological functions.

Course Outcomes: I hope that the students will enjoy & benefit from the learning of this syllabus regarding cell structure & its function etc. Each Unit starts with learning objectives these will be important in the study of bio-Organic chemistry.

Course Contents:

Unit-I
Introduction: Basic Consideration, Proximity effects and molecular adoption. Enzymes: Introduction, Chemical and Biological catalysis, remarkable properties of enzymes, Nomenclature and classification, concept and identification of active site by use of inhibitors, reversible & irreversible inhibition.

Unit-II
Co-Enzyme Chemistry: Cofactors as derived from vitamins, coenzymes, prosthetic groups, apoenzymes, Structure and biological functions of coenzyme A.

Unit-III
Enzyme Models: Host guest chemistry, Chiral recognition and catalysis, molecular recognition, molecular asymmetry and prochirality, Biomimetic chemistry, crown ethers, cryptates, cyclodextrins, cyclodextrin based enzyme models, Calixarenes, ionophores, micelles synthetic enzyme or synzymes.

Unit-IV

Unit-V
Metalloenzymes, Copper enzymes, superoxide dismutase, cytochrome oxidase and ceruloplasmin; Coenzymes; Molybdenum enzyme: xanthine oxidase; Zinc enzymes: carbonic anhydrase, carboxy peptidase and interchangeability of zinc and cobalt in enzymes; Vitamin B12 and B12 coenzymes; Iron storage, transport, biomineralization and siderophores, ferritin and transferrins.

Reference Books:
3. Williams: An Introduction to Bioinorganic Chemistry, C.C. Thomos Spring III.
5. Williams: Metals in Life.
* Latest editions of all the suggested books are recommended
Semester-IV

Bio-Physical Chemistry

Course Code: MCH415

Objective: Biophysical Chemistry is a scientific discipline at the intersection of Physical chemistry & biology. The syllabus involves the various type of organic substances viz enzyme, carbohydrate, lipids & nucleic acids for their biological functions.

Course Outcomes: I hope that the students will enjoy & benefit from the learning of this syllabus regarding cell structure & its function etc with reference to physical phenomenon.

Course Contents:

UNIT – I


UNIT – II

Thermodynamics of Biopolymers Solutions: Osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system. Statistical mechanics in biopolymers chain configuration of macromolecules, statistical distribution end – to – end dimensions, calculation of average dimensions for various chain structures. Polypeptide and protein structures and protein folding.

UNIT – III


UNIT – IV

Biomolecular Interactions: Interactions between biomolecules (proteins), Interaction of biomolecules with small ligands, independent ligand binding sites, the Scatchard plot, forces involved in the stability of proteins, hydrophobic interactions, hydrogen bonding, electrostatic interactions, electron delocalization, van der Waal’s forces Scope of Genomics, proteomics and bioinformatics, ribosomes: Site and Function of protein synthesis.

UNIT – V

Protein molecules: Protein sequence and structure (primary structure), secondary structure: α-Helix, β- Sheet, classification of proteins, torsion angles, tertiary structure, quaternary structure, Protein folding and refolding, computer simulation: thermodynamic-kinetic approach, statistical mechanics approach, Homolog Modelling, De Novo prediction, Protein misfolding, Biological factors (Chaperones) and chemical factors(Intra and intermolecular interactions) leading folding/refolding/misfolding. Brain diseases associated with it.
Reference Books:

1. Physical Chemistry of Macromolecules: S.F. Sun
2. The Enzyme Molecules: W. Ferdinand
4. Biochemistry: Zubay
5. Principles of Biochemistry: A.I. Leninger

* Latest editions of all the suggested books are recommended
Semester-IV

Environmental Chemistry

Course Code: MCH416

L T P C
4 0 0 4

Objective: Air & water pollution are the worth problem. The physico-chemical studies of air & water pollution & their abatement is of great interest to clean the environment. Methods of control of air pollution & water pollution have been included at large scale to clean the air & water. The sampling & analysis is done for CO, CO₂, SO₂, H₂S etc. Radiation pollution effects directly on plants & animals & human beings. The different methods of protection & control have been studied.

Course Outcomes: The concentration of poisonous gases is done by continuous monitoring in the environment. If concentration increases the pollution control department check the gaseous inflow of industries in to the environment. Similarly, water pollution is monitored and necessary steps are taken to stop the pollution. Protection of ozone layer is of great importance & all countries in the world has stop the use of solvent & CFCs. To check the environmental toxicology everyone has to be alert otherwise it will be like Bhopal gas Tragedy & Minimatta Disaster everywhere in the world.

Course Contents:

Unit I
Environment:

Hydrosphere:

Unit II

Unit III
Industrial Pollution:
Cement, sugar, distillery, drug, paper and pulp, thermal power plants, nuclear power plants, metallurgy. Polymers, drugs etc. Environmental disasters – Cherbonyl, Three-mile island, Seveso and minamata disasters, Japan tsunami.
Unit IV

Environmental Toxicology:

Unit-V


Reference Books:
1. A.K. De, Environmental Pollution.
2. Wark & Werner Air Pollution.
3. S.P. Mahajan Environmental Pollution Control in Process Industries
4. B.K. Sharma & H. Kaur Environmental Pollution.
5. P.K. Trivedi Introduction to Air Pollution.

* Latest editions of all the suggested books are recommended
Semester-IV
Course Code: MCH492

Project, Seminar & Viva

For students to enter into preliminary research field both in theory and experiment the concept of Project has been introduced in the final Semester. In the Project, the student will explore new developments from the books and journals, collecting literature / data and write a Dissertation based on his / her work and studies. The Project Work can also be based on experimental work in industries / research laboratories.

Selection of Topic:

1. Students will make project which should be preferably a working of third thoughts based on their subject.
2. The student will be assigned a faculty guide who will be the supervisor of the students. The faculty would be identified at the end of the III semester.
3. The assessment of performance of the students should be made at least twice in the semester. Internal assessment shall be for 50 marks. The students shall present the final project live using overhead projector PowerPoint presentation on LCD to the internal committee and the external examiner.
4. The evaluation committee shall consist of faculty members constituted by the college which would be comprised of at least three members comprising of the department Coordinator’s Class Coordinator and a nominee of the Director/Principal. The students guide would be special in invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each members of the committee.

The Marking shall be as follows.

Internal: 50 marks
By the Faculty Guide – 25 marks
By Committee appointed by the Director/Principal – 25 marks

External: 50 marks
By External examiner by the University – 50
Top Cover - The sample top cover shall be as under:

**TITLE (18 pt Times New Roman CAPS)**

**DISSERTATION/PROJECT (14)**

Submitted in Partial Fulfillment of the Requirements for the Degree of (14)

**MASTER OF SCIENCE (16)**

In (16)

**Chemistry (16)**

Submitted by (12)

Name

Enrollment No

Under the guidance of (12)

Name of Guide & Designation (14)

---

Department of Chemistry (14)
Faculty of Engineering
Teerthanker Mahaveer University (14)
Moradabad-244001(14)

(December, 2017) (14)
Order of Contents (14)

Orders of contents are as follows:
1. Title Page
2. Certificate
3. Candidate’s Declaration
4. Acknowledgement
5. Abstract
6. Contents with page numbers
7. List of Figures
8. List of Tables
9. List of Abbreviations
10. List of Symbols
11. Chapter 1: Introduction
   Chapter 2: Literature Review
   Chapter 3: ....
   Chapter 4: ....
   Chapter 5: Conclusion
   Appendix: Code
12. References
13. Publications
CERTIFICATE

This is to certify that dissertation/Project entitled “……………………………………………
………………………..” which is submitted by ……………………… in partial fulfillment of the
requirement for the award of degree M.Sc. in Chemistry, Faculty of Engineering, Teerthanker
Mahaveer University, Moradabad is a record of the candidate own work carried out by him under
my/our supervision. The matter embodied in this dissertation/Project is original and has not been
submitted for the award of any other degree.

Signature of Supervisor(s)                      Head,

Name & Designation of Supervisor(s)                Department of Chemistry

.                                                FOE, TMU
CANDIDATE’S DECLARATION

This is to certify that Dissertation/Project entitled “…………………………” which is submitted by me in partial fulfilment of the requirement for the award of degree M.Sc. in Chemistry, Faculty of Engineering, Teerthanker Mahaveer University, Moradabad comprises only my original work and due acknowledgement has been made in the text to all other material used.

I, hereby, further declared that in case of legal dispute in relation to my M.Sc. dissertation/Project, I will be solely responsible for the same.

Date: 

Name of Candidate

Enrollment No.
ACKNOWLEDGEMENT

Apart from the efforts of me, the success of this dissertation/project depends largely on the encouragement and guidelines of many others. I take this opportunity to express my gratitude to the people who have been instrumental in the successful completion of this dissertation/project.

I would like to show my greatest appreciation to _ _ _ _. I can’t say thank you enough for his/her tremendous support and help. I feel motivated and encouraged every time I attend his/her meeting. Without his/her encouragement and guidance this dissertation/project would not have materialized.

The guidance and support received from _ _ _ (Name of Guide) was vital for the success of the dissertation/project. Without the wise counsel and able guidance, it would have been impossible to complete the dissertation/project in this manner I am grateful for his/ her constant support and help.

I express gratitude to other faculty members of Chemistry Department, FoE for their intellectual support throughout the course of this work. Finally, I am indebted to all whosoever have contributed in this dissertation/project work and friendly stay at FoE.

Place: Name of Candidate

Date
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<th>Description</th>
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<tr>
<td>RFID</td>
<td>Radio Frequency Identity</td>
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<tr>
<td>IVRS</td>
<td>Interactive Voice Response Service</td>
</tr>
<tr>
<td>ASR</td>
<td>Automatic Speaker Recognition</td>
</tr>
<tr>
<td>PSK</td>
<td>Phase Shift Keying</td>
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<tr>
<td>DFT</td>
<td>Discrete Fourier Transform</td>
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### List of Symbols

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<tr>
<td>$N$</td>
<td>Time index</td>
</tr>
<tr>
<td>$\Omega$</td>
<td>Frequency in radian</td>
</tr>
<tr>
<td>$\Sigma$</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>$x(n)$</td>
<td>Signal variable</td>
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</table>
CHAPTER (Font size 14)

GUIDELINES

1.1 Size
Standard bond paper size A4 (297x210mm) should be used.

1.2 Page number
Page should be numbered consecutively and clearly. No page number should be indicated on title page. Certificate, candidate’s declaration and acknowledgement, pages are to be counted & from certificate to acknowledgement Greek numbers should be used. From main text to end of dissertation Indian numerals should be used. All typing should be on right hand pages only.

1.3 Margin
Top 1.0”, Bottom 1.0” Left 1.5” Right 1.0”

1.4 Line spacing
Line spacing should 1.5.

1.5 Font
Times new roman, size 12 for text, 12 (BOLD) may be used for headings & subheadings.

1.6 CD-ROM
All dissertation/project report should include soft copy on CD-ROM accompanied with dissertation/project report in pocket pasted on inside of back cover.

1.7 Text
Before producing the final copies of a dissertation /project report the candidate should ensure that all the spelling, grammar, punctuation and bibliography is complete and exact. Text should in 3rd person form. One is not supposed to use the words like I, we etc.

1.8 File Binding
The Project Report should be hard bound with Title page in Maroon color. The name of the candidate, degree (specifying the specialization) etc shall be printed in golden color on the Title page.

A candidate/group will submit two hardcopies with soft copies in CD to the department and candidate/group will also make an extra copy for themselves.

1.9 Figure

Figure 1.1: Waveform of ECG signal
1.10 Table

Table 1.1: Comparison of different methods

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<td>Method 3</td>
<td>CD</td>
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</table>

1.11 Reference

All the references should be arranged year wise. Examples are in reference page

1.11.1 First reference is for book.

1.11.2 Second reference is for article of journal.

1.11.3 Third reference is for proceeding of conference paper.

References


List of Publications

Journals

International Conferences


National Conferences

EVALUATION SHEET
(To be filled by the GUIDE & Internal Examiners only)

Name of Candidate:
Roll No:

Class and Section:

Please evaluate out of Five marks each.

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<td>Int. Exam. 2</td>
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<td>2.</td>
<td>Literature Review / Background Work (Coverage, Organization, Critical Review)</td>
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<td>3.</td>
<td>Discussion/Conclusions (Clarity, Exhaustive)</td>
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<td>4.</td>
<td>Slides/Presentation Submitted (Readable, Adequate)</td>
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<td>Frequency Of Interaction (Timely Submission, Interest Shown, Depth, Attitude)</td>
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Signature:       Signature:       Signature:
Date:            Date:            Date:
EVALUATION SHEET FOR EXTERNAL EXAMINER  
(To be filled by the External Examiner only)

Name of Candidate: 

Roll No: 

I. For use by **External Examiner ONLY**

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<td>Discussion/Conclusions (Clarity, Exhaustive)</td>
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<tr>
<td>4.</td>
<td>Power Point Presentation (Clear, Structured)</td>
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<tr>
<td>5.</td>
<td>Slides (Readable, Adequate)</td>
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<td><strong>Total (Out of 50)</strong></td>
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Signature:

Date:
EVALUATION SUMMARY SHEET
(To be filled by External Examiner)

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<th>Name and Roll No.</th>
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<th>External Examiner (50)</th>
<th>Total (100)</th>
<th>Result (Pass/Fail)</th>
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</thead>
</table>

**Note:** The summary sheet is to be completed for all students and the same shall also be Compiled for all students examined by External Examiner. The Format shall be provided by the course coordinator.
Semester IV  
DISCIPLINE & GENERAL PROFICIENCY

Course Code: MSC411  

There shall be continuous evaluation of the student on the following broad parameters:

1. Observance of dress code.
2. Participation in Conferences / Workshops / Seminars.
3. Attendance in guest lectures, invited talks and special technical sessions organized from time to time.
4. Participation in community projects including NSS.
5. Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.
6. Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.
7. Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.
8. General behavior

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IIInd & IIIrd CT in semester:

<table>
<thead>
<tr>
<th>No.</th>
<th>Enroll No.</th>
<th>Student Name</th>
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<th>Participation in guest lectures, invited talks and special technical sessions</th>
<th>Participation in community Services</th>
<th>Participation in Culture &amp; extra curriculum activities, Department Club Activities</th>
<th>General Behavior</th>
<th>Any Extra Achievement</th>
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<th>Cultural Events Coordinator &amp; Department Club Coordinator</th>
<th>Sports Coordinator</th>
<th>Mentor</th>
<th>Director or Principal</th>
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