SANT GHIRA GURU VISHWAVIDYALAYA SARGUJA AMBIKAPUR (C.G.)

CHOICE BASED CREDIT SYSTEM (CBCS) 2018-19

Syllabus

M.Sc. Chemistry

CHEMISTRY

ANT GAHIRA GURU VISHWAVIDYALAYA

Sarguja Ambikapur (C.G.)

CHOICE BASED CREDIT SYSTEM (CBCS)

SYLLABUS

M.Sc. CHEMISTRY

SEMESTER SYSTEM
SESSION 2018-19

For Affiliated Colleges of

ANT GAHIRA GURU VISHWAVIDYALAYA

Ambikapur (C.G.) -497001

SANT GAHIRA GURU VISHWAVIDYALAYA SARGUJA, AMBIKAPUR (C.G.)

SANT GAHIRA GURU ORDINANCE 46:
MASTER DEGREE (P.G.) PROGRAMMES

PROPOSED DRAFT ORDINANCE 46:

O.M.D.1.: This Ordinance shall be called "The Sant Gahira Guru Master Degree (Semester Study) Programme with Choice based Credit System.

O.M.D.2.: This Ordinance shall come into the force from the Academic Semester 2017-18.

Notwithstanding anything in the earlier laws of the Sant Gahira Guru Master Degree Programmes in the different faculties (*Ayurveda, Commerce, Education, Fine Arts, Law Life Sciences, Medicine, Management, Science & Social Sciences)* under the "semester system", the "Semester with Choice based Credit System" shall be regulated and conducted as per the provisions of this ordinance.

O.M.D.3. Definitions:

In this Ordinance, unless the context otherwise requires:

a. **"Academic Council"** means Academic Council of the University.

b. **"Administrative Grade Letter"** means the alphabet indicating the administrative comment in place of Grade Letter to indicate the Credit Withdrawn (W), Unfair Means (U), Absent in SEE (X). The Administrative Grade Letter has zero Grade Point associated with it.

c. **"Board of Studies"** means PG Board of Studies in any subject constituted under the university statutes.

d. **"Core Course"** means the course pertaining to main subject or theme of the master programme.

e. **"Credit"** means the unit by which the academic activity of course work is measured. In these Regulations, One Credit means one hour of Class Room Teaching per week in case of theory papers and 1.5 hours in practical / laboratory work.

f. **"Credit Courses"** means the course classified as Compulsory Core Courses(**CCC**), Elective Core Courses(**ECC**), Seminar **(SEM)**,Project Work(**PRJ**), Field Study(**FST**), Self Study Course(**SSC**), Other Supportive Courses(**OSC**), Educational/Study Tour (**EST**) and Research Publications **(RPJ).**

g. **"Credit Monitoring"** means an act to monitor the credit by a Credit Monitoring Committee **(CMC)** consists of the Head (as Chairperson) and three senior most teachers on the Roll of the Department. In case, when the Department does not have the required number of the teachers in the department than the Vice chancellor may constitute the said committee by nominating the number of expert(s) required by the Ordinance from any other university or institute who are not below the post of Professor.

h. **"Credit Points"** means the product of 'credits assigned to the course' and 'the Grade Point secured for the same course by the student'.

I. **"Semester Grade Point Average (SGPA)"** means the Semester Grade Point average computed on the basis of the formula prescribed in the ordinance. It measures the performance of a student in a given Semester. The SGPA is the ratio of the 'total credit points earned by the student in all the credits earned in the concerned semester' and the 'total number of credits earned in that Semester'.

j. **"Cumulative Grade Point Average (CGPA)"** means the Cumulative Grade Point weightage average of SGPA computed on the basis of the formula prescribed for the entire Programme. It measures the overall performance of a student in a Master degree programme. The CGPA is the ratio of the 'total credit points earned by the student in all the credits earned in the Master degree programme' and the 'total number of credits earned in that Master degree programme'.

k. **"Degree"** means Post Graduate Degree in any subject.

l. **"Departmental Staff Council (DSC)"** means a Council of the Department consisting of its whole time faculty which falls in the category of teacher. The DSC will be empowered to consider and decide the academic matters, as specified in Master Degree Ordinances and Regulations.

m. **"Elective Course" means the course, which can be offered as 'optional subject' to the provisions of this Ordinance and the respective syllabus from inter or intra subjects and or disciplines including interdisciplinary or multidisciplinary nature.**

n. **"Fee"** means the fee prescribed by the University for the respective Master Degree Programme from time to time.

o. **"Grade Letter"** means the alphabet indicating the performance of a student in a particular course. It is the transformation of the scaled marks secured by the student in a Course. Grade letters are O, A, B, C, D, E, and F.

p. **"Grade Point"** means the numerical weightage allotted to each stratum of scaled marks corresponding to each 'Grade letter'.
However, the "Administrative Grade Letter" as defined will represent the categories mentioned in the OMD.3 sub clause 'b' of this ordinance.

q. **"Master Degree Programme"** means a Masters Degree Programme in any subject studied at Master degree level under any faculty of the University.

r. **"Semester End Examination (SEE)'** means the examination due to be conducted after the end of the respective semester.

s. **"Semester"** means an academic term constituting 20(twenty) weeks. Each semester shall have at least 15 (fifteen) weeks of direct class room teaching. The Academic Year shall be of bi-semesters. Odd Semesters shall be normally from mid June to mid December and Even Semesters shall be from mid December to mid June.

t. **"Student"** means student admitted to Master Degree Programme in any subject being run under the University Ordinance and Regulations.

O.M.D.4.Course Structure:

1. A Master Degree programme shall consist of the duration of at least two academic years consisting four semesters. A candidate will be required to complete this programme within 4 years from the date of his/her first admission in the semester – I.

   Provided that subject to the approval of the UGC Regulations, when the Master Degree Programme is of one academic year and spreads in the two academic semesters then the study has to be completed within a period of two years from the date of admission in the Semester – I.

2. Subject to the provisions of this Ordinance the programme/study shall be based on (a) Semester System Examination, (b) Continuous Assessment, (c) Choice Based Credit System, and (d) Semester Grade Point Average and Cumulative Grade Point Average Systems.

3. "'Core Course' means a 'course/subject', the knowledge of which is considered essential for a student of the respective programme. This may also include elective courses.

4. 'Elective Course' allow students to acquire knowledge and skills in areas of their choice. Such course(s) may be offered by concerned department and / or other departments within the university. This may be inter or/ and intra department/institution subject to the approval by the university.

5. The Course of respective Master Degree Programme shall have following (i) Course Code(**CC**), (ii)Course Title (**CT**), (iii) Course type such as Compulsory Core Courses(**CCC**), Elective Core Courses(**ECC**), Seminar **(SEM)**,Project Work**(PRJ)**, Field Study**(FST)**, Self Study Course**(SSC)**, Other Supportive Courses**(OSC)**, Educational/Study Tour (**EST**) and Research Publications**(RPJ)** (iv) Credits Assigned, (v) Number of Contact Hours for Lecture(**L**), Tutorial (**T**) and Practical or other (**P**) to be assigned per week.

S No.	Course Code	Course Title	Course Type	Credits	Contact Hours Per week		
					L	T	P

6. Fifteen (15) hours of theory teaching will lead to one credit((which means one hour per week theory teaching in a semester is equivalent to one credit) and in case of practical 45 hours of laboratory work will lead to two credit (Which means 3 hour practical classes per week in a semester is equivalent to two credits). Each semester of Master's course shall offer 30 credits or more. Number of semester of Examinations and minimum credit required to be earned for Master Degree in various post-graduate courses specified as under:

S No.	Course Code	Number of Semesters	Minimum Required Credi
1.	All Two Year Master Degree Programme	Four	120
2.	All One Year Master Degree Programme	Two	60

- **Note:** The curriculum may be described in the syllabus in form of 'Courses' or 'Papers'. The number of papers, course type and credits with detailed syllabus for each course shall be described in the 'syllabus of the respective course'. Candidate will be required to earn minimum credits prescribed for the respective Master Degree.
- 7. Each course shall be assigned a specific number of credits. A course or paper is identified by a course code designated by a string of six alphanumeric characters and a course title. In a course code the first three characters of the string indicate the Department offering the course and the later three alphanumeric characters designate a particular course. In the case of compulsory core courses (CCC) the fourth character identifies the semester numeric digit and in case of the elective core courses (ECC) the fourth character indicates the cluster of specialization. For compulsory theory core courses the fifth character is **'0'**, for laboratory core courses it is **'1'** and for project/seminar it is **'2'** and for research publications in journals it is **'3'**.
- The examination shall comprise of the requirement of four (in case of one year course two) semesters and the Subjects for each semester will be as per the schedule of the structure of the Master Degree Programme with the particulars mentioned therein.
- 8. CBCS offers flexibility for effective **teaching learning processes** in terms of number of contact hours for Lecture (**L**), Tutorial (**T**) and Practical or other (**P**) to be assigned per week for a course or paper.

9. Type of courses

There shall be following categories of courses in the MASTER DEGREE Regular Programme:

9.1. Compulsory Core Course (CCC)

- A course, prerequisite for a student to obtain the Degree in the concerned Programme.

9.2. Elective Core Course (ECC)

- A course, which is to be chosen by the student from a pool of courses offered by the Department.

9.3. Other Supportive Course (OSC)

- Subject to the availability of the course and provisions of university rules, a student admitted in a Master Degree Programme shall have option to offer **Other Supportive Courses** including Interdisciplinary **(ID)**/Multidisciplinary **(MD)** course/s offered by a Department/cluster of Departments. For formation of a cluster, two or more Departments shall come together for offering ID/MD courses depending on their available expertise and infrastructure. The Departmental Staff Council (DSC) shall be competent to decide the nature and scope and number of such courses to be offered by the concerned Department in collaboration with other Department/s.

9.4. Self Study courses (SSC)

Since one of the main objectives of the CBCS is to enable the students to learn on their own. The Self Study course(s) shall be offered to realize this objective. A list of Self Study course(s) shall be designed by different faculty of the Department and after the approval of the DSC, the course(s) shall be made available to the students for self study. Such a course(s) shall have advisory academic support of the faculty, who proposed the course, and the same faculty shall evaluate the student at the end of the semester for a Course Report of 50 marks and a viva voce examination of 50 marks. The number of credits that can be earned in a semester in SSC shall be limited to 4.

O.M.D.5.Admission:

1. A candidate, who has passed Bachelor Degree programme in the concerned subject/discipline from this university or any other university established by law and recognized by the Sant Gahira Guru for the purpose of admission in the Master Degree programme of this university shall be eligible to apply for admission in the respective Master Degree programme of this university.

   Provided further that a candidate, who has passed Bachelor Degree programme from the Faculty of Arts/Social Science shall be eligible to submit his candidature for any subject of the Master degree programme(s) of the said faculties except the Master degree programme in Mathematics run under the same faculties. A candidate can apply for Master Degree in Mathematics only when he has passed Bachelor degree with subject of Mathematics either from Faculty of Social Sciences/ Science.
2. The University may prescribe further stipulation with respect to minimum qualifications subject to the approval of the Academic Authorities of the university.
3. The University may prescribe different qualifications for different courses.
4. The admissions shall be granted strictly on the basis of the merit list.
5. The Department/ University may with the previous permission of the Vice-Chancellor (including the approval of the scheme entrance test/examination), hold entrance test and /or Oral examination for admission in the respective Master degree programme of the department.
6. In case when the Department conducts Entrance Test and/ or Oral Test, the university will give at least "Fifty per cent' weightage to the marks obtained by the candidate at the concerned qualifying examination.

7. It will be obligatory for the authorities involved in the admission process to strictly observe the reservation policy in admissions formulated time to time by the Union Government or State Government, UGC, Rehabilitation Council and adopted by the University. The data based information in this regard has to be provided to the university within a period of 15 days after the completion of the admissions in the respective degree.
8. Admitting authority shall have to prepare and publish the merit list in the two fold as mentioned below:-
   (i) Candidates, who have passed the qualifying examination indicating category against each of the name in the last column such as General/S.T./S.C./S.E.B.C./Physically Challenged/Women etc.
   (ii) Candidates, who have passed the qualifying examination from a foreign university.
9. Admission granted by the University/Department to any student shall be provisional till the enrolment/registration/enlistment is made by the University. When the admission is granted on the bases of provisional eligibility certificate, the conditions & instructions given by the University should be complied within the time limit fixed by the University or latest by the beginning of next semester otherwise, term kept by such students will be forfeited and no fees on any account will be refunded.

O.M.D.6.Medium of Instruction and Examinations :

1. English or Hindi shall be the medium of instruction & examination.
2. No student shall be allowed to change the medium to appear in the examinations once he/she has opted any medium for particular Semester.
3. No student shall be allowed to opt or write papers with two different medium in one examination.

4. Notwithstanding anything in this ordinance the University may declare English as compulsory medium for instructions and/ or examinations for any Master Degree Course keeping academic considerations in mind

O.M.D.7.Mandatory Requirement of Attendance to appear in Examination:

1. The Choice Based Credit System (CBCS) Programme of the University is a comprehensive and continuous evaluation programme .Therefore; no students shall be allowed to appear in the examination unless he has at least 75% (seventy five per cent) attendance separately in all the papers/courses.
2. The respective term/ semester of the student shall be liable for rejection in case the attendance is short in any paper/subject due to the reasons, whatsoever.

   Provided that the Vice chancellor may on the medical ground condone the requirement of attendance not exceeding 10% (ten percent) short to the required minimum attendance on the recommendation of the Head of the concerned Department that the illness was of such a serious nature (recorded by the doctor treating him/her) that it was beyond his or her control to attend the classes during the said period. The production of false certificate in this regard will be a ground for rejection from the Master degree programme and criminal action.

   Provided further that the Vice chancellor may on any other reasonable ground condone 5% (five per cent) attendance lesser than to the required 75% (seventy five per cent) to his satisfaction on the recommendation of the concerned Head of the Department.

3. A student. who represented the university/ institution/ Department/Centre/ State or Nation in Sports, N.C.C., N.S.S., Cultural or other Activities conducted and / or sponsored officially by such institution(s) or agencies shall be entitle to

relaxation of ten percent in the attendance required for the purpose. Such cases should also be recommended by the concerned Head before he/she proceeds for leave and forwarded his application with appropriate documents to prove his participation. Submission of his case without prior permission will not be considered in any case.

Explanation: The University in no case will grant relaxation in attendance to a student, separate or combined on all the heads mentioned in O.M.D. 7 exceeding 15% (fifteen percent). Therefore, no candidate, who does not have 60% (sixty) or more than 60% (sixty per cent) attendance, will not be allowed to appear in the examination for reasons and grounds whatsoever.

O.M.D.8. Advisory for Students:

1. Each Department shall develop 'Advisory Mechanism' to address complex nature of the issues including advice to elect the course(s) from the category of elective courses.

2. Each Department will appoint Advisors in appropriate number required for the purpose.

3. The Department may Prepare "Student Hand Book" containing the detail of the courses available at the Department. This includes both the 'Core' and 'Elective Course (s)'.

4. A student subject to the availability of the elective courses will be required opt course(s) and submit his 'Option in writing' in triplicate on the prescribed 'Performa' for his registration in the concerned semester to the Head of the Department immediately after the commencement of the respective semester; i.e. on or before the last date notified by the concerned department.

5. The last date for registration and permission for election of subject should not exceed more than two weeks after the commencement of the semester.

6. A student may be permitted to withdraw from his registration from two weeks from the date of the registration.

7. A student may be permitted to withdraw from/change the elective subject opted by him after the allocation. However, he /she will not be allowed to withdraw/ change the same on or before the last date fixed for exercising his/her option to opt the same. Provided further that no student will be allowed to withdraw or change the option, who has been allowed for late registration/permission or entry.

O.M.D.9. Semester Schedule:

1. A Semester shall consist of the duration of Fifteen weeks (90 working Days)

2. First Semester of each Academic year will commence from July 15th of every Academic year.

3. Mid-academic year Semester(s) will commence on the stipulated date notified by the university or within in a period of seven days after the completion of the examination of the preceding semester for those students, who fall in this category can seek provisional admission.
   Their admission will be regularized within a period of seven days after the date of the declaration of the result of the said semester.

O.M.D.10. Examination Schedule:

1. **Proposed Time of Examinations**: The examinations of the **"Even Semester(s)"** shall commence in the **month of May** in case of "Odd Semester(s)" it may commence in the **month of December.**

2. **Examination Application**: A candidate shall be required to apply on the prescribed **'Examination Application Form'** for the 'Semester End Examination' to the Registrar/Dean/ Controller of Examinations through the Head of the concerned Department.

3. **'Examination Application Form'** must consist with following particulars and certificates signed by the appropriate authorities:
   (a) Candidate has attended minimum number of lectures etc. in respect of all the Courses.
   (b) Statement of 'No due Certificate' with regard to all the dues including the fee due on all the heads.

O.M.D.11. Salient Features of the Choice Based Credit System:

1. PG Departments of the different Faculties of the University shall design the Semester based Choice Based Credit System (CBCS) for Master Degree programme. Students will be provided choice to select courses offered by the respective Department of the same faculty or any other Department of the same or any other Faculty, depending on his/her interest, needs and long term goals as well as the feasibility in terms of the available expertise and infrastructure at the Department level.

2. Each PG Department shall design and offer courses after the due consideration and approval of the **Departmental Staff Council (DSC)** and concerned authorities of the University.

3. **Composition of the DSC**: The DSC shall consist of all the regular faculty of concerned Department and the Head of the Department shall chair it. The DSC shall recommend to the Vice chancellor for approval the constitution of "Credit Monitoring Committee **(CMC)**", which consists of the Head of the Department and three senior most teachers of the

department. The Department having the faculty strength of less than three (including HOD) shall co-opt maximum up to two members of the rank of Professor of the same subject from other Universities with the permission of the Vice - Chancellor. The Vice chancellor shall have prerogative to drop, alter or substitute any name suomoto or on the further recommendation of the same. In the absence of the HOD, the DSC/CMC shall be chaired by the next senior faculty member of the concerned Department.

4. Registration of candidates in first and subsequent semesters after the last date will not be permitted. For subsequent semesters, no minimum credit earning criteria will be applicable. Credit registration at least once in all Compulsory Credit Course shall be binding. However, earning all CCC credits for accumulation of the prescribed minimum credits shall not be required.

5. A student shall be evaluated through CCA (Comprehensive Continuous Assessment) and Semester End Examination (SEE). The distribution of marks between the CCA and the Semester end examination shall be in the ratio of 30:70. Each paper/ Course shall consist of 100 marks .However; the Programme governed by the provisions of different Councils in case of inconsistency shall be exempted from this requirement.

6. The candidate will be required to finalize the number of credits at the time of the registration in the semester and no change will be permitted after seven days of the commencement of the semester. The CMC of the concerned Department will forward the credits registration detail of all the students enrolled in the semester. The prior approval of the CMC will be essential and its decision shall be final and binding.

7. Each course shall be assigned a specific number of credits.

8. The marks obtained by a student in a course shall be converted into Grade Points and Credit Points based on scale-normalized marks. The performance of a student in a Semester shall be expressed as Semester Grade Point Average (SGPA) and the combined performance of a student in all the semesters of the Master degree programme shall be expressed as Cumulative Grade Point Average (CGPA).

9. The Department is under obligation to arrange all Compulsory Core Courses and the special number of Elective Core Courses so that the students enrolled for the course can complete/obtain prescribed minimum number of credits. However, it will not be at all obligatory for the department to make provision for all the Elective Core Courses. Department can add, remove or substitute any course and course both in the Core and/ or Elective Course(s).

10. There will be no provision to conduct supplementary, due paper of special examination for any examination. Students with 'F' or "E' Grade will be provided an option to re-register themselves in the said course subject to their desire as 'Self Study Course' or in a 'Regular Course' subject to the feasibility and availability of the resources in the department. The credit earned will not be considered in any case if the candidate has not re-registered and the same has not been approved by the CMC of the department at the time of the registration in the respective semester.

O.M.D.12. Credits: Weightage and Distribution:

1. The term **'Credit'** refers to the weightage given to a course and means the unit by which the academic activity of course work is measured. In these Regulations, One Credit means one hour of Class Room Teaching per week in case of theory papers. For a theory course of 6 credits, 6 'contact hours' per week will be assigned in time-table and thus in a semester 90 contact hours will be assigned to a 5 credit course.

2. The minimum number of credits to be earned for a degree will be 30 times the number of semesters specified in the syllabus for the degree. For example for a two year four semester course the minimum numbers of credit to be earned will be 120. In case where a candidate earned more than the minimum number credits specified, the best credits upto minimum number of credits will be considered for CGPA. However, the total credits for different courses may be different subject to the nature and design of the course concerned and norms formulated by the regulatory authorities.

3. **Distribution of Credits:** Ordinarily, all semester shall have uniform distribution of credits.

4. **Credit Card:** Every department will be under an obligation to maintain academic credit card on the prescribed Performa developed and provided by the University Examination Department for students. The Credit card shall be issued to the students before the commencement of the next semester and a student will be under the obligation to attach the copy of the same with the application for registration as student in the next semester. The department will prepare two copies of the Credit Card one each for the student and for the office record of the department.

O.M.D.13. Assessment and Evaluation:

1. The CBCS is student centric not only in the teaching-learning processes but also in their evaluation process. In CBCS, the evaluation process is divided into two parts. The first part consists of Comprehensive Continuous Assessment (CCA) and the second part consists of the Semester End Examination. The division of marks between the two shall be as per the provisions of this ordinance in ratio 30:70. In the CBCS, the evaluation process shall follow the norm that the faculty, who teaches the course, shall conduct the

Comprehensive Continuous Assessment (CCA) and the Semester End Examination (SEE). The concerned faculty shall be accountable for transparency and reliability of the entire evaluation of the student in the concerned Course.

2. The comprehensive continuous assessment and evaluation (based on the performance of the student) process in CBCS is in continuous model is conducted for the purpose to bring periodically in to the notice of the candidate about his/her progress. The assessment is divided into four discrete components for reporting the scores to the student as earned by him/ her. The CMC shall announce policy for CCA for all the courses in the Department in the beginning of the Semester and the same shall be communicated to the students.

3. The details of the Comprehensive Continuous Assessment and Semester End Examination are summarized in the Table below:

Component	Unit covered in a Course/Paper	Mode of Evaluation	Weightage in Percentage	Marks	Period of Continuous Assessment
CCA-I	First 30%	Assignment/ Field-Project Study/ Tour	10%	10	First part of the Semester. *Completed by the Fifth(5th) Week.
CCA-II	Succeeding 30%	Seminar Presentation	10%	10	Second part of the semester. *Completed by the Tenth(10th) Week.
CCA-III	Remaining 40%	Written/MCQ Test	10%	10	Third part of the Semester. *Completed by the Fifteenth(15th) Week.
CCA-Sub Total			**30%**	**30**	
SEE	100%	**Semester End Examination**	70%	70	To be completed between 18th - 20th week of the Semester.

4. The marks/ grades awarded for the continuous assessment shall be notified to the students within a period of ten days from the date of the completion of the assessment. In case a student fails to secure 12 out of 30 in the CCA (all three components taken). He/she shall not be allowed to appear for the Semester End Examination.

5. Students may seek clarifications within period of a week from the date of the notification of the said result. No clarifications will be entertained after the expiry of the said period.

6. The Department will constitute a committee consists of three members and the Head will be the ex officio chairperson of the Committee to supervise the whole Examination Process.

7. The marks awarded by the teacher(s) are shall be kept confidential unless moderated and approved by the CMC/Dept. Examination committee constituted for the purpose. The Committee shall be under consideration to maintain the standards of the evaluation.

O.M.D.14. Semester End Examination:

1. Semester End Examination shall be conducted between 18th - 20th week of the semester.

2. The duration for per course shall be of three hours for theory courses and four hours for practical/laboratory courses, and half hour for seminar, project work or field study presentations.

3. Question papers for Semester End Examination shall be set keeping in mind to examine the candidates' creativity, comprehension, problem solving capacity, application side of the subject, interpretation and awareness capacities. It should not be expected from the students to reproduce the answers by memorizing the answers.

4. Paper Setting:

4.1.1. The question paper for the end-semester examinations for each course shall be set by the paper setter appointed for the purpose. It shall be the responsibility of the paper setter to ensure that the syllabus for the course is adequately covered in the question paper.

4.1.2. The questions may comprise; objective type, short notes, Descriptive or any other types as per the policy developed and designed by the department and approved by the competent academic authorities of the university and notified in advance. The University may retain the earlier pattern of setting papers which includes the requirement of 10/8 questions and students may be provided with choice to answer respectively 5/4 questions. The maximum marks of SEE shall be 70. All questions shall carry the marks mentioned in the paper.

4.1.3. The answer scripts for End-Semester Examinations shall be evaluated preferably, by the respective paper-setters and or the mechanism developed by the university.

4.2.1. **Appointment of paper-setter/examiner**: The Boards of Studies in each subject shall draw a panel of paper-setters/examiners ordinarily in the month of August every alternate year and forward the same to the Academic Council which shall approve the panel of Paper-Setter/Examiner. While drawing the panel, the Chairman of the Board of Studies shall take into consideration the confidential aspect of the assignment.

The Vice chancellor if present preside the meeting of the Board but will not cast his vote. In his absence the Chairperson of the Board will preside the meeting.

However, the University may constitute group of teachers to set the paper through workshop method.

Provided further that the university may develop question bank with the help of examiners appointed subject to the provisions of this ordinance.

4.2.2. A person to be appointed as a Paper –Setter must be a full time teacher of the University/Colleges having at least 3 years Post Graduate teaching experience.

4.2.3. However, in exceptional circumstances, the Vice-Chancellor may relax the condition of experience and or alter or remove any paper setter.

4.3.1. **Moderation Board and moderation of Question Papers:**
There shall be a Moderation Board for each subject/programme of study and it shall consist of-

a) Dean of the School concerned

b) Head of the concerned Department,

c) Two senior teachers nominated by the Head of the Department/ Departmental committee recommended by the Dean of school and finally approved by the Vice Chancellor.

4.3.2. The functions of the Board shall be:

a) To ensure that the question paper has been set strictly in accordance with the syllabus and instructions given by the University covering broad areas adequately.

b) To delete question(s) set from outside syllabus and to make necessary substitution, if required.

c) To remove ambiguity in the language of question, if any,

d) To moderate the questions properly giving ample opportunity to candidates of both average and exceptional capabilities,

e) To ensure proper distribution and indication of marks for each question or part or parts thereof, time prescribed for the paper and to correct errors, if any, in this regard.

f) To bring to the notice of the Controller of Examinations lapses or omission on the part of the Paper-Setter, if any.

4.4. Evaluation:

1. The CBCS is student centric scheme, not only in the teaching-learning processes but also in the evaluation process.

2. In CBCS, the evaluation process is divided into two parts. The first part consists of Comprehensive Continuous Assessment (CCA) and the second part consists of the Semester End Examination.

3. The division of marks between the two shall be as per the provisions of this Ordinance i.e. the CCA will have a weightage of 30 and SEE of 70 out of 100.

4. In the CBCS, the evaluation process shall follow the norm that the faculty, who teaches the course, shall conduct the Comprehensive Continuous Assessment (CCA) and the Semester End Examination (SEE) and the concerned faculty shall be accountable for transparency and reliability of the entire evaluation of the student in the concerned Course.

5. In Comprehensive Continuous assessment and Semester End *Examination* evaluation for each course shall be carried out on the basis of performance of students.

6. Continuous Assessment means 'internal assessment tests'or' sessional tests' and end-on semester means theoretical or practical laboratory examinations along with

Project work/Field study/Educational Tour or preparation of dissertation or Term paper.

7. Each course shall carry credits as may be prescribed by Board of Studies time to time in the syllabus. The weightage assigned to 'Continuous Assessment' and 'Semester End Examination' shall be taken into the consideration for the purpose of determining the grade obtained by the student in a course,

8. Grade point shall be calculated for each course in 10 point scale system on the basis of total marks obtained in CCA and SEE.

9. The Vice chancellor on the recommendation of Board of studies and approved by the Academic Council shall appoint Paper Setter-cum Examiner or constitute Board of Examiners for each course of study subject to the provisions of this Ordinance .

10. The Semester End Practical Examinations shall be jointly conducted by an external and an internal examiner.

O.M.D.15. Result Preparation:

1. The final result of the examination shall be prepared on the basis of 'comprehensive continuous assessment' and 'semester end examination' along with credits earned by the respective student.

The results after computation and tabulation shall be placed before the Vice Chancellor for approval after it has been moderated/scrutinized by a Board consisting of the Head of the concerned Department and not less than two faculty members appointed by the Dean.

2. **Grade Assignments:**

The grades in a course will be assigned on the basis of combined marks obtained in CCA and SEE. The total of maximum marks in CCA and SEE shall be 100 in all courses with a weightage of 30% to CCA. The letter grades and points will be assigned as per table given below.

Total Marks of CAA and SEE	Grade	Grade Definition	Grade Point
90<X<=100	O	Outstanding	10
80<X<=90	A	Excellent	9
70<X<=80	B	Very good	8
60<X<=70	C	Good	7
50<X<=60	D	Fair	6
39<X<=50	E	Average	5
Les than 40	F	Failed	0

3. **Credit Point Assignments:** Credit points earned in a course will be equal to product of Credit assigned to the course in the syllabus and grade point earned by the student on the basis of combined score in CAA and SEE.

4. **Grade Card and /Mark sheet:**

The University will issue the 'Grade Card' and "Mark Sheet" at the end of each semester to each student registered for the respective course from the examination. The Grade Card shall consist of at least the following particulars:

Basic Details: i. Name of the Student. ii. Father's Name. iii. Roll Number. iv. Enrolment / Registration / Unique Number.

Performance Details: For each course i. Course Code. ii. Course Title, iii Course type, iv. Credit of course, v. CAA marks, SEE Marks, Total Marks, Grade Point, Credit Point

Summary Performance Details: i. Total credit points earned in the semester, ii. Total credit earned in the semester, iii. SGPA, iv. Credit earned in Previous Semesters and v. CGPA (calculated till the end of current semester)

5. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) will be calculated on the credit ighted average of the grade points obtained as given below.

$$CGPA=\frac{\sum_{i=1}^{n} C_i P_i}{\sum_{i=1}^{n} C_i}$$

Where

C_i: Number of credits earned in the i^{th} course of Semester for which SGPA is to be calculated.

P_i: Grade Point Earned in i^{th} course

i: 1, 2, ...n represents the number of courses in which a student is registered in the concerned semester.

$$SGPA=\frac{\sum_{i=1}^{n} C_i P_i}{\sum_{i=1}^{n} C_i}$$

Where

C_i: Number of credits earned in the i^{th} course of Course till date for which CGPA is to be calculated.

P_i: Grade Point Earned in i^{th} course

i: 1, 2, ...n represents the number of courses in which a student is registered in the concerned semester.

6. The Cumulative Grade Point Average (CGPA) of all the courses after completing the programme or all semesters at the final stage of study shall be awarded in the Final Cumulative Grade Card. The Final Grade of the Master degree programme will be assigned on the basis of Final CGPA as per table given below.

CGPA	Letter Grade	Classification
9.00 to 10.00	O	Outstanding
8.00 to 8.99	A	Excellent
7.00 to 7.99	B	Very good
5.50 to 6.99	C	Good
4.50 to 5.49	D	Fair
3.60 to 4.49	E	Average
O to 3.59	F	Failed

7. Equivalent Percentage of marks may be computed as ten times of CGPA. The candidates with CGPA equal to or higher than 5.5 (Letter Grade C) will be considered with good academic record and shall be treated as eligible wherever the minimum percentage of 55% is specified.
8. In case of LLM examination and other cases wherever specified specifically the candidates with CGPA less than 4.8 will be declared failed.

O.M.D.16. Promotion Rules:

a) A candidate is eligible to continue the classes of next semester immediately after the examinations of one semester is over and he/ she can appear the next semester examination with any number of back/arrear papers.

b) A candidate shall have to appear in 1st semester examinations to be eligible for promotion to 2nd semester. If and student could not appear or apply for 1st semester examination then he/she must have to take re-admission in 1st semester afresh.

c) A candidate may get chance to clear the all courses double the duration of the course of study .i e. for 2 year course within four years, for 3 year courses within 6 years, for 4 year courses within eight years and for 5 year courses within ten years.

O.M.D.17.: When a candidate at a 'University Semester End Examination' fails to obtain minimum marks for passing in a particular courses he/she will be required to reappear in that

course without keeping term for that semester. The candidate will have to reappear in the semester end examination by paying fresh examination fee along with an application form. Such candidate when obtains minimum or more than minimum marks for passing in the course, his/her actual marks of reappearance will be carried forward for award of class/CGPA.

O.M.D.18. RANKS:

First and Second Ranks will be awarded after completion of the course of study at the end of the final semester examination on the day of publication of final results.

On the basis of Average percentage of results as declared and on this basis of CGPA, Ranks will be awarded to the candidates in a subject.

O.M.D.19. General Guidelines:

I) There will be no provision for repeat of betterment i.e. scope for appearing and paper again for obtaining better result.

ii) If a candidate after admission in first semester could not continue the classes or could not obtain eligibility to get admission in first semester examination then he/she is to get re-admission in first semester again as fresh and he/she will not be allowed to continue study in other semester.

iii) Candidates should be registered under Sant Gahira Guru, within 3 months of study, if not obtained earlier. The conditions for obtaining Registration must be followed as specified in the Application form. Without Registration number of Sant Gahira Guru no students will be allowed to get admission in first semester examination or 2nd semester course of study.

iv) The dates of commencement and termination of each semester shall be as fixed by the Academic Council.

v) It will be obligatory for the Head of Department to take appropriate measures against Ragging & Gender problems arising in the University Department. In case of occurrence of any such incident, the violator shall be dealt with very seriously and appropriate stringent action be taken by the Head of Department by observing principle of natural justice. The Head of Department may appoint a committee to inquire in to the matter which will also observe the principle of natural justice. The committee will submit its report to the head of Department who will forward the, same with his comment there upon to the University Registrar, for taking further necessary action in the matter.

vi) Candidates must forward their applications for admission to University examination to the registrar on or before the prescribed date with a certificate of attendance duly signed by the Head of the Department along with the examination fees fixed by the University.

vii) Thirty percent internal evaluation shall be within the exclusive purview of the concerned Head of Department which requires purity, transparency accuracy in the evaluation & assessment of students. The benefits of re-assessment scheme will not be made available to the students as regards the internal assessment.

viii) There will be theory and practical examination if prescribed in the syllabus, at the end of the fourth semester. The viva voce examination will be conducted at the end of the fourth semester.

ix) Subject to the provisions of University Act., Statutes, Ordinances, Rules and Regulations, the University will prepare, design and enact syllabus/prospectus for different Master Degree prorgammes under the different faculties time to time.

O.M.D.20.: EMPOWERING CLAUSE: Subject to the provisions of this ordinance, the University shall run Master Degree programme(s) prepared and approved by the Academic authorities of the University including the Board of Studies and Faculty of the respective subject and approved by the Academic Council and the Executive Council.

Semester Structure Table

Appendix –I

Note: The Department Staff Council may subject to the approval of the Board of Studies of the respective subject, respective Faculty and the Academy Council of the University, may by way of addition or deletion introduction of new or additional subject or amend the given scheme including the increase in the number of papers under the same code number or by inserting additional or new code numbers.

Provided further that the University may design different CBCS scheme for the different Master Degree programme depending on their nature, scope & requisites. In such situation, the scheme will be notified with semester wise detail evaluation scheme and the syllabus of the respective subject/course.

Thus the actual semester structure table may vary for the different master degree programme. The one given below is for an example.

ABC: In tables given below ABC shall be replace by Three Letter Subject Code of the degree programme for example PHY for M.Sc. Physics.

The table assumes that six cluster A, B, C, D, E, F are available for Elective Core Courses each involving four courses labeled like A01, A02, Ao3, A04.

The Interdisciplinary courses are classified under OSC

First Semester Structure Table

S. No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	ABC 101		CCC	6	4	2	0	3	0
2.	ABC 102		CCC	6	4	2	0	3	0
3.	ABC 103		CCC	6	4	2	0	3	0
4.	ABC S01	Other Supportive Course	OSC	6	4	2	0	3	0
5.	ABC A01/B01/ C01/D01/ E01/F01		ECC	6	4	2	0	3	0
				30					

Second Semester Structure Table

S. No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	ABC 201		CCC	6	4	2	0	3	0
2.	ABC 202		CCC	6	4	2	0	3	0
3.	ABC 203		CCC	6	4	2	0	3	0
4.	ABC 221		PRJ/FST/ EST	6	4	2	0	3	0
5.	ABC A02/B02/ C02/D02/ E02/F021		ECC	6	4	2	0	3	0
				30					

Third Semester Structure Table

S. No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	ABC 301		CCC	6	4	2	0	3	0
2.	ABC 302		CCC	6	4	2	0	3	0
3.	ABC 303		CCC	6	4	2	0	3	0
4.	ABC S02		OSC	6	4	2	0	3	0
5.	ABC A03/B03/ C03/D03/ E03/F03		ECC	6	4	2	0	3	0
				30					

Fourth Semester Structure Table

S. No.	Subject Code	Course Title	Course Type	Credit	Contact Hours Per week			EoSE Duration (Hrs.)	
					L	T	P	Thy	P
1.	ABC 401		CCC	6	4	2	0	3	0
2.	ABC 402		CCC	6	4	2	0	3	0
3.	ABC 403		CCC	6	4	2	0	3	0
4.	ABC 421		PRJ/FST/ EST	6	4	2	0	3	0
5.	ABC A04/B04/ C04/D04/ E04/F04		ECC	6	4	2	0	3	0
				30					

M.Sc. CHEMISTRY FIRST SEMESTER

First Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per WeeK			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 101	CCC	INORGANICCHEMISTRY-1	6	4	3	0	3	0	80	20
MSC 102	CCC	ORGANICCHEMISTRY-1	6	4	3	0	3	0	80	20
MSC 103	CCC	ANALYTICAL CHEMISTRY	6	4	3	0	3	0	80	20
MSC 111	CCC	INORGANIC AND ANALYTICAL CHEMISTRY-1 LAB	6	0	0	9	0		100	
MSC S01	OSC	RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS	6	4	3	0	3	0	80	20
MSC A01	ECC/CB	CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM	6	4	3	0	3	0	80	20
MSC A02	ECC/CB	GROUP THEORY, SPECTROSCOPY AND DIFFRACTION METHODS								
MSC A03	ECC/CB	COMPUTER PROGRAMMING IN CHEMISTRY								
MSC A04	ECC/CB	MEDICINAL CHEMISTRY								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credit= 36							

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSC101 **COURSE TYPE: CCC**

COURSE TITLE INORGANIC CHEMISTRY-1	
CREDIT:6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE:

To study the concept of coordination Chemistry, stability of the complexes and stereochemistry of complexes. To study about structure and bonding.

UNIT-1 16 Hours

STEREO CHEMISTRY AND BONDING IN MAIN GROUP COMPOUNDS, QUANTUM MECHANICS

VSEPR, Walsh Diagram (Tri and Penta atomic molecules), Bent rule and energetic of hybridization. Some simple reactions of covalently bonded molecules.

Metal ligand Equilibria in Solution-Stepwise and overall formation constants and their interaction, trends in step-wise formation constants, factors affecting the stability of metal complexes with reference to nature of metal ion ligand, chelate effect and it's thermodynamic origin, model of chemical bonding-molecular orbital(MO), Valency bond theries, application to diatomic molecule such as H2,H2+, etc. quantitative MO theory-Huckel-electron theory and its application to ethelene ,butadiene and benzene.

UNIT-2 16 Hours

REACTION MECHANISM OF TRANSITION METAL COMPLEXES

Energy profile of a reaction, reactivity of metal complexes, inert and labile complexes, kinetic application of valence bond and crystal field theories, Kinetic s of octahedral substitution, acid hydrolysis, Base hydrolysis, factors affecting acid hydrolysis, conjugate base mechanism, direct , substitution reactions without metal ligand cleavage, substitution reaction in square planar complexes, the trans effect, mechanism of substitution reaction, Redox reactions, electron transfer reactions, Mechanism of one

electron transfer reaction in octahedral, outer sphere type reactions, cross reactions and Marcus- Hush Theory, inner sphere type reactions.

UNIT-3 18 Hours

CHEMICAL BONDING:LCAO-MO theory, metallic bonding, band theory, hydrogen bonding,,

METAL LIGAND BONDING

VBT, Crystal field theory and application, Limitation of Crystal Field Theory, molecular orbital theory ,tetrahedral, octahedral, and square planar complexes,

UNIT-4 18 Hours

METAL COMPLEXES

Metal carbonyls, structure and bonding, vibrational spectra of metal carbonyls for bonding and structural elucidation, important reactions of metal carbonyls, nitrosyls- preparation, bonding and structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes, tertiary phospine as ligand.

UNIT-5 22 Hours

(A) CROWN ETHER COMPLEXES NAD CRYPTANDS, INCLUSION COMPOUND

(B) ISOPOLY AND HETROPOLY ACIDS AND SALTS.;

(C) INORGANIC POLYMERS: Preparation, structure and its application of Phosphazines ,borazine , silicones,

SUGGESTED READING BOOKS

1. J.E. Huheey, Inorganic Chemistry - Principles, Structure and Reactivity, Harper Collins, New York, IV Edition (1993)
2. F.A. Cotton and G. Wilkinson, Advanced Inorganic Chemistry - A Comprehensive Text, John Wiley and Sons, V Edition (1988)
3. K.F. Purcell and J.C. Kotz, Inorganic Chemistry - WB Saunders Co., USA (1977)
4. M.C. Day and J. Selbin, Theoretical Inorganic Chemistry, Van Nostrand Co., New York (1974)
5. J.E. Huheey, Inorganic Chemistry, Harper Collins NY IV Edition, (1993)
6. G.S. Manku, Inorganic Chemistry (1984)

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSC102 COURSE TYPE: CCC

COURSE TITLE ORGANIC CHEMISTRY-I	
CREDIT:6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE:

To learn the concepts of stereochemistry, conformationa analysis and their application in the determination of reactio mechanism. To understand the nucleophilic and electrophili substitution.

UNIT-1 20 Hours

STEREOCHEMISTRY:

Optical activity and chirality, enatiomers, diastereoisomers] Classification chiral molecules as asymmetric and dissymmetric. A brief Study of dissymmetry allenes, biphenyls, spiro compounds, R, S notation of biphenyls and allenes. Fisch projection. Inter conversion of Sawhorse, Newman and Fischer projection Molecules with more than one asymmetric center (restricted to five carbons). e Erythro and threo compounds. Asymmetric synthesis, Cram's rule.
Geometrical isomerism: E, Z - nomenclature of olefins, . Stereo specific and ster selective reactions.

CONFORMATIONALANALYSIS :

Conformation of 1, 2 disubstituted cyclohexane and their stereo chemi features (geometric and optical isomerism). Conformation and reactivity substituted cyclohexanol (oxidation and acylation),. cyclohexanon (reduction) and cycloehexane carboxylic acid derivatives (esterificati and hydrolysis). Conformation and stereochemistry of cis and trans deca and 9 - methyldecalin

UNIT-2 18 Hours

REACTION INTERMEDIATES: Introduction ,generati ,structure,,stability and reaction of carbocation, carboanion,free radic carbenes ,nitrenes,and benzynes.

ELIMINATION REACTION: Introduction,E1 and E2 reacti mechanism, pyrolytic syn elimination reaction, dehydration of alcoh dehalogenation of vicinal dihalides, Peterson reaction.

UNIT-3 19 Hours

ALIPHATIC NUCLEOPHILIC SUBSTITUTION REACTION

SN1, SN2 and SNi mechanisms,SET mechanism - Neighbooring group participation - reactivity, structural and solvent effects - substitution in norbornyl and bridgehead systems - nucleophilic substitution at allylic and vinylic carbons ,phase transfer catalyst,resioselectivity, ambident nucleophiles , - alkylation and acylation of amines, Von-Braun reaction, alkylation and acylation of active methylene carbon compounds, Esterification and ester hydrolysis mechanims, Claisen and Dieckmann condensation.

ALIPHATIC ELECTROPHILIC SUBSTITUTION:

SE1, SE2 and SEi mechanism, double bond shift - Reactivity. Migration of double bond, keto-enol interconversion, HVZ reaction, Stark-Enamine reaction, halogenation of aldehydes and ketones .

UNIT-4 17 Hours

AROMATIC ELECTROPHILIC SUBSTITUTION REACTIONS

The arenium ion mechanism. Orientation and reactivity of ortho/para and meta directing group, IPSO attack. Typical reactions - nitration, sulphonation, halogenation, Friedal Crafts alkylation and acylation reaction and, Formylation reaction-,Reimer - Tieman reaction, Vilsmeyer - Hack, Gattermann, Gattermann - Koch ,. Fries rearrangment , Electrophilic susbstitution of furan, Pyrrole, thiophene and pyridine-N-oxide.

UNIT-5 16 Hours

AROMATIC NUCLEOPHILIC SUBSTITUTIONS AND DETERMINATION OF REACTION MECHANISM

Methods for the generation of benzyne intermediate and reactions of aryne intermediate. Nucleophilic substitution involving diazonium ions. Aromatic Nucleophilic substitution of activated halides. Ziegler alkylaiton. Chichibabin reaction, ArSN1 and ArSN2 reaction. Von Richter rearrangement, Sommlet-Hauser rearrangement, Smiles rearrangement.
Kinetic and non-kinetic methods of determining organic reaction mechanism:The rate determining steps, intermediate and transision state, thermodynamics and kinetics control, isotopes effect,
Hammett and Taft equations - Simple Problems.

SUGGESTED READING BOOKS

1. Organic Synthesis by R.O.C. Norman, Chapman and Hall, NY, (1980)
2. Physical Organic Chemistry by Niel Isaacs, ELBS Publications (1987)
3. Organic Reaction Mechanism by S.M. Mukherji and S.P. Singh, MacMillan India Ltd., Chennai (1990)

4. Organic Chemistry IV Edition by Stanley Pines
5. Structures and Mechanism by E.S. Gould
6. Advanced Organic Chemistry, Part A and B, by Francis A. Carey a Richard J. Sundberg, 3rd Edition (1990), Plenum Press.
7. Aromatic Nucleophilic Substitution by J. Miller
8. Advanced Organic Chemistry III Edition by J. Miller
9. Reactive Molecules, C. Wentrup, John Wiley and Sons, New Yo (1984)
10. Advanced organic reaction mechanism and structure by J. March, Ta McGraw Hill.
11. Organic Chemistry, Marc London
12. Organic Chemistry, Mc Murray
13. Organic Chemistry, Graham Solomons
14. Carbenes, Nitrenes and Arynes by T.L. Gilchrist and C.W. Re Thomas Nelson and Sons Ltd., London.
15. Stereochemistry, Conformation analysis and Mechanism by P.S. Ka 2nd Edition (1993), Wiley Eastern Limited, Chennai.
16. Stereochemistry of carbon compounds by Ernest Eliel
17. Stereochemistry and Mechanism through solved problems by P Kalsi. Wiley Eastern Ltd., (1994)
18. Basic principles of Organic Stereochemistry by P. Ramesh - Madu Kamaraj University.
19. Organic Reaction Mechanism by R.K. Bansal.
20. A Guide book to mechanism in organic chemistry by Longman.
21. Structure and mechanism in organic chemistry by C.K. Ingold, cornell University press.

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSC103 **COURSE TYPE: CCC**

COURSE TITLE ANALYTICAL CHEMISTRY	
CREDIT:6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE: to learn about the chemical analysis, solvent extraction, separation technique and spectroscopic technique.

UNIT-1 18Hours

Fundamentals of Chemical Analysis:
Quantitative and Qualitative analysis; Error, types of errors, minimization of errors, statistical method of error analysis, Sensitivity and Selectivity of Analytical methods; Sampling; Accuracy & precision; Standard Deviation; Calibration curve and Correlation Coefficient; linear regression;, student 't' test, Analysis of Variance (ANOVA).

UNIT-2 18 Hours

Solvent extraction And organic reagents:
Quantitative and Qualitative treatment of solvent extraction; Organic reagents dithiols, diketones, oxine, dithizone, cuproin, cupferron, dimethylglyoxime and dithiocarbamates in solvent extraction; Synergistic Extraction: determination of Nickel; Crown ethers for ion association complexes.

UNIT-3 18 Hours

Ion Exchange technique :Basic features of ion exchange reactions; Ion exchange resins and their classification; action of ion exchange resins; Factors affecting the selectivity of ion exchange resin; Ion Exchange capacity, Ion selective Electrodes. Ion Exchange Chromatography

UNIT-4 18 Hours

Separation Techniques: Principle, methodology and applications: Super Critical Fluid Chromatography, , Gel Filtrations and Gel Permeation Techniques; Electrophoresis,
TLC Chromatography-introduction, principle, technique,solvent system,

plate development, detection of components, application and limitation. *Column chromatography*- principle, experimental details, theory of development ,column efficiency ,factor affecting column efficiency.

UNIT-5 18 Hours

Spectroscopic Techniques:
Principle, General layout of instrument and applications of: Flame Photometry; Atomic Absorption Spectroscopy (AAS); Fluorescence Spectroscopy; Nephelometry & Turbidometry.

1. Vogel's Textbook of Quantitative Chemical Analysis, G.H.Jeffery, J.Bassett, J. Mendham and R.C. Denney, Publ ELBS, Longman, UK
2. Basic Concepts of Analytical Chemistry, S. M. Khopkar, Wiely Eastern.
3. Fundamentals of Analytical Chemistry, D.A. Skoog, D.M. West and F.J.Holler. Publ. W B Saunders.
4. Analytical Chemistry, G.D. Christian, John Willy & Sons.

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSC111 **COURSE TYPE: CCC**

COURSE TITLE
INORGANIC AND ANALYTICAL CHEMISTRY LAB

CREDIT:6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100	MARKS: THEORY: PRACTICAL :

OBJECTIVE: To learn and practical experience of different quantitative and qualitative analysis.

1. Semimicro qualitative analysis of mixture containing eight radicals including two common and two rare cations. The following are the rare cations to be included. W, Ti, Te, Se, Ce, Th, Zr, V, U, Li, Mo, Be.
Quantitative Analysis involving two of the following in ores, alloys, mixtures in solution : one by volumetric and other by gravimetric method
Ag, Cu, Fe, Cr, Mn, Ni, Zn, Ba, Ca

2. a) Complexometric titrations (EDTA) - Estimation of Ca, Mg and Zn.
b) Preparation of the following:
(i) Potassium tris (oxalate) aluminate (III) trihydrate
(ii) Tris (thiourea) copper (I) sulphate
(iii) Potassium tris (oxalaato) chromate (III) trihydrate
(iv) Sodium bi (thioshophato) cuprate (I)
(v) Bis (dimethylglyoximato) nicke (II)
(vi) Sodium hexanitrocobaltate (III)
(vii) Chloropentammine cobalt (III) chloride
(viii) Bis (acetylacetanato) copper (II)
(ix) Hexanrinennickel (II) chloride
(x) Bis (thicyanato) pyridine manganese (II)
c) Separation of zinc and magnesium on an anion exchange.

3. Volumetric and Gravimetric Analysis
Determination of iodine and saponification values of oil sample.
Determination of DO, COD, BOD, Hardness of water sample.
Determination of metal ions e.g. Ni, Cu, etc. by gravimetric methods using organic precipitants such as dimethylglyoxime, dithizone, etc.

4. Chromatography: Separation of anions and cations by paper chromatography
pH meter and potentiometer : Determination of strength of solutions
Flame photometry/ Colorimetry : Determination of cations/anions and metal ions
Spectrophotometry : Verification of Beer-Lambert's law, Molar absorbity calculation. Plotting graph to obtain λ_{max}
Nephelometry/Turbiditymetry : Determination of chlorides, phospates turbity etc.
Estimation of aminacid using ninhydrin method,
Estimation of carbohydrate by spectrophotometric method.

SCHEME OF PRACTICAL EXAMINATION FOR M.Sc.I SEMESTER CHEMISTRY

M.SC. I SEM CHEMISTRY
INORGANIC & ANALYTICAL CHEMISTRY LAB
MAX.MARKS 100
TIME 12 HRS (SPREAD OVER TWO DAYS)

1.semi micro qualitative analysis of mixture. 30 Marks
(4 acid and 4 basic radicals)
or
Quantitative analysis ivolving two of the following in mixtures i solution: one by volumetric and other by gravimateric metho Ag,Cu,Fe ,Cr,Mn, Ni,Zn,Ba,Ca

2. one exercise from analytical chemistry . 30 Marks

3.Viva-voce. 20 Marks

4.Sessional . 20 Marks

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSCS01 **COURSE TYPE: OSC**

COURSE TITLE : RESEARCH METHODOLOGY & COMPUTER APPLICATION: BASICS

CREDIT:6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundamentals and Office Software Package .

UNIT-1 18 Hours

CONCEPT OF RESEARCH :

Meaning and characteristics of research , Steps in research process , Types of research
i) Basic, applied and action research ii) Quantitative and qualitative research , Areas of research in concern discipline

SELECTION OF PROBLEM FOR RESEARCH :

Sources of the selection of the problem , Criteria of the selection of the problem ,Drafting a research proposal , Meaning and types of variables ,Meaning and types of hypotheses.

UNIT-2 18Hours

TOOLS OF RESEARCH :

Meaning and general information about construction procedure of (i) Questionnaire, (ii) Interview, (iii) Psychological test, (iv) observation (v) Rating scale (vi) Attitute scale and (vii) check list , Advantages and disadvantages of above tools

SAMPLING : Meaning of population and sample , Importance and characteristics. of sample , Sampling techniques - i) Probability sampling : random sampling, stratified random sampling, systematic sampling, cluster sampling ii) Non-probability sampling: incidental sampling, purposive sampling, quata sampling

UNIT-3 18 Hours

METHODS OF RESEARCH: Meaning and conducting procedure of following methods of research : Historical method , Survey method , Case study , Causal comparative method, Developmental methods, Experimental methods

UNIT-4 18 Hours

TREATMENT OF DATA: Level of measurements of data, Steps in treatment of data: editing, coding, classification, tabulation, analysis and interpretation of results

WRITING RESEARCH REPORT : Sections of report : Preliminary section , Content section : various chapters , Supplementary section : appendices, references, abstract , Format and style

UNIT-5 18 Hours

Computer Fundamentals:

Computer System : Features, Basic Applications of Computer, Generations of computers.

Parts of Computer System : Block Diagram of Computer System ; Central Processing Unit (CPU) ; Concepts and types of Hardware and Software, Input Devices - Mouse, Keyboard, Scanner, Bar Code Reader, track ball ; Output Devices - Monitor, Printer, Plotter, Speaker ; Computer Memory - primary and secondary memory, magnetic and optical storage devices.

Operating Systems - MS Windows : Basics of Windows OS ; Components of Windows - icons, taskbar, activating windows, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders ;

Word Processing - MS Word : Creating, Saving, Opening, Editing, Formatting, Page Setup and printing Documents ; Using tables, pictures, and charts in Documents ; Using Mail Merge sending a document to a group of people and creating form, letters and label.

Spreadsheet - MS Excel : Opening a Blank or New Workbook, entering data/Function/ Formula into worksheet cell, Saving, Editing, Formatting, Page Setup and printing Workbooks.

Presentation Software - MS Power Point : Creating and enhancing a presentation

SUGGESTED READINGS

*Agrawal, Y. P. (1988). **Better sampling : Concepts, Techniques and Evaluation.** New Delhi : sterling Publishers Private Ltd. Best, J. W. (1993).*

***Research in Education** (6th ed.) New Delhi : Prentice-Hall of India Pvt. Ltd.*

*Broota, K. D. (1992) **Experimental design in Behavioral Research** (2nd ed.)*

New Delhi : Wiley Eastern Limited.

*Dasgupta, A. K. (1968). **Methodology of Economic Research.** Bombay: Asia Publishing House. Edwards, A. L. (1957). **Techniques of Attitude Scale construction.** New York : Appleton-Contury*

*Gall, M. D., Gall, J. P. and Borg, W. R. (2007). **Educational Research : An introduction***

(8th ed.) Coston : Allyn and Bacon.

*Garrett, H. E. & Woodworth, R. S. (1969). **Statistics in Psychology and Education.** Bombay : Vakils, Fecffer & Simons Pvt. Ltd.*

*Goode, W. J. & Hatt, Paul K. (1952). **Methods in Social Research.** New York : McGraw-Hill.*

*Gopal, M. H. (1964). **An Introduction to research Procedure in Social Sciences.** Bombay : Asia Publishing House.*

*Hillway, T. (1964) **Introduction to Research** (2nd ed.) Noston : Houghton Miffin.*

*Hyman, H. H., et al. (1975). **Interviewing in Social Research.***

Chicago : University of Chicago Press.

*Kerlinger, F. N. (1983) **Foundation of Behavioural Research.** (2nd*

Indian Reprint)

New York : Holt, Rinehart and Winston.

*Kothari, C. R. (2007) **Research Methodology: Methods & Techniques** (3rd ed.)*

New Delhi : Wishwa Prakashan. Fundamentals Of Computers, Dr. P. Mohan, Himalaya Publishing House.

Microsoft First Look Office 2010, K. Murray, Microsoft Press.

Fundamental Of Research Methodology And Statistics, Y.K. Singh, New Age

International (P) Limited, Publishers.Practical Research Methods, Dr Catherine Dawson,

The Essence Of Research Methodology, Jan Jonker & Bartjan Pennink, Springer.

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSCA01 **COURSE TYPE: ECC/CB**

COURSE TITLE : CONSTITUTIONALISM & INDIAN POLITICAL SYSTEM

CREDIT : 6 THEORY : 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS : THEORY : 100 (80+20)	

OBJECTIVE:

- Understands the concept of Constitutionalism
- Gets acquainted with various Indian Political System
- Becomes familiar with various Union Executive
- Gets conversant with Legislatures, Legislative Bills
- Achieves skills in various writings

UNIT-1 12 Hours

Meaning: Constitution, Constitutional government & constitutionalism; Difference between Constitution & Constitutionalism; Constitutionalism: Basis, Elements, Features & future. Forms of Government: Democracy & Dictatorship, Unitary & Federal, Parliamentary & Presidential form. Ideals of the Indian Constitution incorporated in the Preamble.
Special Features of the Indian Constitution.

UNIT-2 24 Hours

Concept of State and Citizenship, Judicial Review and Fundamental Rights, Directive Principles of the State Policy, Fundamental Duties, Procedure to Amend the Indian Constitution, Judiciary: Supreme Court and High Court, Judicial Activism and Public Interest Litigation and Provisions relating to Emergency.

UNIT-3 10 Hours

Union Executive- President, Prime Minister, Council of Ministers.
State Executive- Governor, Chief Minister and Council of Ministers.
Local Bodies &Panchayati Raj

UNIT-4 — 24 Hours

Parliament of India, State Legislatures, Legislative Bills: Ordinary Money and Financial, Union State Relations, Principles of th 'Separation of Power and the 'Principles of Check & Balance'. Political Parties and Pressure Groups.
Challenges before Indian Democracy: Terrorism, Regionalism Communalism, *Linguistics* and National Integration.

UNIT-5 — 20 Hours

Controller & Accountant General of India, Solicitor Genera Advocate General, Election Commission, Union and State(s) Publi Service Commission, Finance Commission.

SUGGESTED READINGS

1. HOBBES, Thomas, The Leviathan, Chapters XIII & XVII [entry]
2. LOCKE, John, The Second Treatise of Civil Government, Chapter IX [entry]
3. ROUSSEAU, Jean-Jacques, The Social Contract or Principles of Political Right
4. MONTESQUIEU, The spirit of the laws,
5. RAZ, Joseph, "The rule of law and its virtue", in The authority of law, Oxford University Press, 1979
6. Dicey on British constitution
7. P. Ishwara Bhat Inter-relationship between Fundamental Rights
8. M P Jain Indian Constitutional Law
9. H M Seervai Constitutional Law of India
10. V N Shukla Constitution of India
11. D DBasu Shorter Constitution of India
12. B Sivarao Constitutional Assembly Debates
13. J. V R Krishna Iyer Fundamental Rights and Directive Principles
14. Paras Diwan Human Rights and the Law
15. P K Tripathi Some Insight into Fundamental Rights
16. S P Sathe Fundamental Rights and Amendment to the Constitution
17. P B Gajendragadkar Law, Liberty and Social Justice

David Karrys Politics of Law

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSCA02 — **COURSE TYPE: ECC/CB**

COURSE TITLE : GROUP THEORY, SPECTROSCOPY AND DIFFRACTION METHODS

CREDIT:6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE: To study the diffraction techniques and to learn about group theory and spectroscopy.

UNIT-1 — 18 Hours

Diffraction Techniques : Miller indices; X-ray diffraction – Bragg Law, Laue method; Debye-Scherrer method of X-ray structural analysis of crystals; Index reflections; Identification of unit cells from systematic absences in diffration pattern; X-ray diffration method for Identification of crystalline compound.

UNIT-2 — 18 Hours

Group Theory: Symmetry elements and symmetry operation, definitions of group,subgroup, Group and subgroup. Schonflies symbols, representations of groups bymatrices (representation for the Cn, Cnv, Cnh, Dnh etc. groups to be worked outexplicitly.). Character of a representation. The great orthogonality theorem (withoutproof) and its importance. Character tables and their use in spectroscopy

UNIT-3 — 17 Hours

Photoelectron Spectroscopy : Photo-electric effect, ionizagtion process, Koopman's theorem. Photoelectron spectra of simple molecules. Electronically excited states: Fluorescence, phosphorescence and Chemiluminscence; Fluorescence Spectroscopy: Principle, basic instrumentation and Applications.

UNIT-4 — 19 Hours

Nuclear Magnetic Resonance Spectroscopy (NMR): Theory of NMR: Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei,

OBJECTIVE: To study the diffraction techniques and to learn about group theory and spectroscopy.

UNIT-1 — 18 Hours

Diffraction Techniques : Miller indices; X-ray diffraction – Bragg Law, Laue method; Debye-Scherrer method of X-ray structural analysis of crystals; Index reflections; Identification of unit cells from systematic absences in diffration pattern; X-ray diffration method for Identification of crystalline compound.

UNIT-2 — 18 Hours

Group Theory: Symmetry elements and symmetry operation, definitions of group,subgroup, Group and subgroup. Schonflies symbols, representations of groups bymatrices (representation for the Cn, Cnv, Cnh, Dnh etc. groups to be worked outexplicitly.). Character of a representation. The great orthogonality theorem (withoutproof) and its importance. Character tables and their use in spectroscopy

UNIT-3 — 17 Hours

Photoelectron Spectroscopy : Photo-electric effect, ionizagtion process, Koopman's theorem. Photoelectron spectra of simple molecules. Electronically excited states: Fluorescence, phosphorescence and Chemiluminscence; Fluorescence Spectroscopy: Principle, basic instrumentation and Applications.

UNIT-4 — 19 Hours

Nuclear Magnetic Resonance Spectroscopy (NMR): Theory of NMR: Nuclear spin, nuclear resonance, saturation, shielding of magnetic nuclei, deshielding; factors influencing chemical shift; Spin-spin interactions, factors influencing coupling constant 'J' Spin decoupling; Instrument –basic ideas; Applications of NMR; Basic idea of 13C NMR and FT NMR, advantages of FT NMR.

UNIT-5 — 18 Hours

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSCA03 **COURSE TYPE: ECC/CB**

COURSE TITLE : COMPUTER PROGRAMMING IN CHEMISTRY

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE: To study about computer programming and its application in Chemistry.

UNIT-1 — 18 Hours

Fundamentals of Programming

Generation for Computer Languages, Principles of Programming : Algorithm, Pseudo code and flowchart

UNIT-2 — 18 Hours

Introduction to C and Programming: Constants, variables, operators and expressions, data input and output, format specifications, control statements, nesting of loops, arrays and subscripted variables, functions and subroutines.

UNIT-3 — 19 Hours

Numerical Analysis: Data fitting by least square, Newton–Raphson and iterative methods for solving non-linearequations; Linear simultaneous equations - Cramer's rule, Gauss elimination method and Gauss-Seidel method; Numerical integration – interpolation, Gauss's quadrature formula; trapezoidalmethod, Simpson's 1/3 rule.

UNIT-4 — 20 Hours

Development of small computer codes involving simple formula in Chemistry such as vander Wall equation, pH titrations, Kinetics radioactive decay, evaluation of lattice energy and ionic radii, Secular equation (within Huckel theory), Elementary structural features such as bond length, bond angles, di-hedral angles etc. of

molecule extracted from a data base such as Cambridge data base.

UNIT-5 15 Hours

Introduction and use of computer packages

MS Word and Excel, preparation of graphs and charts

RECOMENDE READINGS:

1. W. E. Mayo & M. Chiakala. Programming with FORTRAN 77, chaum's Outline Series, New Delhi (1995).

2. E. Balagurusamy. Computer Oriented Statistical and Numerical Methods, Macmillan India Ltd. (1988).

3. A. C. Norris. Computational Chemistry: An Introduction to Numerical Methods, John Wiley, New York (1981).

M.Sc. CHEMISTRY FIRST SEMESTER

COURSE CODE:MSCA04 **COURSE TYPE: ECC/CB**

COURSE TITLE : MEDICINAL CHEMISTRY

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE: to learn about additives in drug analysis And Synthesis.

UNIT-1 16 Hours

PRINCIPLES & CONCEPT OF GREEN CHEMISTRY:

Introduction –Concept and Twelve Principlesof green chemistry, - development of Green Chemistry- Atom economy reactions –rearrangement reactions , addition reactions- atom uneconomic-sublimation-elimination-Wittig reactions-toxicity measures- Need of Green Chemistry in our day to day life.: Environmental friendly green techniques-solvent supported catalysts and reagents, heterogenous reactions .calculations related to solvent extractions, stochiometry organic reactions and steam distillation.

UNIT-2 16 Hours

PHARMACEUTICAL CHEMISTRY:

Introduction, Classification, mode of action adverse Side effect and their synthesis of following drugs-

antibacteirials Drugs- sulpha acetamide , dapsone ,

antimycobacterial drugs- ofloxacin, ciprofloxacine Hydrochloride

antineoplastic- Azothiopurine, Lomustine, dactinomycin,

antipyretic and Analgesics- Quinoline derivatives, aspirin, paracetamol.

Dignostic and therapeutic isotopes application in pharmacy and medicine

- ^{125}I, ^{32}P, ^{51}Cr, ^{60}Co, ^{59}Fe, ^{99m}Tc

UNIT-3 18 Hours

ANTIBIOTIC DRUGS :

Introduction, classification, mechanisum of action,and synthesis of antibiotics-.penicillins,ampicillin, cephalexin, cefixime, tetracyclines

,chloramphenicol, Anticancer Antibiotic -Daunorubcin,

UNIT -4 — 22 Hours

DRUG SYNTHESIS :Synthesis of the following drugs -

a. Anxiolytics – Benzodiazepines
,b. Neuroleptics – Phenothiazines,
c. Hypnotics and Sedatives – Barbitone, Phenobarbital, Glutethimide ,
d. Local anesthetics – Aminobenzoic acid and its derivatives,
e. Diuretics -Triamterene,Quinethazone
f. Anthelmintic agents-piperazine, Albendazole
g. Antihistaminic agents – Ethylenediamine derivatives,
h. Antimalarials – Aminoquinolines ,pamaquine., primaquine
j. Anti – inflammatory –Ibufenac

UNIT-5 — 18 Hours

DRUG DESIGN:

Development of new drugs, Procedures followed in drug design. Structure Activity Relationship (SAR) of morphines and Penicillins. Physico – chemical parameters: Lipophilicity, partition coefficient, electronic ionization constants, Quantitative Structure Activity Relationship. Free – Wilson analysis, Hansch analysis, relationships between – Wilson and Hansch analysis – case study.

SUGGESTED READING BOOKS

1. Wilson and Gisvold's, Text Book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F.DOrge
2. RashmiSanghi and MM, Green Chemistry – Environment Friendly Alternatives, Srivastavasa, Narosa Publishers, New Delhi
3. Hougen, O.A., K.M. Watsen, and R.A. Ragartz, Chemical Process Principles, Part – I, John Wiley and Asia Publishing Co., 1975
4. Graham L. Patrick, An introduction to Medicinal Chemistry, Oxford, Edition II
5. Ilango, K and P. Valentina, Text Book of Medicinal Chemistry, Volume-I, Kreethi Publishers 7. AshutoshKar, Medicinal Chemistry, Edition III, New Age International Publishers.
6. Ishar, M.P.S and Abdul Faruk, Syntheses of Organic Medicinal Compounds, Narosa Publishing House
7.. A Gringuage, Introduction to Medicinal Chemistry, Wiley –

8. Wolff, M.E., Burger's Medicinal Chemistry and Drug Discovery, Vol-I (Chap 9 & 14), Ed., John Wiley
9.. Goodmann and Gilman's Pharmacological Basis of Therapeutics, McGraw Hill.
10. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ed Robert F. Dorge.
11. Ashutosh Kar ,Medicinal chemistry,6th edn, New Age International.

Second Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per WeeK			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 201	CCC	INORGANICCHEMISTRY-2	6	4	3	0	3	0	80	20
MSC 202	CCC	ORGANICCHEMISTRY-2	6	4	3	0	3	0	80	20
MSc 203	CCC	PHYSICALCHEMISTRY	6	4	3	0	3	0	80	20
MSC 211	CCC	ORGANIC AND PHYSICALCHEMISTRYLAB	6	0	0	9	0		100	
MSC S02	PRJ/SSC	SOCIAL OUTREACH AND SKIL DEVELOPMENT	6	4	3	0	3	0	80	20
MSC B01	ECC/CB	ENVIRONMENTAL AND FOREST LAWS	6	4	3	0	3	0	80	20
MSC B02	ECC/CB	POLYMER CHEMISTRY								
MSC B03	ECC/CB	ORGANIC SYNTHESIS-1								
MSC B04	ECC/CB	APPLIED CHEMISTRY								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credit= 36							

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSC201 **COURSE TYPE: CCC**

COURSE TITLE :INORGANIC CHEMISTRY-2

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE:

To study about the theories of coordination complexes, Chemistry of lanthanides, to learn about Nanotechnology and use of Inorganic Compounds in Biological Chemistry.

UNIT-1 24 Hours

ELECTRONIC SPECTRA AND MAGNETIC PROPERTIES OF TRANSITION METAL COMPLEXES

Spectroscopic ground states,determinating the ground state term,-Hund rules, correlation,Orgel diagram d1 and d9,d2 and d8 and d5 ions and Tanabe-Sugano diagrams for transition metal complexes(d1 to d9 states), calculation of Dq B and P parameters, charge transfer spectra, spectroscopic method of assignment of absolute configuration in Optically active metal chelates and their stereochemical information, and spin crossover.coupling of orbital angular momenta, coupling of spin angular momenta,,spin orbital coupling

UNIT-2 15 Hours

METAL CLUSTURES

Higher Boranes, Carboranes, Metalloboranes and Metallo carboranes,Metal Carbonyl and halide clusters, compounds with metal metal multiple bonds.

ACID AND BASE: Bronsted and Lewis acid and base concept ,HSAB concept and its application, Buffer solutions.

UNIT-3 18 Hours

THE CHEMISTRY OF LANTHANIDES,ACTINIDES AND NANOTECHNOLOGY

lanthanides and actinides: electronic structure oxidation state, colour and spectral, magnetic characteristics, coordination numbers, stereochemistry, lanthanide contraction, separation of the lanthanide

and actinide by solvent extraction and ion exchange. use of lanthanide compounds as ships reagents.

Nanotechnology - introduction - preparatory methods, characterization, application as sensors, biomedical applications, application in optics and electronics.

UNIT-4 15 Hours

BIOINORGANIC CHEMISTRY IN BIOLOGICAL SYSTEM

Transport proteins: Oxygen carriers, metalloenzymes, carboxy peptidase, carbonic anhydrase, redox process, iron-sulphur proteins, chlorophyll, salient features of the photo synthetic process, vitamin B_{12}, role of sodium, potassium, calcium, zinc and copper; fixation of nitrogen, nitrogen cycle.

Metal deficient diseases of Fe,Zn, Cu and Mn and their therapy.

UNIT-5 18 Hours

COORDINATION CHEMMISTRY

Werners theory, effective atomic numbers(EAN), VBT,CFT,MOT ,effect of crystal field spilitting, tetragonal distortion of octahedral complex(Janh-Jahn. Teller distortion ,),Stability of complexes, thermodynamic aspects of complex formation, factors affecting stability.

Stereochemical aspects – Stereoisomerism in inorganic complexes, isomerism arising out of ligand and ligand confirmation, chirality and nomenclature of chiral complexes, optical rotator dispersion and circular dichroism.

RECOMENDE READINGS BOOKS

1. A.R. West, Basic solid state chemistry, John Wiley, (1991).
2. S. Glasstone, Source Book on Atomic Energy, Van Nostrand Co., (1969).
3. G. Frielander, J.w. Kennedy and J.M. Miller, Nuclear and Radiochemistry, John Wiley and Sons, (1981).
4. Hari JeevanArnikar , Essentials of nuclear chemistry, New Age International (P) Ltd., (2005).

5. Hari JeevanArnikar,Nuclear Chemistry Through Problems, New Age International (P) Ltd., (2007).
6. G.T. Seaborg, Transuranium elements, Dowden Hitchinson and Ross, (1978).
7. NishitMathur, Nanochemistry, RBSA publishers (2010).
8. Patric Salomon, A hand book on Nano Chemistry, Dominant publishers and distributors (2008).
9. G.B. Sergeev ,Nanochemistry ,Elsevier Science and Technology (2007).
10. U. Saityanarayana, Essentials of Biochemistry, Books and Allied (P) Ltd.,

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSC202 COURSE TYPE: CCC

COURSE TITLE : ORGANIC CHEMISTRY-2

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE:

To learn the various types of reactions, rearrangements and their synthetic utility.

UNIT-1 19 Hours

ADDITION TO CARBON - CARBON AND CARBON – HETERO MULTIPLE BONDS

Electrophilic, nucleophilic and neighbouring group participation mechanisms - addition of halogen and chlorine, hydrogen halides to olefins. Hydration of olefins and acetylenes, addition of catalytic hydrogenation, .Hydroboration, hydroxylation of alkenes ,addition of per acids, the sharpless asymmetric epoxidation, Robinson Annelation reaction,Michael addition, 1, 3 - dipolar additions, Carbenes and their additions to double bonds -Simon - Smith reaction. Mannich, Stobbe, Darzen, Wittig, Wittig - Horner and Benzoin reactions.

UNIT-2 19Hours

OXIDATIONS:

oxidation of alcohals, ketones and acids, Jones reagent, Swern oxidation, Collins reagent,PCC,PDC,DDQ, $KMnO_4$, OsO_4 ,Ozonolysis, mCPBA, Enzymatic oxidation(Bio- oxidation),RuO_4.

REDUCTIONS: Catalytic homogeneous hydrogenation and mechanism ,reduction of nitrile,oximes and nitro compounds,reduction of acid and esters ,reduction with $LiAlH_4$, $NaBH_4$,$NaBH_3CN$,Birch reduction, Wilkinson catalyst, diborane, enzymatic reduction(bio reduction), photoreduction , hydrazine,

UNIT-3 16Hours

MOLECULAR REARRANGEMENTS:

A detailed study with suitable examples of the mechanism of the following rearrangements: Pinacol - Pinacolone , - Wagner - Meerwein rearrangment,, Tiffeneau-Demjanov, Dienone - phenol rearrangment, Favorski, Baeyer - Villiger oxidation, Wolf rearrangment, Stevens rearrangement, Benzil- benzilic rearranment, Beckmann rearrangement, Lossen rearrangment.

UNIT-4 20 Hours

AROMATICITY AND NON - BENZOIDS COMPOUNDS:

Concept of aromaticity ,Aromaticity in benzenoids, antiaromatics, Homo - aromatocity, Huckel's rule and its limitation , Huckel molecular orbital (HMO) theory for aromaticity,. PMO approach and non-benezoid compounds: Azulene ,Annulene, Tropone, and Troponolone, energy level of molecular orbitals,

UNIT-5 16 Hours

SELECTED ORGANIC REAGENT: Lithium dimethyl cuprate(LDC), 1,3 Dithiane umpolung, trimethyl silyl iodide ,Baker yeast, phase transfer catalyst , Gilman`s reagent, NBS, Lead tetra acetate(LTA).

ORGANOMETALLIC COMPOUND AND CATALYSIS: Wilkinson catalyst, organo pladium compound :Heck reaction, Suzuki reaction, The waker reaction,octacarbonyl cobalt complex -oxo reaction, Ziegler-Natta catalyst.

Organo metallic compound: Grignard reagent, organo lithium compounds, organo zinc compound, organo copper compound, organo cadmium compound.

SUGGESTED READING BOOKS

1. E.S. Gould,Structure and Mechanism,
2. Francis A. Carey and Richard J, Sundberg, Advanced Organic Chemistry - Part B,3rdEdition (1990).
3. H.O. House, Modern Synthetic Reactions,The Benjamin Cummings Publishing Company, London (1972).
4. I.L.Finar, Organic chemistry, Vol.I and II, 5th Edition, ELBS Publication.

5. J. March,Advanced organic reaction mechanism and structure, Tata McGraw Hill.
6. Mc Murry,Advanced organic chemistry, Thomas Pvt. Ltd.,
7. Michael B. Smith, Organic Synthesis, McGraw Hill, International Edition(1994).
8. Michael Smith,Organic synthesis.
9. Michael Smith,Organic synthesis.
10. Parmer and Chawla, Organic reaction mechanisms, S. Chand and Co.,
11. Paul de Mayo,Molecular Rearrangements, Vol. I and II.
12. R.E. Ireland, Organic synthesis,Prentice Hall of India
13. R.O.C. Norman, Principles of organic synthesis, Chapman and Hall, London. 1980.
14. Raymond K. Mackie and David M. Smith,Guide book to Organic synthesis, ELBS Publication.
15. S.M. Mukherji and S.P. Singh,Organic Reaction Mechanism, MacMillan India Ltd., Chennai (1990).
16. Stuart Warren, Work book for organic synthesis, The Disconnection Approach,John Wiley & Sons (Asia) Pvt. Ltd.,
17. W. Carruther, Jain Coldham, Modern Methods of organic synthesis, IV Edition.
18. W.Carruthers,Some Modern Methods of Organic Synthesis,IIIEdition,Cambridge University Press, (1993).

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSC203 **COURSE TYPE: CCC**

COURSE TITLE : PHYSICAL CHEMISTRY

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE:

To learn the various types of spectroscopy ,thermodynamics ,surface chemistry and radio chemistry.

UNIT- 1 — 16Hours

Microwave spectroscopy: rigid rotor,non rigid rotor, effect of isotopic substitution on the transition frequencies , rotation spectra of di – and poly- atomic molecules,Stark effect, application of microwave spectroscopy.

Infra red spectroscopy : Harmonic and an harmonic oscillator, vibrational spectra of di – and poly- atomic molecules, Born Oppenheimer approximation , normal mode of molecular vibration, coarse and fine structure, Nuclear spin effect, application

UNIT -2 — 18 Hours

RAMAN SPECTROSCOPY: Introduction, quantum mechanical and classical theories of Raman effect, Rotational Raman spectra, Vibrational Raman Spectra, polarization of light and Raman effect, structure elucidation from combined Raman and IR spectroscopy, applications in structure elucidation.

ELECTRONIC SPECTROSCOPY OF MOLECULES: Born Oppenheimer approximation,
electronic spectra of diatomic molecules, vibrational coarse structure, rotationafine structure dissociation energy and dissociation products, electronic structure of Diatomic molecules, molecular photoelectron spectroscopy, application.

UNIT -3 — 16 Hours

Thermodynamics: Nernst heat theor em,third law of thermodynamics,

concept of entropy, partial molar properties, partial molar quantities, Gibbs -Duhem equation, concept of activity, fugacity, determination of fugacity,,phase rule ,most probable distribution and Maxwell-Boltzmann distribution law of energy, molar partial function ,

Chemical kinetics and Surface chemistry : introduction ,rate constant, order of reaction ,difference between order of reaction and molecularity ,methods of determining rate laws ,,ionic reaction and kinetics salt effects ,Adsorption,factor affecting adsorption , adsorption isotherm ,BET adsorption isotherm.

UNIT-4 18Hours

RADIO CHEMISTRY : type of radioactive decay, Decay Kinetics, theory of alpha- beta decay, magic numbers, Detection& measurement of radioactivity - G.M. & Scintillation counter, Radiolsis of water, free radiation in water Radiolsis, nuclear reaction cross section, The fission energy, the Breeder reactor, .Isotopes for nuclear reactors. Isotope separation, separation of selected isotopes, Plutonium. Typical reaction involved in preparation of radioisotopes: ^{3}H, ^{14}C, ^{22}Na, ^{32}P, ^{35}S, and ^{137}I General principles of using radioisotopes

UNIT -5 22 Hours

APPLICATIONS OF RADIOACTIVITY :-

Physico-chemical , Diffusion coefficients, surface area, solubility, Analytical applications- neutron activation analysis, isotope dilution analysis, radiometric titration.- Industrial applications ,tropical application of radioisotopes as tracers ,agricultural applications, age determination.

RECOMENDE READINGS:

1. Fundamentals of molecular spectroscopy : C.N. Banewell and E.Mc. Cash (Fourth edition).
2. Elements of Nuclear chemistry – H.J. Arnikar, fourth edition wileyEstern Ltd.
3. Source book of atomic energy – S. Glasstanc, D. Van Norton company.

4. Chemical applications of radioisotopes – H.J. M. Brown Buffer & JammerLtd.
5. H.J.Arnikar,Nuclear chemistry though problems ,New Age, International, 2 nd edn.
6. Puri and Sharma, advanced physical chemistry.

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSC211 COURSE TYPE: CCC

COURSE TITLE : PHYSICAL AND ORGANIC CHEMISTRY LAB	
CREDIT: THEORY: PRACTICAL : 6	HOURS: THEORY: PRACTICAL : 135
MARKS: 100 THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

PHYSICAL CHEMISTRY

SURFACE TENSION

1. To find out the composition of mixture of two liquids Aand B.
2. To find out the surface tension of liquids at room temperature and hence calculate the atomic parachor of C, H, O.
3. To determine the parachor of a mixture of two liquids.

SOLUTION

1. Determination of molecular weight of non volatile substance cryoscopically using water as solvent.
2. Determination of solubility product of sparingly soluble electrolyte.
3. determination of molecular weight of a given solute by boiling point elevation method.

PARTITION COEFFICIENT

1. Determination of distribution coefficient of Iodine between water and CCl4, Succinic acid between ether and water, or Benzoic acid between benzene and water.
2. Determination of equilibrium constant of the reaction between KI and I2.

REFRACTOMETRY

1. Determination of refractive index of a liquid by Abbe refractometer and hence specific and molar refraction.

2. Deter mination of molar refractivity of CH3COOH, CH3OH, CH3COOC2H5 and CCl4 and calculate the refraction equivalent of C, H and Cl.

CHEMICAL KINETICS

1. Determination of Rate constant of hydrolysis of methyl acetate catalysed by acid and also energy of activation.
2. Determination of Rate constant of hydrolysis of ethyl acetate by NaOH.
3. Study of kinetics of decomposition of H2O2 and HI.
4. To study the inversion of cane sugar in presence of HCl and H2SO4 and hence determine the relative strength of acids.
5. To determine the relative strength of acids by studying the hydrolysis of an ester.

CONDUCTIVITYMETRY

1. Determination of dissociation constant of electrolytes.
2. Determination of equivalent conductance of electrolytes.
3. Determination of solubility and solubility product of sparingly soluble salts.
4. Determination of strength of strong and week acids in given mixture.
5. Determination of degree of hydrolysis and hydrolysis constant of CH3COONa and NH4Cl2
6. Determination of relative strength of two acids.

PH METRY/POTENTIOMETRY

1. Titrate ferrous ammonium sulphate against K2Cr2O7 potentiometrically and determine the

redox potential of errous ferric system.
2. Titrate mixture of HCl and CH3COOH potentiometrically/pHmetrically.
3. Potentiometric precipitation titration using silver electrode.
4. Determination of strength of acids by pH meter.
5. Determination of dissociation constant of acids by Albert Serjean method.

COLORIMETRY/SPECTROMETRY

1. To verify Lambert Pear's law using a colorimeter
2. Determination of composition of binary mixture containing K2Cr2O7 and KMnO4 using spectrophotometer
3. Determination of the wavelength of maximum absorbtion of a compound using spectrophotometer.
4. Titration of a solution of Ferrous ammonium sulphate and KMnO4 spectrometerically/ colorimeter.
5. To determine the concentration of Ni in solution by spectrophotometric titration.

ORGANIC CHEMISTRY

QUALITATIVE ANALYSIS: Separation, Purification and Identification of Binary mixture (solid-solid, solid-liquid).

ORGANIC SYNTHESIS: Two and three step synthesis of organic compounds including Acylation, Oxidation, Grignard's reaction, Aldol reaction, Sandmayer reaction, Friedle Craft's reaction, Aromatic electrophlic substitution.

QUANTITATIVE ANALYSIS:

1. Determination of the percentages number of hydroxyl group.
2. Estimation of amine/phenols.
3. Estimation of Carbonyl group.
4. Estimation of Glycine.
5. Determination of equivalent weight of corboxlic compound.
6. Estimation of carboxlic group.

Recommended Reading:

Arthur I.Vogel, A text book of Practical Organic Chemistry, ELBS Raj K. Bansal, Laboratory Manual of Organic Chemistry, Wiley Eastern limited.

N.N. Greenwood and A. Earnshaw, Chemistry of the Elements, Vol.II, Pergamon Press (1997).

SCHEME OF PRACTICAL EXAMINATION FOR M.Sc.II SEMESTER CHEMISTRY

M.SC. II SEM CHEMISTRY
PHYSICAL & ORGANIC CHEMISTRY LAB
MAX.MARKS 100
TIME 12 HRS(SPREAD OVER TWO DAYS)

1. Qualitative analysis of binary organic mixture.	30 Marks
or	
a.Organic Synthesis 2 or 3 step preparation	15 Marks
b.Estimation Quantitative analysis	15 Marks
2.One exercise from physical Chemistry	30 Marks
3.Viva-voce.	20 Marks
4.Sessional .	20 Marks

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSCB01 **COURSE TYPE: ECC/CB**

COURSE TITLE : ENVIRONMENTAL AND FOREST LAWS	
CREDIT: 6 THEORY: 6	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 +20	

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundamentals and Office Software Package.

UNIT - 1 **18 Hrs**

EVOLUTION OF FOREST AND WILD LIFE LAWS

a) Importance of Forest and Wildlife
b) Evolution of Forest and Wild Life Laws
c) Forest Policy during British Regime
d) Forest Policies after Independence.
e) Methods of Forest and Wildlife Conservation.

UNIT - 2 **18 Hrs**

FOREST PROTECTION AND LAW

a) Indian Forest Act, 1927
b) Forest Conservation Act, 1980 & Rules therein
c) Rights of Forest Dwellers and Tribal
c) The Forest Rights Act, 2006
d) National Forest Policy 1988

UNIT - 3 **18 H rs**

WILDLIFE PROTECTION AND LAW

a) Wild Life Protection Act, 1972
b) Wild Life Conservation strategy and Projects
c) The National Zoo Policy

UNIT - 4 **18 Hrs**

CHAPTER – BASIC CONCEPTS

a. Meaning and definition of environment.
b. Multidisciplinary nature of environment
c. Concept of ecology and ecosystem
d. Importance of environment
e. Meaning and types of environmental pollution.
f Factors responsible for environmental degradation.

CHAPTER– INTRODUCTION TO LEGAL SYSTEM

a. Acts, Rules, Policies, Notification, circulars etc
b. Constitutional provisions on Environment Protection
c. Judicial review, precedents
d. Writ petitions, PIL and Judicial Activism

CHAPTER – LEGISLATIVE FRAMEWORK FOR POLLUTION CONTROL LAWS

a) Air Pollution and Law.
b) Water Pollution and Law.
c) Noise Pollution and Law.

UNIT - 5 **18 Hrs**

CHAPTER- LEGISLATIVE FRAMEWORK FOR ENVIRONMENT PROTECTION

a) Environment Protection Act & rules there under
b) Hazardous Waste and Law
c) Principles of Strict and absolute Liability.
d) Public Liability Insurance Act
e) Environment Impact Assessment Regulations in India

CHAPTER – ENVIRONMENTAL CONSTITUTIONALISM

a. Fundamental Rights and Environment
   i) Right to Equality .....Article 14
   ii) Right to Information .....Article 19
   iii) Right to Life .....Article 21
   iv) Freedom of Trade vis-à-vis Environment Protection
b. The Forty-Second Amendment Act
c. Directive Principles of State Policy & Fundamental Duties
d. Judicial Activism and PIL

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE: MSC02 COURSE TYPE: CCC PRJ/SSC

COURSE TITLE : SOCIAL OUT REACH & SKILL DEVELOPMENT FIELD WORK	
CREDIT:6 THEORY: 0	HOURS: 135 PRACTICAL : 100

Objective : The aim of the project work or field work ua to introduce students with the research methodology in the subject and to prepare them for pursuing research in theoritical experimental or computational areas of the subject.

Preparation - 40
Report submission - 40
Presentation - 20

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSCB02 COURSE TYPE: ECC/CB

COURSE TITLE : POLYMER CHEMISTRY	
CREDIT: 6 THEORY: 6	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 + 20	

OBJECTIVE:

To gain the knowledge in the preparation, properties, characterization and Uses of polymers.

UNIT-1 16 Hours

Basic Concepts

Classification – Nomenclature and isomerism – functionality – Molecular forces and chemical bonding in polymers – Molecular weight – Linear, branched and cross linked polymers.

Thermoplastic and thermosetting polymers – Elastomers, Fibers and resins.

Techniques of polymerization–emulsion, bulk, solution and suspension.

UNIT-2 16 Hours

Kinetics and Mechanism

Kinetics and Mechanism of polymerization – free radical, cationic, anionic and co-ordination polymerization (Ziegler - Natta Catalyst).Copolymerisation – Kinetics (Detailed Study).

General characterization–Kinetic chain length–degree of polymerization, chain transfer - initiators – inhibitors – retarders.

UNIT-3 22Hours

Structure and Properties

Structure - property relationship – Mechanical properties, Thermal properties – Glass transitiontemperature – Factors affecting Glass transition temperature – crystallinity and melting point –related to

structure.

Nitrogenase enzyme : Introduction, Types of nitrogen fixing microorganism,metal clusters in nitrogenase. Nitrogen fixation pathway.Transition metal complexes : Dinitrogen complexes. Biological redox reactions. Photosynthesis and chlorophyll.

Polymer characterization and analysis:

Crystalline nature – X-Ray diffraction – Differential Scanning Calorimetry (DSC)–Thermo

Gravimetric Analysis – molecular weight determination – Osmometry (membrane), Viscosity,

Ultra centrifuge and Gel Permeation Chromatography.

UNIT-4 18 Hours

INDUSTRIAL NATURAL POLYMERS

Important industrial polymers – preparation and application of polyethylene, poly vinyl

chloride, poly urethanes, polytetrafluro ethylene (TEFLON), Nafion and ion –exchange resins.

Importance of natural polymers – application and structures of starch, cellulose and chitosin

derivatives.

UNIT-5 18 Hours

SPECIALITY POLYMERS

Bio polymers – biodegradable polymers – biomedical polymers – poly electrolytes - conducting

polymers–high temperature and fire retardant polymers - polymer blend–polymer

composites – polymer nanocomposites – IPN inter penetrating network polymers–

Electroluminescent polymers.

RECOMENDE READINGS BOOKS

1.F. W. Bill Meyer. Text book of polymer science, III Edition, John Wiley and sons, New York.

2. P. J. Flory. Principles of Polymer Chemistry, Cornell Press (recent edition).

3. V. R. Gowarikar, B. Viswanathan, J. Sridhar, Polymer Science – Wiley Eastern, 1986.

4. G. S. Misra–Introduction to Polymer Chemistry, Wiley Eastern Ltd.,

5. P. Bahadur, N. V. Sastry, Principles of Polymer Science, Narosa Publishing House.

6. G. Odian, Principles of Polymerization, McGraw Hill Book Company, New York, 1973.

7. A. Rudin, The Elements of Polymer Science and Engineering. Academic Press, New York, 1973.

8. I. C. E. H. Brawn, The Chemistry of High Polymers, Butter worth & Co., London, 1948.

9. G. S. Krishenbaum, Polymer Science Study Guide, Gordon Breach Science publishing, New York, 1973.

10. E. A. Coolins, J. Bares and E. W. Billmeyer, Experiments in Polymer Science, Wiley Interscience, New York, 1973.

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSCB03 **COURSE TYPE: ECC/CB**

COURSE TITLE : ORGANIC SYNTHESIS - I

CREDIT: 6 THEORY: 6	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 CCA: 20	

OBJECTIVE:

To study about reagents in organic synthesis, reaction and mechanism.

UNIT-1 — 18 Hours

MODERN SYNTHETIC METHODS, REACTIONS AND REAGENTS

Synthesis of simple organic molecules using standard reaction like acetylation alkylation of enamines and active methylene compounds, Grignard reaction, Phosphorus and sulphurylides Robinson annulations, Diels Alder reactions, protection and deprotection of functional groups (R-OH, R-CHO, RCO, R-NH2 and R-COOH).

UNIT-2 — 18 Hours

Nucleophilic C-C bond formation: Henry reaction, Wittig reaction and Horner-WordwothEmmons reaction and their selectivities; Chemistry of enolates – E, Z geometry of enolates, kinetic vs thermodynamic control of enolates, stereoselectiveenolate reactions, alkylation, aldol condensation (Zimmerman and Evans models), Mukaiyama reaction.

UNIT-3 — 18 Hours

Electrophilic C-C bond formation: Prins reaction, Vilsmeier-Hack reaction, Pictet-Sprengler reaction, Heck reaction, Stille coupling, Suzuki coupling, Neigishii reaction, reactions of allylsilane, Acylation of carbonyl carbon; Carbonyl cyclizations and cleavages.

UNIT-4 — 18 Hours

Miscellaneous reactions: Biginelli reaction, Hantzsch reaction, Passerini reaction, Ugi reaction, McMurry olefination, Ring closing metathesis (RCM) - Grubb's reaction, Mitsonobu reaction, Nef reaction, Sharpless asymmetric epoxidation and asymmetric dihydroxylation. Carboxylic acids and derivatives, decarboxylation reactions, 1,3-dithiane reactivity: Umpolung effect, Peterson's synthesis.

UNIT-5 — 18 Hours

Reagents in organic synthesis: K-selecteride and L-selecteride, sodium cyanoborohydride, super hydrides, 9-BBN, IBX, Dess-Martin periodinane, manganese dioxide, Fetizon reagent, dioxiranes, ceric ammonium nitrate, Gilman's reagent, lithium disopropylamide, dicyclohexylcarbodimide, trimethysilyl iodide, tri-n-butyltin hydride, Tebbe reagent, CoreyNicolaou reagent, baker's yeast, lipase, Mosher's reagent, use of Os, Ru, and Tl reagents and DDQ.

SUGGESTED READING BOOKS

1. F. A. Carey & R. J. Sundberg. Advanced Organic Chemistry Part B, Plenum Press (2007).

2. M. B Smith. Organic Synthesis (2 nd end.), McGraw-Hill, Inc. (2001).

3. J. March. Advanced Organic Chemistry: Reactions, Mechanism and Structure (4th edn.), John Wiley & Sons (2005).

M.Sc. CHEMISTRY SECOND SEMESTER

COURSE CODE:MSCB04 **COURSE TYPE: ECC/CB**

COURSE TITLE : APPLIED CHEMISTRY	
CREDIT: 6 THEORY: 6	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 + 20	

OBJECTIVE:

To gain the knowledge in the preparation, properties, characterization and Uses of polymers.

UNIT-1 18 Hours

CHEMISTRY OF WATER ANALYSIS: Water quality parameters - Total dissolved solids - hardness - dissolved oxygen - Physical, Chemical, Biological contaminants in water - Municipal water treatment - sterilization - Chlorination - Ozonisation - Conversion of seal water into drinking water - Reverse Osmosis - Deionization.

UNIT-2 18 Hours

a) Analysis of fertilizers. Classification of fertilizer, NPK value, Chemical composition of super phosphate, Lime and Potash fertilizer, Analysis of commercially available fertilizers for N, P & K.

b)Analysis of pesticides. : Legislation and recent amendments with respect to pesticides materials. Names of pesticides and their chemical structures. , Application dosage of different pesticides. , Analysis of specific pesticides.

UNIT-3 18 Hours

CHEMISTRY OF POLYMER: Classification of polymers - Addition and condensation polymers - Polymerisation reaction - co-polymers - homopolymers - Thermoplastics and thermosetts - Rubbers - Inorganic polymers - Biopolymers - Domestic and industrial application of polymers.Kinetics of polymerization ,Molecular mass, Number and mass average molecular mass,Molecular mass determination by osmometry, Viscometry,

Soap and Detergents:

Introduction to soaps, Analysis of soaps, for saponification, Unsaponifiable and unsaponified matter in soaps, Estimation of free alkali and phenol in soap, Classification of detergents (in Brief),

Analysis of active ingredients from detergents , Estimation of CMC, Chlorides,Total phosphates

UNIT-4 18 Hours

Petroleum:

Occurrence, mining of petroleum. Prospecting colour and consistency. Origin composition, classification ,terms related to petroleum. .Distillation of crude petroleum. Treatment of there sidual liquid, Determination of flash point. Determination of aniline point .Knocking and Antiknocking compounds. Octane number. Cetane number, Numericals

.Gases fuels: Analysis of natural gases, liquefied petroleum gas, coalgas, water gas, producer gas, gober gas, blast furnace gas and their calorific value determination

.Petrochemical analysis: Analysis of naphtha and their feed stocks, characterization of the catalyst used for cracking

UNIT-5 18 Hours

CHEMISTRY OF ENVIRONMENTAL POLLUTANTS: Gaseous pollutants - Effect of gaseous pollutants on human health - Method of Control - Water pollutants - types - Removal methods - Soil pollutants - types - Control methods - nuclear wastes - Adverse effects - Control methods

CHEMISTRY OF MATERIALS: Cement - Manufacture of cement - Setting of cement - Paint - Varnishes - Enamel and Lacquers - Refractories - Properties - Manufacturing methods - adhesives - types - Adhesive action - Preparation of adhesives.

.SUGGESTED READING BOOKS

1. Engineering chemistry, Jain and Jain, Dhanpat Rai Publishing company.

2. Fundamental concepts of applied chemistry by Jayashree Ghosh, S. Chand & Company Ltd.

3. Introductory polymer chemistry, G.S. Mistra - New age international Pvt. Ltd.

4. Environmental science - Koushik and AmbauKoushik. New age international Publishers.

Third Semester (CBCS)

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per Week			ExSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 301	CCC	APPLICATIONS OF SPECTROSCOPY-INORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC 302	CCC	APPLICATIONS OF SPECTROSCOPY-ORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC 303	CCC	PHOTOCHEMISTRY AND PERICYCLIC REACTION	6	4	3	0	3	0	80	20
MSC 311	CCC	ORGANIC CHEMISTRY LAB	6	0	0	9	0		100	
MSC S03	OSC	INTELLECTUAL PROPERTY, HUMAN RIGHTS & ENVIRONMENT: BASICS	6	4	3	0	3	0	80	20
MSC C01	ECC/CB	TRIBAL STUDIES	6	4	3	0	3	0	80	20
MSc C02	ECC/CB	GREEN CHEMISTRY								
MSC C03	ECC/CB	ORGANIC SYNTHESIS II								
MSC C04	ECC/CB	HETEROCYCLIC CHEMISTRY								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credit=36							

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE:MSC301 **COURSE TYPE: CCC**

COURSE TITLE : APPLICATIONS OF SPECTROSCOPY- INORGANIC CHEMISTRY

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE: To learn about application of Spectroscopy in various field of In organic Chemistry.

UNIT-1 16 Hours

Applications of Atomic Absorption Spectroscopy, Atomic Emission Spectroscopy, Plasma Emission Spectroscopy, Flame Emission Spectroscopy, photo electron spectroscopy and there application and raman spectroscopy in inorganic chemistry.

UNIT-2 18 Hours

Vibrational Spectroscopy Symmetry and shapes of AB2, AB3, AB4, AB5 and AB6, mode of bonding of ambidentate ligands, ethylenediamine and diketonato complexes, application of resonance Raman spectroscopy particularly for the study of active sites of metalloproteins.

UNIT-3 20 Hours

Electron Spin Resonance Spectroscopy :Hyperfine coupling, Zero field splitting and kramers degeneracy, spin orbit coupling and significance of g-tensors, application to transition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals such as PH_4, F_2 and $[BH_3]$.

UNIT-4 17 Hours

Nuclear Magnetic Resonance of Paramagnetic Substances in Solution The contact and pseudo contact shifts, factors affecting nuclear relaxation, some applications including biochemical systems, an overview of NMR of metal nuclides with emphasis on 195 Pt and 199Sn NMR,specific study of MRI ,

UNIT-5 19 Hours

Mossbauer Spectroscopy : Basic principles, spectral parameters and spectrum display. 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 – nature of ML bond, coordination number, structure and (3) detection of oxidation state and inequivalent MB atoms,Application in biological system,

RECOMENDE READINGS:

1. Structural Methods in Inorganic Chemistry, E.A.V. Ebsworth, D.W.H. Rankin and S. Cradock, ELBS.
2. Infrared and Raman Spectra: Inorganic and Coordination Compounds, K. Nakamoto, Wiley.
3. Progress in Inorganic Chemistry vol., 8 ed., F.A. Cotton, vol., 15, ed. S.J. Lippard, Wiley.
4. Inorganic Electronic Spectroscopy., A.P.B. Lever, Elsevier.
5. NMR, NQR, EPR and Mossbauer Spectroscopy in Inorganic Chemistry, R.V. Parish, Ellis Horwood.
6. Practical NMR Spectroscopy, M.L. Martin, J.J. Delpeuch and G.J. Martin, Heyden.

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE:MSC302 **COURSE TYPE: CCC**

COURSE TITLE : APPLICATIONS OF SPECTROSCOPY-ORGANIC CHEMISTRY

CREDIT: 6 THEORY: 6 PRACTICAL : 0	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 100 (80+20)	MARKS: THEORY: PRACTICAL :

OBJECTIVE: To learn about application of Spectroscopy in various field of Organic Chemistry.

UNIT -1 20 Hours

Ultraviolet and Visible Spectroscopy : Various electronic transitions (185-800 nm), Beer-Lambert law, effect of solvent on electronic transitions, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, ultraviolet spectra of aromatic and heterocyclic compounds. Steric effect in biphenyls.

UNIT -2 19 Hours

Mass Spectrometry : Introduction, ion production – EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral framentation of organic compounds, Retro-diels Alder Reaction , molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. ring rule ,Retro- Diels Alder reaction, High resolution mass spectrometery. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination.

UNIT -3 18Hours

Infrared Spectroscopy: Instrumentation and sample handling. Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters, amides, acids, anhydrides, lactones, lalctams and conjugated carbonyl compounds). Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. FT IR. IR of gaseous, solids and polymeric materials. Optical Rotatory Dispersion (ORD) and Circular Dichroism (CD) Definition, deduction of absolute configuration, octant rule for ketones.

UNIT-4 — 17 Hours

Nuclear Magnetic Resonance Spectroscopy : General introduction and definition, chemical shift, spin-spin interaction, shielding and deshielding mechanism, mechanism of measurement, chemical shift values and correlation for protons bonded to carbon (aliphatic, olefinic, aldehydic and aromatic) and other nuclei (alcohols, phenols, enols, carboxylic acids, amines, amides &mercapto), chemical exchange, effect of deuteration, complex spin-spin interaction between two, three, four and five nuclei (first order spectra), virtual coupling. Stereochemistry, hindered rotation, Karplus curve-variation of coupling constant with dihedral angle.

UNIT-5 — 16 Hours

Simplification of complex spectra-nuclear magnetic double resonance, contact shift reagents, solvent effects. Fourier transform technique, nuclear Overhauser effect (NOE). Resonance of other nuclei-F, P. **Carbon-13 NMR Spectroscopy:** General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants. Two dimension NMR spectroscopy – COSY, NOESY, DEPT, and techniques.

RECOMENDE READINGS:

1. Spectrometric Identification of Organic Compounds, R.M. Silverstein, G.C. Bassler and T.C. Morrill, John Wiley.
2. Introduction to NMR Spectyroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley. 21
3. Application of Spectroscopy of Organic Compounds, J.R. dyer, Prentice Hall.
4. Spectroscopic Methods in Organic Chemistry, D.H. Williams, I. Fleming, Tata McGraw-Hill.

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE:MSC303 — **COURSE TYPE: CCC**

COURSE TITLE : PHOTOCHEMISTRY AND PERICYCLIC REACTION

CREDIT: 6 **THEORY: 6 PRACTICAL : 0**	**HOURS: 90** **THEORY: 90 PRACTICAL : 0**
MARKS: **THEORY: 100 (80+20)**	**MARKS:** **THEORY: PRACTICAL :**

OBJECTIVE: To learn about principle and application of Photochemistry in various fields.

UNIT-1 — 19 Hours

BASICS OF PHOTOCHEMISTRY

Absorption, excitation, photochemical laws-Grotthurs-Drapper ,Ensteins equivalence law,Beer -Lambert`s law, quantum yield, the reason for high and low quantum yield, type of electronic excitation and molecular orbital view of excitation, . Flash photolysis, stopped flow techniques. Energy dissipation by radiative and non-radiative processes, absorption spectra, Franck-Condon principle, photochemical stages- primary and secondary processes , Jablohski Diagram , energy transfer of photo senstization , Actinometry.

UNIT-2 — 18 Hours

PHOTOPHYSICAL PROCESSES IN EXCITED STATE

Types of photophysical pathways, Fluorescence emission, Triplet state and phosphorescence emission, Chemiluminescence, Fluorescence quenching, Stern-Volmer equation, quenching and excimer formation, electron transfer quenching, Exciplex formation ,.rate of unimolecular photochemical reaction from Singlet and triplet excited state.

EXCITED STATES OF METAL COMPLEXES: Excited states of metal complexes: comparison with organic compounds, electronically excited states of metal complexes, charge-transfer spectra, charge transfer excitations,

UNIT-3 17 Hours

PHOTOCHEMISTRY OF CARBONYL COMPOUNDS AND ALKENES

Norrish Type I process And Norrish type II process ,β-Clevage Reaction, Intramolecular Hydrogen Abastraction (Υ-Hydrogen Abstraction).Hydrogen Abstraction from Other sites - β - Hydrogen Abstraction , δ-Hydrogen abstraction , Hydrogen Abstration from Distant sites ,Formation of Photoenolisation, formation of oxetane, Intermoecular Photo Reduction ,Photo cycloadition Reaction (Paterno -Buchi Reaction), Intramolecular Paterno -Buchi Reaction .

ALKENES: Cis -trans isomerisation by the use of photosenstizer,Cyclisation reaction-1,5 and 1,6 diene, Rearrangment of 1,4 and 1,5 diene., photoaddition of alkene to aromatic compounds-1,3 and 1,4 photoaddition.

UNIT-4 16 Hours

PHOTO REARRANGEMENT AND REACTIONS:

Photo rearrangement of cyclopentanone, dienones, β,Υ - unsaturated ketones and aromatic compounds, photo-Fries rearrangement, Di-Methane(DPM) rearrangement, Barton reaction ,The Hoffmann Loeffler Freytag reaction .Photo substitution reaction-nucleophilic,electrophilic and radical substitution, photo oxidation, photo oxygenation and photo reduction

Applications of Photochemistry:

Importance of photochemistry, origin of life, photosynthesis and mechanism of vision. phto chemical formation of smog,photo degradation of polymers.

UNIT-5 20 Hours

PERICYCLIC REACTIONS:

introduction, types, stereo chemistry of pericyclic Reaction,theory of pericyclic reaction , Woodward -Hoffmann rule, Frontier Molecular orbitals(FMO), Symmetry in molecular orbitls of ethylene and 1,3,butadiene, perturbation molecular orbitals (PMO) Method, Electrocyclic Reaction, cycloaddition Reaction, Sigmotropic Rearrangements, Cheletropic Reaction, Ene Reactions, 1-3 dipolar Cycloaddition, Cope and Claisen Rearrangements.

SUGGESTED READING BOOKS

1. C. E. Wayne & R. P. Wayne, *Photochemistry*, OUP (1996).
2. N. J. Turro. *Modern Molecular Photochemistry*, University Science Books (1991).
3. K.K.Rohatgi-Mukherjee,Fundamentals Of photochemistry, New Age International .
4. J.Singh and Jaya Singh, Photochemistry and Pericyclic Reactions, New Age International.
4 V.K.Ahluwalia and R.K. Parashar. Organic Reaction Mechanism, Narosa PublishingHouse.
5. P.S. Kalsi,OrganicReaction And their Mechanisms ,New Age International,

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE: MSC311	COURSE TYPE: CCC
COURSE TITLE : ORGANIC CHEMISTRY LAB	
CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 135
MARKS: THEORY: PRACTICAL :	MARKS: 100 THEORY: PRACTICAL :

OBJECTIVE:

To gain practical knowledge of Organic preparations, Purifications and Chromatography.

1. Purification Techniques of organic compounds and their spectroscopic identifications.
a) Purification of binary mixtures by Thin Layer Chromatography (TLC) and Column chromatography (CC).
b) Purification of tertiary mixtures of amino acids by Paper Chromatography.

2. Extraction of Natural Products: Any one of the following – solasodine, caffeine, nicotine, piperine, rosine, carotenoids.

3. Organic Preparations: At least eight preparations (involving two or more than two steps)involving the following representative reactions.
a. Esterification and saponification
b. Oxidation (peracid, chromic acid, Mn(VII)
c. Hydride reduction or hydrogenation
d. Nucleophilic substitution
e. Cycloaddition reaction
f. Grignard reaction
g. Condensation reaction
h. Preparation of dyes
i. Aromatic electrophilic substitution
j. Heterocyclic synthesis

4. Qualitative Analysis of Binary Mixtures (only two)

Recommended Reading:

Text Books

1. R. K. Bansal. *Laboratory Manual of Organic Chemistry* (3rd edn.), Wiley-Eastern (1994).

2. R. G. Brewster & W.E. Mcwedn. *Unitized Experimental Organic Chemistry* (4th edn.), East-West Press (1977).

3. A. I. Vogel. *Practical Organic Chemistry* (3rd edn.), Longman Group Ltd. (1973).

SCHEME OF PRACTICAL EXAMINATION FOR M.Sc.III SEMESTER CHEMISTRY

M.SC. III SEM CHEMISTRY
ORGANIC CHEMISTRY LAB
MAX.MARKS 100
TIME 12 HRS (SPREAD OVER TWO DAYS)

1. Isolation of natural product	30 Marks
2. Organic Synthesis two or three steps preparation	30 Marks
3. Viva-voce.	20 Marks
4. Sessional .	20 Marks

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE: MSCS03 **COURSE TYPE: OSC**

COURSE TITLE : INTELLECTUAL PROPERTY RIGHTS, HUMAN RIGHTS & ENVIRONMENT: BASICS

CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 135
MARKS: 80 + 20 THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data.

UNIT - 1 12 Hrs

- Patents :- Introduction & concepts, Historical Overview.
- Subject matter of patent.
- Kinds of Patents.
- Development of Law of Patents through international treaties and conventions including TRIPS Agreement.
- Procedure for grant of patents & term of Patent.
- Surrender, revocation and restoration of patent.
- Rights and obligations of Patentee
- Grant of compulsory licenses
- Infringement of Patent and legal remedies
- Offences and penalties
- Discussion on leading cases.

UNIT - 2 24 Hrs

- Meaning of Copyright, Historical Evolution,
- Subject matter of copyright.
- Literary works
- Dramatic Works & Musical Works
- Computer Programme
- Cinematographic films
- Registration of Copyrights

- Term of Copyright and Ownership of Copyrights
- Neighboring Rights
- Rights of Performers & Broadcasters
- Assignment of Copyright.
- Author's Special Rights (Moral Rights)
- Infringement of Copyrights and defenses
- Remedies against infringement (Jurisdiction of Courts and penalties)
- International Conventions including TRIPS Agreement WIPO, UCC, Paris Union, Berne Convention, UNESCO.
- Discussion on leading cases.

UNIT - 3 10 Hrs

- Rights: Meaning
- Human Rights- Meaning & Essentials
- Human Rights Kinds
- Rights related to Life, Liberty, Equals & Disable.

UNIT - 4 24 Hrs

- National Human Rights Commission
- State Human Rights Commission
- High Court
- Regional Court
- Procedure & Functions of High & Regional Court.

UNIT - 5 20 Hrs

- Right to Environment asHuman Right
- International HumanitarianLaw and Environment
- Environment and ConflictManagement
- Nature and Origin ofInternational EnvironmentalOrganisations (IEOs)
- Introduction to SustainableDevelopment and Environment
- Sustainable Development and Environmental Governance.

SUGGESTED READINGS

1. G.B.Reddy, *Intellectual Property Rights and Law,* Gogia Law Agency, Hyderabad.
2. S.R.Myneni, *Intellectual Property Law*, Eastern Law House, Calcutta

3. P Narayanan *Intellectual Property Rights and Law (1999)*, Eastern Law House, Calcutta, India
4. Vikas Vashistha, *Law and Practice of Intellectual Property*,(1999) Bharat Law House, New Delhi.
5. Comish W.R *Intellectual Property,3rd ed. (1996)*, Sweet and Maxwell
6. P.S. Sangal and Kishor Singh, *Indian Patent System and Paris Convention,*
7. Comish W.R *Intellectual Property, Patents, Copyrights and Allied Rights, (2005)*
8. BibeckDebroy, *Intellectual Property Rights, (1998)*, Rajiv Gandhi Foundation.

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE: MSCC01 **COURSE TYPE: ECC/CB**

COURSE TITLE : TRIBAL STUDIES

CREDIT: 06 THEORY: 06	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 + 20	

OBJECTIVE:

- Understands the concept and place of research in concerned subject
- Gets acquainted with various resources for research
- Becomes familiar with various tools of research
- Gets conversant with sampling techniques, methods of research and techniques of analysis of data
- Achieves skills in various research writings
- Gets acquainted with computer Fundamentals and Office Software Package.

UNIT-1 **12 Hours**

Tribal Studies : Meaning, Nature, Scope, Need & importance of tribal studies. Meaning, Definition & characteristics of Tribe, Caste & Race.

UNIT-2 **24 Hours**

Scheduled Tribe in India : Population Composition of tribal, classification of Indian Tribe – Racial, Lingual, Geographical, Cultural.

Some Major Tribes in India : Santhal, Khasi, Munda, Bhils.
Some Major Tribes in Central India : Gond, Baiga, Bharia, Korkus.

UNIT-3 **10 Hours**

Iliteracy : Poverty, Indebness, Unemployment, migration & Exploitation Environmental & Degradation.

Problem of Health and sanitation :
Prostitution, Culture Decay due to assimilation. Replacement & Rehabilitation of Tribal population.

UNIT -4 — 24 Hours

Welfare-Concept, Characteristics: Tribal Welfare in post independence period. Constitutional provision & safe guard after independence, Legislation & Reservation Policy.

UNIT -5 — 20 Hours

Tribal Development Programs for Scheduled Tribes : Medical, Education, Economy, Employment & Agriculture Evaluation of Programs **Tribal Welfare & Advisory Agencies in India :** Role of NGO's in tribal development, Role of Christian missionaries in tribal welfare & development. Tribal Welfare Administration.

SUGGESTED READINGS

1. *Tribal Development In India (Orissa)* by Dr. Taradutt
2. *Books on Tribal studies* by PK Bhowmik
3. *Books on 'Tribal Studies'* by W.G. Archer

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE: MSCC02 **COURSE TYPE: ECC/CB**

COURSE TITLE : GREEN CHEMISTRY

CREDIT: 06 THEORY: 06	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 + 20	

OBJECTIVE:

To know eco-friendly methods of synthesis. This helps in planning the synthesis of any type of organic compounds with the revolution of Green Chemistry.

UNIT-1 — 18 Hours

PRINCIPLES & CONCEPT OF GREEN CHEMISTRY

Introduction –Concept and Principles-development of Green Chemistry-Atom economy reactions –rearrangement reactions , addition reactions-atom uneconomic-sublimation-elimination-Wittig reactions-toxicity measures- Need of Green Chemistry in our day to day life.

UNIT-2 — 18 Hours

MEASURING AND CONTROLLING ENVIRONMENTAL PERFORMANCE

Importance of measurement – lactic acid production-safer Gasoline – introduction to life cycle assessment-four stages of Life Cycle Assessment (LCA) –Carbon foot printing-green process Matrics-eco labels -Integrated Pollution and Prevention and Control(IPPC)-REACH (Registration, Evaluation, Authorization of Chemicals)

UNIT-3 — 18 Hours

EMERGING GREEN TECHNOLOGY AND ALTERNATIVE ENERGY SOURCES

Design for Energy efficiency-Photochemical reactions- Advantages-Challenge faced by photochemical process. Microwave technology on Chemistry- Microwave heating –Microwave assisted reactions-Sono chemistry and Green Chemistry –Electrochemical Synthesis-Examples of Electrochemical synthesis.

UNIT-4 18 Hours

RENEWABLE RESOURCES

Biomass –Renewable energy – Fossil fuels-Energy from Biomass-Solar Power- Other forms of renewable energy-Fuel Cells-Alternative economics-Syngas economy- hydrogen economy-Bio refinery chemicals from fatty acids-Polymer from Renewable Resources –Some other natural chemical resources

UNIT-5 18 Hours

INDUSTRIAL CASE STUDIES

Methyl Methacrylate (MMA)-Greening of Acetic acid manufacture-Vitamin C-Leather manufacture –Types of Leather –Difference between Hide and Skin-Tanning –Reverse tanning –Vegetable tanning –Chrome tanning-Fat liquoring –Dyeing –Application-Polyethylene- Ziegler Natta Catalysis-Metallocene Catalysis-Eco friendly Pesticides-Insecticides.

RECOMENDE READINGS

1. Mike Lancaster , Green Chemistry and Introductory text, II Edition
2. P.T.Anastas and J.C Warner,Green Chemistry theory and Practice, Oxford University press, Oxford (1988).
3. P.Tundoet. al., Green Chemistry, Wiley –Blackwell, London (2007).
4. ProttiD.Dondiet.al.,Green Chemistry
5. T.E Graedel, Streamlined Life cycle Assessment, Prentice Hall, NewJersey (1998).
6. V.K. Ahluwalia,Methods and Reagents of Green Chemistry: An Introduction by Green Chemistry.
7. www.clri.org

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE: MSCC03 COURSE TYPE: ECC/CB

COURSE TITLE : ORGANIC SYNTHESIS II

CREDIT: 06 THEORY: 06	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 CCA : 20	

OBJECTIVE:

To gain the knowledge in the preparation, properties, characterization and Uses of polymers.

UNIT-1 20 Hours

Disconnection Approach: An introduction to synthons and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, ch_emoselectivity, reversal of polarity,cyclisation reactions, amine synthesis

UNIT-2 19 Hours

Protecting Groups: Principle of protection of alcohol, amine, carbonyl and carboxyl groups. one Group C-C Disconnections Alcohols and carbonyl compounds, regioselectiviity. Alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis

UNIT-3 18 Hours

Two Group C-C Disconnections : Diels-Aider reaction, 1,3-difunctionalised compounds, cx,j3-unsaturated carbonyl compounds, control in carbonyl condensations, 1,5-difunctionalised compounds. Micheal addition and Robinson annelation.

UNIT-4 16 Hours

Ring Synthesis : Saturated heterocycles, synthesis of 3-, 4-, 5- and 6-membered rings, aromatic heterocycles in organic synthesis.

UNIT-5 17 Hours

Synthesis of Some Complex Molecules : Application of the above in the synthesis of following compounds: - Camphor, Longifoline, Cortisone, Reserpine, Vitamin 0, Juvabione, Aphidicolin and Fredericamycin A.

Suggested reading books

1.Designing Organic Synthesis,S.Warren,Wiley.

2.OrganicSynthesis·Concept,Methods and Starting Materials, J.Fuhrhopand G.Penzillin, Verlage VCH.

3.SomeModernMethodsofOrganicSynthesis.W.Carruthers,CambridgeUniv.Press.

4.ModernSyntheticReactions,H.O.House,W.A.Benjamin,

5.AdvancedOrganicCht!1nistry:Reactions,MechanismsandStructure,J.March,Wiley.

6.Principlesof OrganicSynthesis,R.NormanandJ.M.Coxon, BlackieAcademic &Professional.

7.AdvancedOrganicChemistryPartB,F.A.CareyandR.J.Sundberg,PlenumPress.

M.Sc. CHEMISTRY THIRD SEMESTER

COURSE CODE: MSCC04 **COURSE TYPE: ECC/CB**

COURSE TITLE : HETEROCYCLICCHEMISTRY

CREDIT: 06 THEORY: 06	HOURS: 90 THEORY: 90
MARKS: 100 THEORY: 80 CCA : 20	

OBJECTIVE:

To study of Nomenclature, Preparations, Characteristics and Structure of Heterocycles.

UNIT-1 20 Hours

NOMENCLATURE OF HETEROCYCLES:

nomenclature (Hantzsch-Widman system) for monocyclic fused and bridged heterocycles. Aromatic Heterocycles General chemical behaviour of aromatic heterocycles, classification (structural type), Empirical resonance energy, delocalization energy and Dewar resonance energy, Heteroaromatic reactivity and tautomerism in aromatic heterocycles. pyramidal inversino and 1,3-diaxial interaction. Stereo-electronic effects anomeric and related effects, Attractive interactions-hydrogen bonding and intermolecular nucleophilic, ectrophilic interactions. Heterocyclic Synthesis. Principles of heterocyclic synthesis involing cyclization reactions and cycloaddition reactions

UNIT-2 18 Hours

SMALL RING HETEROCYCLES:

Three-membere heterocycles-synthesis and reactions of aziridines, oxiranes, thiranes.

four-membered heterocycles-synthesis and reactions of azetidines, oxetanes and thietanes

UNIT-3 18 Hours

FIVE MEMBERED HETEROCYCLIC COMPOUNDS AND BENZO-FUSED RING:

Five-Membered Heterocycles Synthesis and reactions of Pyrrols, furanes, thiophenes

fused benzo ring: synthesis and reaction including medicinal applications of benzopyrroles, bezofurans and benzothiophenes.

UNIT-4 — 18 Hours

BICYCLIC RING SYSTEM AND MESO IONIC HETEROCYCLES:

six- membered Heterocycles with one Heteroatom. Synthesis and reactions of pyridines, quinolines, isoquinolines, pyrylium salts and pyrones and Synthesis and reactions of quionlizinium and benzopyrylium.

UNIT-5 — 16 Hours

HIGHER HETEROCYCLES:

Six membered Heterocycles with two or more Heteroatoms. Synthesis and reactions of diazenes, and thiazines,pyrimidines.

Seven-and Large-membered Heterocycles: Synthesis and reactions of azepines, oxepines, thiepines.

SUGGESTED READING BOOKS

1. Heterocyclic Chemistry Vol. 1-3, R.R. Gupta,.M. Kumar and V.Gupta, Springer Verlag.
2. The Chemistry of Heterocycles, T. Eicher and S. Hauptmann, Thieme.
3. Heterocyclic chemistry J.A. Joule, K. Mills and G.F. Smith, Chapman and Hall.
4. Heterocyclic Chemistry, T.L. Gilchrist, Longman ScietificTechinal.
5. Contemporary Hetrocyclic Chemistry, G,.R. Newkome and W.W. Paudler, Wiley-Inter Science.
6. An Introductiion to the Heterocyclic Compounds, R.M. Acheson, Johnwiely.
7. Comprehensive Heterocyclic Chemistry, A.R. Katrizky and C.W. Rees, eds. Pergamon Press
8. R.K..Bansal, Hetrocyclic chemistry, 5th edn. New Age International .Publishers

Course Code	Course Type	Course (Paper/Subjects)	Credits	Contact Hours Per WeeK			EoSE Duration (Hrs.)		Marks	
				L	T	P	Thy	P	SEE	IA
MSC 401	CCC	BIOINORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC 402	CCC	ENVIRONMENTAL CHEMISTRY	6	4	3	0	3	0	80	20
MSC 403	CCC	SOLID STATE CHEMISTRY	6	4	3	0	3	0	80	20
MSC 411	CCC	GENERAL CHEMISTRY LAB	6	0	0	9	3	0	100	
MSC S04	PRJ/SSC	DISSERTATION	6	4	3	0	3	0	80	20
MSC D01	ECC/CB	PHOTOINORGANIC CHEMISTRY	6	4	3	0	3	0	80	20
MSC D02	ECC/CB	MATERIAL SCIENCE								
MSC D03	ECC/CB	CHEMISTRY OF NATURAL PRODUCT								
MINIMUM CREDITS IN INDIVIDUAL SUBJECT IS 6 AND IN COMPLETE SEMESTER IT WOULD BE 30			Total Credit = 36							

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSC401 **COURSE TYPE: CCC**

COURSE TITLE : BIOINORGANIC CHEMISTRY

CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: 80 CCA:20 PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE : To learn about Trace metal ions, Enzymes and medicinal bio inorganic chemistry.

UNIT-1 18 Hours

ESSENTIAL AND TRACE METAL IONS

Alkali and alkaline earth and transition metal cations. Crown ethers, Na & K ion transport, Metal ion toxicity in biochemical system. Bio membranes and calcium carriers.

UNIT-2 18 Hours

RESPIRATORY PROTEINS

Heme-oxygen carrier: Introduction, Models for transports Heme iron proteins, porphyrin system, substituent effects. Oxygen carriers- Haemoglobin, Myoglobin- structural characteristics and Bohr effect. Non-heme oxygen carriers: Hemerythrin and hemocyanin, Model compounds for oxygen carriers- Cobalt Schiff base, Vaska's complexes.

UNIT-3 18 Hours

METALLOENZYMES (REDOX AND NON REDOX) / METAL ION TRANSPORT AND STORAGE

Hydrolases: Carboxypeptidase, carbonic anhydrase, alkaline phosphatase and other dinuclear phosphatases and hydrolases. Electron Transfer Proteins: Blue copper, Iron-Sulphur proteins – Ferridoxins&Rubredoxin, and cytochromes.Redoxenzymes : Cu, Zn SOD and Cytochrome P450, Manganese enzyme and xanthine oxidase. Haem enzymes- peroxidase and catalase.

UNIT-4 17 Hours

Nitrogenase enzyme : Introduction, Types of nitrogen fixing microorganism,metal clusters in nitrogenase. Nitrogen fixation pathway.Transition metal complexes : Dinitrogen complexes. Biological redox reactions. Photosynthesis and chlorophyll.

UNIT-5 19Hours

MEDICINAL BIO-INORGANIC CHEMISTRY/CHELATION THERAPY:

Pt complexes in cancer therapy: Cisplatin and its mode of action, cytotoxic compounds of other metals. Gold containing drugs as antirheumatic agents and their mode of action, Lithium in psychopharmacological drugs. Metal complexes as probes of nucleic acid: Function of metal ions in genetic regulation, Metal DNA and RNA interactions – potential binding sites.

RECOMENDE READINGS:

1.Advanced Inorganic Chemistry, F.A. Cotton and G. W. Wilkinson. John Wiley &Sons, 5th Ed.1988.

2. Inorganic Chemistry, Principles of Structure and Reactivity, J. E. Huheey,E.A. Keiter 4th Ed.Harper Collins, 1993.

3. Bioinorganic chemistry, R. W. Hay, Halsted Press, 1984.

4. Principles of Bioinorganic Chemistry, S. J. Lippard and J.M. Berg, Panima Publishing Corporation, 2nd Ed., 1995.

5. Inorganic Chemistry of Biological Processes, M.N. Hughes, John Wiley &Sons, 2nd Edition, 1985.

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSC402 **COURSE TYPE: CCC**

COURSE TITLE : ENVIRONMENTAL CHEMISTRY

CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: 80+20 THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE : To learn about Earth, Biosphere and Polution and its Control.

UNIT-1 17 Hours

ATMOSPHERIC CHEMISTRY:

The structure of the earth's atmosphere- chemistry of the lower and upper atmosphere.The chemistry of air pollution- oxides of nitrogen- hydrogen sulphide and oxides of sulphur- Aerosols – ozone depletion and consequences- dioxins burning plastics- other atmospheric chemicals- smog- radio activity and fallout- air pollution abatement.Green house effect- Global warming, oxides of carbon.Nitrogen cycle,carbon cycle,Acid rain.

UNIT-2 20 Hours

Air Pollution:

General considerations: polluted air; Types of pollution and units of measurements. Air quality standards, Sampling, Monitoring, Analysis of CO, Sources and sinks of CO pollution, Effects of CO on plants and humans, Control of CO pollution, Analysis of oxides of nitrogen, NOx sources and sinks of NOx pollution, Control of NOx pollution, Hydrocarbons and photochemical smog and its control, Analysis of hydrocarbon in exhaust gasses, Petrol and air, Sulphur di oxide sources, Analysis and control, Acid rain particulates and their effects on human and climate, Control of particulates.

UNIT-3 17 Hours

Water Pollution: The chemistry of water pollution – sewage treatment, primary, secondary- and tertiary – activated sledge – trickling filters-

denitrification –biology and energy chain – reactor design theory – anaerobic digestion –eutrophication. Aquatic environment, Water pollutants, Sampling of water and its preservation Trace metals in water, Chemical speciation with special reference to Copper, Lead, Mercury and Arsenic. Water quality standards Water quality parameters.

Oxygen Demanding Wastes: Dissolved oxygen, Biological oxygen demand, Monitoring techniques and methodology with special reference to ammonia, Nitrates, Nitrites, Fluorides, Cyanides, Total hardness, Lead, Cadmium and Mercury. Detection and control of Detergents, oils, Pesticides, Sewage treatment.

UNIT-4 19 Hours

Soil analysis: Sampling of soil, Determination of water holding capacity Determination of total nitrogen, Ammonia and nitrates. Determination of Na,Mg, Ca, K phosphate and Sulphur in soil.

Chemical toxicology: Toxic chemicals in environment, Impact of toxic chemicals on enzymes, Biochemical effects of Arsenic, Cadmium, Lead, Mercury, Carbon monoxide, Sulphur dioxide, Pesticides and Carcinogens.

UNIT-5 17 Hours

Noise pollution- Introduction, sources, measurement of noise level, differences between sound and noise pollution, reverberating of sound, effect and control.

Industrial pollution: Pollution due to cement industry, Distillery, Pharmaceutical (Drug) industries, Sugar industry, Paper and pulp industries, Thermal power plants, Nuclear power plants, Metallurgical industries, Polymer industries. Recycle, reuse, recovery, disposal, and management of solid industrial waste.

RECOMENDE READINGS:

1. Chemistry of our environment R.A.Horne
2. Environmental chemistry A.K.De
3. Environmental chemical analysis Iain L, Marr and Malcom S. Cresser
4. Pollution control in process industries S.P.Mahajan.

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSC403 **COURSE TYPE: CCC**

COURSE TITLE : SOLID STATE CHEMISTRY

CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: 80 + 20 THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE : Study of Solid States.

UNIT-1 — 18 Hours

SOLID STATE REACTIONS

Preparative Methods: Vapor phase transport, preparation of thin films - electrochemical methods, chemical vapour deposition; Crystal growth - Bridgman & Stokbarger methods, zone melting. Characterization of Solids: Crystal diffraction of X-rays, X-ray diffraction method; Powdermethod – principles and uses; Scattering of X-rays by crystals – systematic absences; Electron diffraction; Neutron diffraction.

UNIT-2 — 20 Hours

POWDER COMPACT REACTIONS AND SOLID-STATE DEFECTS

Diffusion Model: Parabolic rate law, Jander's rate equation, Kroger-Zeigler equation, Ginstling- Brounshtein rate equation. Stoichiometric Defects: Equilibrium concentration of point defects in crystals - Schottky defects, Frenkel defects; The photographic process - light sensitive crystals, mechanism of latent image formation, lithium iodide battery.

Non-Stoichiometric Defects: Origin of non-stoichiometry, consequences of non-stoichiometry; Equilibria in non-stoichiometric solids, Colorcenters: F-centre, electron and hole centre; colour centre and information storage.

UNIT-3 — 16 Hours

ELECTRONIC PROPERTIES AND BAND THEORY

Metals insulators and semiconductors, electronic structure of solids band theory, band structure of metals, insulators and semiconductors,

doping semiconductors, p-n junction, super conductor.electrically conducting solids, organic charge transfer complex organic metals, new super conductors.

UNIT-4 — 18 Hours

SOLID ELECTROLYTES

Typical Ionic Crystals: Alkali metal halides (vacancy conduction), silver chloride (interstitial conduction); Solid Electrolytes -β-alumina, silver iodide, halide and oxide ion conductors; Application of Solid Electrolytes. Fuel cells: electrochemical power generator (hydrogen-oxygen cell, Solid state Galvanic cell); Thermoelectric Effects: Seebeck effect; Hall Effect.

UNIT-5 — 18 Hours

MAGNETIC AND OPTICAL PROPERTIES OF SOLIDS

Behaviour of substances in magnetic field; Effects of temperature (Curie & Curie-Weiss laws); Magnetic moments; Mechanism of ferro- and antiferromagnetic ordering – super exchange. Luminescence and phosphors; Configurational coordinate model, Antistoke phosphors, Lasers — ruby and neodymium.

Conducting Organics: Organic conductors, preparation, mechanism of conduction in organic semiconductors, photoconductivity of polymers.

RECOMENDE READINGS:

1 A. R. West. *Solid State Chemistry and its Applications*, John Wiley (1987).

2. F. Gutmann& L.E. Lyons. *Organic Semiconductors*, John Wiley (1987).

3. N. B. Hannay, *Solid State Chemistry*, Prentice Hall of India (1979)

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSC411 **COURSE TYPE: CCC**

COURSE TITLE : ORGANIC CHEMISTRY LAB

CREDIT: THEORY: PRACTICAL : 6	HOURS: 0 THEORY: 0 PRACTICAL : 135
MARKS: THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE : To gain practial knowledge of instrumental experiments, estimation of Organic and In organic field.

A. SPECTROPHOTOMETRIC DETERMINATIONS

I. Manganese/Chromium,Vanadium in steel sample.
II. Nickel/Molybdenum/tungsten/Vanadium/Uranium by extractive spectrophotometric Method.
III. Fluoride/Nitrate/Phosphate.
IV. Iron-phenanthroline complex; job's Method of tinuous variations.
V. Zironium-Alizarin Red -S complex : Mole-ratio method.
VI. Copper - Ethylene diamine complex: Slope-ratio method.

B. pH METRY

Stepwise proton-ligand and metal-ligand stability constant of complexes by Leving-Rossoti methods.

C. POLAROGRAPHY

Composition and stability constant of complexs.
Nepholometeric/Turbidity meteric determination of sulphate, phosphate, silver, etc.

D. FLAME PHOTOMETRIC DETERMINATIONS.

(i) Sodium and potassium when present together.
(ii) Lithium/Calcium/Barium/Strontium.
(iii) Cadium and magnesium in tap water.

E. REFRACTOMETRY

1. Determination the specific and molar refraction of a given liquid by abbe Refractometer.
2. Determine the variation of refractive index.
3. To verify law of refraction of mixture (glycerol + water).

F. SEPARATION AND QUANTITATIVE ESTIMATIO AND TERNARY MIXTURES BY THE USE O SEPARATION TECHNIQUS.

1. paper chromatography - separation of cations and anion
2. Thin-layer chromatography - separation of nickel, m and zinc.
3. Ion-exchange
4. Solvent extraction.
5. Electrophoretic separation.

G.ESTIMATIONS

1. Estimation of carbohydrate by spectrophotometric meth
2. Estimation of amino acid by hydrine method.
3. Estimation of ascorbic acid.
4. Estimation of total blood cholesterol.
5. Estimation of proteinby biuret method.
6. Estimation of Nitrogen.
7. Estimation of Sulphur.

SCHEME OF PRACTICAL EXAMINATION FOR M.Sc.IV CHEMISTRY

M.SC. IV SEM CHEMISTRY
GENERAL CHEMISTRY LAB
MAX.MARKS 100
TIME 12 HRS (SPREAD OVER TWO DAYS)

1. Quantitative Estimation of organic compounds	30
2. One exercise from A to E (Instrumental Analysis)	3
3. Viva-voce.	20
4. Sessional .	20

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSCD01 **COURSE TYPE: ECC/CB**

COURSE TITLE : PHOTO INORGANIC CHEMISTRY	
CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: 80+20 THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE : To learn about Photochemistry, Excited States and Ligand field Photochemistry.

UNIT -1 — 18 Hours

BASICS OF PHOTOCHEMISTRY : Absorption, excitation, photochemical laws, quantum yield, electronically excited states life times-measurements of the times. Flash photolysis, stopped flow techniques. Energy dissipation by radiative and non-radiative processes, absorption spectra, Franck-Condon principle, photochemical stages- primary and secondary processes

UNIT -2 — 18 Hours

II PROPERTIES OF EXCITED STATES: Structure, dipole moment, acid-base strengths, reactivity. Photochemical calculation of rates of radiative processes. Bimolecular deactivation - quenching kineticsIII EXCITED STATES OF METAL COMPLEXES: Excited states of metal complexes: comparison with organic compounds, electronically excited states of metal complexes, charge-transfer spectra, charge transfer excitations, methods for obtaining charge-transfer spectra.

UNIT -3 — 18 Hours

LIGAND FIELD PHOTOCHEMISTRY :
Photosubstitution, photooxidation and photoreduction, lability and selectivity, zero vibrational levels of ground state and excited state, energy content of excited state, zero zero spectroscopic energy, development of the equations for redox potentials of the excited states.

UNIT -4 — 20 Hours

REDOX REACTIONS BY EXCITED METAL COMPLEXES: Energy transfer under conditions of weak interaction and strong interaction-exciplex formation; conditions of the excited states to be useful as redox reactants, excited electron transfer, metal complexes as attractive candidates (2,2'-bipyridine and 1,10- phenonthroline complexes), illustration of reducing and oxidising character of Ruthenium2+(bipyridal complex, comparision with Fe(bipy)s; role of spin-orbit coupling-life time of these complexes. Application of redox processes of electronically excited states for catalytic purposes, transformation of low energy reactants into high energy products, chemical energy into light

UNIT -5 — 16 Hours

Metal Complex Sensitizers: Metal complex sensitizer, electron relay, metal colloid systems, semiconductor supported metal or oxide systems, water photolysis, nitrogen fixation and carbon dioxide reduction

SUGGESTED READING BOOKS

1. Concepts of Inorganic Photochemistry, A.W. Adamson and P.O. Fleischauer, Wiley.
2. Inorganic Photochemistry, J. Chem. Educ., vol. 60, no. 10, 1983.
3. Progress in Inorganic Chemistry, vol. 30, ed. S.J. Lippard, Wiley.
4. Coordination Chem. Revs., 1981, vol. 39, 121, 131; 1975, 15, 321; 1990,97,313.
5. Photochemistry of Coordination Compounds, V. Balzari and V. Carassiti, Academic Press.
6. Elements of Inorganic Photochemistry, G. J. Ferraudi, Wiley.

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSCD02 **COURSE TYPE: ECC/CB**

COURSE TITLE :

MATERIAL SCIENCE

CREDIT:		**HOURS: 90**	
THEORY:	**PRACTICAL : 6**	**THEORY: 90**	**PRACTICAL : 0**
MARKS:	**80+20**	**MARKS:**	
THEORY:	**PRACTICAL :**	**THEORY:**	**PRACTICAL :**

OBJECTIVE: To gain knowledge about Material Science including Conductors and Semiconductors.

UNIT-1 — 18 Hours

Classification of crystals

Seven crystal systems and fourteen Bravaislattices.Structure and bonding in solids- Cohesive force in crystals, van der waal'sinteractions,Ionic bonding, covalent bonding and hydrogen bonding in solids.Structure aspects os rock salt, rutile, fluorite, antifluorite, diamond, zinc blende, wurtzite,Crystobalite, spinels, inverse spinels and silicates.

UNIT-2 — 18 Hours

Crystal geometry

Symmetry elements for solids (including glide planes and screw axis).Introduction to space groups with examples.Techniques of structure determination in solid state – X-ray diffraction, electron and neutron diffractions and electron microscopy – principle, instrumentation and applications; Calculation of structure factor.

UNIT-3 — 17 Hours

Theories of metallic state

Free electron theory,(Brillouin) and Band models.Defects in crystals – Frenkel and Schotky defects, F-centres, effect of defects on the electrical, optical, magnetic, thermal and mechanical properties of crystals.Smart metals- binary and ternary – examples and applications.

UNIT-4 — 17 Hours

Ionic conductors

Optimised ionic conductors-silver ion, copper ion, alumina and related electrolytes, alkali metalion, fluoride ion and proton conductors; super conductors – principle and applications.Models of ionic motion- simple hopping motion – cooperative motion models.Photo conducting materials – principle, examples and applications.

UNIT-5 — 20 Hours

Organic semiconductors

Organic semiconductors – photo physical processes, thermal and photo generation of carriers;Aromatic hydrocarbons, phthalocynins-anthracene mechanisms; excitons and polarons.Change transfer complexes – characterization and their electrical properties.Conduction polymers- polyacetylenes, polyanilines and polyvinylidenes-preparation and Applications.Carbon Nano particles- fullerenes-preparation and potential applications. liquid crystals- classification-thermotropic and lyptropic- nemetic, smectic and cholestric and their applications.

RECOMENDE READINGS:

1. Materials science Raghavan
2. Materials Science Vol I and II by ManasChanda
3. Structural Inorganic chemistry A.F . Wells
4. Introduction to solid state physics McCrey et al.
5. Solid state chemistry and applications Antony West
6. Solid state chemistry Hannay
7. Chemistry of Nanomaterials,Vol.I&II, C.N.R. Rao, Muller and A. K. Cheetham,
8. Wiley VCH Verlag GmbH KGaA, 2002.

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSCD03 **COURSE TYPE: ECC/CB**

COURSE TITLE : CHEMISTRY OF NATURAL PRODUCTS	
CREDIT: THEORY: PRACTICAL : 6	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY:80+20 PRACTICAL :	MARKS: THEORY: PRACTICAL :

OBJECTIVE : To study of natural products.

UNIT-1 — 20 Hours

TERPENOIDS AND CAROTENOIDS:

Classification ,Nomenclature,occurrence ,Isolation ,general method of structure determination ,Stereochemistry,biosynthesis and synthesis of following representative molecules: Citral, Gerniol, α Terpeniol ,Menthol, Zingiberene, and Structure and Synthesis of β Carotene, Synthesis of retinol (vitamin-A)

UNIT-2 — 20 Hours

STEROIDS:

Occurance, nomenclature, basic skeleton, Diels hydrocarbon and Stereochemistry ,Isolation structure determination and synthesis of Cholesterol, Bile acids, Steroids Hormones-Androsterone, Testosterone,Estrone,Progestron,Aldosterone, Biosynthesis of steroids.

UNIT-3 — 11 Hours

PLANT PIGMENTS :

Occurrence nomenclature and general methods of structure determination. Isolation, structure elucidation and synthesis of Apigenine , Luteoline , Quercetin , Myricetin ,Anthocyanidins and Anthocyanins ,Biosynthesis of flavonoids Acetate pathway and Sh[ikimic acid pathway .

OBJECTIVE : To study of natural products.

UNIT-1 — 20 Hours

TERPENOIDS AND CAROTENOIDS:

Classification ,Nomenclature,occurrence ,Isolation ,general method of structure determination ,Stereochemistry,biosynthesis and synthesis of following representative molecules: Citral, Gerniol, α Terpeniol ,Menthol, Zingiberene, and Structure and Synthesis of β Carotene, Synthesis of retinol (vitamin-A)

UNIT-2 — 20 Hours

STEROIDS:

Occurance, nomenclature, basic skeleton, Diels hydrocarbon and Stereochemistry ,Isolation structure determination and synthesis of Cholesterol, Bile acids, Steroids Hormones-Androsterone, Testosterone,Estrone,Progestron,Aldosterone, Biosynthesis of steroids.

UNIT-3 — 11 Hours

PLANT PIGMENTS :

Occurrence nomenclature and general methods of structure determination. Isolation, structure elucidation and synthesis of Apigenine , Luteoline , Quercetin , Myricetin ,Anthocyanidins and Anthocyanins ,Biosynthesis of flavonoids Acetate pathway and Sh[ikimic acid pathway .

UNIT-4 — 25 Hours

ALKALOIDS:

Introductin,classification of Alkaloids ,Physiological action Method of structure determination of alkaloids ,synthesis and Biosythesis of Conine, Nicotine, Atropine, Quinine and Morphine

PROPHYRINS: Structure and Synthesis of chlorophyll.

UNIT-5 — 14Hours

M.Sc. CHEMISTRY FORTH SEMESTER

COURSE CODE: MSCS04 COURSE TYPE: PRJ/CCC

COURSE TITLE : DISSERTATION	
CREDIT: THEORY: 80+20 PRACTICAL :	HOURS: 90 THEORY: 90 PRACTICAL : 0
MARKS: THEORY: PRACTICAL :	MARKS: THEORY: PRACTICAL :

The following topic have been proposed by the Board of studies in Chemistry for completion of M.Sc.IV SEM. Any one major heading may be chosen for writing Dissertation.

1. Soil Analysis
2. Cosmetics
3. Water Analysis
4. Food Adulteration
5. Medicinal plant
6. Nanotechnology
7. Spectroscopic techniques in Characterisation
8. Air quality
9. Chemiluminiscence
10. Material Science
11. Drug Delivery
12. Phytochemistry
13. Biochemistry
14. Surfactants
15. Ligand Chemistry

Dissertation Proforma

Preface
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Declaration

1. Introduction
2. Review of Literature
3. Method and Materials
4. Result and Discussion.
5. Conclusion.
6. Reference.