

**SATHYABAMA  
INSTITUTE OF SCIENCE & TECHNOLOGY  
(Established under section 3 of UGC Act, 1956)**



**SYLLABUS**

**BACHELOR OF SCIENCE IN CHEMISTRY**

**DEPARTMENT OF CHEMISTRY**

**CHENNAI - 600119**

**REGULATIONS 2021**

**SATHYABAMA  
INSTITUTE OF SCIENCE AND TECHNOLOGY**

**REGULATIONS – 2021**

Effective from the academic year 2021 and applicable to the students admitted to the Degree of Bachelor of Science. (Six Semesters)

### **1. NOMENCLATURE**

<b>Programme</b>	Refers to the Bachelor / Master of Science stream that a student has chosen for study. Eg. B.Sc. / M.Sc., Chemistry
<b>Course</b>	Refers to the course (Subjects) that a student would have to undergo during the studying in the institution
<b>Batch</b>	Refers to the starting and completion year of a programme of study. Eg. Batch of 2021–2024 refers to students belonging to a 3 year Degree programme admitted from 2021.
<b>School</b>	Each programme and Department of the institution is grouped under various School. Eg. School of Science and Humanities consists of Departments of Chemistry, Physics, Mathematics, English, Viscom and Psychology. This Faculty offers various Undergraduate and Postgraduate programmes like BA, B.Sc, MA., M.Sc. programmes
<b>Dean</b>	Refers to the Head of a Group of Departments under which various UG and PG Programmes are offered.
<b>HoD</b>	Refers to the Head of a Department (HoD) offering various UG and PG programmes. He/She will be the Head of all staff members and Students belonging to the Department

### **2. STRUCTURE OF PROGRAMME**

2.1. Every Programme will have a curriculum with syllabi consisting of theory and practical such as:

1. General Foundation courses comprising of English and Language (French and Hindi)
  2. Core courses belonging to the Major Programme of study.
  3. Electives offered by the Department and school related to the Major program
  4. Electives to be chosen from a group of courses offered, which student can choose from any stream.
  5. Laboratory courses offered by the department or inter/intra school departments
  6. Professional Training Courses during the summer or winter semester vacation.
  7. Project Work
- 2.2. Each semester curriculum shall normally have a blend of lecture courses not exceeding 5 and practical courses not exceeding 3.
- 2.3. Each course is normally assigned certain number of credits as follows:  
Lecture Hours: 1 credit per lecture hour per week, 1 credit per tutorial hour per week,  
Lab Hrs: 1 credit for 2 Practical hours, 2 credits for 3 or 4 hours of practical per week  
Project Work : 4 credit for project work.  
Professional Training : 3 credits industrial training during the prefinal semester.
- 2.4. The medium of instruction, examinations and project report will be in English language throughout the programme.
- 2.5. For the award of the degree, a student has to earn the total number of credits as specified in the curriculum of the relevant branch of study.

### **3. DURATION OF THE PROGRAMME**

A student is normally expected to complete the B.Sc. programme in 6 semesters but in any case not more than 10 consecutive semesters from the time of commencement of the course. The Head of the Department shall ensure that every teacher imparts instruction as per the number of hours specified in the syllabus and that the teacher teaches the full content of the specified syllabus for the course being taught.

### **4. REQUIREMENTS FOR COMPLETION OF A SEMESTER**

A candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirement for completion of a semester.

- 4.1 He/She secures not less than 90% of overall attendance in that semester.
- 4.2 Candidates who do not have the requisite attendance for the semester will not be permitted to write the semester Examinations.

### **5. DEAN**

Each school comprises of many Departments and Courses offered by them is headed by a Dean. The Dean is responsible for all activities taking place inside the Faculty in coordination with all Department Heads and all staff members belonging to the faculty. The Dean will be appointed by the institution on rotational basis. The Dean shall act as a linkage between the HoD's, faculty members and the students. The Dean makes a review of all the academic activities of Staff, Students and Research on a regular time interval and takes steps to improve the morale of all staff and students.

### **6. HEAD OF THE DEPARTMENT**

Each Department offers various UG and PG programmes is headed by a Head (HoD). The HoD is responsible for allotting courses to each staff member uniformly in consultation with other HoD's and Deans. The HoD is responsible for streamlined teaching of courses to students, improvement and Assessment of Teaching Quality within the Department on a continuous basis, Assessment of staff members, transparent conduct of Continuous Assessment Examinations, Interacting with Parents, ensuring that all academic and non academic activities of staff and students are monitored and steps taken for their improvement.

## 7. BATCH COORDINATOR

The Head of the Department shall appoint a Batch coordinator for each batch of students admitted into a programme, throughout their period of study. The Batch coordinator shall act as a linkage between the HoD, faculty members and the students. The Batch coordinator gets information about the Syllabus coverage by the staff members, requirements of the students academically and otherwise, attendance and progress of the students from the respective Class Counselors. The Batch Coordinator also informs the students of the academic schedule including the dates of assessments and syllabus coverage for each assessment, weightage for each assessment, their Continuous assessment Marks and attendance % details before the commencement of End Semester examinations.

## 8. CLASS COUNSELOR

There shall be a class counselor for each class. The class counselor will be one among the teachers of the Department. He / She will be appointed by the HoD of the department concerned. The responsibilities for the class Counselor shall be:

- To act as the channel of communication between the HoD, Dean, Batch Coordinator, Course Coordinator, staff and students of the respective class.
- To collect and maintain various statistical details of students.
- To help the Batch Coordinator in planning and conduct of the Classes.
- To monitor the academic performance of the students including attendance and to inform the Batch Coordinator.
- To take care of the students' welfare activities like industrial visits, Seminars, awards etc.

## 9. COURSE COORDINATOR FOR EACH COURSE

Each theory course offered to more than one class or branch or group of branches, shall have a "Course coordinator" comprising all the teachers teaching the course, with one of the senior staff amongst them normally nominated as course coordinator, by the Dean in consultation with the respective HoD's.

- The "Course Coordinator" shall meet the teachers handling the course, as often as possible and ensure a Common Teaching Methodology is followed for the course; Study materials are prepared by the staff members and communicated to the students periodically. The students are involved in course based projects and assignments. Course coordinator will prepare common question paper for continuous assessment tests, to ensure that uniform evaluation of continuous assessments.
- The Course coordinator is responsible for analysing the Performance of the students in the Continuous Assessments and End Semester exams and to find suitable methodologies for improvement in the performance. The analysis should be submitted to the HoD and Dean for suitable action.

## 10. EXAMINATIONS

The end semester examinations shall normally be conducted between October and December during the odd semesters and between March and May in the even semesters. The maximum marks for each theory and practical course (including the project work and Viva Voce examination in the final Semester) shall be 100 with the following breakup.

1. Theory Courses	Continuous Assessment	: 50 Marks
	End Semester Exams	: 50 Marks
2. For Practical courses	Continuous Assessment	: 50 Marks
	End Semester Exams	: 50 Marks
3. Project	Continuous Assessment(Reviews)	:50 Marks
	Viva	:50 Marks

## 11. CONTINUOUS ASSESSMENT EXAMS

### a. Theory courses

There will be a Minimum of two Continuous Assessment Exams, for each Theory course. Each Assessment Exam will be conducted for a Maximum of 50 Marks. The total marks secured in the Two Assessment Exams out of 100, will be converted to 40 Marks. The % of attendance secured by the candidate, assignment course in a semester will carry a weightage of 10 Marks, which will be added to the Continuous Assessment Marks for each course.

The Continuous assessment marks obtained by the candidate in the first appearance shall be retained and considered valid for all subsequent attempts, till the candidate secures a pass.

### a. Practical courses

- For Practical Courses, the student will be evaluated on a continuous basis for 30 Marks, which will include performing all experiments, submitting Observation and Record Note Book in scheduled Format in Time, 15 Marks for Model Exam at the end of the semester and 5 Marks for Attendance in the course.
- For Practical courses, if a student has been absent for some Practical Classes or has performed poorly, then the student will have to get permission from the Lab in charge and batch coordinator to do the experiments, so that he/she meets all the requirements for the course and thereby allowed to appear for Model and End Semester Exams.
- If a student has not done all the experiments assigned for that Lab, before the scheduled date or has attendance percentage is less than 90%, the student will not be allowed to appear for the Model and end semester Practical Exam. Such students will have to redo the course again by doing all the experiments in the next semester when the course is offered.

## 12. ELECTIVE COURSES

Every student has the option of choosing one elective or 2 elective out of 10 elective courses during the period of study. These electives will be offered in the Second year of study. The student has to select at least one electives offered by the respective department.

## 13. FINAL YEAR PROJECTWORK

- Project work is to be undergone by each student in the final year.
- Project work may be allotted to a single or two students as a Group. In special cases, the number of students in a Project Group cannot exceed three, if it can be justified by the Project Supervisor and HoD, that the Project Work Content is large enough.
- For Project work, Assessment is done on a continuous basis by 3 Reviews for 50 Marks and Final Viva voce carries 50 Marks.
- There shall be three Project Reviews (during the Pre-final semester and Final Semester) to be conducted by a review

committee. The student shall make presentation on the progress made, before the committee. The Head of the Department shall constitute the review committee for each programme in consultation with Dean. . The members of the review committee will evaluate the progress of the Project and award marks.

	CONTINUOUS ASSESSMENT (REVIEW) PROJECT			FINAL PROJECT VIVA VOCE
	REVIEW-1	REVIEW - 2	REVIEW -3	
Max. Marks	5	15	30	50

- The total marks obtained in the three reviews, rounded to the nearest integer is the Continuous Assessment marks out of 50. There shall be a viva-voce examination for Semester Examination conducted by one internal examiner, one external examiner and the supervisor concerned.
- A student is expected to attend all the Project Reviews conducted by the institution on the scheduled dates. It is mandatory for every student to attend the Reviews, even if they are working on a project in an industry based outside Chennai city. It is their duty to inform the organization about the project reviews and its importance, and get permission to attend the same. If a student does not attend any of the Project Reviews, he / she shall not be allowed for the successive reviews and thereby not allowed to appear for the Final viva voce.
- The final Project viva-voce examination shall carry 50 marks. Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination. The external examiner shall be appointed by the Controller of Examinations. The Internal and External Examiner will evaluate the Project for 20 Marks each. The project report shall carry a maximum of 10 marks.
- The candidate is expected to submit the project report as per the guidelines of the institution on or before the last day of submission. If a candidate fails to submit the project report on or before the specified deadline, he / she can be granted an extension of time up to a maximum limit of 5 days for the submission of project work, by the Head of the Department.
- If he / she fails to submit the project report, even beyond the extended time, then he / she is deemed to have failed in the Project Work and shall register for the same in the subsequent semester and re-do the project after obtaining permission from the HoD and Dean.

#### 14. PASSING REQUIRMENTS

- A candidate should secure not less than 50% of total marks prescribed for the courses, subject to securing a minimum of 30% of marks out of Max. Mark in End Semester Exams. Then he / she shall be declared to have passed in the Examination.
- If a candidate fails to secure a pass in a particular course, it is mandatory that he / she shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that he / she should continue to register and reappear for the examination till he / she secures a pass.

#### 15. AWARD OF GRADES

- All assessments of a course will be done on absolute marks basis. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range of total marks (out of 100) obtained by the candidate in each course as detailed below:

#### RANGE OF MARKS FOR GRADES

Range of Marks	Grade	Grade Points (GP)
90-100	A++	10
80-89	A+	9
70-79	B++	8
60-69	B+	7
50-59	C	6
00-49 (Reappear)	RA	0
ABSENT	AAA	0
Withdrawal	W	0
Authorised Break of Study	ABS	0

#### CUMULATIVE GRADE POINT AVERAGE CALCULATION

The CGPA calculation on a 10 Point scale is used to describe the overall performance of a student in all courses from first semester to the last semester. RA, AAA and W grades will be excluded for calculating GPA and CGPA.

$$CGPA = \frac{\sum_i C_i GP_i}{\sum_i C_i}$$

Where

$C_i$	–	Credits for the course
$GP_i$	–	Grade Point for the course
$\sum_i$	–	Sum of all courses successfully cleared during all the semesters

Final Degree is awarded based on the following:

CGPA $\geq$ 9.0		– First Class - Exemplary
CGPA $\geq$ 7.50	< 9.00	– First Class with Distinction
CGPA $\geq$ 6.00	< 7.50	– First Class
CGPA $\geq$ 5.00	< 6.00	– Second Class

Minimum requirements for award of Degree, a student should have obtained a minimum of 5.0 CGPA.

#### 16. GRADE SHEET

After revaluation results are declared, Grade Sheets will be issued to each student which will contain the following details:

- Name of the Candidate with Date of Birth and Photograph.
- The programme and degree in which the candidate has studied
- The list of courses enrolled during the semester with marks and grade secured
- The Grade Point Average (GPA) for the semester.

#### 17. ELIGIBILITY FOR THE AWARD OF DEGREE

A student shall be declared to be eligible for the award of the B.Sc. degree, provided the student has successfully completed all the requirements of the programme, and has passed all the prescribed examinations in all the 6 semesters within the maximum period specified in clause 3.

- 1) Successfully gained the required number of total credits as specified in the curriculum corresponding to his/her programme within the stipulated time.
- 2) Successfully completed the programme requirements and has passed all the courses prescribed in all the semesters within a maximum period of 5 years reckoned from the commencement of the first semester to which the candidate was admitted.
- 3) Successfully completed any additional courses prescribed by the institution.
- 4) No disciplinary action pending against the student.
- 5) The award of Degree must have been approved by the Board of Management of the institution.

#### 18. CLASSIFICATION OF THE DEGREE AWARDED

1. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the 6 semesters in his/her first appearance within a maximum of 6 consecutive semesters securing a overall CGPA of not less than 9.0 (Calculated from 1st semester) shall be declared to have passed the examination in **First Class - EXEMPLARY**. Authorized Break of Study vide Clause 20, will be considered as an Appearance for Examinations, for award of First Class – Exemplary. Withdrawal from a course shall not be considered as an appearance for deciding the eligibility of a candidate for First Class –Exemplary
2. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the 6 semesters in his/her first appearance within a maximum of 6 consecutive semesters securing a overall CGPA of not less than 7.5 (Calculated from 1st semester) shall be declared to have passed the examination in **First Class with Distinction**. Authorized Break of Study vide Clause 20, will be considered as an Appearance for Examinations, for award of First Class with Distinction. Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class with Distinction.
3. A candidate who qualifies for the award of the Degree having passed the examination in all the courses of all the 6 semesters within a maximum period of 6 consecutive semesters after his/her commencement of study securing a overall CGPA of not less than 6.0 (Calculated from 1st semester), shall be declared to have passed the examination in **First Class**. Authorized break of study vide Clause 20 (if availed of) or prevention from writing End semester examination due to lack of attendance will not be considered as Appearance in Examinations. For award of First class, the extra number of semesters than can be provided (in addition to three years for Normal B.Sc) will be equal to the Number of semesters availed for Authorized Break of Study or Lack of Attendance. Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class.
4. All other candidates who qualify for the award of the Degree having passed the examination in all the courses of all the 6 semesters within a maximum period of 8 consecutive semesters after his/her commencement of study securing a overall CGPA of not less than 5.0, (Calculated from 1<sup>st</sup> semester) shall be declared to have passed the examination in **Second Class**.
5. A candidate who is absent in semester examination in a course/project work after having registered for the same, shall be considered to have appeared in that examination for the purpose of classification.
6. A candidate can apply for revaluation of his/her semester examination answer paper in a theory course, immediately after the declaration of results, on payment of a prescribed fee along with application to the Controller of Examinations through the HoD. The Controller of Examination will arrange for the revaluation and the result will be intimated to the candidate concerned through the Head of the Department. Revaluation is not permitted for practical courses and for project work.

#### 19. WITHDRAWAL FROM EXAMINATIONS

- A candidate may, for valid reasons, (medically unfit / unexpected family situations) be granted permission to withdraw from appearing for the examination in any course or courses in any one of the semester examination during the entire duration of the degree programme.
- Withdrawal application shall be valid only if the candidate is otherwise normally eligible (if he/she satisfies Attendance requirements and should not be involved in Disciplinary issues or Malpractice in Exams) to write the examination and if it is made within FIVE days before the commencement of the examination in that course or courses and also recommended by the Dean through HoD.
- Notwithstanding the requirement of mandatory FIVE days notice, applications for withdrawal for special cases under extraordinary conditions will be considered based on the merit of the case.

- Withdrawal shall not be considered as an appearance for deciding the eligibility of a candidate for First Class – Exemplary, First Class with Distinction and First Class.
- Withdrawal is NOT permitted for arrears examinations of the previous semesters.

#### 20. **AUTHORIZED BREAK OF STUDY**

- This shall be granted by the Management, only once during the full duration of study, for valid reasons for a maximum of one year during the entire period of study of the degree programme.
- A candidate is normally not permitted for temporarily break during the period of study. However, if a candidate would like to discontinue the programme temporarily in the middle of duration of study for valid reasons (such as accident or hospitalization due to prolonged ill health), he / she shall apply through the Dean in advance (Not later than the Reopening day of that semester) through the Head of the Department stating the reasons. He / She should also mention clearly, the Joining date and Semester for Continuation of Studies after completion of break of Study. In such cases, he/she will attend classes along with the Junior Batches. A student who availed break of study has to rejoin only in the same semester from where he left.
- The authorized break of study will not be counted towards the duration specified for passing all the courses for the purpose of classification only for First Class.
- The total period for completion of the programme shall not exceed more than 10 consecutive semesters from the time of commencement of the course irrespective of the period of break of study in order that he / she may be eligible for the award of the degree
- If any student is not allowed to appear for Examinations for not satisfying Academic requirements and Disciplinary reasons, (Except due to Lack of Attendance), the period spent in that semester shall NOT be considered as permitted 'Break of Study' and is NOT applicable for Authorized Break of Study.
- In extraordinary situations, a candidate may apply for additional break of study not exceeding another one Semester by paying prescribed fee for break of study. Such extended break of study shall be counted for the purpose of classification of First Class Degree.
- If the candidate has not reported back to the department, even after the extended Break of Study, the name of the candidate shall be deleted permanently from the institution enrollment. Such candidates are not entitled to seek readmission under any circumstances.

#### 21. **PROFESSIONAL TRAINING**

- Every student is required to undergo Industrial Visits during every semester of the programme. HoDs shall take efforts to send the students to industrial visits in every semester.
- The students will have to undergo Professional training for a Minimum period of 120 hours during the semester Holidays in the 5<sup>th</sup> Sem.
- This could be internship in an industry approved by the Dean or Professional Enrichment courses (like attending Summer Schools, Winter Schools, Workshops) offered on Campus or in Registered Off Campus recognized Training Centres approved by the Dean for a minimum period of 2 weeks.
- A report on Training undergone by the student, duly attested by the Coordinator concerned from the industry / Organisation, in which the student has undergone training and the Head of the Department concerned, shall be submitted after the completion of training. The evaluation of report and viva voce examination can be computed as per norms for the Semester examination.
- The evaluation of training will be made by a three member committee constituted by Head of the Department in consultation with Batch Coordinator and respective Training Coordinator. A presentation should be made by the student before the Committee, based on the Industrial Training or Professional Enrichment undergone.

#### 22. **NON CREDIT COURSES**

- Every student has the opportunity to enroll in any of the following Non Credit Courses, during the programme. The student will have to register for the courses with the respective coordinator before the end of First Semester.
- National Cadet Corps(NCC)
- National Service Scheme(NSS) Youth Red Cross(YRC)
- SPORTS CONTRIBUTION: The student is involved in any sport and represents the institution in Tournaments.
- PROFESSIONAL CLUBS: Any student can also involve in any of the Professional Clubs available in the institution.
- Participation in National and International Short Film Festivals.
- The above contribution should be completed by the end of sixth Semester (end of Pre-final year) as per the requirements. The Contribution and the Performance of the candidate, will be Printed in the Final Semester Grade sheet and Consolidate Grade Sheet under the Category "NON CREDIT COURSES" indicated as SATISFACTORY or NOTSATISFACTORY.

#### 23. **OPPORTUNITY TO GAIN EXPOSURE OUTSIDE THE INSTITUTION**

- This is facilitated by the "Centre for Academic Partnerships" of Sathyabama Institute of Science and Technology consisting of a team of experienced faculty members involved in forging Partnerships with Leading Universities, Educational Institutions, Industrial and Research establishments in India and Abroad.
- A student can be selected, to get Professional Exposure in his/her area of Expertise in any Reputed Research Organization or Educational Institution of repute or any Universities in India and abroad.
- This is possible only with the List of Research Organizations, Educational Institutions in India and abroad approved by Sathyabama Institute of Science and Technology.
- A student should have got a minimum of 6 CGPA without any arrears at the time of applying and at the time of undergoing such courses outside, to avail this facility.
- The student can have the option of spending not more than three to Six months in the Final year or Pre-final year of his/her Degree. During this period, the student can do his/her Project work or register for courses which will be approved by the

Centre for Academic Partnerships (CAP), under the Guidance of a Project Supervisor who is employed in the Organization and Co-guided by a staff member from our institution.

- Applications for the above should be submitted by the students to the Centre for Academic Partnerships (CAP), in the required format, with complete details of institution, Courses and Equivalence Details and approved by the Dean.
- The Centre will go through the applications and select the students based on their Academic Performance and enthusiasm to undergo such courses. This will be communicated to the Universities Concerned by the Centre.
- The performance of the student in the courses, registered in that Institute or University will be communicated officially to Centre for Academic Partnerships(CAP).
- The students who undergo training outside the institution (either in India or Abroad) is expected to abide by all Rules and Regulations to be followed as per Indian and the respective Country Laws, and also should take care of Financial, Travel and Accommodation expenses.

**24. DISCIPLINE**

- Every student is required to observe disciplined and decorous behavior both inside and outside the institution and not to indulge in any activity which will tend to bring down the prestige of the institution. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he/she shall be liable for punitive action as prescribed by the institution from time to time.

**25. REVISION OF REGULATIONS AND CURRICULUM**

- The institution may from time to time revise, amend or change the regulations, scheme of examinations and syllabi if found necessary.

**PROGRAMME: B.Sc.,  
GENERAL CHEMISTRY  
CURRICULUM**

<b>SEMESTER 1</b>										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	STA1101	Tamil - I	3	0	0	3	50	50	12
2	Theory	SFR 1101	French - I	3	0	0	3	50	50	14
3	Theory	SHN 1101	Hindi - I	3	0	0	3	50	50	15
4	Theory	SHSA 1104	General English-I	3	0	0	3	50	50	17
6	Theory	SCYA 1103	General Chemistry-I	3	1	0	3	50	50	18
7	Theory	SMTA 1110	Ancillary Mathematics-I	3	1	0	3	50	50	19
9	Theory	SBTA 1101	Environmental Science	3	0	0	3	50	50	20
10	Practical	SCYA 2102	Volumetric Analysis Lab	0	0	3	2	50	50	21
11	Practical	SCYA 2103	Preparatory Inorganic Chemistry Lab	0	0	3	2	50	50	22
<b>Total Credits for Semester: 19</b>										
<b>Total Marks for Semester: 700</b>										

<b>SEMESTER 2</b>										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	STA 1102	Tamil – II	3	0	0	3	50	50	23
2	Theory	SFR 1102	French - II	3	0	0	3	50	50	25
3	Theory	SHN 1102	Hindi - II	3	0	0	3	50	50	26
4	Theory	SHSA 1204	General English –II	3	0	0	3	50	50	27
5	Theory	SCYA 1201	General Chemistry-II	3	1	0	3	50	50	28
6	Theory	SMTA 1209	Ancillary Mathematics-II	3	1	0	3	50	50	29
7	Theory	SBS 1104	Basic Computing	3	1	0	3	50	50	30
8	Practical	SBS 4104	Basic Computing Lab	0	0	3	2	50	50	31
9	Practical	SCYA 2201	Gravimetric Analysis and Organic Preparations Lab	0	0	3	2	50	50	34
<b>Total Credits for Semester: 19</b>										
<b>Total Marks for Semester:700</b>										

SEMESTER 3										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCYA 1301	General Chemistry-III	3	1	0	3	50	50	35
2	Theory	-	Elective - 1	3	1	0	3	50	50	
3	Theory	-	Elective - 2	3	1	0	3	50	50	
4	Theory	SPHA 1314	Ancillary Physics-I	3	1	0	3	50	50	36
5	Theory	SBTA1002	Basic Biochemistry	3	1	0	3	50	50	38
6	Practical	SBTA 4101	Biochemistry Lab	0	0	3	2	50	50	39
7	Practical	SPHA 2314	Ancillary Physics Lab – I	0	0	3	2	50	50	40
8	Practical	SCYA 2301	Physical Chemistry Lab	0	0	3	2	50	50	41
<b>Total Credits for Semester: 21</b>										
<b>Total Marks for Semester:800</b>										

SEMESTER 4										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCYA 1401	General Chemistry-IV	3	1	0	3	50	50	42
2	Theory	-	Elective – 3	3	1	0	3	50	50	
3	Theory	SBIA1403	Cheminformatics	3	1	0	3	50	50	43
4	Theory	SPHA 1415	Ancillary Physics-II	3	1	0	3	50	50	44
5	Theory	-	Elective – 4	3	1	0	3	50	50	
6	Practical	SCYA 2401	Organic Qualitative Analysis	0	0	3	2	50	50	45
7	Practical	SPHA 2415	Ancillary Physics Lab - II	0	0	3	2	50	50	46
8	Practical	SBIA 2402	Computational Chemistry Lab	0	0	3	2	50	50	47
<b>Total Credits for Semester: 21</b>										
<b>Total Marks for Semester: 800</b>										

SEMESTER 5										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCYA 1501	Inorganic Chemistry-I	3	1	0	3	50	50	48
2	Theory	SCYA 1502	Organic Chemistry-I	3	1	0	3	50	50	49
3	Theory	SCYA 1503	Physical Chemistry-I	3	1	0	3	50	50	50
4	Theory	SCH 1314	Processes and Separation In Chemical Industry	3	1	0	3	50	50	51
5	Theory	-	Elective – 5	3	1	0	3	50	50	
6	Practical	SCYA 2501	Industrial Chemistry Lab	0	0	3	2	50	50	52
7	Practical	SCH 4061	Chemical Process and Separation Lab	0	0	3	2	50	50	53
8	-	S03APT	Professional Training	0	0	0	3	-	100	
<b>Total Credits for Semester: 22</b>										
<b>Total Marks for Semester: 800</b>										

SEMESTER 6										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCYA 1601	Inorganic Chemistry-II	3	1	0	3	50	50	54
2	Theory	SCYA 1602	Organic Chemistry-II	3	1	0	3	50	50	55
3	Theory	SCYA 1603	Physical Chemistry-II	3	1	0	3	50	50	56
4	Theory	-	Elective – 6	3	1	0	3	50	50	
5	Practical	SCYA 2601	Inorganic Qualitative Analysis	0	0	3	2	50	50	57
6		S03APROJ	Project Work	0	0	0	4	-	100	58
<b>Total Credits for Semester: 18</b>										
<b>Total Marks for Semester: 600</b>										

LIST OF ELECTIVES										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCYA 3001	Analytical Chemistry	3	1	0	3	50	50	59
2	Theory	SCYA 3002	Fundamentals of Spectroscopy	3	1	0	3	50	50	60
3	Theory	SCYA 3003	Food Chemistry	3	1	0	3	50	50	61
4	Theory	SCYA 3004	Chemistry of Pharmaceutical, Pesticides and Cosmetics	3	1	0	3	50	50	62
5	Theory	SCYA 3005	Chemistry of Natural Products	3	1	0	3	50	50	63
6	Theory	SCYA 3006	Polymer Chemistry	3	1	0	3	50	50	64
7	Theory	SCYA 3007	Agricultural Chemistry	3	1	0	3	50	50	65
8	Theory	SCYA 3008	Materials Chemistry	3	1	0	3	50	50	66
9	Theory	SCYA 3009	Industrial Chemistry	3	1	0	3	50	50	67
10	Theory	SCYA 3010	Synthetic Organic Chemistry	3	1	0	3	50	50	68

List of Allied Papers Ancillary for B.Sc., Mathematics, Bio, Physics Department students										
Sl. No.	Course Type	Course Code	Course Title	L	T	P	C	Marks		Page No.
								CAE	ESE	
1	Theory	SCYA 1302	Ancillary Chemistry - I	3	1	0	3	50	50	69
2	Theory	SCYA 1402	Ancillary Chemistry - II	3	1	0	3	50	50	70
3	Theory	SCYA 2302	Ancillary Chemistry Lab - I	0	0	3	2	50	50	71
4	Theory	SCYA 2402	Ancillary Chemistry Lab - II	0	0	3	2	50	50	72

Semester	Theory courses (including elective courses)			Practical Courses (including PT and project)		
	Total No.	Total Credits	Total Marks	Total No.	Total Credits	Total Marks
1	5	15	500	2	4	200
2	5	15	500	2	4	200
3	5	15	500	3	6	300
4	5	15	500	3	6	300
5	5	15	500	2L+1PT	7	300
6	4	12	400	1L+1PROJ	6	200
<b>Overall Total</b>	29	87	2900	13L+1PT+1PROJ	33	1500

Overall total credits for B.Sc. CHEMISTRY Programme	120
Overall total marks for B.Sc. CHEMISTRY Programme	4200

STA 1101	தமிழ் - முதல் தாள்	L	T	P	Credits
		3	0	0	3

**நோக்கம்**

மாணவர்களுக்குத் தமிழ் இலக்கியப் பரப்பை எடுத்துரைத்து சிற்றிலக்கியம், உரைநடை, புதினம், சிறுகதை, புதுக்கவிதை ஆகிய இலக்கிய வகைமைகளை அறிமுகப்படுத்துதல்.

**பயன்**

- நெடிய தமிழ் இலக்கிய வரலாற்றில் சிற்றிலக்கியம், உரைநடை, புதினம், சிறுகதை, புதுக்கவிதை ஆகிய இலக்கிய வகைமைகளை அறிதல்.
- பல்வேறு இலக்கிய ஆளுமைகளையும் அவர்தம் படைப்பு, மொழிநடை, மொழிப்பற்று ஆகியவற்றை உணர்ந்துகொள்ளுதல்.
- நவீன சிந்தனைகளோடு மாணவர்தம் கருத்தாக்கங்கள் உருப்பெறல்.
- படைப்பாக்க உத்திகளையும் திறன்களையும் அறிதல்.
- மாணவர்கள் இலக்கிய படைப்புகளை உருவாக்க அறிந்து கொள்ளுதல்.

**அலகு - ஒன்று: தமிழ் இலக்கிய வரலாறு**

1. சிற்றிலக்கியம் - தோற்றமும் வளர்ச்சியும்
2. உரைநடை - தோற்றமும் வளர்ச்சியும்
3. புதினம் - தோற்றமும் வளர்ச்சியும்
4. சிறுகதை - தோற்றமும் வளர்ச்சியும்
5. புதுக்கவிதை - தோற்றமும் வளர்ச்சியும்

**அலகு - இரண்டு: சிற்றிலக்கியம்**

1. கலிங்கத்துப்பரணி - போர்பாடியது : 404 --- 408 பாடல்கள்
2. குற்றாலக்குறவஞ்சி - மலைவளம்
  - i. வானரங்கள் கனிகொடுத்து ... எனத் தொடங்கும் பாடல்
  - ii. முழங்கு திரைப்புனருவி கழங்கென முத்தாடும் ... எனத் தொடங்கும் பாடல்

**அலகு - மூன்று: புதுக்கவிதைகள்**

1. பாரதியார்
 

நெஞ்சு பொறுக்கு திலையே ... என்று தொடங்கும் கவிதை.
2. பாரதிதாசன்
 

உலக ஒற்றுமை - தன்பெண்டு தன்பிள்ளை ... என்று தொடங்கும் கவிதை.
3. நா.காமராசன் - கருப்புமலர்கள்
 

காகிதப்பூக்கள் - கால மழைத் தூறலிலே... என்று தொடங்கும் கவிதை
4. இன்குலாப் - மரங்களின் சுற்றம்
5. பாரதிபுத்திரன் - மாறிக்கால இரவுகள்
 

சிவகாசிச்சிகக்கள் - மகனே அன்றொருநாள்... என்று தொடங்கும் கவிதை

**அலகு - நான்கு: சிறுகதை மற்றும் புதினம்**

1. புதுமைப்பித்தன் சிறுகதைகள்
 

சாபவிமோசனம்  
கடவுளும் கந்தசாமிப்பிள்ளையும்  
அன்று இரவு  
வாடாமல்லி  
ஒருநாள் கழிந்தது
2. புதினம்
 

வாடிவாசல் - சி.சு. செல்லப்பா

**அலகு - ஐந்து: உரைநடைப்பகுதி**

பண்டைத் தமிழர் வாழ்வும் வழிபாடும் - கலாநிதி க. கைலாசபதி

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**பார்வை நூல்கள்**

1. புதுக்கவிதை தோற்றமும் வளர்ச்சியும் - வல்லிக்கண்ணன்
2. தமிழில் சிறுகதை வரலாறும் வளர்ச்சியும் - சிட்டி, சிவபாதசுந்தரம்
3. தமிழ் நாவல் (புதினம்) தோற்றமும் வளர்ச்சியும் - சிட்டி, சிவபாதசுந்தரம்,
4. தமிழ் உரைநடை வரலாறு - வி.செல்வநாயகம்
5. நூற்றாண்டு தமிழ் உரைநடை - சு.சக்திவேல்
6. கலிங்கத்துப்பரணி - புலியூர்க் கேசிகன் உரை
7. குற்றாலக்குறவஞ்சி - புலியூர்க் கேசிகன் உரை
8. பாரதியார் கவிதைகள்
9. பாரதிதாசன் கவிதைகள்
10. மரங்களின் சுற்றம் - இன்குலாப்
11. கருப்புமலர்கள் - நா.காமராசன்
12. மாறிக்கால இரவுகள் - பாரதிபுத்திரன்
13. புதுமைப்பித்தன் சிறுகதைகள்
14. வாடிவாசல் - சி.சு. செல்லப்பா
15. பண்டைத்தமிழர் வாழ்வும் வழிபாடும் - கலாநிதி க. கைலாசபதி

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மொத்த மதிப்பெண்கள்: 100

காலம் : 3 மணிநேரம்.

பகுதி அ: 10 வினாக்களுக்குத் தலா 2 மதிப்பெண்கள் - 20 மதிப்பெண்கள்

பகுதி ஆ: 7 வினாக்களில் 5 வினாக்களுக்குத் தலா 7 மதிப்பெண்கள் - 35 மதிப்பெண்கள்

பகுதி இ: 3 வினாக்களுக்குத் தலா 15 மதிப்பெண்கள் - 45 மதிப்பெண்கள்

SFR 1101	FRENCH- I	L	T	P	Credit	Total Marks
		3	0	0	3	100

**COURSE OBJECTIVES:**

- To get a good exposure to the basics of French.
- The learner will be able to make simple sentences in French as well as articulate using the various parts of speech.
- Be able to effectively understand and use French grammar and the pronunciation.

UNIT 1: Decouvrir le langue francaise – Discover the French Language. (8 Hrs)

UNIT 2: Faire Connaissance – Getting to know people and learning to converse. (8 Hrs)

UNIT 3: Organsizer son temps – Articulation of how we are organising our time. (8 Hrs)

UNIT 4: Découvrir son environnement – Communication with respect to discovering and explaining one's environment. (8Hrs)

UNIT 5: S'informer, se faire plaisir.–Learning and understanding the language with practical usage (8 Hrs)

**COURSE OUTCOME:**

**Students will be able to**

**CO1:** To get a good exposure to the basics of French.

**CO2:** The learner will be able to make simple sentences in French as well as articulate using the various parts of speech.

**CO3:** Understand and use simple words in expressing ideas.

**CO4:** Be able to effectively understand and use French grammar and the pronunciation.

**CO5:** Getting to know people and learning to converse.

**CO6:** Découvrir son environnement – Communication with respect to discovering and explaining one's environment.

**TEXT / REFERENCE BOOKS**

**1. Methode de Francais. Author Jacky Girardet & Jacques Pecheur.**

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks:100**

**Exam Duration: 3 Hrs.**

**PART A:** 6 Questions to be answered out of 8 questions and each question carries 5 Marks **30 Marks**

**PART B:** 4 questions to be answered out of 8 questions and each question carries 10 Marks **40 Marks**

**PART C:** 2 questions/Problems to be answered out of 4 questions each carries 15 marks **30 Marks**

SHN 1101	HINDI - I	L	T	P	Credits	Total Marks
	Common to B.Sc., (CSE, Chemistry & Physics)	3	0	0	3	100

**COURSE OBJECTIVES:**

- To get a good to the functional language – Hindi
- The learner will be able to make simple sentence in Hindi as well as articulate using various parts of parts of speech.
- Be able to effectively understand and use Hindi grammar and the pronunciations.

**Introduction to spoken Hindi – कथितहिन्दीपरिचय**

Numbers	–	संख्या
Name of the week days	–	सप्ताहकेदिनोंकानाम
Name of the months	–	महीनोंकानाम
<b>Tense</b> —काल		
Simple present	–	सामान्यवर्तमानकाल
Simple past	–	सामान्यभूतकाल
Simple future	–	सामान्यभविष्यतकाल
Present Continuous	–	तात्कालिकवर्तमानकाल
Past continuous	–	अपूर्णभूतकाल
Future Continuous	–	संभाव्यभविष्यतकाल
Present perfect	–	पूर्णवर्तमानकाल
Past Perfect	–	पूर्णभूतकाल

**Parts of Speech –शब्दभेद**

Noun	-	संज्ञा
Pronoun	–	सर्वनाम
Adjective	–	विशेषण
Adverb	–	क्रियाविशेषण
Preposition	–	संबन्धसूचक
Conjunction	–	समुच्चयबोधक
Interjection	–	विस्मयादिबोधक

**Gender – लिंग**

Masculine	–	पुलिंग
Feminine	-	स्त्रीलिंग

**Number – वचन**

Singular	–	एकवचन
Plural	-	बहुवचन

**Sentence Type- वाक्यविचार**

Nominative	–	नियुक्तवाक्य
Imperative	–	आज्ञार्थकवाक्य
Negative	–	निषेधार्थकवाक्य
Interrogative	–	प्रश्नार्थकवाक्य

**Question type- प्रश्नप्रकार**

Open type - close type	-	ओपनटाइप – क्लोजटाइप
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**Introduction to Hindi letters – हिंदीअक्षरोंकापरिचय**

Hindi words/Sentences	–	हिन्दीशब्दों / वाक्यों
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**Verb - क्रिया**

Transitive verb	–	सकर्मकक्रिया
Intransitive verb	–	अकर्मकक्रिया

**Voice - वाच्य**

Active voice	–	कर्त् वाच्य
Passive voice	–	कर्मवाच्य
Developing script in Hindi	–	हिंदीमेंस्क्रिप्टकाविकास
Dialogue writing in Hindi	–	हिंदीमेंसंवादलेखन
Voice Modulation	-	वाँट्समॉड्यूलेशन
DBHS Parichaya	-	DBHS परिचय
DBHS Anuvadabyas	-	DBHS अनुवादअभ्यास

**Course outcome**

Students will be able to

**CO1:**To get a good exposure to the functional language – Hindi

**CO2:** The learner will be able to make simple sentence in Hindi as well as articulate using the various parts of speech

**CO3:** Understand and use simple words in expressing ideas.

**CO4 :** Be able to effectively understand and use Hindi grammar and the pronunciation

**CO5:** Getting to know people and learning to converse.

**CO6:** Communication with respect to discovering and explaining one's environment.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks : 100**

**PART A :** 10 questions of 2 marks each - No choice

**PART B :** 2 questions from each unit of internal choice; each carrying 16 marks

<b>SHSA 1104</b>	<b>GENERAL ENGLISH I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- To provide opportunities for students to read and respond to representations of current issues
- To prepare the students to effectively communicate by applying reflective thinking practices
- To provide an opportunity to the students to improve their vocabulary
- To build on vocabulary and improve writing skills

**UNIT 1**

**9 Hrs**

Listening for specific information- Self Introduction- Fill in the gaps - Developing dialogue between characters- Talking about neighbours, family members, likes and dislikes Reading Comprehension strategies- Parts of Speech- Kinds of Sentences- Tenses and its Types- Voice- Impersonal Passive.

**UNIT 2**

**9 Hrs**

Sentence structure ,Parts and types of sentences-Voice – Rules of Passive voice formation-Types of words- homonyms, homophones Listening for inference - Discourse Markers- Word Association-Transcoding - Encoding and Decoding- Paragraph Writing- Bar chart, Pie Chart- Tabular Column

**UNIT 3**

**9 Hrs**

Listening to telephonic talk to fill blanks- Giving information- travel, hotel booking, making enquiries about availability of seats for admission, asking about courses Essay Writing - Note Making - Preparing checklists-WH questions - Question Tags - Types of sentences- simple, compound, complex

**UNIT 4**

**9 Hrs**

Reported speech- Phrasal verbs and idioms-Email Writing :to reschedule interview-to congratulate - Reading and identifying the topic sentence, - Recommendations and Instructions - Letter to the editor- Preparing user manual - Editing - Punctuation- Idioms & Phrases- Collocations

**UNIT 5**

**9 Hrs**

Listening to Movie reviews and book reviews - Types of words- homonyms, homophones, eponyms, acronyms Listening and summarizing- Giving impromptu talks- Reading and Summarizing- E-mail writing-Letter inviting dignitaries- Accepting/declining- Rearranging the Jumbled sentences- Reported Speech

**Total. 45 Hrs**

**COURSE OUTCOMES**

On the completion of the course, the student will be able to

CO1: Remember knowledge of linking words related to both spoken and written discourse

CO2: Understand collocations, words to express one's point of view in both writing and speaking

CO3: Apply the rules for writing compare and contrast paragraphs by using cohesive devices based on prompts given

CO4: Analyze critical thinking skills by framing questions related to elements of reasoning

CO5: Evaluate written pieces to self-correct in the topic areas of verbs, reported speech, and punctuation

CO6: Equip the students with the required Professional Skills

**TEXT / REFERENCE BOOKS**

1.Sen S, Mahendra etal. ( 2015) Communication and Language Skills. Foundation books. Chennai

**REFERENCE BOOKS**

1.English Grammar Reference Book, ASIN : B017OIP3PM, Publisher : Farlex (5 November 2015)

2. Cambridge guide to literature in English by Ian Ousby ISBN: 052126751X (2008)

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks : 100**

**Exam Duration : 3 Hrs.**

**PART A** : 10 questions of 2 marks each - No choice

**20 Marks**

**PART B** : 2 questions from each unit of internal choice; each carrying 16 marks

**80 Marks**

SCYA 1103	GENERAL CHEMISTRY-I	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To understand the basic concepts of atomic structure and Quantum mechanics.
- To study the basic concepts of ionic bonding.
- To provide knowledge in covalent bonding for formation of MO theory.
- To understand the nomenclature of organic molecules.
- To study the postulates of gas laws and its applications

**UNIT 1 ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS****9 Hrs**

Rutherford's and Bohr's model an atom- Bohr's theory and origin of hydrogen spectrum-Electromagnetic radiation- definitions for  $\lambda$ ,  $\nu$  and velocity-Dualism of light -Particle nature of radiation- black body radiation and Planck's quantum theory, photoelectric effect and Compton effect of matter- De Broglie hypothesis and Davisson and Germer experiment. Heisenberg's uncertainty principle. Schrodinger wave equation (Derivation not needed). Physical significance of  $\Psi$  and  $\Psi^2$ .

**UNIT 2 IONIC BOND****9 Hrs.**

General characteristic of ionic bonding, Energy considerations in ionic bonding, Lattice energy and Solvation energy and their importance in the context of stability and solubility of ionic compounds.Statement of Born-Landé equation for calculation of Lattice energy, Born – Haber cycle and its applications, polarizing power and polarisability.Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

**UNIT 3 COVALENT BOND****9 Hrs.**

Valence Bond theory-arrangement of electrons in molecules, Hybridization and geometry. VSEPR model-  $\text{BeF}_2$ ,  $\text{BF}_3$ ,  $\text{PF}_5$ ,  $\text{SF}_6$ ,  $\text{IF}_7$ ,  $\text{H}_2\text{O}$ ,  $\text{NH}_3$ ,  $\text{IF}_5$ ,  $\text{XeF}_2$ ,  $\text{XeF}_4$ ,  $\text{XeF}_6$  and  $\text{XeOF}_4$ .Effect of bonding and nonbonding electrons on the structure of molecules.MO theory: LCAO method-criteria of orbital overlap, types of molecular orbitals, qualitative MO energy level diagram of homo and hetero diatomic molecules, and their magnetic properties, bond length, bond energy, bond order and stability of molecules.

**UNIT 4 CLASSIFICATION AND PROPERTIES OF ORGANIC COMPOUNDS****9 Hrs.**

IUPAC Nomenclature (Monofunctional and polyfunctional) –Shapes of simple molecules - Bond energy, bond length and bond angle - Bond polarity – dipole moment –Bond dissociation energy - Isomerism – Structural and Stereoisomerism – types of isomerism with suitable examples - Concept of hybridization - Structure of organic molecules based on  $sp^3$ ,  $sp^2$  and  $sp$  hybridization – Energy requirements of a reaction – Activation Energy – Transition state – Intermediate – Effect of catalyst on energy of activation.

**UNIT 5 KINETIC THEORY AND GASEOUS STATE****9 Hrs**

Postulates of kinetic theory of gases-derivation of gas laws from the kinetic gas equation. Kinetic energy and temperature-Degrees of freedom of a molecule-Principle of equipartition of energy: Average translational kinetic energy and its calculation-Maxwell's distribution of molecular velocities (no derivation)-mean, root mean square and most probable velocity-Collision diameter, collision number, collision frequency, mean free path. Transport properties: viscosity, thermal conductivity, diffusion.

**Max. 45 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Apply the laws of radiation and principles of quantum mechanics to the particle matter  
 CO2: Assess the stability of ionic bonding in molecules  
 CO3: Examine the hybridization and geometry of chemical bonding in molecules  
 CO4: Apply the concept of bond energies to the structure and formation of organic compounds  
 CO5: Analyze the postulates of kinetic theory of gases for the determination of kinetic energy and molecular velocities  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

- R. K. Prasad, Quantum Chemistry, New Age International Publishers, Revised th<sup>d</sup> Edition, 2020.
- Selected topics in inorganic chemistry, [R D Madan](#), [G D Tuli](#) & [Wahid U Malik](#), S.Chand publication, 1976.
- R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th ed., Prentice-Hall of India Limited, New Delhi, 1992.
- Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
- S. H. Pine, Organic Chemistry, 5th ed., McGraw Hill International Edition, Chemistry Series, New York, 1987.
- B. R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Shoban Lal Nagin Chandand Co. 23<sup>rd</sup> edition, 1993.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 marks each-No choice**20 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 16 marks**80 Marks**

SMTA1110	ANCILLARY MATHEMATICS-I (FOR BASIC SCIENCES)	L	T	P	Credit	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVE**

The ability to identify, reflect upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

**UNIT 1 MATRICES****9 HRS**

Characteristic Equation of a square matrix- Eigen values, Eigen vectors of a real matrix, Properties of Eigen values and Eigen vectors. Cayley Hamilton Theorem (without proof) Verification-Finding inverse and power of a matrix.

**UNIT 2 DIFFERENTIATION AND ITS APPLICATIONS****9 HRS**

Differentiation of all standard functions (without proof): Product rule, quotient rule, function of a function rule, logarithmic differentiation, differentiation of implicit function. Applications of differentiation: Slope, tangent, normal to a curve, angle between curves (Cartesian coordinates), maxima, minima of a curve.

**UNIT 3I INTEGRATION****9 Hrs**

Methods of Integration-Integration by parts-Bernoulli's formula-Definite Integrals- Properties of Definite Integrals-Simple problems.

**UNIT 4 ORDINARY DIFFERENTIAL EQUATIONS****9 Hrs**

Solving higher order linear differential equations with constant coefficients: Particular integral for  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ ,  $x^n$ ,  $x^n e^{ax}$ ,  $e^{ax} \sin bx$ ,  $e^{ax} \cos bx$  -Method of variation of parameters.

**UNIT 5 PROBABILITY AND DISTRIBUTIONS****9 HRS**

Probability-Bayes'theorem(without proof)-problems-Random Variable-discrete-Continuous, Expectation-Binomial, Poisson, Normal distributions(without derivation)-Simple problems.

**TEXT / REFERENCE BOOKS**

1. T.K.Manickavachagam Pillai, Matrices, S.Viswanathan Printers & Publishers, 2012.
2. Dipak Chatterjee, Integral Calculus and differential equations, TATA Mc Graw Hill Publishing Company Ltd., 2000.
3. Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. I, S. Viswanathan Printers Pvt. Limited, 2007.
4. P. R. Vittal, Mathematical Statistics, Margham Publications, Chennai, 2002.

**Course Outcomes: At the end of the course, the student will be able to:**

CO1: Identify using Cayley Hamilton theorem, the power and the inverse of the matrix.

CO2: Understand the concept of slope, tangent, normal to a curve and derivatives to find maxima and minima of a curve.

CO3: Uses of properties of definite integrals. Solve problems involving the various methods of integration

CO4: Point out the complementary function and particular integral of ODE.

CO5: Produce the problems using Baye's theorem.

CO6: Evaluate the problems based on Binomial, Poisson and Normal distributions.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration: 3 Hrs.****PART A** : 10 questions of 2 Marks each – No choice**20 Marks****PART B** : 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SBTA 1101	ENVIRONMENTAL SCIENCE	L	T	P	CREDITS	TOTAL MARKS
		3	0	0	3	100

**COURSE OBJECTIVE**

- To impart knowledge on the issues related to environment and to emphasize the importance of a clean environment

**UNIT 1 Multidisciplinary nature of environmental studies and Natural resources****10 Hrs.**

Definition, scope and importance- Need for public awareness. Natural Resources : Renewable and non-renewable resources : Natural resources and associated problems. Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

**UNIT 2 Ecosystems, Biodiversity and its conservation****10 Hrs.**

Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem :- Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: Definition- genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels. India as a mega- diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

**UNIT 3 Environmental Pollution****9 Hrs.**

Definition -Cause, effects and control measures of :- Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster management : floods, earthquake, cyclone and landslides.

**UNIT 4 Social Issues and the Environment****8 Hrs.**

Idea of Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case Studies. Environmental ethics : Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

**UNIT 5 Human population and the environment****8Hrs.**

Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health. Case Studies.

Visit to a local area to document environmental assets-river/forest/grassland/hill/mountain

- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc.

**Course outcomes:**

- CO1: Recognize the need of conservation of natural resources for the future generations.  
 CO2: Differentiate the uniqueness of each and every ecosystem and biodiversity.  
 CO3: Identify the environmental pollution and to control them in a sustainable way.  
 CO4: Execute the possible solutions to manage the natural and manmade disasters for the sustainable living.  
 CO5: Distinguish the reasons for over population and give awareness to people through media to control population growth.  
 CO6: Solve the environment related problems by conserving the natural resources for the future generations.

**Max. 45 Hrs.****TEXT / REFERENCE BOOKS**

1. Erach Bharucha, Text Book of Environmental Studies, 2nd Edition, University Press, Chennai, 2006
2. Meenakshi. P, Elements of Environmental Science and Engineering, 1st Edition, Prentice Hall of India, New Delhi, 2009.
3. Ravikrishnan. A, Environmental Science & Engineering, 3rd Edition, Sri Krishna Publications, Chennai, 2008.
4. Wrigh. R. T & Nebel B.J, Environmental science-towards a sustainable future by Richard 8<sup>th</sup> edition, Prentice Hall of India, NewDelhi, 2006

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 marks each-No choice**20 Marks****PART B:** 2 Questions from each unit with internal choice, each carrying 16 marks**80 Marks**

SCYA 2102	VOLUMETRIC ANALYSIS LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To bridge the conceptual ideas with practical experiments.
- To promote analytical skills in volumetric analysis.

**VOLUMETRIC ANALYSIS:**

1. Laboratory safety and Hygiene
2. Preparations of Reagents and Standard Solutions
3. Calibration of volumetric apparatus: Burette, pipette and standard flasks.
4. Determination of Mean, Standard Deviation, Co-efficient of Variations of given sample.
5. Acid – base titrations:
  - a. Estimation of HCl.
  - b. Estimation of oxalic acid.
6. Redox titrations:
  - a. Estimation of Ferrous ammonium sulphates (Permanganometry).
  - b. Estimation of  $\text{KMnO}_4$  (Iodometry).
  - c. Estimation of Copper (Iodometry).
7. Complexometric titration:
  - a. Estimation of Calcium using EDTA.
  - b. Estimation of Magnesium using EDTA

**COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1: Apply safety protocols in chemistry laboratory

CO 2: Interpret the statistical parameters in quantitative analysis

CO3: Quantitative skills in volumetric analysis..

**TEXT / REFERENCE BOOKS**

- 1). S. Sundaram and K. Raghavan, Practical Chemistry, S. Viswanathan Co. Pvt., 1996.
- 2). N. S. Ganapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S.Viswanathan Co. Pvt., 2002.
3. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry.5th ed., Pearson Education, 2005.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 50**

**Exam Duration: 2 Hrs.**

CAE	Evaluation of Regular Lab class	<b>15 Marks</b>	<b>25 Marks</b>
	Model practical exam	<b>10 Marks</b>	
ESE	End Semester Practical exam		<b>25 Marks</b>

SCYA 2103	PREPARATORY INORGANIC CHEMISTRY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- > To bridge the conceptual ideas with practical experiments.
- > To introduce the preparative skills involved in the synthesis of inorganic complexes.

**INORGANIC PREPARATIONS**

- a. Preparation of ferrous ammonium sulphate and record the percentage of yield.
- b. Preparation of tetraammine copper(II) sulphate and record the absorption maxima( $\lambda_{\max}$ ) of this complex
- c. Preparation of potassium trioxalatoaluminate and record the percentage of yield.
- d. Preparation of potassium trioxalatochromate and record the percentage of yield.
- e. Preparation of Reinecke's Salt,  $[\text{Ni}(\text{en})_3]\text{Cl}_2$  and record the absorption maxima( $\lambda_{\max}$ ) of this complex
- f. Preparation of trithiourea copper(I)sulphate dehydrate and record the absorption maxima( $\lambda_{\max}$ ) of this complex
- g. Studies on composition of complexes in following systems(any two) by Job's and Mole ratio methods
  - (a) Cu(II)-ethylene diamine
  - (b) Fe(III)- sulphosalysilic acid
  - (c) Fe-1,10 phenanthroline compounds

**COURSE OUTCOMES**

On successful completion of the course,

CO1: Outline the techniques in preparatory inorganic chemistry

CO2: Assess the absorption maxima of the given sample

CO3: Validate the composition of the inorganic complexes.

**TEXT / REFERENCE BOOKS**

- 1). S. Sundaram and K. Raghavan, Practical Chemistry, S. Viswanathan Co. Pvt., 1996.
- 2). N. S. Ganapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S.Viswanathan Co. Pvt., 2002.
3. B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry.5th ed., Pearson Education, 2005.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 50**

**Exam Duration: 2 Hrs.**

CAE	Evaluation of Regular Lab class	<b>15 Marks</b>	<b>25 Marks</b>
	Model practical exam	<b>10 Marks</b>	
ESE	End Semester Practical exam		<b>25 Marks</b>

STA 1102	தமிழ் – இரண்டாம் தாள்	வி	ப	செ	வரவு	மொத்த மதிப்பெண்கள்
		3	0	0	3	100

அறிவியல் மற்றும் தொழில் நுட்பக் கல்வி நிறுவனம்

**நோக்கம்**

மாணவர்களுக்குத் தமிழின் செவ்விலக்கியங்கள் மற்றும் காப்பியங்களை அறிமுகப்படுத்துதல்.

**பயன்**

- ஈராயிரம் ஆண்டுகளுக்கு முந்தைய தமிழின் செவ்விலக்கியங்களின் சிறப்பினை உணர்தல்.
- பண்டைய காலத் தமிழ் மக்களின் அக மற்றும் புற வாழ்வியலையும் பண்பாட்டையும் அறிதல்.
- தமிழர்தம் அறச்சிந்தனைகளையும் அற வாழ்வியலை அவர்கள் பேணிய முறையினையும் உணர்தல்.
- தமிழர்களுடைய மெய்யியல் தத்துவங்களையும் கடவுள் பற்றிய கோட்பாடுகளையும் உணர்தல்.
- நெடுங்கதைகளாகத் திகழும் காப்பியங்களின் வழி பல பண்பாட்டுச் செய்திகளை அறிதல்.

**அலகு – ஒன்று : தமிழ் இலக்கிய வரலாறு**

1. சங்க இலக்கியங்கள்
2. அற இலக்கியங்கள்
3. பக்தி இலக்கியம்
4. காப்பியங்கள்

**அலகு – இரண்டு : சங்க இலக்கியம்**

1. 'முளி தமிழ் பிசைந்த' என்று தொடங்கும் குறுந்தொகைப் பாடல் (167)
2. 'நின்ற சொல்லர்' என்று தொடங்கும் நற்றிணைப்பாடல் (1)
3. 'மனை நடு வயலை வேழம் சுற்றும்' என்று தொடங்கும் ஐங்குறுநூற்று பாடல் (11)
4. 'எம்வெங்காமம் இயைவது ஆயின்' என்று தொடங்கும் அகநானூற்றுப்பாடல் (15)
5. 'சுடர் தொடடி கேளாய்' என்று தொடங்கும் கலித்தொகைப்பாடல் (51)
6. 'மண்டு அமர் அட்ட' என்று தொடங்கும் புறநானூற்றுப்பாடல் (213)
7. 'நறவுவாய் உறைக்கும் நாகமுதிர்' என்று தொடங்கும் சிறுபாணாற்றுப்படை பாடல் (51 - 67)

**அலகு – மூன்று : அற இலக்கியங்கள்**

1. திருக்குறள் – நட்பாராய்தல், புலவிநுணுக்கம் (2 அதிகாரம்).
2. நாலடியார் – பொருட்பால் – மேன்மக்கள் – (5) பாடல்கள்

**அலகு – நான்கு : பக்தி இலக்கியங்கள்**

**சைவம் – பன்னிருதிருமுறைகள்**

1. திருஞானசம்பந்தர் தேவாரம் – முதலாம் திருமுறை  
'காதல் ஆகி, கசிந்து' என்று தொடங்கும் பாடல்.
2. திருநாவுக்கரசர் தேவாரம் – ஐந்தாம் திருமுறை  
'மாசில் வீணையும் மாலை' என்று தொடங்கும் பாடல்.
3. சுந்தரர் தேவாரம் – ஏழாம் திருமுறை  
'பொன்னார் மேனியனே' என்று தொடங்கும் பாடல்.

**வைணவம் – நாலாயிரத்திவ்யப்பிரபந்தம்**

1. பூதத்தாழ்வார்  
'பெருகு மத வேழம் மாப்பிடிக்கு' என்று தொடங்கும் பாடல்.
2. குலசேகராழ்வார்  
'ஆனாதசெல்வத்து அரம்பையர்கள் தற்கும்' என்று தொடங்கும் பாடல்.

**அலகு – ஐந்து : காப்பிய இலக்கியங்கள்**

1. சிலப்பதிகாரம்  
மங்கல வாழ்த்துப் பாடல் முழுவதும்
2. சீவகசிந்தாமணி  
கோவிந்தையார் இலம்பகம் முழுவதும்
3. கம்பராமாயணம்  
திருவடித் தொழுத படலம் (பாடல் எண் : 25 – 48)

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**பார்வை நூல்கள்**

16. தமிழ் இலக்கிய வரலாறு – மு.வ.
17. தமிழ் இலக்கியவரலாறு – மது. ச. விமலானந்தம்
18. சங்க இலக்கியம் – ஓவை ச. துரைசாமிப் பிள்ளை
19. சங்க இலக்கியம் – புலியூர் கேசிகள்
20. திருக்குறள் – பரிமேலழகர் உரை
21. திருக்குறள் – மு.வ. உரை
22. நாலடியார் – கு. மதுரை முதலியார்
23. சைவத்திருமுறைகள் – வர்த்தமான் பதிப்பகம்
24. நாலாயிர திவ்வியப்பிரபந்தம் – வர்த்தமான் பதிப்பகம்
25. சிலக்கதிகாரம் – ஞா.மாணிக்கவாசகன்
26. சீவகசிந்தாமணி – துரை ராசாராம்
27. கம்பராமாயணம் – கழக வெளியீடு.

\*\*\*பருவத்தேர்வு வினாத்தாள் அமைப்பு

மொத்த மதிப்பெண்கள்: 100

காலம் : 3 மணிநேரம்.

பகுதி அ: 10 வினாக்களுக்குத் தலா 2 மதிப்பெண்கள் - 20 மதிப்பெண்கள்

பகுதி ஆ: 7 வினாக்களில் 5 வினாக்களுக்குத் தலா 7 மதிப்பெண்கள் - 35 மதிப்பெண்கள்

பகுதி இ: 3 வினாக்களுக்குத் தலா 15 மதிப்பெண்கள் - 45 மதிப்பெண்கள்

SFR 1102	FRENCH- II	L	T	P	Credit	Total Marks
		3	0	0	3	100

**COURSE OBJECTIVES:**

- To understand the intermediate concepts of French.
- The learner will be able to make slightly more complex sentences in French as well as articulate using the various parts of speech.
- Be able to effectively understand and use French grammar and the pronunciation.

UNIT1: Découvrir le langue française – Discover the French Language. Intermediate (5 Hrs)

UNIT 2: Faire Connaissance – Getting to know people and learning to converse. - Intermediate (5 Hrs)

UNIT 3: Organiser son temps – Articulation of how we are organising our time – Intermediate (5Hrs)

UNIT 4: Découvrir son environnement – Communication with respect to discovering and explaining one's environment. - Intermediate (5Hrs)

UNIT 5: S'informer, se faire plaisir. – Learning and understanding the language with practical usage (5 Hrs)

**COURSE OUTCOME:****Students will be able to**

**CO1-** To get a good exposure to the intermediate level of French.

**CO2 -** The learner will be able to make simple to slightly complex sentences in French as well as articulate using the various parts of speech.

**CO3-** Understand and use simple to slightly complex words in expressing ideas.

**CO4-** Be able to effectively understand and use French grammar and the pronunciation.

**CO5-** Getting to know people and learning to converse.

**CO6-** Découvrir son environnement – Communication with respect to discovering and explaining one's environment.

**TEXT / REFERENCE BOOKS**

**TEXT BOOK : Campus 1. Methode de Francais. Author Jacky Girardet & Jacques Pecheur. – Part 2**

**END SEMESTER EXAM QUESTION PAPER PATTERN**

Max. marks:100

Exam Duration:3 Hrs.

Part A: 10 question of 2 marks each – No choice

20 marks

Part B: 5 Questions out of 7 questions with 7 marks each

35 marks

Part C : 3 Questions of 15 marks each

45 marks

SHN1102	HINDI - II	L	T	P	Credits	Total Marks
	Common to B.Sc., (CSE, Chemistry & Physics)	3	0	0	3	100

**COURSE OBJECTIVES:**

- To get a good to the functional language – Hindi
- The learner will be able to make simple sentence in Hindi as well as articulate using various parts of parts of speech.
- Be able to effectively understand and use Hindi grammar and the pronunciations

**UNIT - 1**

## Poem

- 1 Pushp ki abilasha
- 2 Ek boond
- 3 E malik tere bande hain hum
- 4 Honge kamiyab, Honge kamiyab

**UNIT – 2**

## Prose

Chalees karode kurte kahan se

Dakshin bharath hindi prachar sabha

Meri kahani apni jubani

Bhagavan budh ka gruh tyag

**UNIT -3**

## Vyakaran

Kal, Ling, Vachan, Vakya vichar,

Sarvanam, Visheshan, Kriya

Kriya visheshan, Shudh lekhan

**UNIT – 4**

## Patra lekhan

**UNIT – 5**

## Niband lekhan

**Course outcomes**

- CO1** – To get a good exposure to the functional language – Hindi  
**CO2** – The learner will be able to make simple sentence in Hindi as well as articulate using the various parts of speech  
**CO3** – Understand and use simple words in expressing ideas.  
**CO4** -Be able to effectively understand and use Hindi grammar and the pronunciation  
**CO5** – Getting to know people and learning to converse.  
**CO6** – Communication with respect to discovering and explaining one’s environment.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****ExamDuration: 3 Hrs.****PART A** : 10 questions of 2 Marks each – No choice**20 Marks****PART B** : 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SHSA 1204	GENERAL ENGLISH- II	L	T	P	CREDIT
		3	0	0	3

**COURSE OBJECTIVES**

- The paper provides opportunities for students to read and respond to representations of current issues through texts that present themes and topics that are familiar, insightful and informative.
- To provide an opportunity to the students to improve their vocabulary
- To develop skills relating to creative writing.

**UNIT 1****9Hrs.**

Listening for details, Speaking - making a presentation, Reading for details and Global Comprehension Vocabulary Binomials Types of Words- Synonyms, Antonyms that describe people, things and their actions-Letter Writing - Informal Letters- Letter to a Friend / Family Members - Creating blogs to post written materials.

**UNIT 2****9Hrs**

Listening for details - Speaking: Giving Interview, Public Speech based on specific topics given. Reading for Comprehension and for overall idea -. Vocabulary: Archaic words, phrases.Letter writing- Formal letters- inviting dignitary for a function, Application for job with resume, complain about local problems to the Collector

**UNIT 3****9Hrs.**

Speaking Telephonic conversation - Vocabulary: positive and negative connotations - Critical Thinking Self-regulation: Continuing improvement in thinking -Language Focus: Adjective- degrees of Comparison, Direct and Indirect Speech - Types of Sentences (simple, compound, complex) -Collocations

**UNIT 4****9Hrs.**

Listening for Overall information - Making requests and suggestions - Speaking: Group Discussion - Vocabulary: Simile, metaphor - Writing: Writing recommendations, stories and poems - Process description: flow chart -sending mails, creating diagrams - Language Focus: Transitive and Intransitive verbs, Wh questions

**UNIT 5****9Hrs.**

Listening for specific details - Speaking using imagination. Reading to identify facts - Writing: Imaginative writing by predicting, .Note Making, Writing a Five-paragraph essay /Book or film review. Vocabulary: Countable forms and meaning, foreign nouns and framing of plurals. - Language focus: Modal verbs, Tenses

**Max. 45 Hours****COURSE OUTCOMES**

On the completion of the course, the student will be able to

- CO1: Remember knowledge of linking words related to both spoken and written discourse  
 CO2: Understand collocations, words to express one's point of view in both writing and speaking  
 CO3: Apply the rules for writing compare and contrast paragraphs by using cohesive devices based on prompts given  
 CO4: Analyze critical thinking skills by framing questions related to elements of reasoning  
 CO5: Evaluate written pieces to self-correct in the topic areas of verbs, reported speech, and punctuation  
 CO6: Equip the students with the required Professional Skills

**TEXT / REFERENCE BOOKS**

1.Sen S, Mahendraetal. ( 2015) Communication and Language Skills. Foundation books. Chennai

**REFERENCES**

- 1.Practical English Usage: Michael Swan (June 2017)ISBN-10 : 0194202461  
 2.Effective English (January 2009) Pearson EducationISBN-10 : 8131731006

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****ExamDuration: 3 Hrs.****PART A** : 10 questions of 2 Marks each – No choice**20 Marks****PART B** : 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SCYA 1201	GENERAL CHEMISTRY-II	L	T	P	Credits
		3	1	0	3

**COURSE OBJECTIVES**

- To understand the properties of liquid state and liquid crystal states.
- To study the structure of atoms and periodic properties of elements
- To understand the structure and reactivity of organic molecules
- To learn various methods of preparation and reactions of hydrocarbons
- To learn the classification of solids and conduction in semiconductors and superconductors.

**UNIT 1 LIQUID STATES****9 Hrs**

Intermolecular forces in liquids- vapour pressure of a liquid- surface tension of a liquid– surface active agents-capillary rise method for determining surface tension-Parachor– viscosity-Poiseuille's equation-molar refractivity-optical exaltation. Liquid Crystals: Types of liquid crystals –Applications of liquid crystals.

**UNIT 2 PERIODIC TABLE AND PERIODIC PROPERTIES****9 Hrs**

.Periodicity-Periodic law and arrangement of elements in the periodic table, IUPAC nomenclature and group number.Horizontal, vertical and diagonal relationships in the periodic table.Properties of atoms- Size of atoms and ions-atomic radii, ionic radii, covalent radii, trend in ionic radii, ionization potential, electron affinity, electronegativity - Simple problems.-Pauling, Mulliken-Jaffe, Allred-Rochow definitions, oxidation states and variable valency, isoelectronic relationship, inert-pair effect. Atomic, molecular and equivalent weights, Avagadro's principle and mass-volume relationship.

**UNIT 3 STRUCTURE AND REACTIVITY OF ORGANIC COMPOUNDS****9 Hrs**

Types of organic reactions - Cleavage of bonds - Homolytic and Heterolytic bond fission -Reactive intermediates - carbocation, carbanion, and free radicals - Structure, shape, stability and reactivity -Carbenes, nitrenes and arynes - Factors affecting stability of the reaction intermediates - Electron displacement effects - Inductive effect, electromeric, mesomeric, resonance, hyperconjugation- Hydrogen bonding - Tautomerism – Keto-enol tautomerism

**UNIT 4 ALKANES AND CYCLOALKANES****9 Hrs**

Structure – Nomenclature – General methods of preparing alkanes - Preparation by Wurtz reaction and Kolbe's method – Physical and Chemical properties – Substitution: Halogenation, nitration, sulphonation, oxidation, pyrolysis, aromatization with mechanism - Cycloalkanes – Nomenclature – Preparation by Wurtz reaction, Dieckmann's ring closure, Clemmensen's reduction - Physical and Chemical Properties - Mechanism of substitution and ring opening reactions – Baeyer's strain theory.

**UNIT 5 SOLID STATES****9 Hrs**

Classification of solids- Isotropic and anisotropic crystals- elements of symmetry basic seven crystal systems- laws of crystallography- representation of planes miller indices, space lattice and unit cell. Semiconductor: Band theory of solids-Intrinsic and Extrinsic semiconductors-n-type and p-type conductors-doping of semiconductors. Superconductors: Definition-characteristics-copper and iron-based superconductors-applications of superconductors.

**Max. 45 Hrs****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Examine the properties of liquid state and liquid crystal for the application in surface active agents and LCD displays  
 CO2:Analyze the periodic properties of elements in periodic table  
 CO3: Assess the relationship between the structure and reactivity of organic molecules  
 CO4: Apply the substitution and ring opening mechanism to the alkane and cycloalkane reactions  
 CO5: Apply the principles of band theory to the conduction mechanism in solids and superconductors  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. R. Gopalan, P. S. Subramanian and K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand, New Delhi, 2007.
2. Selected topics in inorganic chemistry, R D Madan, G D Tuli & Wahid U Malik, S.Chand publication, 1976.
3. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th ed., Prentice-Hall of India Limited, New Delhi, 1992.
4. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
5. S. H. Pine, Organic Chemistry, 5th ed., McGraw Hill International Edition, Chemistry Series, New York, 1987.
6. J. March and M Smith, Advanced Organic Chemistry, 5th ed., John-Wiley and sons, 2001.
7. B. R. Puri and L.R. Sharma, Principles of Physical Chemistry, Shoban Lal Nagin Chandand Co. 23<sup>rd</sup> edition, 1993.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SMTA 1209	ANCILLARY MATHEMATICS – II (FOR BASIC SCIENCES)	L	T	P	Credit	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVE**

The ability to identify reflects upon, evaluate and apply different types of information and knowledge to form independent judgements. Analytical, logical thinking and conclusions based on quantitative information will be the main objective of learning this subject.

**UNIT 1 TRIGONOMETRY****9 Hrs**

DeMoivre's Theorem-Expansion of  $\sin^n\theta, \cos^n\theta, \sin^n\theta, \cos^n\theta, \sin\theta, \cos\theta$ - Hyperbolic functions, Inverse Hyperbolic functions, Relation between Circular and Hyperbolic Functions-Separating into Real and Imaginary parts.

**UNIT 2 PARTIAL DIFFERENTIAL EQUATIONS****9 Hrs**

Formation of PDE by eliminating constants and functions-Solving first order PDE (only Lagrange's linear equation): using grouping and multiplier method-Solution of linear homogeneous PDE of higher order with constant coefficients.

**UNIT 3 NUMERICAL METHODS FOR SOLVING EQUATIONS****9 Hrs**

Solution of algebraic equation and transcendental equation: Regula Falsi Method, Newton Raphson Method- Solution of simultaneous linear algebraic equations: Gauss Elimination Method, Gauss Jacobi & Gauss Seidel Method

**UNIT 4 NUMERICAL INTERPOLATION****9 Hrs**

Difference operators-Relation between the operators-Interpolation: Newton's forward and backward difference interpolation formula (equal interval) - Lagrange's interpolation formula (unequal interval).

**UNIT 5 NUMERICAL DIFFERENTIATION AND INTEGRATION****9 Hrs**

Numerical Differentiation using Newton's forward and backward difference interpolation formula (equal interval) – Numerical Differentiation using Lagrange's interpolation formula (unequal interval)-Numerical Integration: Trapezoidal rule, Simpson's  $1/3^{\text{rd}}$  and  $3/8^{\text{th}}$  rule.

**TOTAL 45 HRS****TEXT / REFERENCE BOOKS**

1. Narayanan. S, Manicavachagom Pillay. T.K, Trigonometry, S.Viswanathan Printers & Publishers 1980.
2. S. Arumugam & Others, Trigonometry, New Gamma Publications, Revised Edition, 1985.
3. Kandasamy P, Thilagavathy. K and G. Gunawathy, Numerical Methods, S.Chand & Sons, 3rd Revised Edition, 2013.
4. Balagurusamy. E, Numerical Methods, Tata Mcgraw Hill Publishing Company, 3rd Edition, 2000.
5. Narayanan, T.K. Manichavasagam Pillai, Calculus, Vol. I, S. Viswanathan Printers Pvt. Limited, 2007.

**Course Outcomes: At the end of the course, the student will be able to:**

CO1: Identify the trigonometric functions and the relation between circular and hyperbolic functions

CO2: Understand the concept of formation of PDE and solving them.

CO3: Use Gauss method to solve system of linear equations.

CO4: Discuss the problems on the Numerical interpolation methods.

CO5: Produce numerical differentiation using Newton's and Lagrange's methods.

CO6: Evaluate the integration problems using Newton's and Simpson's methods.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration: 3 Hrs.****PART A** : 10 questions of 2 Marks each – No choice**20 Marks****PART B** : 2 questions from each unit of internal choice, each carrying 16 Marks**80 Marks**

SBS 1104	BASIC COMPUTING	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES:**

- To familiarize in MS Office applications
- To learn the basic concepts of computer hardware

**UNIT1****9 Hrs.**

Introduction to Computer Hardware – Processors – Assembling a Personal Computer – Hard disk partitioning – Installing Hardware Drivers – Installation of Operating System

**UNIT2****9 Hrs.**

Word Processor – Introduction – Alignments – Formats – Table - Mail Merge – Spell Check – Grammar – Macros

**UNIT3****9 Hrs.**

Spread Sheet – Introduction – Cells – Cell Formats – Auto Fill – Pivot Table – Formulas – Conditional Formatting – Sort – Filter – Data Validation – Charts - Macros

**UNIT4****9 Hrs.**

Presentation – Introduction – Master Slide – Format – Insert Images – Videos – Graphs – OLE – Animation – Hyper Links

**UNIT5****9 Hrs.**

Introduction to Online Tools – Online Forms – Online Storage – Collaboration – Calendar

**Max.45 Hrs.****COURSE OUTCOME**

On the completion of the course, the students will be able to

- CO1: Understand the basic concepts of computer hardware
- CO2: Explain the various styles of word processor
- CO3: Explore the calculation knowledge in spread sheet
- CO4: Design and develop various presentation using PowerPoint
- CO5: Understand and implement various online tools.
- CO6: Explore the significant aspects of online storage.

**TEXT / REFERENCE BOOKS**

1. Peter Weverka, Office 2010 All-in-One For Dummies, 2010
2. N. Saravanan, Computer Fundamentals With Ms Office Applications, 2008
3. <https://www.tutorialspoint.com/word/>
4. <http://www.java2s.com/Tutorial/Microsoft-Office-Word-2007/CatalogMicrosoft-Office-Word-2007.htm>

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN****Max.Marks:100****Exam Duration: 3Hrs.****PART A:** 10 Questions of 2 marks each-No choice**20Marks****PARTB:** 2 Questions from each unit with internal choice, each carrying 16 marks**80Marks**

<b>SBS 4104</b>	<b>Basic Computing Lab</b> <b>(B.Sc., Chemistry, Physics, Maths, English)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>100</b>

## Course Objective

- Equip students with the fundamental knowledge of computer technologies.
- Provide an understanding of the role of computation can play in solving problems.
- Develop the student's understanding of the basic concepts of computer oriented programming and how to test their programs in using an integrated approach.
- Engage learning core concepts through a hands-on practical approach to enable students to apply their skills to different scenarios.

**a. Word Processing**

1. Change the layout of the page as given below.  
Page size: A4 (8.27" x 11.69")  
Page orientation: Landscape
  2. Change the page margins as follows:  
Top: 1.25" Bottom: 1.25"  
Right: 1.25" Left: 1.25"
  3. Create drop cap for first paragraph. Drop it 2 lines down with 'Algerian' font and there should be 0.4" space between dropped character and paragraph.
  4. Present second paragraph in three columns with a line between each column. The first and third columns will be 1" wide and the second column is 4"
  5. Apply gray color background and double line border around third paragraph. Border lines should be of blue color and 1½ thick.
  6. Justify third paragraph and apply 2" indent from left and right.
  7. Enter "History of Computer Technology" as header and enter footnote for the underlined word of third paragraph.
- 8. Create a custom watermark, cross referencing in word, a user entry form**
9. Create a main document for the invitation of a birthday party.

**b. Spreadsheet**

1. Create an Excel Formula for the given string format using String Functions. Input: I Love India

Output: India 5

2. In a Table, we have student's name and their Marks in Science, social & maths subjects. Find the top student in each subject based on their mark (using Excel Formula)

Name	Subject	Marks
Raja	Science	75
Bala	Maths	45
Umar	Social	57
Raja	Maths	87
...		

3. Count the total number of occurrences of "A" in the following table using Excel Formula – (Should be Generic)
4. Create a Formula to count the cells that having values except blank cells
5. Create a Formula to calculate the EB bill with the given tariff 1 – 100 : Ps.75

101–200	: Rs.1.10
201-300	: Rs.2.00
301–500	: Rs.3.00
501 & above	: Rs.5.00

6. Create a formula to calculate the classification of result
  - a. Below 40 : Fail
  - b. 40 – 50 : 3<sup>rd</sup> Class
  - c. 51-60 : 2<sup>nd</sup> Class
  - d. 61–70 : 1<sup>st</sup> class
  - e. Above 70 : Distinction
7. With the given chart,

	A	B	C	D	E
1	Master List				
2	Sales Person ID	Sales Person Name	Sales Person Revenue	Quota	Met Quota?
3	1	John	\$ 232,103.00	\$ 500,000.00	Did Not Meet Quota
4	2	Joe	\$ 835,477.00	\$ 500,000.00	Met Quota
5	3	Jen	\$ 116,371.00	\$ 500,000.00	Did Not Meet Quota
6	4	Frank	\$ 393,841.00	\$ 500,000.00	Did Not Meet Quota
7	5	Mark	\$ 989,303.00	\$ 500,000.00	Met Quota
8	6	Amanda	\$ 641,883.00	\$ 500,000.00	Met Quota
9	7	Erik	\$ 525,894.00	\$ 500,000.00	Met Quota
10	8	Mike	\$ 732,195.00	\$ 500,000.00	Met Quota
11	9	Matt	\$ 513,372.00	\$ 500,000.00	Met Quota
12	10	Josh	\$ 961,561.00	\$ 500,000.00	Met Quota
13	11	Shea	\$ 235,652.00	\$ 500,000.00	Did Not Meet Quota

Find the average of Sales person revenue who are all met the quota and who are all not met.

8. From the giventable,

Forename	Middle Name 1	Middle Name 2	Surname
Raja	Ravi	Chandar	Dilak

Print the **Full name** using excel formula

9. Convert float values into integervalues

10. Findthefactorialofgivenvalue 11.

SESSION_NO	ROUND1	ROUND2	ROUND3	TOTAL/ 300	PERCENTAGE	GRADE
SS1	56	46	65			
SS2	78	56	67			
SS3	98	85	81			
SS4	71	77	68			

Criteria to find GRADE

- PERCENTAGE >= 80 -----  GRADE – A
- PERCENTAGEbetween79and60(bothareinclusive)----- GRADE –B
- PERCENTAGEbetween59and50(bothareinclusive)----- GRADE –C
- Otherwise -----  GRADE –F

- (a) FindoutTOTALandPERCENTAGEofallsessionsusingfunctionorformula.(1)
- (b) FindoutGRADEusingabovespecifiedcriteriaofallsessions.(1)
- (c) UsingSESSION\_NOandPERCENTAGEcreatealinechart.(2) 12.

AAAA College								
Mark Sheet								
ID.No	Name	Physics	Chemistry	Biology	English	Total	Average	Rank
1A001	Lavanya	72	65	57	82			
1A002	Rithika	78	64	54	56			
1A003	Ram	56	63	72	54			
1A004	Ritesh	46	48	64	52			
1A005	Pranesh	48	65	56	65			
1A006	Pavithra	57	53	63	62			
1A007	Sara	65	54	53	51			

- a. Use therelevantformulatocalculatethetotalmarksof“Lavanya”(IDNo.1A001)andcopytheformulatotherelevant cells.
- b. Use therelevantformulatocalculatetheaveragemarksof“Lavanya”(IDNo.1A001)andcopytheformulatotherelevantcells.
- c. Useconditionalformattingtochangethecolorofthecellsofwhichtheaveragemarkismorethan60,intogreen
- d. CreateaPiechartforthestudentmarksinthegiventable

**C. PresentationTool**

1. Add notes to power pointpresentation
2. CreateapowerpointapplicationtoPlayavideo
  - a. Play a video fullscreen
  - b. Hide a video when notplaying
  - c. Loop avideo
3. CreateadynamicpresentationinPowerpoint
  - a. Toaddanimationtotextoranobject
  - b. Applysoundeffectstoanimatedtextandobjects
  - c. Createamotionpathtotextandobjects
4. CreationofPowerPointpresentationabout“**Computergeneration**”.
5. Create maximum 5 slides(1)
6. Use different layouts and backgrounddesign.(1)
7. Add bulleted list with animationeffects.(1)
8. Set different slide transition effects.(1)

**d. Usage of Google tools in education**

Google  
docs  
Google  
Forms  
Google  
Spread  
sheets  
Google  
Blogger

**Course Outcomes**

CO1: Understand the basic commands of Linux and VI editor.

CO2: Identify the hardware components necessary to assemble the CPU and installation of software.

CO3: Relate the networking concepts to configure a network.

CO4: Make use of various controls in Microsoft word to create forms, invitations and documentations

CO5: Experiment with the options in Microsoft Excel and to do various manipulations.

CO6: Create an effective presentation that can include text, image, audio, video, animations.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 2201	GRAVIMETRIC ANALYSIS AND ORGANIC PREPARATIONS LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To understanding the concept of gravimetric analysis
- To learn the chemistry of various organic preparations

**LIST OF EXPERIMENTS**

1. Estimation of Barium as Barium Sulphate.
2. Estimation of Barium as Barium Chromate.
3. Estimation of Lead as Lead Chromate.
4. Estimation of Nickel as Ni-DMG.
5. Estimation of Calcium as Calcium oxalate.
6. Estimation of Copper in an alloy.

**ORGANIC PREPARATIONS****SINGLE STAGE ORGANIC PREPARATIONS**

1. Oxidation-Benzaldehyde to benzoic acid.
2. Hydrolysis-Methyl salicylate or ethyl benzoate to the acid.
3. Nitration- Meta dinitrobenzene or picric acid.
4. Halogenation- parabromoacetanilide from acetanilide.

**COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1: Estimate the amount of analyte by gravimetric analysis.

CO2: Apply the mechanism pathway for the single stage synthesis of simple organic compounds

CO3: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. Sundaram, Krishnan, Raghavan, Practical Chemistry (Part III), S. Viswanathan Co. Pvt., 1996.
2. Vogel's Text Book of Quantitative Chemical Analysis. 5th Edi., ELBS/Longman England, 1989.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 1301	GENERAL CHEMISTRY III	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn the chemical reactions and theories of acids and bases, oxidation reduction processes and electron transfer reactions.
- To understand the properties and chemical reactions of s-block elements and their compounds.
- To learn the preparation, nomenclature and structure of halogen compounds, dienes and alkynes.
- To understand stereochemistry of organic compounds from geometric isomerism, conformers and their interconversions.
- To study the solution laws and properties of binary solutions and dilute solutions

**UNIT 1 ACIDS AND BASES****9 Hrs.**

Types of chemical reactions- Acid-base, oxidation-reduction, electron transfer and double decomposition reactions. Balancing chemical reactions by oxidation number and ion electron method. Theories of acids and bases- Arrhenius theory - Bronsted-Lowry theory - Lewis theory - solvent system - Lux-Flood definition and Usanovich definition, HSAB concept.

**UNIT 2 s-BLOCK ELEMENTS****9 Hrs.**

Chemical properties of the group metals: reaction with water, air, nitrogen; uses of s-block metals and their compounds. Compounds of s-block metals: oxides, hydroxides, peroxides, superoxides - preparation and properties; oxo salts - carbonates, bicarbonates, nitrates; halides and polyhalides; anomalous behavior of Li, Be and B, extraction of beryllium. Complexes of s-block metals: complexes with crown ethers, biological importance of sodium and potassium.

**UNIT 3 ALKENES, DIENES AND CYCLOALKENES****9 Hrs.**

Structure and Nomenclature-Methods of Preparation-Dehydration of alcohols, dehydrohalogenation of alkyl halides-Elimination reactions- Hoffmann and Saytzeff rules- dehalogenation-Physical and Chemical Properties-Addition of hydrogen, halogen, hydrohalogenation(Markovnikov's and Anti-Markovnikov's rule)- Epoxidation, Ozonolysis, Polymerization-.Dienes-Conjugated, Non-conjugated dienes, cumulative dienes-Structure-1, 3-butadiene-Preparation and properties-Diels Alder reaction.Cycloalkenes- Structure and Nomenclature- Methods of preparation-Physical and chemical properties cyclopentadiene and cyclohexene.

**UNIT 4 ALKYNES****9Hrs**

Nomenclature- Preparation- Dehydrohalogenation, Dehalogenation, alkylation of acetylene-Physical properties, Chemical properties- Electrophilic addition Addition of halogen, halogen acids- Nucleophilic addition: Addition of HCN, NH<sub>3</sub>, acids and alcohols- Oxidation- Hydroboration- Reduction- Metal-ammonia reactions-Formation of sodium or lithium alkyne.

**UNIT 5 SOLUTIONS****9Hrs**

Types of solutions- Raoult's law and Henry's law. Deviation from Raoult's law and Henry's law-ideal and non-ideal solutions- Binary solutions: fractional distillation-Azeotropic mixture-immiscible liquids-steam distillation-partially miscible liquids-critical solution temperature-phenol-water system-aniline-hexane system-Nicotine-water system. Dilute solutions: Colligative properties, relative lowering of vapour pressure, osmosis, Law and osmotic pressure, Thermodynamic derivation of elevation of boiling point and depression in freezing point. Determination of molecular masses using the above properties.

**Max.45 Hrs.****COURSE OUTCOMES**

On successful completion of the course, student will be able to

- CO1: Examine the mechanism involved in various theories of acids and bases  
 CO2: Assess the structure and reactivity of s-block elements  
 CO3: Examine the physical and chemical properties of alkenes, dienes and cycloalkenes  
 CO4: Apply the electrophilic and nucleophilic addition mechanism to the alkyne reactions  
 CO5: Apply the laws of solutions to determine the colligative properties for dilute solutions and critical solution temperature for binary solutions  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. Kalsi P. S., Stereochemistry, 3rd Edition, New Age International Publishers, 1995.
2. Selected topics in inorganic chemistry, R D Madan, G D Tuli & Wahid U Malik, S.Chand publication, 1976.
3. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th ed., Prentice-Hall of India Limited, New Delhi, 1992.
4. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
5. S. H. Pine, Organic Chemistry, 5th ed., McGraw Hill International Edition, Chemistry Series, New York, 1987.
6. I. L. Finar, Organic Chemistry, Vol-1, 6th ed., Pearson Education Asia. 2004.
7. B. R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Shoban Lal Nagin Chandand Co. 23<sup>rd</sup> edition, 1993.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SPHA 1314	ANCILLARY PHYSICS-I			Credits	Total Marks
		L	T	P	3

**COURSE OBJECTIVE**

- This course would empower the student to acquire engineering skills and practical knowledge. It helps the students in their everyday life.
- This syllabus will provide the basic requirements for their higher studies and also provide a theoretical basis for doing experiments in related areas.

**Unit 1: GRAVITATION:****9 Hrs**

Newton's law of Gravitation-Determination of G by Boy's method mass and density of earth – acceleration due to gravity-Determination of g by compound pendulum.

Elasticity: Basic concepts – bending of beams – depression of cantilever Determination of Y by uniform and non- uniform bending method- Torsion in a wire Determination of rigidity modulus by torsional pendulum.

The universal law of gravitation- Acceleration due to gravity and its variation with altitude and depth- Kepler's laws of planetary motion- Gravitational potential energy; gravitational potential-Escape velocity- Orbital velocity of a satellite. Geo-stationary satellites.

**Unit 2: HEAT AND THERMODYNAMICS:****9 Hrs**

Heat: Specific heat - Callender's Barne's method to determine the specific heat of a liquid-Newton's law of cooling - determination of specific heat of a liquid using Newton's law of cooling - Emissivity and Emissive power. Low Temperature: J.K. Effect - Positive effect - Negative effect - Temperature of inversion - liquefaction of air Linde's method - Helium I and II - production of low temperature- adiabatic demagnetisation.

Thermodynamic systems (closed and open); thermodynamic properties and equilibrium; state postulate for simple compressible substances, state diagrams, paths and processes on state diagrams; concepts of heat and work, zeroth law-first and second of thermodynamics; concept of temperature.

**Unit 3: ELECTRICITY AND MAGNETISM:****9 Hrs**

Electricity: Potentiometer - Principle - Calibration of low range voltmeter - Measurement of internal resistance of cell - measurement of an unknown resistance- Kirchhoff's laws and their applications. Wheatstone bridge, Metre Bridge.

Magnetism :Moment and pole strength of a magnet - Deflection magnetometer - Tan C position - Vibration magnetometer - Theory - period of oscillation - Determination of M and BH using the deflection magnetometer in Tan C position and the vibration magnet

**Unit 4: OSCILLATIONS AND WAVES:****9 Hrs**

Periodic motion - period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M.) and its equation; phase; oscillations of a spring -restoring force and force constant; energy in S.H.M. - kinetic and potential energies; Simple pendulum - derivation of expression for its time period; Free, forced and damped oscillations, resonance.

Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, Standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect in sound.

**Unit 5: GEOMETRICAL OPTICS AND PHYSICAL OPTICS:****9 Hrs**

Defects of Images (Lens): Spherical aberration - minimizing spherical aberration by using two thin lenses in contact - chromatic aberration- Achromatic combination of two thin lenses in contact

Physical Optics: Interference - Air Wedge - description - Determination of diameter of a thin wire by air wedge Diffraction: Theory of transmission grating - Normal Incidence - Determination of Wavelength of monochromatic source and Wavelength of mercury lines using a grating by normal Incidence. Polarisation: Optical activity - specific rotatory power - Polarimeter - Determination of specific rotatory power of a solution using the polarimeter

Max. 45 Hours

**Course outcomes:**

**CO1:** Understand the concept of gravitational force, Elastic properties of materials, behaviour of pendulum and understand that there are various forms of potential energy, all of which depend on the position of an object rather than on its motion.

**CO2:** The course aims through a theoretical and experimental analysis to provide a fundamental understanding of thermal equilibrium, described by thermodynamics, kinetic gas theory and basic statistical mechanics.

**CO3:** Students will be able to demonstrate knowledge and understanding of the basic laws that underlie the properties of electric circuit elements and the relationship between electrostatic field and electrostatic potential.

**CO4:** Students understand concept of simple harmonic motion mathematically including equations for position, velocity and acceleration. They will study the spring oscillators and establish the relationship between angular frequency and the physics properties of the spring oscillator.

**CO5:** The student shall have knowledge about optical phenomena and able to explain concepts such as numerical aperture, F-number, spatial resolution and image quality for optical systems that originates from diffraction.

**TEXT / REFERENCE BOOKS**

1. Allied Physics - R. Murugesan S. Chand & Co. First Edition (2005)
2. Allied Physics - Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
3. Allied Physics - Prof. Dhanalakshmi and others.
4. Elements of Properties of Matter - D.S Mathur, S. Chand & Co. (1999).
5. Heat and Thermodynamics - N. Brijlal and Subramaniam S. Chand & Co.
6. A text book of Sound - by M. Narayanamoorthy and other National Publishing companies (1986).
7. Modern Physics - R. Murugesan S. Chand & Co.(2004)
8. Electronic Principles and applications - A. B. Bhattacharya, New Central Book Agency, Culcutta.
9. Introduction to Solid state Physics - C. Kittel, 5th Edition Wiley Eastern Ltd.
10. Renewable & sustainable energy sources - Agarwal.
11. Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999)

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100 Exam Duration: 3 Hrs.**

**PART A:** 10 Questions of 2 mark each - No choice.

**20 Marks**

**PART B:** 2 Questions from each unit of internal choice, each carrying 16 marks.

**80 Marks**

SBTA 1002	BASIC BIOCHEMISTRY	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVE**

- To give an insight into the chemical aspects of biological macromolecules and their importance..

**UNIT 1 CARBOHYDRATES****9 Hrs.**

Carbohydrates: Classification, Monosaccharides: -linear and ring forms (Haworth's formula), Structures, Stereoisomers and structural isomers, mutarotation, and chemical properties. Dissaccharides-structure and importance of sucrose, Lactose, maltose, Polysaccharides: - Structure and significance of homopolysaccharides and heteropolysaccharides.

**UNIT 2 AMINO ACIDS AD PROTEINS****9 Hrs.**

Amino acids: Structures and Classifications, Essential and Non-essential amino acids, amphoteric nature, isoelectric point, zwitter ion.

Protein: Classification - shape, solubility and composition; biological functions of proteins, bonds involved in protein structure, structural levels of organization: - primary, secondary, tertiary and quaternary structures with examples.

**UNIT 3 LIPIDS AD NUCLEIC ACIDS****9 Hrs.**

Lipids: Classifications, physical and chemical properties of fats, structure and functions of saturated and unsaturated fatty acids.

Nucleic acids: Nitrogenous bases, structures of Ribonucleotides and deoxyribonucleotides, structure and functions of DNA and RNA.

**UNIT 4 ENZYMES AND METABOLIC CYCLES****9 Hrs.**

Enzymes: IUB classification of enzymes with example. Active site, enzyme units, Enzyme kinetics: - MM equation, factors affecting enzyme activity.

Metabolic cycles: Glycolysis, TCA cycle, Urea cycle

**UNIT 5 VITAMINS AND MINERALS****9 Hrs.**

Vitamins: fat soluble and water soluble vitamins. .Deficiency disorders. Minerals: Micro and Macro minerals. Biological importance of vitamins and minerals.

**Max.45 Hrs.****COURSE OUTCOMES**

CO1: To understand about the basic classification and biological significance of carbohydrates.

CO2: To have insight on structure, classification and properties of amino acids and to study their impact on organizing the structure of proteins.

CO3: To recite the categorization, structure and various functions of lipids and nucleic acids.

CO4: To analyze the concept of enzyme activity.

CO5: To apply the importance of enzymes in metabolism.

CO6: To interpret the vital role of vitamins and minerals

**TEXT / REFERENCE BOOKS**

1. Lehninger, Nelson and Cox, Principles of Biochemistry, W.H.Freeman, 4th Edition, 2005
2. Donald Voet, Judith Voet and Charlotte Pratt, Principles of Biochemistry, John Wiley and Sons, 2008.
3. Reginald H. Garrett and Charles M. Grisham, Biochemistry, 6th Edition, Brooks Cole publisher, 2017.
4. Harper's Illustrated Biochemistry 31<sup>st</sup> edition, by Lange Publishers, 2018
5. Biochemistry by U. Sathyanarayana & U.Chakrapani, fifth edition, Elsevier publications, 2018

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

<b>SBTA 4101</b>	<b>BIOCHEMISTRY LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>100</b>

COURSE OBJECTIVE → To understand and analyze various biomolecules using biochemical methods

<b>S. No.</b>	<b>EXPERIMENT</b>
1.	QUALITATIVE ANALYSIS OF CARBOHYDRATES
2.	QUALITATIVE ANALYSIS OF AMINO ACIDS
3.	WORKING PRINCIPLE AND STANDARDIZATION OF COLORIMETER
4.	QUANTITATIVE ESTIMATION OF PROTEIN BY LOWRY'S METHOD.
5.	QUANTITATIVE ESTIMATION OF UREA BY DAM METHOD.
6.	ESTIMATION OF ASCORBIC ACID
7.	DETERMINATION OF SAPONIFICATION VALUE OF EDIBLE OIL

#### COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Identify carbohydrates and amino acids in various sources

CO2 - Apply the principle and instrumentation of colorimeter

CO3 - Interpret the quantity of protein and urea in samples

CO4 - Apply titrimetry in analyzing vitamins like ascorbic acid

CO5 – Analyze the properties of lipids through their applications

CO6 – Choose appropriate biochemical methods to analyze various biomolecules

#### END SEMESTER EXAM QUESTION PAPER PATTERN

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

<b>SPHA 2314</b>	<b>ANCILLARY PHYSICS LAB-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>100</b>

**COURSE OBJECTIVE**

To make the students to understand a broad range of experimental techniques and to enable them to demonstrate their ability to use the techniques in conducting scientific experiments and observations.

**LIST OF EXPERIMENTS**

1. Surface tension of a liquid by capillary raise method
2. Coefficient of viscosity – burette method.
3. Viscosity of highly viscous liquid using Stokes method
4. Youngs modulus of a bar - cantilever - bending - pin and microscope.
5. Youngs modulus of a bar - cantilever - bending - optic lever.
6. Rigidity modulus of a wire-Torsion pendulum.
7. Determine the value of g and K using Compound Bar Pendulum
8. Determine the coefficient of thermal conductivity of a bad conductor by Lee 's disc method.
9. Newton's law of cooling.
10. Determine the mass of a substance by sonometer

**Course Outcomes:**

CO1: Students would gain practical knowledge about viscosity, youngs modulus and its measurements.

CO2: The course makes the students able to understand the basic physics of heat and temperature.

CO3: Students would gain practical knowledge about heat and radiation, thermodynamics & thermo emf.

CO4: Students can understand the properties of pendulum.

CO5: Students understand the sonometer apparatus and it's working. Also, develop the idea about standing waves.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 2301	PHYSICAL CHEMISTRY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To improve the analytical skills of the students in quantitative analysis.

**LIST OF EXPERIMENTS**

1. Kinetics of acid catalyzed hydrolysis of methyl acetate.
2. Determination of molecular weight by Rast's method (using naphthalene, or biphenyl as solvent and acetanilide, p-dichlorobenzene as solute).
3. Critical solution temperature: Phenol-water system. Effect of impurities on CST
4. Phase diagram of a simple eutectic system and determination of unknown composition.
5. Conductometry: Acid – base titration.
6. Potentiometry: Redox titration of ferrous vs dichromate.
7. pH metry: Acid – base titration
8. Verification of Beer-Lambert's law and determination of concentration of metal ions spectrophotometrically.
9. Determination of partition coefficient of iodine between water and carbon tetrachloride.
10. Determination of equivalent conductance of an electrolyte.

**COURSE OUTCOMES:** On successful completion of the course, student will be able to

CO1: Estimate the molecular weight of the unknown solute.

CO2: To Determine the Critical Solution Temperature of the organic compounds.

CO3: To Estimate the amount of metals ion present in unknown solution using photocolourimetry.

**TEXT / REFERENCES**

1. J.N. Gurthu and R. Kapoor: Advanced Experimental Chemistry, S. Chand and Co., 1987.
2. David P. Shoemaker, Carl W. Garland, Joseph W. Nibler: Experiments in Physical Chemistry, 5<sup>th</sup> Ed. McGraw- Hill Book company, 1989
3. W. G. Palmer: Experimental physical chemistry, Cambridge University Press.
4. J. B. Yadav: Advanced Practical Physical Chemistry, Goel Publishing House.
5. R. C. Das and B. Behra: Experiments in Physical Chemistry, Tata McGraw hill.
6. K. K. Sharma : An Introduction of Practical Chemistry, Vikas Publishing House, New Delhi

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 1401	GENERAL CHEMISTRY-IV	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To understand the structure and properties of important boron and carbon compounds
- To learn the trend observed for the nitrogen and oxygen groups and understand the structural importance in forming nitrogen and phosphorous compounds.
- To learn the preparation of Nitrogen and Oxygen group elements
- To appreciate the concept of stereochemistry and optical isomerism
- To learn the properties of colloidal systems, emulsions and macromolecules

**UNIT 1 BORON AND CARBON GROUP ELEMENTS****9 Hrs.**

Group 13 (Boron group): Extraction of B and Si - types of compounds - reactions involving Boron - Compounds of boron with oxygen - boron sesquioxide – borates – borax; Boron hydrides - reaction with ammonia, hydroboration, structure of boranes – uses of Boron hydrides – Aluminium - amphoteric behaviour - aluminates.

Group 14 (Carbon group): Catenation and heterocatenation - allotropes of carbon - graphite, diamond, fullerenes and carbon nanotubes (structural features and uses); carbides - salt-like carbides, interstitial carbides, covalent carbides; Silicates - ortho-, pyro-, cyclic-, chain-, sheet - three dimensional silicates - properties and structures - silicates in technology - alkali silicates.

**UNIT 2 NITROGEN AND OXYGEN GROUP ELEMENTS****9 Hrs.**

Group-15 (Nitrogen group): metallic and nonmetallic character - compounds of Nitrogen - N<sub>2</sub>H<sub>4</sub>, NH<sub>2</sub>OH, HN<sub>3</sub> - Phosphorous compounds - halides and oxohalides.

Group-16 (Oxygen group): Types of oxides - basic oxides, amphoteric oxides, acidic oxides, neutral oxides. Oxides of sulphur - S<sub>2</sub>O, SO<sub>3</sub> - oxyacids of sulphur - thionic acid series - peroxyacid series – oxohalides - thionyl compounds (methods of preparation and properties).

**UNIT 3 STEREOCHEMISTRY-I****9 Hrs.**

Geometrical Isomerism-Cis and trans, syn and anti, E and Z notations-Cis-trans interconversion-Conformational isomerism: Conformers, dihedral angle, torsional strain-Conformational analysis of ethane and n-butane, conformers of cyclohexane (Chair, boat and skew boat forms), axial-equatorial positions and their interconversions, conformers of mono and disubstituted cyclohexanes - diaxial interactions.

**UNIT 4 STEREOCHEMISTRY – II****9 Hrs.**

Optical isomerism – Chirality – Measurement of optical activity – Specific rotation – Enantiomerism and Diastereomerism - Wedge, Fischer, Newmann and Sawhorse projection formulae — Difference between Configuration and Conformation - Absolute and Relative configuration - D and L notation - Cahn-Ingold-Prelog's rules – R and S notation – Optical isomerism in compounds containing more than one carbon atom – Isomerism in tartaric acid - Racemic modification – Racemization - Resolution of racemic mixtures –Asymmetric synthesis (definition only) - Walden inversion.

**UNIT 5 COLLOIDS AND MACROMOLECULES****9 Hrs**

Colloidal systems – classification – preparation – purification of colloids-Properties of colloids: Kinetic, optical and electrical properties. Emulsions: Types of emulsions, preparation, properties and applications, Donnan membrane equilibrium-applications of colloids. Macromolecules-Different types of polymers – classification of polymers. Molecular weight of polymers – number average and weight averages – determination of molecular weight of polymer –osmotic pressure and light scattering methods.

**Max.45 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Examine the properties of boron and carbon group elements  
 CO2: Analyze the metallic and non-metallic character of nitrogen group elements and nature of oxides of oxygen group elements  
 CO3: Apply the concept of conformation analysis to the conformations of acyclic and cyclic compounds  
 CO4: Apply the configurational rules for assigning the absolute and relative configuration to organic molecules  
 CO5: Examine the properties and industrial applications of colloids and macromolecules  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th ed., Prentice-Hall of India Limited, New Delhi, 1992.
2. Selected topics in inorganic chemistry, R D Madan, G D Tuli & Wahid U Malik, S.Chand publication, 1976.
3. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
4. S. H. Pine, Organic Chemistry, 5th ed., McGraw Hill International Edition, Chemistry Series, New York, 1987.
5. I. L. Finar, Organic Chemistry, Vol-1, 6th ed., Pearson Education Asia. 2004.
6. Kalsi P. S., Stereochemistry, 3rd Edition, New Age International Publishers, 1995.
7. Eliel E. L., Stereochemistry of Carbon Compounds, Tata-McGraw Hill, 2000.
8. B. R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Shoban Lal Nagin Chandand Co. 23<sup>rd</sup> edition, 1993.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 Marks each-No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 Marks.****80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SBIA 1403	CHEMINFORMATICS	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn the chemical compounds data representation formats as well as resources related to cheminformatics
- To understand the basics of small molecule library construction and constraints involved in virtual screening
- To introduce molecular modelling and significance of molecular mechanics
- To understand the basics of computer aided drug design and relevant platforms like molecular docking and dynamics simulation

**UNIT 1 INTRODUCTION TO CHEMINFORMATICS****9 Hrs.**

An Outline about Cheminformatics - What You Can Do with Cheminformatics - Open-Source Tools, Techniques, and Data in Cheminformatics

**UNIT 2 CHEMOINFORMATICS APPROACH FOR THE DESIGN AND SCREENING OF FOCUSED VIRTUAL LIBRARIES****9 Hrs.**

Introduction to Structure–Property Correlations- Descriptors- Online Property Prediction Tools- Virtual Library Generation (Enumeration)- Virtual Screening- Thumb Rules for Computing Molecular Properties -Molecular docking

**UNIT 3 QUANTUM MECHANICS AND MOLECULAR MECHANICS****9 Hrs.**

Features of molecular mechanics, force fields; Bond structure and bending angles –electrostatic, van der Waals and non – bonded interactions, hydrogen bonding; Derivatives of molecular mechanics energy function; Application of energy minimization

**UNIT 4 MOLECULAR DYNAMICS SIMULATION****9 Hrs.**

Molecular Dynamics using simple models; Molecular Dynamics with continuous potentials and at constant temperature and pressure; Time dependent properties; Solvent effects in Molecular Dynamics; Conformational changes from Molecular Dynamics simulation and application.

**UNIT 5 DRUG DESIGN****9 Hrs.**

Introduction, History of Drug Development, drug development time lines, stages of drug discovery, strategic issues in drug discovery, emerging approaches to drug design and discovery, drug metabolism physicochemical properties, Basic pharmacodynamics and pharmacokinetics.

**Max.45 Hrs.****Course outcomes:**

On successful completion of the course,

- CO1:** Students can explore the basic concepts of cheminformatics and related open source platforms
- CO2:** Students can perform virtual screening with chemical compound databases to find the scaffold structure for drug design
- CO3:** Students will get the knowledge of molecular descriptors computation for combinatorial library descriptors computation for combinatorial library
- CO4:** Students can understand the basic constraints in performing molecular dynamics and simulation-based studies
- CO5:** Students will get to know the strategies' used in CADD
- CO6:** Students can explore the various platforms that assist the CADD

**TEXT/REFERENCE BOOKS**

1. Andrew Leach - Molecular Modelling: Principles and Applications, 2nd Edition. Pearson Education EMA, 2001.
2. Rick NG. Drugs: from Discovery to Approval, John Wiley & sons. 2004
3. Andrew R Leach, Valerie J Gillet, An Introduction to Cheminformatics, Kluwer Academic publishers. 2003.
4. Cheminformatics: A Textbook; Publisher: John Wiley & Sons Ltd; Edition Year: 2005
5. Concepts in Pharmacogenomics; Publisher: American Society of Health System Pharmacists; Edition Year: 2010
6. Drug Design: Structure and ligand based approaches: Kenneth M.Merz, Dagmar Ringe, Charles H.Reynolds

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 Marks each-No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SPHA1415	ANCILLARY PHYSICS II	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVE**

To make the students aware of the fundamental concepts behind materials and their applications

**Unit – I: WAVE MECHANICS****9 Hrs**

Wave Mechanics - De Broglie Waves -Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light.-Experimental study of matter waves -wave nature of particle, de Broglie relation-Davisson and Germer's experiment - G.P. Thomson's experiment - Heisenberg's uncertainty Principle - The position and momentum of a particle.

**Unit- II NUCLEAR PHYSICS:****9 Hrs**

Particle accelerators - cyclotron, particle detectors - GM Counter-Artificial Transmutation - Rutherford's experiment - The Q value equation for a nuclear reaction - Threshold energy - Nuclear reactions. Conservation Laws: Conservation of Charge - Conservation of Nucleons - Conservation of Mass - Energy - Conservation of Parity - Quantities conserved and quantities not conserved in a nuclear reaction Biological effects of radiation - control of radiation hazards.

**UNIT-III: ENERGY PHYSICS:****9 Hrs**

Sources of conventional energy - Need for non-conventional energy - resources - solar energy utilization - solar water heater - solar drier - conversion of light into electrical energy - solar cell - merits and demerits of solar energy - wind energy - its conversion systems - energy from Bio mass - Bio gas generation - Industrial and spaceapplication.

**UNIT-IV: CRYSTALLOGRAPHY AND FIBRE OPTICS:****9 Hrs**

Crystallography: The crystal structure - Unit cell - Miller indices - Reciprocal lattice vectors-properties of Reciprocal Lattice-Bragg's law-Types of bonding in crystal-crystal packing-Atomic packing factor for SC,FCC and BCC- examples of simple structures like NaCl, CaCl and Diomand. Fiber Optics: Principle - classification of optical fibres - modes of propagation-single mode-multi mode - advantages and disadvantages. Fiber optic communication system block diagram-loss of enegy

**UNIT-V: ELECTRONICS:****9 Hrs**

Electronics: Zener diode - Characteristics - Voltage regulation using zener diode - LED - uses of LED. Digital electronics: AND, OR NOT, NAND and NOR gates - NAND and NOR as universal building blocks - elementary ideas of Integrated circuits-Fabrication of Integrated circuits by monolithic technology - Advantages and limitations of an integrated circuit – Flexible Electronics-merits and demerits.

**COURSE OUTCOME:**

**CO1:** Students can understand of concept of wave mechanics in three dimensions and Photoelectric effect.

**CO2:** They can also study about the nuclear shell model, concept of filling of major shells, nucleons moving independently in central potential, nuclear potential, splitting of levels, prediction of ground-state spin and parities.

**CO3:** Students can study about the solar cell, structure, working and its applications and different type of energy resources.

**CO4:** They will understand about polycrystalline solids, crystalline and amorphous crystals. They also to Calculate the number of atoms/ unit cell, atomic radii and packing factor for diamond/HCP lattice.

**CO5:** They will acquire the ability to analyze PN junctions in semiconductor devices under various conditions, Ability to design and analyze simple rectifiers and voltage regulators using diodes, Ability to describe the behaviour of special purpose diodes.

**Max. 45 Hours****TEXT / REFERENCE BOOKS**

- Allied Physics - R. Murugesan S. Chand & Co. First Edition (2005)
- Allied Physics - Dr. K. Thangaraj, Dr. D. Jayaraman Popular Book Department, Chennai.
- Allied Physics - Prof. Dhanalakshmi and others.
- Elements of Properties of Matter - D.S Mathur, S. Chand & Co. (1999).
- Heat and Thermodynamics - N. Brijlal and Subramaniam S. Chand & Co.
- A text book of Sound - by M. Narayanamoorthy and other National Publishing companies (1986).
- Modern Physics - R. Murugesan S. Chand & Co.(2004)
- Electronic Principles and applications - A. B. Bhattacharya, New Central Book Agency, Culcutta.
- Introduction to Solid state Physics - C. Kittel, 5th Edition Wiley Eastern Ltd.
- Renewable & sustainable energy sources - Agarwal.
- Introduction to Fiber optics by K. Thyagarajan and Ajay Ghatak, Cambridge, University Press (1999) B.Sc. Chemi

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100 Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 mark each - No choice.**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 marks.**80 Marks**

SCYA 2401	ORGANIC QUALITATIVE ANALYSIS	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To develop the students to understand the basic mechanism involved in functional group analysis.
- To elaborate the student to develop the analytical skill in organic quantitative analysis.
- To determine the melting point for the prepared organic derivatives.

**Identification of Functional group of a given Organic Substance**

Identification of acidic, phenolic, basic and neutral organic substances.

Detection of N, S and halogens. Test for aliphatic and aromatic nature of substances. Test for saturation and unsaturation.

Identification of functional groups – Acid – Phenol – Ester - Aldehydes – Ketones – Carbohydrates – Amines – Amide – Anilide - Nitro compound – Thiourea – Halogen compound

Preparation of derivatives for the functional groups and determination of melting point of the derivative.

**COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1: Identify qualitatively the acidic, phenolic, basic and neutral organic substances.

CO2: Develop the skill in analyzing the special elements present in the organic substances.

CO3: Discuss the aliphatic and aromatic nature of the organic substances.

CO4: Determine the different functional group present in the organic substances.

CO5: Develop the derivatives of the functional group for a given organic substance.

CO6: Determine the melting point of the prepared organic derivatives.

**TEXT / REFERENCE BOOKS**

- N.S. Gnanapragasam and G. Ramamurthy, Organic Chemistry – Lab manual, S. Viswanathan Co. Pvt., 2002.
- J.N. Gurthu and R. Kapoor, Advanced Experimental Chemistry (Organic), S. Chand and Co., 1987.
- B.S. Furniss, A.J. Hannaford, P.W. G. Smith and A.R. Tatchell, Vogel's Text Book of Practical Organic Chemistry. 5<sup>th</sup> ed., Pearson Education, 2005.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

Max. Marks: 100

Exam Duration: 3 Hrs

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SPHA 2415	ANCILLARY PHYSICS LAB-II	L	T	P	Credits	Total Marks
		0	0	3	2	100

### COURSE OBJECTIVE

To make the students to understand a broad range of experimental techniques and to enable them to demonstrate their ability to use the techniques in conducting scientific experiments and observations.

### LIST OF EXPERIMENTS

1. Ultrasonic Interferometer- Determination of velocity of a liquid
2. Sonometer - frequency of the tuning fork.
3. Determine a Low Resistance by Carey Foster's Bridge
4. Multimeter for measuring (a) Resistances, (b)AC and DC Voltages, (c)DC Current, and (d) checking Electrical fuses.
5. Determine the refractive index of the given liquid forming liquid prism.
6. Diffraction grating and hence to determine the wavelength of mercury spectral lines by normal incidence method using spectrometer.
7. Determination of wave length of laser- Laser Experiment
8. Characteristics of Zener diode.
9. Magnetic susceptibility of a liquid using Quinck's method.
10. Band gap of a semiconductor diode.

### Course Outcomes:

- CO1: Students understand the basic principle of piezo-electric effect of generation of ultrasound.  
 CO2: Students get the relation between frequency, length and tension of a stretched string under vibration  
 CO3: They understand the measurement of resistance by carey foster's bridge.  
 CO4: Students can understand the working of multimeter.  
 CO5: They can understand the characteristics of zener diode.

### END SEMESTER EXAM QUESTION PAPER PATTERN

<b>Max. Marks: 100</b>		<b>Exam Duration: 3 Hrs</b>	
<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SBIA 2402	COMPUTATIONAL CHEMISTRY LAB	L	T	P	Credits	Total Marks
		0	0	3	2	100

**Course Objectives:**

- Assessment of Computational approaches used for structure and function relationships of biomolecules.
- Explore various computational tools used in drug designing
- Demonstration of virtual screening strategies
- Small molecules therapeutic efficacy assessment through computational approaches
- Explore the concepts of molecular docking and intermolecular assessment
- Explore the concepts in pharmacophore mapping and 3D-QSAR

**List of suggested exercises**

1. Molecular Modelling with Chem3D
2. Protein physical and chemical parameters evaluation
3. Energy Calculation with Chem3D
4. Energy minimization-Chem3D
5. Prediction NMR Shifts of any compound using ChemDraw
6. Computing the Molecular Dynamics using Chem3D
7. ADME Toxicity assessment of small molecules
8. Creating and running a simple DFT calculation in GaussView / Gaussian
9. Draw HOMO and LUMO orbitals in GaussView

**Course outcomes:**

On successful completion of the course, student will be able to

**CO1:** Perform all the computational methods used in chemistry

**CO2:** Explain the concepts of molecular modeling, energy calculation and minimization

**CO3:** Knowledge of limitations and advantages of DFT.

**CO4:** Knowledge of Pharmacogenomics will enable students to explore the small molecules as drug choice

**CO5:** Exploring the Chemoffice features for NMR spectra

**CO6:** Exploring HOMO and LUMO orbitals of small molecules

**TEXT/REFERENCE BOOKS**

1. Warren J Hehre, Laboratory book of computational organic chemistry, wave function, 1998.
2. Tim Clark, A Handbook of Computational Chemistry: A Practical Guide to Chemical Structure and Energy Calculations, Wiley Black Well, 1985.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 1501	INORGANIC CHEMISTRY I	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To elaborate on the general characteristics, oxidation reduction processes and catalytic application magnetic properties of coordination compounds.
- To explain the chelate effect, types of isomerism and the theories related to coordination complexes.
- To understand the importance of crystal field splitting based on the theories and correlating them with the properties of the complexes.
- To study the formation and stability of various organometallic compounds based on EAN rule.
- To learn the properties and uses of important inorganic oxidizing and reducing compounds.

**UNIT 1 d-BLOCK ELEMENTS****9 Hrs.**

First, second and third transition series, general characteristics, metallic character, atomic and ionic radii, standard reduction potentials, variable oxidation states and stabilization, colour, complex formation, catalytic and magnetic properties. Origin of magnetism, measurements by Gouy's balance method, Electroneutrality principle, coordination numbers, coordination numbers from 1 – 10 with examples, Kepert model.

**UNIT 2 COORDINATION CHEMISTRY I****9 Hrs.**

Introduction- Types of ligands, coordination number, IUPAC nomenclature, chelate effect - Isomerism- linkage, ionization, hydrate, coordination, coordination position isomerism. Stereoisomerism- geometrical (cis-/trans- and fac-/mer-), optical isomerism in 4 and 6 coordinated complexes. Theories of coordination compounds-Werner's and Sidgwick's EAN concept. Pauling's valence bond theory, Electroneutrality principle, Pi bonding concept, Inner and outer orbital complexes-Merits and Demerits.

**UNIT 3 COORDINATION CHEMISTRY II****9 Hrs.**

Valence bond theory-applications and limitations, hybridization, geometry and magnetic properties of tetrahedral and octahedral complexes. Crystal field theory- splitting of 'd' metal orbitals in octahedral, tetrahedral and square planar complexes-factors influencing the magnitude of crystal field splitting, low-spin and high-spin complexes, Jahn Teller distortion, explanation of colour and magnetic properties, comparison of VBT and CFT, spectrochemical series.

**UNIT 4 ORGANOMETALLIC COMPOUNDS****9 Hrs.**

Definition, Types of organometallic compounds, Classification of ligands, EAN and Nomenclature of organometallic compounds. Preparation, reaction and structure of ferrocene, metal-olefins and metal -alkynes complexes. Carbonyl compounds of transition metals, structure of mono and polynuclear carbonyls.

**UNIT 5 INORGANIC COMPOUNDS****9 Hrs.**

Preparation, properties, uses and structures of  $Ti(NO_3)_4$ ,  $TiO_2$ ,  $VOCl_2$ ,  $K_2CrO_4$ ,  $K_2Cr_2O_7$ , Chromyl chloride, Manganese dioxide, Potassium permanganate, potassium ferrocyanide, potassium ferricyanide, Prussian blue, sodium nitroprusside, Lithiumaluminium hydride, aluminium chloride, hexamine cobalt(III) chloride, Cuprous chloride.

Total:45 hrs

**COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Examine the properties of the first, second and third transition series metal complexes
- CO2: Analyze the inner and outer orbital complexes based on principles of coordination chemistry
- CO3: Apply the basic concepts of coordination to tetrahedral, octahedral and square planar complexes
- CO4: Examine the structure and properties of organometallic compounds
- CO5: Examine the properties and applications of various inorganic compounds
- CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. Advanced Inorganic Chemistry, F.A. Cotton and G. Wilkinson, Wiley Eastern Private Limited 1992.
2. Inorganic Chemistry: Principles of Structure and Reactivity, J.E. Huheey, E.A. Keiter and R.I. Keiter, Addison-Wiley Publication Company, 1993.
3. Inorganic Chemistry, D.F. Shriver, P.W. Atkins, C.H. Longford, Oxford University Press, 1996
4. Concise Coordination Chemistry, R. Gopalan and V. Ramalingam, Vikas Publishing House Private Limited, 2001.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 1502	ORGANIC CHEMISTRY-I	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- **To learn the structure of benzene and reactivity of benzene compounds**
- To understand the mechanism for substitution, elimination and addition reactions.
- To learn the importance of alcohols and phenols in organic reactions.
- To emphasize on chemical reactions involving ethers and epoxides.
- To recognize the importance of carbonyl compounds in organic reactions.

**UNIT 1 BENZENE AND POLYAROMATIC COMPOUNDS****9 Hrs.**

Structure of Benzene –Stability of the benzene ring – Resonance hybrid - Molecular Orbital picture – Aromaticity – Huckel's rule for benzenoid and non-benzenoid compounds –General methods of preparation– Physical and Chemical Properties – Electrophilic substitution – nitration, sulphonation, halogenation, FriedelCrafts alkylation and acylation with mechanism – Orientation in aromatic disubstitution– orientation and reactivity. Polynuclear aromatic hydrocarbons – Preparation and properties of naphthalene – Structure of anthracene and phenanthrene.

**UNIT2 ALKYL AND ARYL HALIDES****9 Hrs**

Structure and Nomenclature– General methods of Preparation– Sandmeyer and Gattermann reactions -Physical and Chemical properties – Nucleophilic substitution reactions ( $S_N1$ ,  $S_N2$ ,  $S_Ni$  and  $S_NAr$ ), Reduction, Eliminations: E1 and E2 mechanisms – Mechanism – Formation of Grignard reagents, addition -Williamson's ether synthesis.

**UNIT3 ALCOHOLS AND PHENOLS****9 Hrs.**

Alcohols –Structure, nomenclature and classification – Methods of preparation - hydration, hydrolysis, reduction of carbonyl compounds, from Grignard reagents – Physical and chemical properties – Reactions involving OH bond –Glycol, glycerols and thiols. Phenols – Structure and nomenclature - Preparation from diazonium salts and sulphonic acid, hydrolysis - Physical and chemical properties –reactions involving OH group, acidity, ether formation, esterification – reactions involving the benzene ring, electrophilic substitution, nitration, sulphonation, halogenation, Friedel-Craft's reaction, coupling reactions, Kolbe's reaction and Riemeer-Tiemann reaction.

**UNIT 4 ETHERS AND EPOXIDES****9 Hrs.**

Structure and nomenclature - Preparation by Williamson's synthesis and by dehydration of alcohols - Physical and Chemical properties – Halogenation, formation of peroxides, hydrolysis, cleavage of C-O bond.Thioethers – Structure – Preparation and Properties - Crown ethers - Preparation and reactions of epoxides.

**UNIT 5 CARBONYL COMPOUNDS****9 Hrs.**

Structure and nomenclature– General methods of preparation of aldehydes and ketones – oxidation, dehydrogenation, from Grignard reagents, Rosenmund reduction, Gattermann-Koch reaction - Physical and Chemical properties –Reactivity of carbonyl group and acidity of alpha hydrogen - Nucleophilic addition reactions – Mechanism of Aldol, Perkin, Knoevenagel, Claisen, Wittig, Cannizarro, Reformatsky and Benzoin reactions – Oxidation and Reduction reactions –Clemmensen and Wolf-Kishner reduction – Electrophilic substitution reactions of aromatic aldehydes and ketones.

**Max.45 Hrs****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Analyze the structure and reactivity of aromatic and polynuclear aromatic hydrocarbon  
 CO2: Apply the nucleophilic substitution and elimination mechanism of alkyl and aryl halides  
 CO3: Examine the structure and reactivity of alcohols and phenols  
 CO4: Examine the physical and chemical properties of ethers and epoxides  
 CO5: Apply the nucleophilic addition and electrophilic substitution mechanism to carbonyl compounds  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

- 1.R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th ed., Prentice-Hall of India Limited, New Delhi, 1992.
2. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
3. S. H. Pine, Organic Chemistry, 5th ed., McGraw Hill International Edition, Chemistry Series, New York, 1987.
4. I. L. Finar, Organic Chemistry, Vol-1, 6th ed., Pearson Education Asia. 2004.
5. I. L. Finar, Organic Chemistry, Vol-2, 6th ed., Pearson Education Asia. 2004.
6. J. March and M Smith, Advanced Organic Chemistry, 5th ed., John-Wiley and sons, 2001.
7. Agarwal O. P., Chemistry of Organic Natural Products, Vol. 1, Goel Publishing House, 1997.
8. Jain J. L., Jain S., and Jain N., Fundamentals of Biochemistry, S. Chand, 2007

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 Marks each-No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 1503	PHYSICAL CHEMISTRY-I	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To understand the basic concepts of First law of thermodynamics and Thermochemistry.
- To understand the concepts and applications of second law of Thermodynamics.
- To learn the concepts and applications of electrolytic conductance.
- To study the concept of order, rate and rate constant and its experimental determination.
- To know about the principles of adsorption and catalysis.

**UNIT 1 Thermodynamics-I****9 Hrs.**

Definitions- system and surrounding- isolated, closed and open system- state of the system- Intensive and extensive variables. Thermodynamic processes-reversible and irreversible, isothermal and adiabatic processes- state and path functions-Work of expansion at constant pressure and at constant volume. First law of thermodynamics- statement- definition of internal energy (E), enthalpy (H) and heat capacity. Relationship between Cp and Cv-Calculation of w, q, dE and dH for expansion of ideal and real gases under isothermal and adiabatic conditions of reversible and irreversible processes. Thermochemistry- relationship between enthalpy of reaction at constant volume (qv) and at constant pressure (qp)- temperature dependence of heat of reaction. Kirchoff's equation- bond energy and its calculation from thermochemical data integral and differential heats of solution and dilution.

**UNIT 2 Thermodynamics-II****9 Hrs.**

Second Law of Thermo Dynamics – Need of the law – Different statements of the law — Thermodynamic scale of temperature – Concept of Entropy – Definition and physical significance of entropy – Entropy as a function of P, V and T-Entropy changes during phase changes – Entropy of mixing-Entropy criterion for spontaneous and equilibrium processes in isolated systems – Gibb's free energy (G) and Helmholtz free energy (A) – Variation of A and G with P, V and T – Gibb's Helmholtz equation and its applications – Thermodynamic equation of state – Maxwell's relations.

**UNIT 3 Electrochemistry-I****9 Hrs.**

Conductance in metal and in electrolytic solution- specific conductance and equivalent conductance. Effect of dilution on equivalent conductance and specific conductance. Kohlrausch's law and its applications. Arrhenius theory of electrolytic dissociation and its limitation. Weak and strong electrolyte according to Arrhenius theory. Ostwald's dilution law- Derivation, applications and limitation. Transport number and Hittorf's rule. Determination of transport number by Hittorf's method and moving boundary method. Application of conductance measurements- determination of degree of dissociation of weak electrolytes -determination of solubility product of a sparingly soluble salt. common ion effect, conductometric titrations.

**UNIT 4 Chemical Kinetics-I****9 Hrs.**

Rate of reaction- rate equation, order and molecularity of reaction. Rate Laws - rate constants- derivation of first order rate constant and characteristics of zero order, first order and second order reactions- derivation of time for half change ( $t_{1/2}$ ) with examples. Methods of determination of order of reactions- experimental methods determination of rate constant of a reaction by volumetry, colorimetry and polarimetry.

**UNIT 5 Adsorption and Catalysis****9 Hrs.**

Adsorption – Types – Chemical and physical. Characteristics of adsorption. Different types of isotherms-Adsorption of gases on solids-Adsorption of solutes from solution- Freundlich and Langmuir-Applications of adsorption. Catalyst-Definition and Characteristics - Types of catalysis-Homogeneous and heterogeneous, induced, auto, positive and negative catalysis, catalytic poisons and catalytic promoters-Theories of catalysis- intermediate compound formation theory and adsorption theory-Enzyme catalysis – Michaelis-Menten equation and Michaelis-Menten law.

**Max. 45 Hrs****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Apply the thermodynamic principles to the reversible and irreversible processes.  
 CO2: Examine the principles of entropy of the spontaneous and equilibrium processes.  
 CO3: Analyze the parameters of equivalent conductance of strong and weak electrolytes  
 CO4: Apply the concept of reaction rate to determine the rate constant of a chemical reaction.  
 CO5: Apply the different catalytic mechanism to industrial adsorbents and enzyme catalysts  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. B. R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Vishal Publishing Co, 48<sup>th</sup> edition, 2020.
2. ArunBahl, B. S. Bahl and G. D. Tuli, *Essentials of Physical Chemistry*, S. Chand publishing, 2012
3. P.W. Atkins, *Physical Chemistry*, 7th ed., Oxford university press, 2001.
4. Glasston & Lewis, *Physical Chemistry*, 2<sup>nd</sup> Edition, McMillan publishers, 1973
5. A.S. Negi and S. C. Anand, *A Textbook of Physical Chemistry*, New Age International, 2004

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCH 1314	PROCESSES AND SEPARATION IN CHEMICAL INDUSTRY	L	T	P	C	Max. Marks
		3	1	0	3	100

**COURSE OBJECTIVES:**

- To equip the learners with chemical processes and separation processes followed in chemical process industries.

**UNIT 1 INTRODUCTION****9 Hrs.**

Basic principles of unit operations and unit process to common devices used in process industries - Standard symbols used for such devices, Process flow sheet.

**UNIT 2 CHEMICAL PROCESSES****9 Hrs.**

Stoichiometric principles, Limiting, excess reactant, conversion, selectivity and yield. Application of material balance in unit process - batch operation, continuous operation, semi-batch operation. – Reactors - ideal batch reactor, plug flow reactor and mixed flow reactor.

**UNIT 3 SEPARATION PROCESSES****9 Hrs.**

Basic principles, types of separation processes like distillation, crystallization, extraction, absorption. Application of material balance in various unit operations.

**UNIT 4 HEAT TRANSFER****9 Hrs.**

Heat capacity of solids, liquids and gases, sensible heat and latent heat, Standard heat of reaction, heat of formation, combustion, mixing. - Calculation of standard heat of reaction. Introduction - types of heat exchangers, types of evaporators.

**UNIT 5 MEMBRANE SEPARATION****9 Hrs.**

Solid and liquid membranes, Membrane fouling, Osmosis, reverse osmosis, Electrodialysis, Ultrafiltration, Microfiltration, Nanofiltration, Pervaporation, IonExchange, Industrial application of membrane process.

**Max. 45 Hrs.****COURSE OUTCOME:**

On completion of the course, student will be able to:

CO1: Ability to explore and apply techniques, skills necessary to solve problems in chemical industry

CO2: Understanding the flow sheets of any process.

CO3: Ability to develop material balance and energy calculation

CO4: Students gain knowledge in chemical kinetics

CO5: Acquire knowledge in Heat transfer and Mass transfer operations

**REFERENCE BOOKS:**

1. Treybal, R.E, Mass Transfer Operations, 3rd Edition, McGraw Hill, 2004.
2. McCabe and Smith, Unit Operations of Chemical Engineering, 7th Edition, McGraw Hill, 2009
3. Bhatt, B.L., Vora, S.M., Stoichiometry, 4th Edition, Tata McGraw-Hill, 2004.
4. Levenspiel, O., Chemical Reaction Engineering, 3rd Edition, John Wiley & Sons, New York, 1995.
5. Smith J.M., Chemical Engineering Kinetics, 3rd Edition, McGraw-Hill, 2003.
6. Shreve. N., Chemical Process Industries, 8th Edition, McGraw Hill, 2004.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

<b>SCYA 2501</b>	<b>INDUSTRIAL CHEMISTRY LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Max. Marks</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>100</b>

**COURSE OBJECTIVES**

- To promote industry based analytical skills.

**LIST OF EXPERIMENTS**

1. Determination of Chemical oxygen demand in a wastewater sample
2. Estimation of available chlorine in Bleaching Powder
3. Determination of Saponification value of oil.
4. Determination of TFM & Alkalinity of given soap.
5. Analysis Pyrolusite ore.
6. Estimation of Cu in ore by Spectrophotometric method
7. Determination of the rate of corrosion of Iron in Mild steel by hydrogen evolution method.
8. Determination of molecular weight of polymer by viscosity measurement method
9. Verification of the Freundlich isotherm by using acetic acid.
10. Determination of the current density of battery

**COURSE OUTCOMES**

On successful completion of the course, student will be able to  
CO1: To understand and interpretations of analysis report of water.

CO2: Analytical skills to estimate and interpretations of soap

CO3: Analytical skills to estimate the constituent present in ore.

CO4: Analytical skills to estimate the molecular weight of polymer

**TEXT / REFERENCE BOOKS**

1. V.V. Ramanujam, Industrial Chemistry Analysis, 3rd ed., The National Publishing Company, Chennai, 1974.
2. Vogel's Text Book of Inorganic Qualitative Analysis, 4th ed., ELBS, London, 1974

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

<b>SCH 4061</b>	<b>CHEMICAL PROCESS AND SEPARATION LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Max. Marks</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>100</b>

**COURSE OBJECTIVE**

- The ability to identify, evaluate and apply different types Chemical processes and separation process followed in chemical industries

**LIST OF EXPERIMENTS**

1. Kinetics study in PFR
2. Kinetics study in Batch reactor
3. Kinetics study in CSTR
4. Non- Catalytic Heterogenous reaction
5. Synthesis of Acetyl Salicylic acid by Alkylation
6. Synthesis of Benzoic acid by Hydrolysis
7. Separation of liquid mixtures by using simple distillation
8. Separation of Acetic acid from acetic acid water mixture using extraction
9. Separation of Sodium carbonate from solid mixture using leaching
10. Absorption studies
11. Adsorption studies

**Course outcomes**

CO1: Determine conversion in various reactors and compare it with the theoretically predicted conversions

CO2: Evaluate the dissolution constant in non catalytic reactor

CO3: Evaluate the performance/calculate the efficiency in leaching, distillation processes and extraction operations

CO4: Evaluate the yield of various unit processes

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 1601	INORGANIC CHEMISTRY II	L	T	P	C	Max. Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn the general characteristics and properties of halogens and interhalogen compounds.
- To explain the preparation, properties and extraction of lanthanides and actinides.
- To understand the importance of inorganic polymers based on phosphazines, nitrides and carboranes.
- To elaborate on the fundamental aspects of nuclear reactions, types of nuclear reactions and the measurement of radioactivity with the help of different types of counters.
- To learn the properties and uses of solid state systems with close packing arrangements along with their imperfections.

**UNIT 1 HALOGENS AND INTERHALOGENS****9 Hrs.**

Group-17 (Halogens): Group discussion, anomalous behavior of F- ionic- covalent - bridging halides, reactivity of halogens, reduction of halogens by thiosulfate and application to iodo/iodimetry. Oxides and oxoacids of halogens, strength of oxoacids - Interhalogen compounds - ClF, ICl - ClF<sub>3</sub> - BrF<sub>3</sub> - IF<sub>3</sub> - ClF<sub>5</sub> - BrF<sub>5</sub> - IF<sub>5</sub> – structure analysis by VSEPR Model.

**UNIT 2 F- BLOCK ELEMENTS****9 Hrs.**

Lanthanides - Properties of lanthanides - Electronic configuration – oxidation states – ionic radii, lanthanide contraction - Colour and magnetic properties - Extraction of lanthanides - Uses of lanthanides. Actinides: Sources of actinides – preparation of transuranic elements - Electronic configuration – oxidation states – ionic radii – Colour of ions – comparison with lanthanides - Extraction of thorium and Uranium.

**UNIT 3 INORGANIC POLYMERS****9 Hrs.**

Properties of inorganic polymers, glass transition temperature, poly phosphonitrilic chlorides, poly di-alkoxy phosphazines, polymeric sulphur and sulphur nitrides, chalcogenide glasses, poly carboranes, polysiloxanes, Silicon rubber and resins.

**UNIT 4 NUCLEAR CHEMISTRY****9 Hrs.**

Fundamental particles of nucleus - concept of nuclides - representation of nuclides - unit of radioactivity - half - life period - radioactive equilibrium - radioactive displacement law - radioactive series - Measurement of radioactivity - ionization chamber, Geiger muller counter, scintillation counter - isotopes, isobars, isotones, nuclear forces, nuclear stability, structure of nucleus (shell and liquid drop model) - packing fractions - mass defect - binding energy - Q-values - artificial transmutations - nuclear reactions – spallation – nuclear fission and fusion - breeder reaction - radio isotopes and applications of radio isotopes.

**UNIT 5 STRUCTURE OF SOLIDS****9 Hrs.**

Solid state- crystalline and amorphous solids - structure and properties - laws of crystallography, Miller indices - simple cube, body centered cube and face centered cube - structure of NaCl and CsCl, diamond and graphite. Symmetry in crystals - crystal systems - crystal lattice - lattice planes and their designation - assignment of atoms/ions per unit cell in a cubic lattice - diffraction of X-rays by crystals - Bragg equation - structures of NaCl and CsCl - Avogadro number from cubic lattice dimension - closest packing - packing in ionic solids.

**Max.45 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Analyze the structure of interhalogen compounds by VSEPR model  
 CO2: Analyze the oxidation states and colour of ions of lanthanides and actinides  
 CO3: Examine the properties of various industrial inorganic polymers  
 CO4: Apply the basic principles of radioactivity to the applications of radioisotopes  
 CO5: Examine the structure and properties of solid crystal systems  
 CO6: Evaluate the basic concept of chemistry to real world applications

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 1602	ORGANIC CHEMISTRY II	L	T	P	C	Max. Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To discuss the concept of organo-nitrogen compounds.
- To understand the chemistry of heterocyclic compounds containing O, N, S.
- To understand the synthesis, properties and reactivity of aliphatic and aromatic carboxylic acids.
- To understand the synthesis, properties and reactivity of acid derivatives.
- To discuss the importance of active methylene groups in organic synthesis.

**UNIT 1 CARBOXYLIC ACIDS AND THEIR DERIVATIVES****9 Hrs.**

Structure and nomenclature - General methods of preparation of carboxylic acids – acidity – Effect of substituents on acidity – Physical and Chemical properties –Hell-Volhard-Zelinsky Reaction - Dicarboxylic acids -Nomenclature- Preparation and properties of oxalic and Malonic acid – Stereospecific addition to maleic and fumaric acids – Derivatives of carboxylic acids – Acid halides, esters, anhydrides and amides – Preparation and Properties – Relative reactivity - Acid and alkaline hydrolysis of esters – trans-esterification.

**Unit 2 AROMATIC CARBOXYLIC ACID AND THEIR DERIVATIVES****9 Hrs**

Structure and Nomenclature- General methods of preparation- Chemical Properties- Individual members- Benzoic acid, benzamide, Benzoyl chloride- Dicarboxylic acids- Phthalic acid- Preparation and Chemical Properties- Monobasic acid in side chain- Cinnamic acid- preparation and Chemical properties-Phenolic acids-Salicylic acid- preparation and Chemical properties

**UNIT 3 ACTIVE METHYLENE COMPOUNDS****9 Hrs.**

Preparation of malonic ester, ethyl acetoacetate and cyanoacetic ester – Physical and Chemical properties – Tautomerism in ethyl acetoacetate - Synthetic applications – preparation of synthetically important compounds from active methylene compounds - Michael addition - synthetic uses.

**UNIT 4 CHEMISTRY OF NITROGEN CONTAINING COMPOUNDS****9 Hrs.**

Amines – Structure, nomenclature and classification - Methods of preparation of primary, secondary and tertiary amines - Physical and chemical properties – Basicity of amines, effect of substituents on basicity of aromatic amines – Quaternary ammonium salts – Hinsberg test – Carbylamine test, Schotten-Baumann reaction. Nitrocompounds – Structure - Aliphatic and Aromatic nitro compounds – Methods of preparation - Physical and Chemical Properties – Substitution of aromatic nitro compounds. Diazo compounds- Diazotisation and its mechanism. Cyanides and isocyanides – Structure, preparation and properties.

**UNIT5 HETEROCYCLIC COMPOUNDS****9 Hrs.**

Nomenclature - Five membered rings - Preparation of pyrrole, furan and thiophene – Molecular orbital picture – Physical and Chemical properties – Electrophilic and nucleophilic substitution mechanism – Oxidation and reduction – Six membered rings – Pyridine and Quinoline– Preparation and properties - Skraup synthesis – BischlerNapieralski synthesis – Preparation and properties of Indole.

**Max. 45 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Examine the effect of substituents on acidity of carboxylic acids and their derivatives  
 CO2: Examine the structure and properties of aromatic carboxylic acids and their derivatives  
 CO3: Analyze the significance of the presence of active methylene group in organic compounds  
 CO4: Analyze the effect of substituents on basicity of aromatic amines and aromatic nitro compounds  
 CO5: Apply the electrophilic and nucleophilic substitution mechanism to heterocyclic compounds  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. R. T. Morrison and R. N. Boyd, Organic Chemistry, 6th ed., Prentice-Hall of India Limited, New Delhi, 1992.
2. Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., 1997.
3. V. K. Ahluwalia, Organic Reaction Mechanism, Ane Books Pvt. Ltd, 2007.
4. I. L. Finar, Organic Chemistry, Vol-1, 6th ed., Pearson Education Asia. 2004.
5. I. L. Finar, Organic Chemistry, Vol-2, 6th ed., Pearson Education Asia. 2004.
6. J. March and M Smith, Advanced Organic Chemistry, 5th ed., John-Wiley and sons, 2001.
7. O. P. Agarwal, Chemistry of Organic Natural Products, Vol 1 and 2, Goel Pub. House, 2002.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 1603	PHYSICAL CHEMISTRY-II	L	T	P	C	Max. Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To understand the basic concepts of chemical potential and Third law of thermodynamics.
- To understand the concepts and applications of electrode potential.
- To study the order, rate and temperature dependence on rate constant.
- To learn the principles of physical photochemical processes.
- To study the phase rule and its application to different heterogeneous systems.

**UNIT 1 THERMODYNAMICS-III****9 Hrs**

Partial molar quantities – Chemical potential – Variation of chemical potential with T, P and X (mole fraction) – Gibb's–Duhem equation. Duhem-Margules equation-Van't Hoff's reaction isotherm – Van't Hoff's isochore – Clapeyron equation and Clausius – Clapeyron equation – Applications – Third Law of Thermodynamics: Nernst heat theorem – Statement of III law and concept of residual entropy.

**UNIT 2 ELECTROCHEMISTRY-II****9 Hrs**

Galvanic cells – Reversible and irreversible cells. Conventional representation of electrochemical cells. Electromotive force of a cell and its measurement computation of E.M.F. Application of Gibbs Helmholtz equation. Concentration of E.M.F. Nernst equation. Types of reversible electrodes – Gas/metal ion-metal/metal ion; metal/insoluble salt/anion and Redox electrodes. Electrode reactions – Nernst equation – Derivation of cell. E.M.F. and single electrode potential standard hydrogen electrode – reference electrodes – standard electrodes potentials – sign convention – Electrochemical series and its significance. Concentration cell with and without transport. Liquid junction potential. Application of EMF concentration cells. Valency of ion, solubility product and activity co-efficient. Potentiometric titrations. Determination of pH using Hydrogen, quinhydrone and glass electrodes.

**UNIT 3 CHEMICAL KINETICS-II****9 Hrs**

Effect of temperature on reaction rate- concept of activation energy, energy barrier, Arrhenius equation. Theories of reaction rates- collision theory- derivation of rate constant of bimolecular reaction- failure of collision theory- Lindemann's theory of unimolecular reaction. Theory of absolute reaction rates – derivation of rate constant for a bimolecular reaction- significance of entropy and free energy of activation. Comparison of collision theory and absolute reaction rate theory (ARRT).

**UNIT 4 PHOTOCHEMISTRY****9 Hrs**

Comparison between thermal and photochemical reactions-Laws of photo chemistry – Lambert-Beer's law-Grothuss-Draper and Stark – Einstein. Quantum efficiency. Consequences of light absorption- Jablonski diagram- radiative and non-radiative transitions. Photosensitization and quenching. Fluorescence, phosphorescence and chemiluminescence. Laser and uses of lasers. Kinetics of  $H_2-Cl_2$ ,  $H_2-Br_2$  and  $H_2-I_2$  reactions, comparison between thermal and photochemical reactions.

**UNIT 5 PHASE CHANGES****9 Hrs**

Definitions of terms in the Gibb's phase rule- derivation and application to one component system – water and sulphur-supercooling, sublimation. Two-component systems-Classification of two component systems-Thermal analysis-simple eutectic system (lead-silver, bismuth-cadmium), de-silverisation of lead. Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (Na-K). Solid solutions (Ag-Au)-fractional crystallization, freezing mixtures-  $FeCl_3-H_2O$  systems,  $CuSO_4-H_2O$  system.

**Max:45 Hrs****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Apply the chemical potential concept in the formulation of different thermodynamic equations.  
 CO2: Examine the electrode potential concept for its application in electrochemical cells.  
 CO3: Apply the concept of activation energy to the temperature dependence on reaction rate of a chemical reaction.  
 CO4: Examine the various kinetics involved in the photochemical reactions.  
 CO5: Apply the phase rule to alloy systems for optimizing their mechanical and thermal properties  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. B. R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Vishal Publishing Co, 48<sup>th</sup> edition, 2020.
2. ArunBahl, B. S. Bahl and G. D. Tuli, *Essentials of Physical Chemistry*, S. Chand publishing, 2012
3. P.W. Atkins, *Physical Chemistry*, 7th ed., Oxford university press, 2001.
4. Glasston & Lewis, *Physical Chemistry*, 2<sup>nd</sup> Edition, McMillan publishers, 1973
5. A.S. Negi and S. C. Anand, *A Textbook of Physical Chemistry*, New Age International, 2004

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 2601	INORGANIC QUALITATIVE ANALYSIS	L	T	P	C	Max. Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To learn the theoretical basis of qualitative inorganic analysis
- To understand the method of identification of group and cations using semimicro analysis
- To analyse the mixture and identify the simple and interfering anions in the mixture
- To remove the interfering anion from mixture

**LIST OF EXPERIMENTS**

Semi micro qualitative analysis of inorganic salt mixtures containing one interfering acid radical Simple anions - Carbonate, nitrate, sulphate, sulphide, sulphite, chloride and bromide Interfering anions - Borate, fluoride, oxalate, phosphate, arsenite and chromate.
<b>Cations:</b> Group I cations: Lead, silver, mercurous. Group II cations: Mercuric, copper, cadmium, bismuth, antimony, tin. Group III cations: Aluminium, ferrous, ferric, chromium. Group IV cations: Cobalt, nickel, manganese, zinc. Group V cations: Barium, strontium, calcium Group VI cations: Magnesium, ammonium.

**COURSE OUTCOMES**

On completion of the course, student will be able to  
 CO1: Analyze the mixture using semi micro analysis  
 CO2: Identify the simple anions and interfering anions in the mixture  
 CO3: Remove the interfering anion from the mixture  
 CO4: Identify the cations present in the mixture  
 CO5: Recognize the classification of various cations under different groups  
 CO6: Acquire the group separation skills

**TEXT / REFERENCE BOOKS**

1. V.V. Ramanujam, Inorganic Semi Micro Qualitative Analysis, 3rd ed., The National Publishing Company, Chennai, 1974.
2. Vogel's Text Book of Inorganic Qualitative Analysis, 4th ed., ELBS, London, 1974

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

<b>S03A PROJ</b>	<b>PROJECT WORK</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Max. Marks</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>100</b>

**COURSE OBJECTIVES**

1. To learn the theoretical and experimental basis of synthetic and analytical methods.

**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1: Able to synthesis and interpretation of the results independently

CO2: To improve the technical presentation skills.

SCYA 3001	Analytical Chemistry	L	T	P	Credits	Total marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To enable the students learn the principles of separation and purification techniques.
- To understand the principles of various chromatographic techniques.
- To construct the techniques for separation of metal ions using various chromatographic methods.
- To develop the skill of learning various thermal methods.
- To discuss the basic principle of polarimetry and amperometry methods.

**UNIT 1 SEPARATION AND PURIFICATION TECHNIQUES****9 Hrs.**

Principles involved in the separation of precipitates, solvent extraction and electrophoresis. Purification of solid organic compounds, extraction - use of immiscible solvents, Soxhlet extraction, crystallization, use of miscible solvents, fractional crystallization, sublimation. Purification of liquids, experimental techniques of distillation, fractional distillation, vacuum distillation, steam distillation, tests for purity.

**UNIT 2 CHROMATOGRAPHY I****9 Hrs.**

Principles adsorption, thin layer, partition and paper. Chromatography column chromatography, adsorbents, preparation of column, adsorption, elution, recovery of substance and applications. TLC - choice of adsorbent and solvent, preparation of chromatogram and applications, R<sub>f</sub> value. Paper chromatography, Solvents used and principles, factors affecting R<sub>f</sub> value, separation of amino acid mixtures. Radial paper chromatography.

**UNIT 3 CHROMATOGRAPHY II****9 Hrs.**

Ion exchange chromatography – principle, resins, action of resins, experimental techniques, applications, separation of Zn-Mg, Co-Ni, Cd-Zn, Chloride, bromide. Gas chromatography and high pressure liquid chromatography – principles, Detectors, experimental techniques, instrumentation and applications.

**UNIT 4 THERMAL ANALYSIS****9 Hrs.**

Thermal analytical methods - Principle involved in thermogravimetric analysis and differential gravimetric analysis, discussion of various components with block diagram, characteristics of TGA and DTA, factors affecting TGA and DTA curves, thermometric titrations.

**UNIT 5 POLAROGRAPHY****9 Hrs.**

Principle, concentration polarization, dropping mercury electrode, advantages and disadvantages, convection, migration and diffusion currents, Ilkovic equation (derivation not required) and significance, experimental assembly, electrodes, capillary solutions, current voltage curve, oxygen wave, influence of temperature and agitation on diffusion layer, polarography as an analytical tool in quantitative and qualitative analysis. Amperometry - basic principles and uses. Polarimetry principle – instrumentation, comparison of strengths of acids, estimation of glucose.

**Max.45 Hours****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Apply the principles of separation and purification to the miscible and immiscible liquids
- CO2: Examine the principles of adsorption in paper and thin layer chromatography
- CO3: Apply the principles of chromatography to the GC and HPLC techniques
- CO4: Examine the principles of thermal methods to TGA, DTA and thermometric titration techniques
- CO5: Apply the polarization principles to the polarography and polarimetry techniques
- CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. Concise Inorganic Chemistry – J.D. Lee – 3<sup>rd</sup> Edition, Von Nostrand
2. Inorganic Chemistry – P. L. Soni – Sultan Chand
3. Inorganic Chemistry – Pun and Sharma Nagin
4. Inorganic Chemistry – Modan S. Chand
5. Advanced Inorganic Chemistry – Cotton and Wilkinson
6. A Textbook of Inorganic Chemistry – A.K. De – New Age
7. Industrial Chemistry- B.K. Sharma – Goel Publications
8. General and Inorganic Chemistry Part I Sarkar, Books and Allied (P) Ltd
9. General and Inorganic Chemistry Part II Sarkar, Books and Allied (P) Ltd
10. Chemical Methods for Environmental Analysis Ramesh and Anbu, Macmillan

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 Marks each-No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3002	FUNDAMENTALS OF SPECTROSCOPY	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To study the interaction of radiation with matter and selection rules
- To learn the fundamentals of spectroscopic techniques
- To understand the principle and instrumentation of various spectroscopic techniques
- To interpret the spectra of various spectroscopic techniques
- To apply the concept of spectral data to assign the structure of organic compounds

**UNIT 1 INTRODUCTION TO SPECTROSCOPY****9 Hrs.**

Interaction of radiation with matter – Electromagnetic spectrum – quantization of energy – Boltzman distribution (formula only) - Electronic, vibrational and rotational energy levels: Relative population – Absorption and emission spectra – Selection rules – line widths – resolution and signal to noise ratio.

**UNIT 2 UV-VISIBLE SPECTROSCOPY****9 Hrs.**

Electromagnetic spectrum – Energy-Wavelength relationship – Introduction to UV-VIS spectroscopy – Beer-Lamberts Law – Instrumentation – Bands in UV-VIS spectrum – Possible electronic transitions – Types of electronic transitions based on selection rules – Characteristic absorption ( $\lambda_{max}$  and  $\epsilon_{max}$ ) – Factors influencing absorption – Chromophore, Auxochrome, Bathochromic shift, Hypsochromic shift, Hypochromic shift, Hyperchromic shift.

**UNIT 3 IR AND RAMAN SPECTROSCOPY****9 Hrs.**

Introduction to IR spectroscopy – Principle, types of stretching and bending vibrations, vibrational frequencies – Instrumentation – Bands in IR spectrum – Selection rules – Identification of organic molecules from characteristic absorption bands.

Raman spectroscopy – Principle – Raleigh and Raman scattering – Stoke's and antistoke's line – Differences between IR and Raman spectroscopy - Mutual exclusion principle – applications.

**UNIT 4 NMR SPECTROSCOPY****9 Hrs.**

Principle of nuclear magnetic resonance – Instrumentation – Shielding mechanism - Chemical shift – Multiplicity – Spin-spin coupling and coupling constants – Splitting of signals - Deuterium labeling – Interpreting the NMR spectra of some organic molecules.

**UNIT 5 MASS SPECTROMETRY****9 Hrs.**

Basic principles of mass spectrometry – Molecular ion peak – Base peak – Isotopic peak – Metastable peak and their uses – Fragmentation –  $m/z$  values of various fragments – Nitrogen rule - McLafferty rearrangement - Interpreting the mass spectra of some organic molecules – Instrumentation – Combined application in identifying organic compounds.

**Max.45 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Examine the principles of spectroscopy for absorption and emission spectra  
 CO2: Analyze the UV-Visible spectral transitions of molecules  
 CO3: Examine the principles of IR and Raman spectroscopic techniques  
 CO4: Apply the principles of NMR spectroscopy to interpret NMR spectra of organic molecules  
 CO5: Analyze the Mass spectra of organic molecules  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCE BOOKS**

1. Banwell C. N., Fundamentals of Molecular Spectroscopy, Tata McGraw Hill, 1983.
2. Kalsi P. S., Stereochemistry, 3rd Edition, New Age International Publishers, 1995.
3. Barrow G. M., Introduction to Molecular Spectroscopy, McGraw-Hill, 1962.
4. Willard H. H., Merritt Jr. L. L., Dean J. A., and Settle Jr. A. F., Instrumental methods of analysis, 6th Edition, Van Nostrand, 1981.
5. Kemp W., Applications of Spectroscopy, English Language Book Society, 1987.
6. Skoog D. A., West D. M., Holler f. J., and Crouch S. R., Fundamentals of Analytical Chemistry, 9th Edition, Wadsworth Publishing Co. Inc., 2012

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A :** 10 Questions of 2 Marks each-No choice**20 Marks****PART B :** 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

<b>SCYA 3003</b>	<b>FOOD CHEMISTRY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>	<b>Total Marks</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>100</b>

**COURSE OBJECTIVES**

- To understand the basic principles of Food Chemistry and the importance of good health
- To learn about the functions and importance of nutrients and a balanced diet
- To learn about the various quality control processes in the food industry

**UNIT 1 FOOD, ENERGY AND HEALTH****9 Hrs**

Food as a source of nutrients – sources and functions of food – nutrients – adequate, optimum, good and malnutrition – Food pyramid – different food groups – food guide - Proper diet – food in relation to health - Food as a source of energy – determination of energy value of food – energy yielding nutrients - Factors influencing energy requirements – recommendations for different age groups and special conditions – Recommended dietary allowances.

**UNIT 2 FOOD ADDITIVES****9Hrs**

Artificial sweeteners – saccharin, cyclamate, and aspartame – food flavours – esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours – changes in cooking. Emulsifying agents - preservatives – leavening agents. Baking powder – Yeast - Taste enhancers – MSG - vinegar.

**UNIT 3 FOOD AND BEVERAGE****9 Hrs**

Production of bread, bun and biscuits - Raw materials, methods and machinery required - Candy manufacturing – Caramelization - Fast foods - Instant foods - Dehydrated foods - Oleoresin of spices – Condiments - Beverages: Soft drinks, soda, fruit juices and alcoholic beverages - Examples, Carbonation - Addiction to alcohol - Cirrhosis of liver. Social problems. Composition of soft drinks - Nitrogen preservation and packing of fruit juices.

**UNIT 4 BALANCED DIET****9 Hrs**

Nutrition – calorific value of food – Respiratory quotient of food – basal metabolic rate – factors influencing BMR and specific dynamic action of food. Energy requirements of individuals – diet and its components – the protein requirements –Protein malnutrition - Nutritional value of carbohydrates. – Fibers in the diet, dietary sugars – nutritional aspects of lipids.

**UNIT 5 FOOD ADULTERATION AND QUALITY CONTROL****9 Hrs**

Adulterants: Common adulterants in different foods – Contamination with toxic chemicals – pesticides and insecticides - Principles involved in the analysis of detection and prevention of food adulteration - Food preservation and processing: Food deterioration, methods of preservation and processing - Quality control: Specifications and standards - PFA, FPO, FDA, drug license, WHO standards, BIS specifications - packing and label requirements - essential commodities act - consumer protection act.

**Max. 45 Hrs****COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1- To learn the nutrient value and energy value of food groups obtained through proper diet.  
 CO2- To learn the properties of food additives and their role as food value enhancers.  
 CO3- To analyse the role of materials in the method and machinery required in food processing.  
 CO4- To understand the energy requirements of individuals in the form of food.  
 CO5- To understand the quality specifications of food in terms of detection and prevention of food adulteration.  
 CO6: Evaluate the basic concept of chemistry to real world applications

**TEXT/REFERENCE BOOKS**

1. Alex Ramani V, Food Chemistry, MJP Publishers, Triplicane, Chennai, 2009.
2. M. Swaminathan Advanced Text Book on Food and Nutrition, Vol. I Printing and Publishing Co., Ltd., Bangalore. 1993.
3. M. Swaminathan Advanced Text Book on Food and Nutrition, Vol II Printing and Publishing Co., Ltd., Bangalore. 1993.
4. B. Sri Lakshmi Nutrition Science, New Age International Pvt. Ltd Publishers, New Delhi, Bangalore. 2003.
5. S N Manay and S Swamy Food, facts and Principles, Wiley Eastern Ltd, New Delhi. 1987.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3004	CHEMISTRY OF PHARMACEUTICAL, PESTICIDES AND COSMETICS	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn about the Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavouring agents, gelatin
- Synthesis of paracetamol, ibuprofen and chloramphenicol
- Classification of Drugs based on Antibacterial, antifungal, antiviral and Cardiovascular agents.
- To impart an insight into structural details of hormones and Vitamins.
- Classification and Synthesis of pesticides
- The basic knowledge on Cosmetics and Perfumes

**UNIT – 1 PHARMACEUTICAL AGENTS -I**

Various types of pharmaceutical excipients – their chemistry, process of manufacture and quality specifications – Glidants, lubricants, diluents, preservatives, antioxidants, emulsifying agents, coating agents, binders, coloring agents, flavouring agents, gelatin and other additives, sorbitol, mannitol, viscosity builders etc.

**UNIT – 2 DRUGS AND PHARMACEUTICAL AGENTS -I**

Drug discovery, design and development; Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, antiinflammatory agents (Aspirin, paracetamol, Ibuprofen); antibiotics (Chloramphenicol)

**UNIT-3 DRUGS AND PHARMACEUTICAL AGENTS -II**

Antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceriltrinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).

**UNIT-4 PESTICIDES**

General introduction to pesticides (natural and synthetic), benefits and adverse effects, changing concepts of pesticides, structure activity relationship, synthesis and technical manufacture and uses of representative pesticides in the following classes: Organochlorines (DDT, Gammexene.); Organophosphates (Malathion, Parathion ); Carbamates (Carbofuran and carbaryl); Quinones ( Chloranil), Anilides (Alachlor and Butachlor).

**UNIT – 5 COSMETICS& PERFUMES**

A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

**Max.45 Hours****COURSE OUTCOMES**

- On successful completion of the course, student will be able to
- CO1: Understand the impact of pharmaceuticals,  
 CO2: Retero synthetic approach for the Analgesic and Antipyretic drugs  
 CO3: Classification of Drugs with respect to antiviral, antifungal and antibacterial activity  
 CO4: Pesticides role in disease control management  
 CO5: Cosmetics& Essential oils and their importance in Daily life  
 CO6: The impact of Pharmaceuticals, Drugs, Pesticides, Cosmetics & Essential oils

**TEXT / REFERENCE BOOKS**

1. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK.
2. Hakishan, V.K. Kapoor: Medicinal and Pharmaceutical Chemistry, VallabhPrakashan, Pitampura, New Delhi.
3. William O. Foye, Thomas L., Lemke , David A. William: Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd. New Delhi.
4. E. Stocchi: Industrial Chemistry, Vol -I, Ellis Horwood Ltd. UK.
5. P.C. Jain, M. Jain: Engineering Chemistry, DhanpatRai& Sons, Delhi.
6. Sharma, B.K. & Gaur, H. Industrial Chemistry, Goel Publishing House, Meerut (1996).
7. Cremlyn, R. Pesticides. Preparation and Modes of Action, John Wiley & Sons, New York, 1978

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 Marks each-No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 Marks.****80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3005	CHEMISTRY OF NATURAL PRODUCTS	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn about the isolation of alkaloids and structural elucidation of coniine, nicotine, piperine and papaverine.
- To emphasize on the isolation of terpenoids and structural elucidation of citral, menthol, geraniol, camphor and vitamin A.
- To recognize the biological importance of purines and pyrimidines in organic reactions.
- To emphasize on the structural determination of cyanidine chloride and Quercetin .
- To impart an insight into structural details of hormones and Vitamins.

**UNIT 1 ALKALOIDS****9Hrs.**

Classification, isolation, purification, general methods of structure determination - functions of alkaloids. Structural elucidation of coniine, nicotine, piperine and papaverine.

**UNIT 2 TERPENOIDS AND CAROTENOIDS****9 Hrs.**

Terpenoids: Introduction, classification, Isoprene rule - General methods of determining structure – Structural elucidation of citral, menthol, geraniol and camphor.

Carotenoids: Introduction, geometrical isomerism, structure determination and synthesis of  $\beta$ -carotene and vitamin A.

**UNIT 3 PURINES AND PYRIMIDINES****9 Hrs.**

Purines: Introduction, biological importance - Structure and synthesis of Uric acid, Xanthine and Caffeine - Pyrimidines: Introduction, Structure and synthesis of Uracil and Thymine.

**UNIT 4 ANTHOCYANINS AND FLAVONES****9 Hrs.**

Anthocyanins: Introduction to anthocyanins - Structure and general methods of synthesis of anthocyanins - Cyanidine chloride: structure and determination – Flavones and Isoflavones: Structure and determination of flavone and flavonoids - Quercetin: Structure determination and importance.

**UNIT 5 HORMONES AND VITAMINS****9 Hrs.**

Hormones: Introduction - Difference between hormones and vitamins. Classification - Structure and functions of steroid hormones: Androsterone - Progesterone - Testosterone - Estrone. Adrenocortical hormones: Cortisone. Vitamins: Structure and importance of Vitamin D - Folic acid - Nicotinamide.

**Max.45 Hours****COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1:Elaborate on the methods and structural elucidation of Coniine, Nicotine, Piperine and Papaverine.

CO2:Explain on the structural elucidation of citral, menthol, geraniol, camphor and vitamin A.

CO3:Examine the structure and synthesis of uric acid, Xanthine, caffeine, Uracil and Thymine.

CO4:Discuss on the general methods of synthesis of anthocyanins.

CO5:Explain on the structural elucidation of cyanidine chloride and Quercetin.

CO6:Summarize the structure and functions of hormones and Vitamins..

**TEXT / REFERENCE BOOKS**

1). O. P. Agarwal, Chemistry of Organic Natural Products, Vol 1 and 2, Goel Pub. House, 2002.

2). L. Finar, Organic Chemistry, Vol-2, 6th ed., Pearson Education Asia. 2004.

3). Gurdeep Chatwal and Anand, Chemistry of Natural Products Vol 1 & 2, Himalayan Publishing Co, 2001.

4). Bahl B.S. and ArunBahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3006	POLYMER CHEMISTRY	L	T	P	C	Max. Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn the characteristics and classification of polymers.
- To explain the mechanism of polymerization in the formation of polymers.
- To learn different types of polymerization reactions and various polymer degradation processes.
- To elaborate on the properties of thermoplastics and thermosetting polymers.
- To learn the compounding process in polymers and to understand the different moulding methods.

**UNIT 1 INTRODUCTION TO POLYMERS****9 Hrs.**

Monomers, Oligomers, Polymers and their characteristics. Classification of polymers: Natural, synthetic, linear, cross linked and network, Plastics, elastomers, fibres, Homopolymers and Co-polymers. Bonding in polymers: Primary and secondary bond forces in polymers, cohesive energy. Determination of Molecular mass of polymers: Number Average molecular mass (Mn) and weight average molecular mass (Mw) of polymers.

**UNIT 2 MECHANISM OF POLYMERIZATION****9 Hrs.**

Chain growth polymerization: Cationic, anionic, free radical polymerization, Stereo regular polymers: Ziegler Natta polymerization, Step growth polymerisation.

**UNIT 3 TECHNIQUES OF POLYMERIZATION AND POLYMER DEGRADATION****9 Hrs.**

Bulk, Solution, Emulsion, Suspension, interfacial and gas phase polymerization. Types of Polymer Degradation, Thermal degradation, mechanical degradation, photodegradation, Photo stabilizers.

**UNIT 4 INDUSTRIAL POLYMERS****9 Hrs.**

Preparation of fibre forming polymers, elastomeric material. Thermoplastics: Polyethylene, Polypropylene, polystyrene, Polyacrylonitrile, Poly Vinyl Chloride, Poly tetrafluoro ethylene, nylon and polyester. Thermosetting Plastics: Phenol formaldehyde and epoxide resin. Elastomers: Natural rubber and synthetic rubber - Buna - N, Buna-S and neoprene. Conducting Polymers: Elementary ideas, examples: poly sulphur nitriles, poly phenylene, poly pyrrole and poly acetylene.

**UNIT 5 INTRODUCTION TO POLYMER PROCESSING****9 Hrs.**

Compounding: Polymer Additives: Fillers, Plasticizers, antioxidants, thermal stabilizers, fire retardants and colourants. Processing Techniques: Calendaring, die casting, compression moulding, injection moulding, blow moulding and reinforcing.

**Max.45 Hrs.****COURSE OUTCOMES**

- On successful completion of the course, student will be able to
- CO1: Explain the characteristics and classification of polymers.
- CO2: Discuss the mechanism involved in different types of polymerization reactions.
- CO3: Understand the different types of polymerization reactions and polymer degradation processes.
- CO4: Analyze the different types of polymers starting from various sources.
- CO5: Understand the basics of conducting polymers and their types.
- CO6: Identify different compounding agents and their importance in moulding methods.

**TEXT / REFERENCE BOOKS**

1. V.R. Gowariker, Polymer Science, Wiley Eastern, 1995
2. G.S. Misra, Introductory Polymer Chemistry, New Age International (Pvt) Ltd, 1996
3. F. N. Billmeyer, Textbook of Polymer Science, Wiley Interscience, 1971
4. A. Kumar and S.K. Gupta, Fundamentals of Polymer Science and Engineering, Tata McGraw-Hill, 1978

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 Marks each-No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 Marks.****80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3007	AGRICULTURAL CHEMISTRY	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn about agricultural chemistry
- To analyse a suitable method to cultivate and promote agricultural growth.

**UNIT 1 SOIL CHEMISTRY****9 Hrs**

Introduction: Formation of Soil. Classification of Soil and properties of Soil–Soil acidity–Causes–Soil alkalinity–causes–determination of soil pH– Buffering of soil–Limitation of Soil–availability of soil nutrients to plants–Reclamation of Soil.

**UNIT 2 FERTILIZERS****9Hrs**

Fertilizers - Classification of fertilizers - Requisites of good fertilizers - Nitrogenous fertilizers - Phosphatic fertilizers - super Phosphate of lime - NPK fertilizers - ill effects of fertilizers - effect of mixed fertilizers on soil pH - Micronutrients - role of micronutrients sources- Need for nutrient balance - Soil management and Micronutrients needs.

**UNIT 3 MANURES****9Hrs**

Bulky organic manures – Farm yard manure – handling and storage. Oil cakes. Blood meal –Meat meal–Fish meal and green manures.

**UNIT 4 PESTICIDES AND FUNGICIDES****9 Hrs**

Pesticides–Classification of Insecticides–Stomach and contact poisons–Fumigants –Insecticides–Organic insecticides–DDT, Gammexene–Malathion– Parathion.

**UNIT 5 FUNGICIDES AND HERBICIDES****9 Hrs**

Fungicides: Inorganic (Bordeaux Mixture) and organic (dithiocarbamate). Industrial fungicides: creosote fractions. Herbicides: Acaricides – Rodenticides. Attractants – Repellants. Preservation of seeds.

**Max.45 Hrs.****COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1- To understand soil chemistry and its nutrient content.

CO2- To learn the classification of fertilizers and the manures.

CO3-To understand and learn the method of effective handling and storage of manures.

CO4- To learn the classification and side effects of pesticides and fungicides.

CO5- To know the composition of different types of fungicides and herbicides.

CO6:Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCES**

1. G.T. Austin :shreve's Chemical Process Industries, 5th edition, Mc-Graw-Hill, 1984
2. B.A. Yagodin (Ed). Agricultural Chemistry, 2 Volumes, Mir Publishers (Moscow), 1976.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3008	MATERIALS CHEMISTRY	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To get an understanding of materials science
- To introduce various instrumental techniques

**UNIT 1 MATERIALS CHARACTERIZATION - OVERVIEW.****9 Hrs**

Introduction to Materials Chemistry- Basics. Introduction to Material Characterization. Various characterization techniques - their application in characterization of materials i.e. UV-VIS , FTIR, XRD, Electron Microscopy, FESEM, TEM, AFM, XPS, OES, Particle Size Analysis, BET Surface Area Analyzer, Zeta potential, TGA, DTA, DSC, Raman Spectroscopy, Conductivity Measurements, NMR, Mass Spectrometry, Mossbauer Spectra.

**UNIT 2 ENERGY MATERIALS****9 Hrs**

Introduction: Current energy requirements, growth in future energy requirements, Importance of Renewable Energy Sources. Introduction to Solar Cell, Fuel cells, Wind energy.

**UNIT 3 MAGNETIC MATERIALS****9Hrs**

Magnetic properties of solids- classification of magnetic materials, Magnetic susceptibility, Langevin diamagnetism, Weiss theory of para-magnetism. Chemistry Electronic Materials.

**UNIT 4 ELECTRONIC MATERIALS****9 Hrs**

Electronic properties of metals, insulators and semi-conductors: Electronic structure of solids, Band theory, band structure of metals, insulators and semiconductors. Electrons, holes and excitons. The temperature dependence of conductivity of extrinsic semiconductors. Photo conductivity and photovoltaic effect-p-n junctions.

**UNIT 5 SUPER CONDUCTIVITY****9 Hrs**

Superconductivity - Occurrence of superconductivity - Destruction of superconductivity by magnetic fields - Meisner effect. Types of superconductors - Theories of super conductivity - BCS theory.

**Max. 45 Hrs****COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1- To learn the characterization of materials by different analytical and spectroscopic methods.

CO2- To understand different types of energy sources and its future demands.

CO3-To learn the classification and properties of magnetic materials .

CO4-To understand the chemistry behind the electronic properties of metals and materials based on the formation of p-n junction.

CO5- To learn the principle of superconductivity and the theory behind superconductivity.

CO6: Evaluate the basic concept of chemistry to real world applications

**TEXTBOOKS / REFERENCES**

1. Material Science, by S. L . Kakani, A. Kakani, New Age International Pvt. Ltd, 2016.
2. Solid State Chemistry, by D K CHAKRABARTHY, New Age International Pvt. Ltd, 2012.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A : 10 Questions of 2 Marks each-No choice****20 Marks****PART B : 2 Questions from each unit of internal choice, each carrying 16 Marks.****80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3009	INDUSTRIAL CHEMISTRY	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES:**

To enable a student to understand:

- The generation of energy from various types of fuels and electrochemical power sources.
- The use of chemicals in improvement of agricultural crops.
- Methods employed for purification of water for industries.
- Manufacturing processes of industrially important materials.

**UNIT 1 INDUSTRIAL FUELS AND EXPLOSIVES****9 Hrs**

Classification of fuels – Solid fuels: Coal: Types, properties and uses – Liquid fuels: Petroleum – Refining of petroleum, fractions and their uses – Fluidized bed catalytic cracking – Knocking and octane number – Gaseous fuels: Natural gas; LPG; Gobar gas: production, composition and uses.

Explosives: Definition and requirements – Classification of explosives – Preparation of gun powder, lead azide, cordite, TNT, RDX, dynamite – Classification of rocket propellants.

**UNIT 2 ELECTROCHEMICAL INDUSTRY****9 Hrs**

Production of materials like chlorine, caustic soda, sodium chlorate – Batteries: Zinc-carbon cell, alkaline battery, lead-acid battery, NICAD battery – Fuel cells: Hydrogen-oxygen fuel cell – Solar cells: Photovoltaic cell – Paints: Pigment volume concentration, constituents of paints and their functions – Types of varnishes.

**UNIT 3 AGROCHEMICALS****9Hrs**

Fertilizers: Manufacture of ammonia, ammonium salts, urea, superphosphate, triple superphosphate and nitrate salts – Insecticides: stomach poisons, contact insecticides, fumigants – Pesticides: Mode of action and synthesis of common pesticides like gammexane, DDT, aldrin, Parathion, Malathion. Herbicides: Manufacture of 2,4-D and 2,4,5-T – Fungicides: Preparation of Bordeaux mixture.

**UNIT 4 WATER TREATMENT****9 Hrs**

Sources of water – Hardness of water – Water softening methods: Zeolite process, demineralisation process – Desalination: Reverse osmosis and electrodialysis.

Sugar industry: Refining and grading of sugar - Sugar substitute: Saccharin and aspartame.

Leather industry: Curing, preservation and tanning of hides and skins – Treatment of tannery effluents.

Cleansing agents: Preparation of toilet and washing soaps – Cleansing action of soaps.

**UNIT 5 CERAMIC INDUSTRY****9 Hrs**

Cement: Manufacture by wet process and dry process – Setting and hardening of cement – Water proof cement – White cement.

Glass: Composition and properties of glass – Manufacture of glass – Types of glasses.

Composites: Definition – Metal-matrix composites – Fiber reinforced composites – ceramic matrix composites.

**COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1-To understand the classification of fuels and explosives and their requirements.

CO2-To learn the different types of batteries and fuel cells.

CO3- To understand the composition of different types of important fertilizers.

CO4- To study the different softening methods of hard water and its application in different industries.

CO5-To learn the composition of cement and glass and their properties.

CO6:Evaluate the basic concept of chemistry to real world applications

**TEXT / REFERENCES**

1. Norris Shreve, R. and Joseph A. Brink, Jr. Chemical process industries, McGraw-Hill, 4<sup>th</sup> Ed (1997).
2. Subba Rao, N. S. Biofertilizers in Agriculture, Oxford and IBH Publishing Co. (1982).
3. Jain, P. C. and Jain, M. Engineering Chemistry, 14<sup>th</sup> Ed.; Dhanpat Rai and Sons, (2016).
4. Sheik Mideen, A. Engineering Chemistry I and II, J B Publications (2015).
5. Kuriakose, J. C. and Rajaram, J. Chemistry in Engineering and Technology Volume 1&2, Tata McnGraw Hill. (1988).
6. Sharma, B. K. Industrial Chemistry, Oxford and IBH Publishing Co. (1981).

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 3010	SYNTHETIC ORGANIC CHEMISTRY	L	T	P	C	Max. Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To learn the importance of oxidizing agents in organic reaction.
- To understand the significance of reducing agents in organic chemical reactions.
- To recognize the importance of organometallic compounds in organic reactions.
- To impart an insight into modern methodologies used in synthesis of organic compounds.
- To emphasize on chemical reactions involving the formation of cyclic transition structures.

**UNIT 1 ORGANIC REAGENTS- I****9Hrs.**

Introduction to Organic Reagents - Types of Reagents - Oxidation Reagents – DDQ - SeO<sub>2</sub> - KMnO<sub>4</sub> - OsO<sub>4</sub> - Epoxidation of Olefins - Jones Reagent - Oppenauer Oxidation - HIO<sub>4</sub>.

**UNIT 2 ORGANIC REAGENTS-II****9 Hrs.**

Reducing Agents - Hydride ion transfer mechanism - Electron Transfer mechanism – LAH - NaBH<sub>4</sub> - Electrophilic Reducing Agents - Allanes and Boranes. Hydroboration - Dissolving metal reduction - Birch Reduction - Clemmensen Reduction - Wolf-Kishner Reduction - Lindlars Reagent.

**UNIT 3 ORGANIC REAGENTS-III****9 Hrs.**

Introduction to organo-metallic reagents - Grignard reagent , Gilman's reagent – LDA - 1, 3 dithianes - Wittig Reagent - Peterson olefination.

**UNIT 4 SYNTHETIC NAME REACTIONS – II****9Hrs.**

Synthetic reactions :Mannich reaction – Mannich bases – Robinson annulations. TheShapiro reaction, Stork–enamine reaction. Use of dithioacetals – Umpolung, phasetransfercatalysis – mechanisms and use of benzyl trialkyl ammonium halides. Wittig reaction.

**UNIT 5 MOLECULAR REARRANGEMENTS****9Hrs**

Types of rearrangement (nucleophilic and electrophilic) - Classification as anionotropic, cationotropic, free radical, inter and intramolecular - Mechanism and Stereochemical aspects of Pinacol-pinacolone rearrangement, Beckmann, Hoffmann, Curtius and Benzilic acid rearrangements – Benzidine, Lossen and Schmidt rearrangements Wagner-Meerwin and Fries rearrangement.

**Max. 45 Hrs.****COURSE OUTCOMES**

On successful completion of the course, student will be able to

CO1: Interpret the products in organic chemical reactions involving oxidizing reagents.

CO2: Solve the chemical reactions involving reducing agents.

CO3: Predict the products formed in organic chemical reactions catalyzed by organometallic reagents.

CO4: Outline the mechanisms for the named reactions

CO5: Propose a strategic plan for molecular rearrangements.

CO6: Design and predict the reaction mechanism in electrophilic, nucleophilic reactions

**TEXT / REFERENCE BOOKS**

1. Clayden, Greeves, Warren and Wothers., Organic chemistry, Oxford University, 2001.
2. J. March's Advanced Organic Chemistry Reaction, Mechanisms and Structure, Wiley 2007.
3. Ian Fleming, Pericyclic Reactions, Oxford Science Publications, Cambridge, 1999.
4. Finar I. L., Organic Chemistry, 6th Edition, Pearson Education Asia, 2004.
5. RashmiSanghi, M.M. Srivastava, Green chemistry, Environment Friendly Alternatives, Narosa Publishing House, 2007.
6. Carey F. A., and Sundberg R. J., Advanced Organic Chemistry Part-A and B, 4th edn, Kluwer Academic/Plenum Publishers 2000.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 1302	ANCILLARY CHEMISTRY – I (B.Sc., Mathematics, Bio, Physics Department only)	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To know about the water quality parameters and methods to estimate the hardness and toxic elements in water.
- To understand the charging and discharging characteristics in batteries.
- To study the phase rule and its application to different heterogeneous systems.
- To understand the properties and various synthetic methods for the preparation of nanomaterials and their applications.
- To learn the basic idea about polymers and various moulding techniques.

**UNIT 1 WATER TECHNOLOGY****9 Hrs**

Introduction: Water quality parameters - Contamination of water by arsenic, lead, fluoride, mercury and their removal. Hardness: Types - Expression - Units. Estimation of hardness of water by EDTA method - Problems. Estimation of iron, calcium and magnesium: AAS method. Water softening: Zeolite process – Demineralization process. Desalination: Reverse osmosis - Electrodialysis.

**UNIT 2 ELECTROCHEMICAL POWER SOURCES****9 Hrs**

Electrochemistry: Galvanic cell - Electrochemical cell representation - EMF series and its significance. Batteries: Terminology - Lead-acid accumulator - Nickel-cadmium batteries. Lithium batteries: Li/SOCl<sub>2</sub> cell- Lithium ion batteries. Fuel Cells: Hydrogen-oxygen fuel cells - Solid oxide fuel cell (SOFC).

**UNIT 3 PHASE EQUILIBRIA****9 Hrs**

Introduction: Definition of phase rule - Terms involved in phase rule with examples. One component system: Water system. Two component alloy systems: Classification - Reduced phase rule - Thermal analysis. Simple eutectic system: Lead-silver system. Congruent system: Zinc-magnesium system. Incongruent system: Sodium potassium system.

**UNIT 4 SYNTHESIS OF NANOMATERIALS****9 Hrs**

Introduction: Nanomaterials: Definition - Classification based on dimensions - Size dependent properties. Types of nanomaterials: Nanoparticles: Synthesis by chemical reduction method. Nanoporous materials: Synthesis by sol-gel method. Nanowires: Synthesis by VLS mechanism. Carbon Nanotubes (CNTs): Single walled and multi walled nanotubes - Applications of CNTs - Synthesis of CNTs by electric arc discharge method and laser ablation method.

**UNIT 5 POLYMER CHEMISTRY****9 Hrs**

Introduction to polymers: Nomenclature - Functionality. Types of polymerization. Mechanism of polymerization: Free radical mechanism - Cationic mechanism - Anionic mechanism. Plastics: Types - Thermoplastics and thermosetting plastics. Properties: Strength - Crystalline and amorphous state – Average molecular weight - Polydispersity. Compounding of plastics. Moulding of plastics: Compression moulding – Injection moulding - Extrusion moulding. Introduction to conducting polymers.

**COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Analyze the water quality parameters of domestic and industrial water.  
 CO2: Examine the charging and discharging characteristics of batteries and fuel cells.  
 CO3: Apply the phase rule to alloy systems for optimizing their mechanical and thermal properties  
 CO4: Apply the concept of dimension change in synthesis of nanomaterials.  
 CO5: Evaluate the properties of polymeric materials for industrial applications.  
 CO6: Evaluate the materials for real world applications.

**TEXT/REFERENCES**

1. Jain P.C. and Monica Jain, Engineering Chemistry, 15th Edition Dhanpat Rai Publishing Co., 2009.
2. Dara S.S., Text Book of Engineering Chemistry, S. Chand & Co, 2008.
3. Sheik Mideen A., Engineering Chemistry (I & II), 13th Edition, Shruthi Publishers, 2010.
4. Kuriakose J.C. and Rajaram J., Chemistry in Engineering and Technology". Vol.1 & 2, 5th reprint, Tata McGraw Hill, Publishing Company (P) Ltd., 2010.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks : 100****Exam Duration : 3 Hrs.****PART A** : 10 Questions of 2 Marks each-No choice**20 Marks****PART B** : 2 Questions from each unit of internal choice, each carrying 16 Marks.**80 Marks**

(Out of 100 Marks, maximum of 10% problems may be asked.)

SCYA 1402	ANCILLARY CHEMISTRY – II (B.Sc., Mathematics, Bio, Physics Department only)	L	T	P	Credits	Total Marks
		3	1	0	3	100

**COURSE OBJECTIVES**

- To know about the types and properties of solutions.
- To expose the students for various separation techniques for the purification of compounds.
- To provide an idea about the chemical kinetics in terms of order, molecularity and their derivations involved.

**UNIT 1 SOLUTIONS****9Hrs.**

Introduction: Solid solution - Hume Rothery's rule. Types of solid solutions: Liquid solutions: Solubility of partially miscible liquids - Phenol-water system. Colligative properties: Lowering of vapour pressure. Raoult's law: Derivation - Osmotic pressure - Isotonic solution - Relationship between osmotic pressure and vapour pressure. Depression in freezing point - Derivation. Elevation in boiling point - Derivation - Problems.

**UNIT 2 INTRODUCTION TO SPECTROSCOPY****9Hrs.**

Electromagnetic spectrum, Absorption of radiation, electronic transition – Vibrational transition – Rotational transition – Intensities of spectral lines – Beer- Lamberts law – Colorimetric analysis – Estimation of concentration of a solution by colorimetry – Flame photometry – Theory, Instrumentation(block diagram only) and application – UV-Visible spectroscopy – principles, instrumentation(block diagram only) and IR spectroscopy – simple application only.

**UNIT 3 CHEMICAL KINETICS****9 Hrs.**

Introduction, Basic Concepts, Factors affecting reaction rates, rate equations for different orders – Derivation of Zero order, First order, Second order (A+A and A+B) reactions, Half life, problem based on First order and second order kinetics. Methods for the determination of the order of a reaction, Steady state hypothesis, Arrhenius Equation, Energy of activation, complex reactions – kinetics of opposing, parallel and consecutive reactions, Theories of reaction rates – Collision theory, Absolute reaction rate theory.

**UNIT 4 SURFACE CHEMISTRY AND CATALYSIS****9Hrs.**

Adsorption – types of adsorption – Adsorption of gases on solids – adsorption isotherm – Freundlich, Langmuir isotherms – Adsorption of solutes from solutions – applications – Role of adsorption in catalytic reactions – Ion exchange adsorption – basic principles in adsorption chromatography – catalysis – classification – characteristic of catalysts – Auto catalysis – Enzyme catalysis – Michaelis – Menten equation – Acid – base catalysis.

**UNIT 5 SEPARATION TECHNIQUES****9 Hrs.**

Distillation techniques: Fractional distillation - Steam distillation - Vacuum distillation. Chromatography: Elution analysis - Paper chromatography - Thin layer chromatography - Liquid chromatography - High performance liquid chromatography (HPLC) - Gas chromatography (GC).

**Max. 45 Hrs****COURSE OUTCOMES**

On completion of the course, student will be able to:

- CO1: Apply the principles of colligative properties to real solutions.  
 CO2: Analyze the spectral transitions for estimation of analytes.  
 CO3: Apply the concept of activation energy to the temperature dependence on reaction rate of a chemical reaction.  
 CO4: Assess the different catalytic mechanism for adsorbents and enzyme catalyst  
 CO5: Compare the chromatographic techniques for different mixtures.  
 CO6: Evaluate the materials for real world applications.

**TEXT / REFERENCES**

1. B. R. Puri and L.R. Sharma, *Principles of Physical Chemistry*, Vishal Publishing Co, 48<sup>th</sup> edition, 2020.
2. Keith J. Laidler, *Chemical Kinetics*, Third Edition, Pearson education limited, 2004.
3. Atkins P. W., *Physical Chemistry*, 6 edition, Oxford University press, 1998.
4. Barrow G. M., *Physical Chemistry*, 5th edition, McGraw-Hill, 1988.

SCYA 2302	ANCILLARY CHEMISTRY LAB – I (B.Sc., Mathematics, Bio, Physics Department only)	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To understand the basics of chemistry laboratory
- To understand and correlate the theory with laboratory

**LIST OF EXPERIMENTS**

1. Estimation of Total hardness of water sample by EDTA method.
2. Estimation of glycine by Sorenson method
3. Estimation of Ferrous ion by potentiometric method.
4. Determination of pH of a strong acid using pH meter
5. Estimation of mixture of acids by conductometric method.
6. Determination of molecular weight of unknown solute
7. Estimation of Fe by photocolormeter
8. Estimation of Nickel in a Nickel-Steel alloy

**Course Outcome:**

At the end of the course, the students will be able to:

CO1: Estimate ionic conductance ( $\Lambda_c$ ) in samples.

CO2: Evaluate the aminoacid content in samples.

CO3: Construct the redox cell and measure emf ( $E_{cell}$ ) of the cell

CO4: Analyse the hardness in water samples.

CO5: Relate viscosity ( $\eta$ ) in determining molecular weight of a polymer.

CO6: Assess the iron content in samples by photocolormetry.

**REFERENCES**

1. Vogel's Text Book of Inorganic Qualitative Analysis, 4th ed., ELBS, London, 1974.
2. Inorganic lab manual by S.Mumazuddin, Shailendra Kumar Sinha. 2009.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>

SCYA 2402	ANCILLARY CHEMISTRY LAB – II (B.Sc., Mathematics, Bio, Physics Department only)	L	T	P	Credits	Total Marks
		0	0	3	2	100

**COURSE OBJECTIVES**

- To understand the basics of chemistry laboratory
- To understand and correlate the theory with laboratory

Objectives: To enable the students to understand better the concepts of organic analysis and appreciate better the applications of organic chemistry towards biological systems.

Organic Analysis:

- a) Identification of acidic, basic, phenolic and neutral organic substances
- b) Detection of N, S and halogens
- c) Test for aliphatic and aromatic nature of substances.
- d) Test for saturation and unsaturation.
- e) Identification of functional groups i) Carboxylic acid ii) Phenols iii) Aldehydes iv) Ketones v) Esters v

**COURSE OUTCOME:**

On successful completion of the course, student will be able to

- C01-** Understand the systematic identification of mixtures containing two compounds  
**C02-** Separation and identification simple binary mixtures having acidic, basic and neutral components by chemical methods  
**C03-** Preparation of the identified compound derivatives  
**C04-** Recognize the chemical reactions in identifying the chemical compounds  
**C05-** Identify the compounds containing one or more functional groups

**END SEMESTER EXAM QUESTION PAPER PATTERN**

**Max. Marks: 100**

**Exam Duration: 3 Hrs**

<b>CAE</b>	Evaluation of Regular Lab class	25 Marks	<b>50 Marks</b>
	Model practical exam	25 Marks	
<b>ESE</b>	University Practical exam		<b>50 Marks</b>