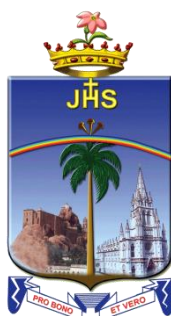


B.Sc. CHEMISTRY
LOCF SYLLABUS – 2021

SCHOOLS OF EXCELLENCE
WITH CHOICE BASED CREDIT SYSTEM (CBCS)



DEPARTMENT OF CHEMISTRY
SCHOOL OF PHYSICAL SCIENCES
ST. JOSEPH'S COLLEGE (AUTONOMOUS)

Special Heritage Status Awarded by UGC,
Accredited at A⁺⁺ Grade (IV Cycle) by NAAC
College with Potential for Excellence by UGC,
DBT-STAR & DST-FIST Sponsored College
Tiruchirappalli - 620 002, Tamil Nadu, India

SCHOOLS OF EXCELLENCE WITH CHOICE BASED CREDIT SYSTEM (CBCS) UNDERGRADUATE COURSES

St. Joseph's College (Autonomous), a pioneer in higher education in India, strives to maintain and uphold the academic excellence. In this regard, it has initiated the implementation of five "Schools of Excellence" from the academic year 2014 – 15, to meet and excel the challenges of the 21st century.

Each School integrates related disciplines under one roof. The school system enhances the optimal utilization of both human and infrastructural resources. It also enhances academic mobility and enriches employability. The School system preserves the identity, autonomy and uniqueness of every department and reinforces Student centric curriculum designing and skill imparting. These five schools adhere to achieve and accomplish the following objectives.

Optimal utilization of resources both human and material for the academic flexibility leading to excellence.

Students experience or enjoy their choice of courses and credits for their horizontal mobility.

The existing curricular structure as specified by TANSICHE and other higher educational institutions facilitate the Credit-Transfer Across the Disciplines (CTAD) - a uniqueness of the choice based credit system.

Human excellence in specialized areas

Thrust in internship and / or projects as a lead towards research and

The multi-discipline nature of the School System caters to the needs of stake-holders, especially the employers.

Credit system:

Weightage to a course is given in relation to the hours assigned for the course. Generally one hour per week has one credit. For viability and conformity to the guidelines credits are awarded irrespective of the teaching hours. The credits and hours of each course of a programme is given in the table of Programme Pattern. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For UG courses, a student must earn a minimum of 130 credits as mentioned in the programme pattern table. The total number of minimum courses offered by the Department is given in the Programme Structure.

OUTCOME-BASED EDUCATION (OBE)

LEARNING OUTCOME-BASED CURRICULUM FRAMEWORK (LOCF)

OBE is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience, each student should have achieved the goal. There is no single specified style of teaching or assessment in OBE; instead, classes, opportunities and assessments should all help the students achieve the specific outcomes

Outcome Based Education, as the name suggests depends on Outcomes and not Inputs. The outcomes in OBE are expected to be measurable. In fact each Educational Institute can state its own outcomes. The ultimate goal is to ensure that there is a correlation between education and employability

Outcome –Based Education (OBE): is a student-centric teaching and learning methodology in which the course delivery, assessment are planned to achieve, stated objectives and outcomes. It focuses on measuring student performance i.e. outcomes at different levels.

Some important aspects of the Outcome Based Education

Course: is defined as a theory, practical or theory cum practical subject studied in a semester.

Course Outcomes (COs): are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

Programme: is defined as the specialization or discipline of a Degree.

Programme Outcomes (POs): Programme outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.

Programme Specific Outcomes (PSOs):

PSOs are what the students should be able to do at the time of graduation with reference to a specific discipline.

Programme Educational Objectives (PEOs): The PEOs of a programme are the statements that describe the expected achievement of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the first few years after Graduation.

Some important terminologies repeatedly used in LOCF.

Core Courses (CC)

A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course. These are the courses which provide basic understanding of their main discipline. In order to maintain a requisite standard certain core courses must be included in an academic program. This helps in providing a universal recognition to the said academic program.

Discipline Specific Elective Courses (DSE)

Elective course may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective (DSE). These courses offer the flexibility of selection of options from a pool of courses. These are considered specialized or advanced to that particular programme and provide extensive exposure in the area chosen; these are also more applied in nature.

DSE: Four courses are offered, two courses each in semester V and VI

Note: To offer **one DSE**, a minimum of two courses of equal importance / weightage is a must.

A department with two sections must offer two courses to the students.

One DSE Course may be offered as interdisciplinary course among the departments in a School (Common Core Course) at the PG level.

Generic Elective Courses

An elective course chosen generally from an **unrelated discipline/subject**, with an intention to seek exposure is called a Generic Elective.

Generic Elective courses are designed for the students of **other disciplines**. Thus, as per the CBCS policy, the students pursuing particular disciplines would have to opt Generic Elective courses offered by other disciplines, as per the basket of courses offered by the college. The scope of the Generic Elective (GE) Courses is positively related to the diversity of disciplines in which programmes are being offered by the college.

Two GE Courses are offered one each in semesters V and VI.

(open to the students of other Departments)

The Ability Enhancement Courses (AEC)

“AECC” are the courses based upon the content that leads to Knowledge enhancement; Communicative English, Environmental Science. These are mandatory for all disciplines.

AECC-1: Communicative English: It is a 4 credits compulsory course offered by the Department of English in the first semester of the Degree Programme, Classes are conducted outside the regular class hours.

AECC-2: Environmental Science: is a 2 credit course offered as a compulsory course during the second semester by the Department of Human Excellence.

Skill Enhancement Courses (SECs)

These courses focus on developing skills or proficiencies in the student, and aim at providing hands-on training. Skill enhancement courses can be opted by the students of any other discipline, but are highly suitable for students pursuing their academic programme.

These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge.

There are four courses under this category

SEC-1 is offered in semester **III as a course** Within the Department (**WD**) it is More of main discipline related skills.

SEC-2 is offered in semester **IV as a course** Between schools (**BS**) Offered to students of other schools (Except the school offering the course)

SEC-3 is offered in semester **V as a compulsory course** on Soft Skills offered by the Department of Human Excellence, common to all the students of UG programme.

SEC-4 is offered in semester **VI as a course** **Within School (WS)** Open to all the students within the same school (including the students of the parent department)

Self-paced Learning: It is a course for two credits. It is offered to promote the habit of independent/self learning of Students. Since it is a two credit course, syllabus is framed to complete within 45 hours. It is not taught in the regular working hours.

Field Study/Industrial Visit/Case Study: It has to be completed during the fifth semester of the degree programme. Credit for this course will be entered in the fifth semester's marks statement.

Internship: Students must complete internship during summer holidays after the fourth semester. They have to submit a report of internship training with the necessary documents and have to appear for a viva-voce examination during fifth semester. Credit for internship will be entered in the fifth semester's mark statement.

Comprehensive Examinations: A detailed syllabus consisting of five units to be chosen from the courses offered over the five semesters which are of immense importance and those portions which could not be accommodated in the regular syllabus.

Extra Credit Courses: In order to facilitate the students, gaining knowledge/skills by attending online courses MOOC, credits are awarded as extra credits, the extra credit are at three semesters after verifying the course completion certificates. According to the guidelines of UGC, the students are encouraged to avail this option of enriching their knowledge by enrolling themselves in the Massive Open Online Courses (MOOC) provided by various portals such as SWAYAM, NPTEL and etc.

Undergraduate Programme:

Programme Pattern:

The Under Graduate degree programme consists of **FIVE** vital components. They are as follows:

Part -I : Languages (Tamil / Hindi / French / Sanskrit)

Part-II : General English

Part-III : Core Course (Theory, Practicals, Discipline Specific Electives, Compulsory and Optional Allied courses, Project, Self paced courses, Internship , Comprehensive Examinations and field visit /industrial visit/Case Study)

Part-IV: Value Education, Ability Enhancement Courses, Skill Enhancement Courses/ Soft Skills , Generic Electives/ National Cadet Corps etc.

Part-V: Outreach Programme (SHEPHERD).

Ability Enhancement Courses (AEC): There are two Ability Enhancement courses viz AECC and SEC.

Value Education Courses:

There are four courses offered in the first four semesters for the First & Second UG Programme.

Course Coding

The following code system (11 alphanumeric characters) is adopted for Under Graduate courses:

21	UXX	N	N	XX	NN/NNX
Year of Revision	UG Department Code	Semester number	Part specification	Part Category	Running number/with choice

N:- Numeral X :- Alphabet

Part Category

GL - Languages (Tamil / Hindi / French / Sanskrit)

GE - General English

CC - Core Theory; CP- Core Practical

WS- Workshop

SP- Self Paced Learning

IS- Internship

FV- Field visit

CE- Comprehensive Examination

PW- Project Work& viva-voce

Electives Courses

ES – Department Specific Electives

EG- Generic Electives

Allied Courses

AC - Allied Compulsory

AO- Allied Optional

EC - Additional Core Courses for Extra Credits (If any)*

Ability Enhancement Courses

AE – Ability Enhancement Compulsory Courses; Bridge Course and Environment Science

SE – Skill Enhancement (WD), (BS), (WS) and Soft skills

VE - Value Education/ Social Ethics/Religious Doctrine

OR – Outreach SHEPHERD & Gender Studies (Outreach)

SU - AICUF / Nature Club / Fine Arts / NCC / NSS /etc. (Service Unit)

CIA AND SEMESTER EXAMINATION

Continuous Internal Assessment (CIA):

Distribution of CIA Marks	
Passing Minimum: 40 Marks	
Library Referencing	5
3 Components	35
Mid-Semester Test	30
End-Semester Test	30
Total CIA	100

MID-SEM & END – SEM TEST

Centralised – Conducted by the office of COE

1. Mid-Sem Test & End-Sem Test: (2 Hours each); will have Objective and Descriptive elements; with the below mentioned question pattern PART-A; PART-B; PART-C and PART D.

2. One of the CIA Component II/III for UG & PG will be of 15 marks and compulsorily a online objective multiple choice question type.

3. The online CIA Component must be conducted by the Department / faculty concerned at a suitable computer centre.

4. The 7 marks of PART-A of Mid-Sem and End-Sem Tests will comprise only: OBJECTIVE MULTIPLE CHOICE QUESTIONS.

5. The number of hours for the 5 marks allotted for Library Referencing/ work would be 30 hours per semester. The marks scored out of 5 will be given to all the courses (Courses) of the Semester.

6. English Composition once a fortnight will form one of the components for UG general English

Duration of Examination must be rational; proportional to teaching hours 90 minute-examination / 50 Marks for courses of 2/3 hours/week (all Part IV UG Courses) 3-hours examination for courses of 4-6 hours/week.

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

S. No.	Level	Parameter	Description
1	K1	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

WEIGHTAGE of K – LEVELS IN QUESTION PAPER

(Cognitive Level) K- LEVELS	Lower Order Thinking			Higher Order Thinking			Total %
	K1	K2	K3	K4	K5	K6	
SEMESTER EXAMINATIONS	15	20	35	30			100
MID / END Semester TESTS	12	20	35	33			100

QUESTION PATTERN FOR SEMESTER EXAMINATION

SECTION	MARKS
SECTION-A (No choice ,One Mark) THREE questions from each unit (15x1 =15)	15
SECTION-B (No choice ,2-Marks) TWO questions from each unit (10x2 =20)	20
SECTION-C (Either/or type) (7- Marks) ONE question from each unit (5x7 =35)	35
SECTION-D (3 out of 5) (10 Marks) ONE question from each unit (3x10 =30)	30
Total	100

BLUE PRINT OF QUESTION PAPER FOR SEMESTER EXAMINATION							
DURATION: 3. 00 Hours.				Max Mark : 100			
K- LEVELS	K1	K2	K3	K4	K5	K6	Total Marks
SECTIONS							
SECTION-A (One Mark, No choice) (15x1=15)	15						15
SECTION-B (2-Marks, No choice) (10x2=20)		10					20
SECTION-C (7- Marks) (Either/or type) (5x7=35)			5				35
SECTION-D (10 Marks) (3 out of 5) (3x10=30) Courses having only K4 levels				3			30
Courses having K4 and K5 levels One K5 level question is compulsory				2	1		
(Courses having all the 6 cognitive levels) One K5 and K6 level questions can be compulsory				1	1	1	
Total	15	20	35	30			100

QUESTION PATTERN FOR MID/END TEST			
SECTIONS			MARKS
SECTION-A (No choice, One Mark) (7x1 =7)			7
SECTION-B (No choice , 2-Marks) (6x2 =12)			12
SECTION-C (Either/or type) (7- Marks) (3x7 =21)			21
SECTION-D (2 out of 3) (10 Marks) (2x10=20)			20
Total			60

BLUE PRINT OF QUESTION PAPER FOR MID/END TEST							
DURATION: 2. 00 Hours.				Max Mark: 60.			
K- LEVELS	K1	K2	K3	K4	K5	K6	Total Marks
SECTIONS							
SECTION -A (One Mark, No choice) (7 x 1 = 7)	7						07
SECTION-B (2-Marks, No choice) (6 x 2 = 12)		6					12
SECTION-C (Either/or type) (7- Marks) (3 x 7 =21)			3				21
SECTION-D (2 out of 3) (10 Marks) (2x10=20) Courses having only K4 levels				2			20
Courses having K4 and K5 levels One K5 level question is compulsory				1	1		
Courses having all the 6 cognitive levels One K6 level question is compulsory					1	1	
Total Marks	07	12	21	20			60
Weightage for 100 %	12	20	35	33			100

Assessment pattern for two credit courses.

S. No.	Course Title	CIA	Semester Examination	Total Marks
1	Self Paced Learning Course	25 + 25 = 50	50 Marks (MCQ) (COE)	100
2	Comprehensive Examinations	25 +25 = 50	50 Marks (MCQ) (COE)	100
3	Internship	100	--	100
4	Field Visit	100	--	100
5	Ability Enhancement Course (AEC) for PG	50 (Three Components)	50 (COE) (Specific Question Pattern)	100
Assessment Pattern for Courses in Part - IV				
6	Value Education Courses and Environmental Studies	50	50 Marks (For 2.00 hours) (COE)	100
7	Skill Enhancement Courses(SECs)	50 marks (by Course in-charge) 50 Marks (by an External member from the Department)		100
8	SEC: SOFT SKILLS (For UG and PG)	100 (Fully Internal)		100

EVALUATION

GRADING SYSTEM

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added and converted as final mark. The marks thus obtained will then be graded as per the scheme provided in Table-1.

From the second semester onwards, the total performance within a semester and the continuous performance starting from the first semester are indicated by semester Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA) respectively. These two are calculated by the following formulae:

$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$	$\text{WAM (Weighted Average Marks)} = \frac{\sum_{i=1}^n C_i M_i}{\sum_{i=1}^n C_i}$
<p>Where,</p> <p>C_i is the Credit earned for the Course i G_i is the Grade Point obtained by the student for the Course i M_i is the marks obtained for the course i and n is the number of Courses Passed in that semester.</p>	

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

CLASSIFICATION OF FINAL RESULTS:

- i) For each of the first three parts, there shall be separate classification on the basis of CGPA, as indicated in Table-2.
- ii) For the purpose of declaring a candidate to have qualified for the Degree of Bachelor of Arts/Science/Commerce/Management/Literature as Outstanding/Excellent/Very Good/Good/Above Average/Average, the marks and the corresponding CGPA earned by the candidate in Part-III alone will be the criterion, provided the candidate has secured the prescribed passing minimum in the all the Five parts of the Programme.
- iii) Grade in Part –IV and Part-V shall be shown separately and it shall not be taken into account for classification.
- iv) A Pass in SHEPHERD will continue to be mandatory although the marks will not count for the calculation of the CGPA.
- v) Absence from an examination shall not be taken an attempt.

Table-1: Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above and below 90	9	A+
70 and above and below 80	8	A
60 and above and below 70	7	B+
50 and above and below 60	6	B
40 and above and below 50	5	C
Below 40	0	RA

Table-2: Final Result

CGPA	Corresponding Grade	Classification of Final Result
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re-appearance

Credit based weighted Mark System is adopted for the individual semesters and cumulative semesters in the column 'Marks secured' (for 100)

Declaration of Result

Mr./ MS. _____ has successfully completed the Under Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part – III is _____ and the class secured is _____ by completing the minimum of 130 credits. The candidate has acquired _____ (if any) more credits from SHEPHERD / AICUF/ FINE ARTS / SPORTS & GAMES / NCC / NSS / NATURE CLUB, ETC. The candidate has also acquired _____ (if any) extra credits by attending MOOC courses.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

The Programme Outcomes (POs)/Programme Specific Outcomes(PSOs) are the qualities that must be imbibed in the graduates by the time of completion of their programme. At the end of each programme the PO/PSO assessment is done from the CO attainment of all curriculum components. The POs/PSOs are framed based on the guidelines of LOCF. There are five POs UG programme and five POs for PG programme framed by the college. PSOs are framed by the departments and they are five in numbers.

For each Course, there are five Course Outcomes to be achieved at the end of the course. These Course outcomes are framed to achieve the POs/PSOs. All course outcomes shall have linkage to POs/PSOs in such a way that the strongest relation has the weight 3 and the weakest is 1. This relation is defined by using the following table.

Mapping	<40%	≥ 40% and < 70%	≥ 70%
Relation	Low Level	Medium Level	High Level
Scale	1	2	3

Mean Scores of COs = $\frac{\text{Sum of values}}{\text{Total No.of POs \& PSOs}}$		Mean Overall Score = $\frac{\text{Sum of Mean Scores}}{\text{Total No.of COs}}$	
Result	Mean Overall Score	< 1.2	# Low
		≥ 1.2 and < 2.2	# Medium
		≥ 2.2	# High

If the mean overall score is low then the course in charge has to redesign the particular course content so as to achieve high level mean overall score.

Vision

Forming globally competent, committed, compassionate and holistic persons, to be men and women for others, promoting a just society.

Mission

- Fostering learning environment to students of diverse background, developing their inherent skills and competencies through reflection, creation of knowledge and service.
- Nurturing comprehensive learning and best practices through innovative and value-driven pedagogy.
- Contributing significantly to Higher Education through Teaching, Learning, Research and Extension.

Programme Educational Objectives (PEOs)

- Graduates will be able to accomplish professional standards in the global environment.
- Graduates will be able to uphold integrity and human values.
- Graduates will be able to appreciate and promote pluralism and multiculturalism in working environment.

Programme Outcomes (POs)

1. Graduates will be able to apply the concepts learnt, in real life situations with analytical skills.
2. Graduates with acquired skills and enhanced knowledge will be employable/ become entrepreneurs or will pursue higher Education.
3. Graduates with acquired knowledge of modern tools and communicative skills will be able to contribute effectively as team members.
4. Graduates will be able to read the signs of the times analyze and provide practical solutions.
5. Graduates imbued with ethical values and social concern will be able to appreciate cultural diversity, promote social harmony and ensure sustainable environment.

Programme Specific Objectives (PSOs)

1. Graduates will be able to understand the concepts in chemistry and apply in real life situations with analytical proficiency.
2. Graduates with acquired practical skills and enhanced theoretical knowledge will be employable or entrepreneurs or will pursue higher education.
3. Graduates with acquired knowledge of advanced tools in chemistry and communicative skills will be able to contribute effectively as team members.
4. Graduates will be able to recognize, analyze, and provide practical solutions to ever demanding chemistry based issues.
5. Graduates inculcated with ethical, scientific social responsibility will be able to create sustainable chemical alternatives to the contemporary environmental challenges.

B.Sc. CHEMISTRY

PROGRAMME PATTERN

Course Details						Scheme of Exams		
Sem	Part	Code	Course Title	Hrs	Cr	CIA	SE	Final
I	1	21UTA11GL01	General Tamil - I	4	3	100	100	100
		21UFR11GL01	French-I					
		21UHI11GL01	Hindi-I					
		21USA11GL01	Sanskrit-I					
	2	21UEN12GE01	General English -I	5	3	100	100	100
	3	21UCH13CC01	General Chemistry – I	4	4	100	100	100
	3	21UCH13CC02	Organic Chemistry – I	3	2	100	100	100
	3	@	Chemistry Practical–I	3	*			
	3	@	Chemistry Practical–II	3	*			
	3	21UCH13AC01	Allied: Mathematics for Chemistry -I	6	4	100	100	100
	4	21UEN14AE01	AECC–1: Communicative English	(6)	4	100	-	100
4	21UHE14VE01	Essentials of Humanity	2	1	50	50	50	
Total				30	21			
II	1	21UTA21GL02	General Tamil - II	4	3	100	100	100
		21UFR21GL02	French-II					
		21UHI21GL02	Hindi-II					
		21USA21GL02	Sanskrit-II					
	2	21UEN22GE02	General English -II	5	3	100	100	100
	3	21UCH23CC03	General Chemistry – II	5	5	100	100	100
	3	21UCH23CP01	Chemistry Practical–I	3	2	100	100	100
	3	21UCH23CP02	Chemistry Practical–II	3	2	100	100	100
	3	21UCH23AC02	Allied: Mathematics for Chemistry-II	6	4	100	100	100
	4	21UHE24AE02	AECC–2: Environmental studies	2	2	50	50	50
	4	21UHE24VE02	Techniques of Social Analysis: Fundamentals of Human Rights	2	1	50	50	50
		Extra Credit Courses (MOOC)–1	-	(2)				
Total				30	22(2)			
III	1	21UTA31GL03	General Tamil - III	4	3	100	100	100
		21UFR31GL03	French- III					
		21UHI31GL03	Hindi- III					
		21USA31GL03	Sanskrit- III					
	2	21UEN32GE03	General English - III	5	3	100	100	100
	3	21UCH33CC04	General Chemistry – III	4	3	100	100	100
	3	21UCH33CC05	Organic Chemistry – II	4	3	100	100	100
	3	@	CORE – @: Chemistry Practical–III	3	*			
	3	21UCH33AO03A	Allied Optional :Physics-I	4	3	100	100	100
		21UCH33AO03B	Allied Optional : Principles of Electronics-I					
		@	Physics Practical	2				
@		Electronics Practical						
4	21UCH34SE01A	SEC –1 (WD):Chemical Instrumentation – I	2	1	100	-	100	
4	21UCH34SE01B	SEC –1(WD):Chemical Instrumentation – II						
4	21UHE34VE03A	Professional Ethics–I: Social Ethics - I	2	1	50	50	50	
4	21UHE34VE03B	Professional Ethics -I: Religious Doctrine-I						

			Extra Credit Courses (MOOC)–2		(2)			
Total				30	17(2)			
IV	1	21UTA41GL04B	Scientific Tamil (SBS, SPS,SCS)	4	3	100	100	100
		21UFR41GL04	French- IV					
		21UHI41GL04	Hindi- IV					
		21USA41GL04	Sanskrit- IV					
	2	21UEN42GE04	General English - IV	5	3	100	100	100
	3	21UCH43CC06	General Chemistry – IV	4	3	100	100	100
	3	21UCH43CC07	General Chemistry – V	4	3	100	100	100
	3	21UCH43CP03	Chemistry Practical – III	3	2	100	100	100
	3	21UCH43AO04A	Allied Optional: Physics-II	4	3	100	100	100
	3	21UCH43AO04B	Allied Optional: Communication Electronics					
	3	21UCH43AP01A	Allied Optional: Physics Practical	2	2	100	100	100
	3	21UCH43AP01B	Allied Optional: Electronics Practical					
	4	21UCH44SE02A	SEC –2 (BS): Health Chemistry	2	1	100	-	100
		21UCH44SE02B	SEC –2 (BS): Industrial Chemistry					
4	21UHE44VE04A	Professional Ethics–II:Social Ethics - II	2	1	50	50	50	
	21UHE44VE04B	Professional Ethics -II: Religious Doctrine-II						
Total				30	21			
V	3	21UCH53CC08	Inorganic Chemistry – I	6	5	100	100	100
	3	@	Chemistry Practical–IV	4	*			
	3	@	Chemistry Practical–V	4	*			
	3	21UCH53ES01A	DSE1: Organic Spectroscopy	5	3	100	100	100
		21UCH53ES01B	DSE1: Organic Synthesis and Characterization					
	3	21UCH53ES02A	DSE–2: Physical Chemistry- I	5	3	100	100	100
		21UCH53ES02B	DSE–2: Physical Chemistry -II					
	3	21UCH53IS01	Internship	–	2	100		100
	3	21UCH53SP01	Self-paced Learning: Essentials of Chemistry	–	2	50	50	50
	3	21UCH53FV01	Field study/ Industrial visit/ Case study	–	1	100		100
	4	21USS54SE03	SEC –3 : Soft Skills	2	1	100	-	100
	4	21UCH54EG01A	GE–1: Chemistry for Competitive Examinations	4	3	100	100	100
21UCH54EG01B		GE–1: Everyday Chemistry						
Extra Credit Courses (MOOC)–3				–	(2)			
Total				30	20(2)			
VI	3	21UCH63CC09	Chemistry of Biomolecules	6	5	100	100	100
	3	21UCH63CP04	Chemistry Practical–IV	4	3	100	100	100
	3	21UCH63CP05	Chemistry Practical–V	4	3	100	100	100
	3	21UCH63ES03A	DSE-3: Inorganic Chemistry–II	5	3	100	100	100
		21UCH63ES03B	DSE-3: Inorganic Chemistry–III					
	3	21UCH63ES04A	DSE–4: Physical Chemistry III	5	3	100	100	100

		21UCH63ES04B	DSE-4:Physical Chemistry IV					
	3	21UCH63PW01	Project Work and Viva Voce	–	2	100	100	100
	3	21UCH63CE01	Comprehensive Examinations	–	2	50	50	50
	4	21UCH64SE04A	SEC –4 (WS):Trends In Chemistry	2	1	100	-	100
		21UCH64SE04B	SEC –4 (WS):Advances In Chemistry					
	4	21UCH64EG02A	GE-2 (BS):Food And Nutrition	4	3	100	100	100
		21UCH64EG02B	GE-2 (BS):Waste Management					
Total				30	25			
	5	21UCW65OR01	Outreach Programme (SHEPHERD)		4			
Total(For three years)				180	130(6)			

@ Practical Exam will be conducted at even semester

*The courses with a scheme of Exam 50 in CIA and SE will be converted to 100 for grading.

SEC-2: BETWEEN SCHOOL 4th Semester							
Between schools (BS)- Offered to students of other schools (Except the school offering the course)							
Course Details					Scheme of Exams		
Offering Department	Course Code	Course Title	Hr	Cr	CIA	SE	Final
SBS							
Botany	21UBO44SE02	Mushroom Technology	2	1	100	-	100
SCS							
Computer Science	21UCS44SE02	Data Analysis Using Spreadsheet	2	1	100	-	100
Mathematics	21UMA44SE02	Numerical Ability	2	1	100	-	100
Statistics	21UST44SE02	Quantitative Methods	2	1	100	-	100
Information Technology	21UBC44SE02	Digital Artwork	2	1	100	-	100
SLAC							
English	21UEN44SE02	English for Competitive Examinations	2	1	100	-	100
History	21UHS44SE02	Historical Monuments in Tiruchirappalli	2	1	100	-	100
Tamil	21UTA44SE02A	மேடைப் பேச்சுக்கலை	2	1	100	-	100
Tamil	21UTA44SE02B	திரைப்படத் திறனாய்வும் குறும்பட உருவாக்கம்	2	1	100	-	100
SMS							
Commerce	21UCO44SE02A	Personal Finance Management	2	1	100	-	100
Commerce	21UCO44SE02B	Marketing Skills	2	1	100	-	100
Commerce	21UCO44SE02C	Event Planning and Management	2	1	100	-	100
Economics	21UEC44SE02	Financial Economics	2	1	100	-	100
BBA	21UBU44SE02A	Entrepreneurial Skills Enhancement	2	1	100	-	100
BBA	21UBU44SE02B	Practical Stock Trading	2	1	100	-	100
CommerceCA	21UCC44SE02	Practical Banking in India	2	1	100	-	100
SPS							
Chemistry	21UCH44SE02A	Health Chemistry	2	1	100	-	100
Chemistry	21UCH44SE02B	Industrial Chemistry	2	1	100	-	100
Physics	21UPH44SE02A	Weather Physics	2	1	100	-	100
Physics	21UPH44SE02B	Electrical Wiring	2	1	100	-	100
Electronics	21UEL44SE02	PC Assembling and Servicing	2	1	100	-	100

GENERIC ELECTIVE -1: 5th Semester							
Generic Elective Courses are designed for the students of other disciplines. (open to the students of other departments)							
Course Details					Scheme of Exams		
Offering Department	Course Code	Course Title	Hrs	Cr	CIA	SE	Final
SBS							
Botany	21UBO54EG01	Landscape Designing	4	3	100	100	100
SCS							
Computer Science	21UCS54EG01	Ethical Hacking	4	3	100	100	100
Mathematics	21UMA54EG01	Mathematics for Competitive Examinations	4	3	100	100	100
Statistics	21UST54EG01	Actuarial Statistics	4	3	100	100	100
Information Technology	21UBC54EG01	Fundamentals Of Data Science	4	3	100	100	100
SLAC							
English	21UEN54EG01	Film Studies	4	3	100	100	100
History	21UHS54EG01	Tamil Heritage and Culture	4	3	100	100	100
Tamil	21UTA54EG01	தமிழிலயக்கத்தில் மனித உரிமைகள்	4	3	100	100	100
SMS							
Commerce	21UCO54EG01A	Computerised Accounting	4	3	100	100	100
Commerce	21UCO54EG01B	Basics of Excel	4	3	100	100	100
Commerce	21UCO54EG01C	Personal Investment Planning	4	3	100	100	100
Economics	21UEC54EG01	Principles of Economics	4	3	100	100	100
Commerce CA	21UCC54EG01	E-commerce and E Business Management	4	3	100	100	100
BBA	21UBU54EG01A	Global Supply Chain Management	4	3	100	100	100
BBA	21UBU54EG01B	Start – Ups and Small Business Management	4	3	100	100	100
SPS							
Chemistry	21UCH54EG01A	Chemistry for Competitive Examinations	4	3	100	100	100
Chemistry	21UCH54EG01B	Everyday Chemistry	4	3	100	100	100
Physics	21UPH54EG01A	Everyday Physics	4	3	100	100	100
Physics	21UPH54EG01B	Renewable Energy Physics	4	3	100	100	100
Electronics	21UEL54EG01A	Everyday Electronics	4	3	100	100	100
Electronics	21UEL54EG01B	Wireless Communication	4	3	100	100	100

GENERIC ELECTIVE -2: 6th Semester							
Generic Elective Courses are designed for the students of other disciplines. (open to the students of other departments)							
Course Details					Scheme of Exams		
Offering Department	Course Code	Course Title	Hrs	Cr	CIA	SE	Final
SBS							
Botany	21UBO64EG02	Solid Waste Management	4	3	100	100	100
SCS							
Computer Science	21UCS64EG02	3D Printing and Design	4	3	100	100	100
Mathematics	21UMA64EG02	Analytical Skill for Competitive Examinations	4	3	100	100	100
Statistics	21UST64EG02	Applied Statistics	4	3	100	100	100
Information Technology	21UBC64EG02	Industry 4.0	4	3	100	100	100
SLAC							
English	21UEN64EG02	English for the Media	4	3	100	100	100
History	21UHS64EG02	Intellectual Revivalism in Tamil Nadu	4	3	100	100	100
Tamil	21UTA64EG02	சித்த மருத்துவம்	4	3	100	100	100
SMS							
Commerce	21UCO64EG02A	Rural Marketing	4	3	100	100	100
Commerce	21UCO64EG02B	Entrepreneurship Development	4	3	100	100	100
Commerce	21UCO64EG02C	Digital Marketing	4	3	100	100	100
Economics	21UEC64EG02	Economics for Competitive Exams	4	3	100	100	100
CommerceCA	21UCC64EG02	Total Quality Management	4	3	100	100	100
BBA	21UBU64EG02A	Personality Development	4	3	100	100	100
BBA	21UBU64EG02B	NGO Management	4	3	100	100	100
SPS							
Chemistry	21UCH64EG02A	Food And Nutrition	4	3	100	100	100
Chemistry	21UCH64EG02B	Waste Management	4	3	100	100	100
Physics	21UPH64EG02A	Laser Technology and its Application	4	3	100	100	100
Physics	21UPH64EG02B	Physics of Earth	4	3	100	100	100
Electronics	21UEL64EG02A	CCTV and Smart Security System	4	3	100	100	100
Electronics	21UEL64EG02B	Entrepreneurial Electronics	4	3	100	100	100

Semester	Course Code	Title of the Course	Hours	Credits
I	21UTA11GL01	General Tamil - I	4	3

CO No.	CO-Statements	Cognitive Levels (K-Levels)
	இப்பாடத்தின் நிறைவில் மாணவர்கள்	
CO-1	இக்கால இலக்கிய வகைகளைக் கண்டறிவர்	K1
CO-2	எழுத்து, சொல் இலக்கணங்களின் அடிப்படைகளைக் கண்டறிவர்	K1
CO-3	அயலகக் கவிதை வடிவங்களை விளங்கிக் கொள்வர்	K2
CO-4	மொழிபெயர்ப்புக் கவிதைகளின் வாயிலாக மொழிபெயர்ப்புத் திறனை வளர்த்தெடுப்பர்	K3
CO-5	புதுக்கவிதை வாயிலாக வெளிப்படும் சமூக, அரசியல் விழுமியங்களை மதிப்பிடுவர்	K4

அலகு - 1

(12 மணிநேரம்)

- பாரதியார் கவிதைகள் - குயில்பாட்டு (குயில் தன் பூர்வ ஜன்மக் கதை உரைத்தல்)
பாரதிதாசன் கவிதைகள் - சஞ்சீவி பர்வதத்தின் சாரல் உரைநடை - முதல் மூன்று கட்டுரைகள்

அலகு - 2

(12 மணிநேரம்)

- வெ.இராமலிங்கனார் - சொல், தமிழன் இதயம்
முடியரசனார் - உயிர் வெல்லமோ, மனத்தாய்மை
பெருஞ்சித்திரனார் - அஞ்சாதீர், மொழி இனம் நாடு, பட்டுக்கோட்டை
கல்யாணசுந்தரனார் - வருங்காலம் உண்டு, உழைக்காமல் சேர்க்கும் பணம்.
இலக்கணம் - எழுத்து
இலக்கிய வரலாறு - மூன்றாம் பாகம் - தண்டமிழ்த் தொண்டர்கள்

அலகு - 3

(12 மணிநேரம்)

- சுரதா - நல்ல தீர்ப்பு
கண்ணதாசன் - ஒரு பாணையின் கதை
அப்துல் ரகுமான் - வீடு
மேத்தா - ஒரே குரல்
இலக்கிய வரலாறு - மூன்றாம் பாகம் - இருபதாம் நூற்றாண்டு
இலக்கியவளர்ச்சி
சிறுகதை - முதல் ஐந்து சிறுகதைகள்

அலகு - 4 : அரசியல் கவிதைகள்

(12 மணிநேரம்)

- ஈரோடு தமிழன்பன் - அகல் விளக்காக இரு
ஆதவன் தீட்சண்யா - இன்னும் இருக்கும் சுவர்களின் பொருட்டு

சுகிர்தராணி	- என் கண்மணியே இசைப்பிரியா
சக்தி ஜோதி	- யுகாந்திர உறக்கம்
பழநிபாரதி	- வெள்ளைக்காகிதம்
லிவிங் ஸ்மைல் வித்யா	- நினைவில் பால்யம் அழுத்தம்
இலக்கணம்	- சொல்

அலகு - 5 அயலகக் கவிதைகள்

(12 மணிநேரம்)

ஓசே ரிசால்	- விடைகொடு என் தாய் மண்ணே
ஹைபுன் கவிதைகள்	- அறுவடை நாளின் மழை (மூன்று கவிதைகள்)
சிறுகதை	- ஆறு முதல் பத்து சிறுகதைகள்
உரைநடை	- நான்கு முதல் ஆறு கட்டுரைகள்

பாட நூல்கள்

1. பொதுத்தமிழ், செய்யுள் திரட்டு, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021
2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, பத்தாம் பதிப்பு, 2017
3. நற்றமிழ்க் கோவை (கட்டுரைத் தொகுப்பு). தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021
4. சிறுகதைத் தொகுப்பு - ஒவ்வொரு கல்வியாண்டிற்கும் ஒவ்வொரு சிறுகதைத்தொகுப்பு
5. (2021-2022 கல்வியாண்டுக்கு மட்டும்): நல்லாசிரியர், சிறுகதைத் தொகுப்பு, - தமிழாய்வுத்துறை, நியூ செஞ்சரி புக் ஹவுஸ், சென்னை, முதற்பதிப்பு, 2021

Relationship matrix for Course outcomes, Programme outcomes / Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours/ week	Credits
I	21UTA11GL01	General Tamil - I									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5		
CO-1	2	1	2	2	3	3	3	2	3	2	2.3	
CO-2	2	1	2	2	2	3	2	2	2	2	2.0	
CO-3	2	1	2	2	3	3	3	2	3	2	2.3	
CO-4	1	2	1	2	2	3	2	2	3	2	2.0	
CO-5	1	1	2	2	3	3	3	2	3	2	2.2	
Mean overall Score											2.16 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UFR11GL01	FRENCH – I	4	3

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO–1	recall and spell the alphabets, numbers, colours, days of the week and months in French.	K1
CO–2	compare the definite and indefinite articles and its usages.	K2
CO–3	construct simple phrases by using ‘er’ verbs in present tense.	K3
CO–4	make use of correct terminology and introduce oneself in French.	K3
CO–5	distinguish between affirmative and negative phrases and take part in role play - conversation.	K4

Unit – I (12 hours)

TITRE: BONJOUR CA VA ?

GRAMMAIRE : Les pronoms personnels sujets, les articles définis et indéfinis, Etre et avoir (verbes auxiliaires)

LEXIQUE : Saluer, Entrer en contact, demander et dire comment ça va ?, L’alphabet, les couleurs, les pays et les nationalités, les animaux domestiques.

PRODUCTION ORALE : Epeler son nom et son prénom, Comprendre des personnes qui se saluent.

PRODUCTION ECRITE : Les formules de politesse

Unit – II (12 hours)

TITRE: SALUT ! JE M’APPELLE AGNES

GRAMMAIRE : La conjugaison du 1^{er} groupe, les adjectifs possessifs, la formation du féminin, la formation du pluriel.

LEXIQUE : Se présenter, Présenter quelqu’un, Remercier, Les jours de la semaine, les mois de l’année, les nombres de 0 à 69, la famille

PRODUCTION ORALE : Comprendre des informations essentielles

PRODUCTION ECRITE : Présentez –vous

Unit - III (12 hours)

TITRE: QUI EST-CE ?

GRAMMAIRE : La phrase interrogative : Qu’est-ce que... ?/Qu’est-ce que c’est ?/Qui est-ce ?, quelques indicateurs du temps, la formation du féminin, les verbes aller et venir

LEXIQUE : Demander et répondre poliment, les professions

PRODUCTION ORALE : Parler de ses projets

PRODUCTION ECRITE : Ecrire de brefs messages

Unit - IV (12 hours)

TITRE: DANS MON SAC, J’AI ?

GRAMMAIRE : la phrase négative, c’est/il est, les articles contractes, les pronoms personnels toniques

LEXIQUE : Demander des informations personnelles, Quelques objets, la fiche d'identité, les nombres à partir de 70

PRODUCTION ORALE : Comprendre un message sur un répondeur téléphonique

PRODUCTION ECRITE : Remplir une fiche d'identité

Unit - V

(12 hours)

TITRE:IL EST COMMENT? / ALLO?

GRAMMAIRE : les adverbes interrogatifs, les prépositions de lieu, les verbes du deuxième groupe, le verbe faire

LEXIQUE : Parler au téléphone, décrire quelqu'un, l'aspect physique, le caractère

PRODUCTION ORALE : Un jeu de rôle – la conversation téléphonique

PRODUCTION ECRITE : Décrivez votre aspect physique et votre caractère en quelques lignes

Book for Study

P. Dauda, L.Giachino and C.Baracco, *Generation AI*, Didier, Paris 2016.

Books for Reference

1. J.Girardet and J.Pecheur, *Echo AI*, CLE International, 2^eedition, 2017
2. Régine Mérieux and Yves Loiseau, *Latitudes AI*, Didier, 2012.
3. Isabelle Fournier, *Talk French*, Goyal Publishers,2011

Web Resources

1. <https://www.wikihow.com/Pronounce-the-Letters-of-the-French-Alphabet>
2. <https://français.lingolia.com/en/grammar/tenses/le-present>
3. <https://www.lawlessfrench.com/grammar/articles/>
4. <https://www.frenchpod101.com/french-vocabulary-lists/10-lines-you-need-for-introducing-yourself>
5. <https://www.tolearnfrench.com/exercices/exercice-french-2/exercice-french-3295.php>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
I	21UFR11GL01	FRENCH – I									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	1	2	3	2	3	2	1	2	3	2.2	
CO-2	3	3	3	2	2	2	1	2	2	3	2.3	
CO-3	3	1	2	3	2	3	2	1	2	2	2.1	
CO-4	2	2	3	2	1	3	2	1	2	3	2.1	
CO-5	3	2	3	2	2	3	2	2	3	2	2.4	
Mean overall Score											2.22 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UHI11GL01	HINDI- I	4	3

CO No.	CO-Statements	Cognitive Levels (K -Levels)
	On successful completion of the course, students will be able to	
CO -1	list out the literary works in Hindi during the period of 12th century in India.	K1
CO -2	compare the vocabulary & expressions related to day-to-day conversation.	K2
CO -3	use simple Phrases from English to Hindi.	K3
CO -4	investigate the values of Indian society & summarize the duties of a citizen for his/her country.	K4
CO -5	identify the sentences in Hindi using basic grammar.	K4

Unit - I (12 Hours)

Dr. Abdul Kalam

Ling

Kabir Ke Dohe

Baathcheeth - Aspathal mein

Adhikal - Namakarn

Unit - II (12 Hours)

Vachan Badaliye

Thulasi ke Dohe

Adhikal - Samajik Paristhithiyam

Moun Hee Mantra Hai

Unit - III (12 Hours)

Sangya

Soordas ke Pad

Baathcheeth - Hotel mein

Adhikal - Sahithyik Paristhithiyam

Unit - IV (12 Hours)

Sarvanam

Rahim ke Dohe

Bathcheeth - Kaksha mein

Adhikal - Salient Features, Main Divisions

Unit - V**(12 Hours)**

Anuvad - 1

Visheshan

Bihari - Dohe

Bathcheeth - Kariyalay mein

Adhikal - Visheshathayem

Books for Study

1. M.kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta,2020.
Unit-I Chapters 2 and 3
2. Viswanath Tripaty, *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd, New Delhi,2018.
Unit-II, III and IV Chapters 4 and 5
3. Dr. Sanjeev Kumar Jain, *Anuwad: Siddhant Evam Vyavhar*, Kailash Pustak Sadan, Madhya Pradesh 2019.
Unit-V Chapter 1

Books for Reference

1. Dr.A.P.J.Abdul Kalam, *Mere sapnom ka Bharath*, Prabath Prakashan, Noida, 2020,
2. Lakshman prasad singh, *Kavya ke sopan*, Bharathy Bhavan Prakashan, 2017.
3. Aravind Kumar, *Sampoorna Hindi Vyakaran our Rachana*, Lucent publisher, 2019.
4. Adhunik Hindi Vyakaran our Rachana, bharati bhawan publishers & distributors, 2018.
5. Acharya ramchandra shukla, *Hindi Sahitya Ka Itihas*, Prabhat Prakashan, 2021.

Web Resources

1. <https://youtu.be/LrdrcP2oiyU>
2. <https://youtu.be/Cib2FNv8KyA>
3. <https://youtu.be/aXARykpYCxA>
4. <https://youtu.be/RUDFis-tdg4>
5. <https://youtu.be/upivTmLTPQA>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
I	21UHI11GL01	HINDI - I									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	2	3	1	3	1	3	3	2	2.3	
CO-2	2	2	3	3	1	3	2	3	3	2	2.4	
CO-3	3	2	2	1	2	3	2	3	2	3	2.3	
CO-4	3	2	1	3	2	3	2	3	3	2	2.4	
CO-5	2	3	3	2	3	2	3	3	3	1	2.5	
Mean Overall Score											2.38 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21USA11GL01	SANSKRIT - I	4	3

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of the course, the student will be able to	
CO-1	remember and Recall words relating to objects.	K1
CO-2	understand classified vocabulary.	K2
CO-3	apply nouns and verbs.	K3
CO-4	analyze different forms of names and verbs.	K4
CO-5	appreciate the good saying of Sanskrit Improve the self-values.	K5

Unit - I (12 Hours)

Samyakthakshatra pada paricaya

Unit - II (12 Hours)

Vartmanakala prayogaha

Unit - III (12 Hours)

Samskruta varathanakalaha

Unit - IV (12 Hours)

Shadha priyoghaa aakaarnta ikaraantha ukarantha

Unit - V (12 Hours)

Subhashitani manoharani Dasaslokani

Book for Study

Shaptamanjari , K.M.,Saral Snakrit Balabodh , Bharathiya Vidya Bhavan , Munushimarg
Mumbai – 4000 007 2018, 2019

Books for Reference

1. Kulapathy , K.M.,Saral Snakrit Balabodh , Bharathiya Vidya Bhavan , Munushimarg
Mumbai – 4000 007 2018
2. R.S.Vadhar & Sons , Book – Sellers and publishers , Kalpathi.Palgahat 678003, Kerala
South India , Shabdha Manjari 2019
3. Balasubramaniam R, Samskruta Akshatra Siksha , Vangals Publications, 14th Main road
JP Nagar , Bangalore – 78

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21USA11GL01	SANSKRIT- I									4	3
Course Outcomes ↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	1	1	3	2	3	2	3	2	2	2.2	
CO-2	2	2	3	3	1	2	2	3	3	2	2.3	
CO-3	3	2	2	2	2	2	2	3	3	2	2.3	
CO-4	3	2	2	3	2	3	3	3	2	2	2.3	
CO-5	3	2	3	2	3	2	2	3	3	3	2.6	
Mean Overall Score											2.34	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UEN12GE01	GENERAL ENGLISH - I	5	3

CO No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	recall what they observe and experience	K1
CO-2	arrange different parts of a text in a coherent manner	K2
CO-3	examine the underlying meaning in a text	K3
CO-4	analyse and evaluate letters regarding the use of appropriate language and format	K4 & K5
CO-5	use conversational English to communicate with friends	K6

Unit-I

(15 Hours)

01. Personal Details
02. Positive Qualities
03. Listening to Positive Qualities
04. Relating and Grading Qualities
05. My Ambition
06. Abilities and Skills
07. Self-Improvement Word Grid
08. What am I Doing?
09. What was I Doing?
10. Unscramble the Past Actions
11. What did I Do Yesterday?

Unit-II

(15 Hours)

12. Body Parts
13. Actions and Body Parts
14. Value of Life
15. Describing Self
16. Home Word Grid
17. Unscramble Building Types
18. Plural Forms of Naming Words
19. Irregular Plural Forms
20. Plural Naming Words Practice
21. Whose Words?

Unit-III

(15 Hours)

22. Plural Forms of Action Words
23. Present Positive Actions
24. Present Negative Actions
25. Un/Countable Naming Words
26. Recognition of Vowel Sounds
27. Indefinite Articles
28. Un/Countable Practice

- 29. Match the Visual
- 30. Letter Spell-Check
- 31. Drafting a Letter

Unit-IV

(15 Hours)

- 32. Friendship Word Grid
- 33. Friends' Details
- 34. Guess the Favourites
- 35. Guess Your Friend
- 36. Friends as Guests
- 37. Introducing Friends
- 38. What are We Doing?
- 39. What is (S)He / are They Doing?
- 40. Yes / No Question
- 41. What was S/He Doing?
- 42. Names and Actions
- 43. True Friendship
- 44. Know Your Friends
- 45. Giving Advice/Suggestions
- 46. Discussion on Friendship
- 47. My Best Friend

Unit-V

(15 Hours)

- 48. Kinship Words
- 49. The Odd One Out
- 50. My Family Tree
- 51. Little Boy's Request
- 52. Occasions for Message
- 53. Words Denoting Place
- 54. Words Denoting Movement
- 55. Phrases for Giving Directions
- 56. Find the Destination
- 57. Giving Directions Practice
- 58. SMS Language
- 59. Converting SMS
- 60. Writing Short Messages
- 61. Sending SMS
- 62. The Family Debate
- 63. Family Today

Book for Study

Joy, J.L., and Peter, F.M. *Let's Communicate 1*. New Delhi, Trinity P, 2014.

Books for Reference

1. Ahrens, Sönke. *How to Take Smart Notes: One Simple Technique to Boost Writing, Learning and Thinking*. New York: Create Space, 2017.
2. Aspinall, Tricia. *Test Your Listening*. London: Pearson, 2002.
3. Bailey, Stephen. *Academic Writing: A Practical Guide for Students*. New York: Routledge, 2004.
4. Fitikides, T.J. *Common Mistakes in English* (6th ed.). London: Longman, 2002.

5. Wainwright, Gordon. *How to Read Faster and Recall More: Learn the Art of Speed Reading with Maximum Recall* (3rd ed.). Oxford: How to Books, 2007.

Web Resources

1. <https://learnenglish.britishcouncil.org/>
2. <https://oneminuteenglish.org/en/best-websites-learn-english/>
3. <https://www.dailywritingtips.com/best-websites-to-learn-english/>

Relationship Matrix for Course Outcomes, Programme Outcomes, and Programmes Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
I	21UEN12GE01	GENERAL ENGLISH – I									5	3
Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO -1	2	3	2	2	3	2	3	2	3	2	2.4	
CO -2	2	2	3	2	3	3	2	3	2	2	2.3	
CO -3	2	3	2	3	2	2	3	2	3	2	2.4	
CO -4	2	2	3	2	3	3	2	3	2	3	2.5	
CO -5	2	2	2	3	2	2	2	3	2	2	2.2	
Mean Overall Score											2.36 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UCH13CC01	CORE 1: GENERAL CHEMISTRY – I	4	4

CO No.	CO – Statements	Cognitive Levels (K –Level)
	On successful completion of this course, students will be able to	
CO–1	acquire the knowledge about periodicity and periodic trends.	K1
CO–2	understand the basics of quantum chemistry.	K2
CO–3	apply VSEPR theory and predict the structure of molecules and ions.	K3
CO–4	comprehend the concepts of ionic equilibrium	K3
CO–5	analyze the bonding in molecules and ions by applying MO theory.	K4

Unit – I Quantum Theory: Introduction and Principles (12 Hours)

The failures of classical mechanics – comparison between classical and quantum mechanics – wave–particle duality – de Broglie Equation – photoelectric effect – Compton effect – Heisenberg’s uncertainty principle – energy quantization –black–body radiation –heat capacities – atomic and molecular spectra – dynamics of microscopic systems: The Schrödinger equation– constraints on the wave function. The principles of quantum theory: operators – eigen value equations – The construction of operators– Hermitian operators – the postulates of quantum mechanics –particle in a 1D box.

Unit– II Periodicity and Periodic Properties (12 Hours)

Arrangement of the elements in the periodic table – groups and periods – sizes of atoms and ions – atomic, ionic, covalent and metallic radii – electronic configurations of elements of various groups The concept of shielding and effective nuclear charge – slater’s rules – ionization energies – variation of ionization energy across the period and down the groups – electron affinities – electronegativity – determination of electronegativity using Pauling and Mulliken methods – metallic and non–metallic character – variable valency and oxidation states.

Unit –III Covalent Bond (12 Hours)

Lewis theory – octet rule and its exceptions – drawing modern Lewis structures for simple molecules and ions and formal charge – Sidgwick – Powell theory – Valence Shell Electron Pair Repulsion (VSEPR) theory – structures of some simple molecules and ions using VSEPR theory – BeCl₂, BF₃, CH₄, PCl₅, SF₆, IF₇, NH₃, NF₃, H₂O, F₂O, SF₄, ClF₃, I₃[–], XeF₂, BrF₅, XeF₄, XeF₆, BF₄[–].

Unit– IV Valence Bond Theory (12 Hours)

Hybridization sp, sp², sp³, sp³d – predicting hybridization and geometry of some selected molecules – BeCl₂, BF₃, CH₄, PCl₅, SF₆, IF₇, NH₃, NF₃, H₂O, F₂O, SF₄, ClF₃, I₃[–], XeF₂, BrF₅, XeF₄, XeF₆, BF₄[–], CO, CO₂, SO₂, SO₃, SO₄^{2–}, CO₃^{2–}, XeOF₄ – resonance – molecular orbital theory – The LCAO method – different types of combinations of atomic orbitals – MO diagrams of simple homonuclear and heteronuclear diatomic molecules and ions –

determination of bond order, magnetic property and stability of H_2 , He_2 , F_2 , O_2 , N_2 , N_2^+ , N_2^- , C_2 , B_2 , NO , O_2^- and O_2^{2-} .

Unit –V Ionic Equilibrium

(12 Hours)

Ionic equilibrium – electrolytes – degree of ionization – factors affecting the degree of ionization – ionization constant and ionic product of water – ionization of weak acids and bases – pH scale – common ion effect – dissociation constants of mono-, di-, and triprotic acids – salt hydrolysis – calculation of hydrolysis constant, degree of hydrolysis and pH for different salts – Buffer solutions – derivation of Henderson’s equation and its applications – buffer capacity – buffer range – buffer action and applications of buffers in analytical chemistry and biochemical processes in the human body.

Books for Study

1. Atkins P W, *Physical Chemistry*, 10th Edition, Oxford University Press, United Kingdom, 2014.

Unit–I Chapters 7 and 9

2. Puri B P and Sharma L R, *Principles of Physical Chemistry*, 47th Edition, Vishal Publication, New Delhi, 2018.

Unit–V Chapter 20

3. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd., Oxford, London, 1996.

Unit–II, III and IV Chapters 1 and 4

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.

2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.

3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Willey and Sons. Inc., New York, 1995.

4. Prasad R K, *Quantum Chemistry*, 4th Edition, New Age International (P) Ltd., New Delhi, 2012.

5. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, New Delhi, 2004.

6. Rajam J B and Broglie L D, *Atomic Physics*, 7th Edition, S. Chand and Co. Pvt. Ltd., New Delhi, 1999.

Web Resources



Photoelectric Effect



Effective nuclear charge



Hybridization sp , sp^2 , sp^3 , sp^3d

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
I	21UCH13CC01	CORE 1: GENERAL CHEMISTRY – I									4	4
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	2	3	2	1	2	3	1	3	2.2	
CO-2	2	3	2	3	2	2	3	2	3	3	2.5	
CO-3	1	3	1	1	3	2	2	3	3	1	2	
CO-4	1	3	1	3	2	2	3	2	1	2	2	
CO-5	2	1	3	3	2	2	3	2	2	3	2.3	
Mean overall Score											2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UCH13CC02	CORE 2: ORGANIC CHEMISTRY – I	3	2

CO No.	CO-Statements	Cognitive Levels (K – Level)
	On successful completion of this course, students will be able to	
CO-1	understand the nomenclature, preparations and reactions of cyclic and acyclic alkanes.	K1
CO-2	identify stereochemistry in addition and elimination reactions of alkenes.	K2
CO-3	comprehend the delocalization in dienes and its chemical consequences.	K3
CO-4	overview the synthetic applications of alkynes.	K4
CO-5	analyze the conformations of cyclic and acyclic hydrocarbons.	K5

Unit– I Alkanes and Cycloalkanes (9 Hours)

IUPAC nomenclature of alkanes and cycloalkanes – petroleum source of alkanes – octane number – preparation of alkanes using Grignard and Gilman reagents – Wurtz synthesis – chlorination and bromination of alkanes – mechanism of free radical substitution – factors determining product distribution – reactivity and selectivity principle – radical substitution in benzylic and allylic carbons – stereochemistry of radical substitution reactions – reactions of cyclic compounds.

Unit –II Conformational Isomers (9 Hours)

Conformational isomerism in ethane and n-butane – projection formula – Fischer, Newman and Sawhorse – conformational isomerism in cycloalkanes – Baeyer's strain theory – conformational analysis of cyclohexane, mono- and disubstituted cyclohexanes – *cis*- and *trans*-decalins.

Unit –III Alkenes –I (9 Hours)

Nomenclature – geometrical isomerism – *cis/trans* – *E/Z* – methods of preparation of alkenes – dehydrohalogenation of alkyl halides – regioselectivity – dehydration of alcohols – Saytzeff's rule relative stability of alkenes – dehalogenation of vicinal dihalides – elimination mechanisms (E1, E2, E1cB) – Hoffman elimination and its regioselectivity – reduction of alkynes – *cis/trans* alkene formation.

Unit– IV Alkenes – II (9 Hours)

Electrophilic addition – general mechanism – addition of HX – regioselectivity – Markovnikov's and Anti-Markovnikov's rules – carbocation stability – bromine and its stereochemistry – halohydrin formation – addition of water (oxymercuration–demercuration, hydroboration–oxidation) – hydroxylation (*syn*- and *anti*-dihydroxylation) – addition of hydrogen – relative stability of alkenes – ozonolysis.

Unit –V Dienes (9 Hours)

Types– preparation of conjugated dienes from consecutive E2 elimination reactions– MO of conjugated diene – 1,2/1,4– addition of HX to conjugated dienes – Diels–Alder reaction – regio– and stereoselectivity – ozonolysis.

Books for Study

- Bruice P Y, *Organic Chemistry*, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
Unit –I Chapters 2 and 9 **Unit– II Chapter 2**
Unit– IV Chapter 5 **Unit– V Chapter 8**
- Morrison R T and Boyd R T, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.
Unit– I Chapter 3 and 13 **Unit– II Chapter 3 and 13** **Unit –III Chapter 8**
Unit– IV Chapter 8 and 9 **Unit– V Chapter 11**

Books for References

- Pine S H, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.
- Finar I L, *Organic Chemistry*, Vol: 1 and 2, 6th Edition,, Addison Wesley Longman Ltd. England, 1996.
- Graham Solomons T W, *Organic Chemistry*, 6th Edition, John Wiley and Sons, New York, 1996.
- Wade L G, *Organic Chemistry*, 5th Edition, Pearson Ltd., University of California, Santa Barbara, 2003.
- Carey F A, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 2000.

Web resources



Alkanes and Cycloalkanes



Nomenclature and conformations

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
I	21UCH13CC02	CORE 2: ORGANIC CHEMISTRY – I									3	2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	1	2	2	3	3	2	1	3	2	2.2	
CO-2	3	2	2	3	3	2	3	2	2	3	2.5	
CO-3	2	1	2	3	2	3	1	2	3	2	2.1	
CO-4	3	3	2	1	2	2	2	3	2	1	2.1	
CO-5	2	2	1	3	2	2	1	2	3	2	2.0	
Mean overall Score											2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UCH13AC01	ALLIED: MATHEMATICS FOR CHEMISTRY-I	6	4

CO No.	CO-Statements	Cognitive Levels (K-levels)
	On successful completion of this course, students will be able to	
CO-1	acquire knowledge of basics of mathematics like series, matrices, trigonometry and differential calculus.	K1
CO-2	understand the process of finding the sum of the series, eigen values and eigen vectors, higher derivatives of a function and trigonometric expansions.	K2
CO-3	apply the Cayley Hamilton Theorem, trigonometric expressions, higher derivatives of functions in working out problems they encounter in chemistry.	K3
CO-4	analyse the importance of mathematical concepts in giving solution to chemistry based real time problems.	K4
CO-5	evaluate eigen values, eigen vectors, summation of series in solving problems on chemistry.	K5

Unit-I (18Hours)
Partial fractions–Binomial series–Summation of series–Finding terms– Coefficient of x^n .

Unit-II (18Hours)
Exponential series–Summation–Logarithmic series–Summation.

Unit-III (18 Hours)
Matrices–Rank of a matrix–Solving simultaneous linear equation in three unknowns using Elementary Operations method – Eigen values and Eigen vectors–Verification of Cayley Hamilton theorem.

Unit-IV (18Hours)
Higher Derivatives – Formation of equations involving derivatives – Applications of Leibnitz’s theorem.

Unit-V (18 Hours)
Expansion of $\cos q$ and $\sin q$ –Powers of sines and cosines of q in terms of functions of multiples of q .

Books for Study

1. S. Narayanan, R. HanumanthaRao, T.K.Manicavachagom Pillay, Kandaswamy, “**Ancillary Mathematics Vol.-I**”, 2009 Edition.

Unit-I-Chapter 1, Sections 1.1 to 1.2

Unit-II-Chapter 1, Sections 1.3

Unit-III-Chapter 3, Sections 3.2 to 3.4

Unit-IV-Chapter 6, Sections 6.1

Unit-V-Chapter 5, Sections 5.1 to 5.4

Books for Reference

1. M.K.Venkatraman, “Engineering Mathematics”
2. S.Narayanan and T.K.Manicavachagom Pillay, “Trigonometry”.

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
I	21UCH13AC01	ALLIED: MATHEMATICS FOR CHEMISTRY-I									6	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	3	1	2	3	2	3	1	2.3	
CO-2	3	3	1	2	2	3	3	2	2	2	2.3	
CO-3	2	3	2	2	2	3	2	2	2	2	2.2	
CO-4	2	2	2	2	2	2	2	2	3	2	2.1	
CO-5	3	2	2	1	2	3	2	2	3	2	2.2	
Mean Overall Score											2.22 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
I	21UHE14VE01	ESSENTIALS OF HUMANITY	2	1

CO. No	CO – Statements	Cognitive Levels (K-levels)
	On completion of this course, the graduates will be able to:	
CO-1	recall the prescribed values and their dimensions	K1
CO-2	examine themselves by learning the developmental changes happening in the course of their life time	K2
CO-3	apply the trained values in their day today life	K3
CO-4	analyze themselves as responsible men and women	K4
CO-5	create a constructive approach to life	K5 & K6

Unit-I Principles of Value Education (6 Hours)

Introduction to values - Characteristics and Roots of Values - Value Education & Value Clarification - Moral Characters - Kinds of Values - Objectives of Values.

Unit-II The Development of Human Personality (6 Hours)

Personality: Introduction, Theories, Integration & Factors influencing the development of personality - SEL Series - Discovering self - Defense Mechanism - Power of positive thinking - Why worry?

Unit-III The Dimensions of Human Development (6 Hours)

Areas of Development: Physical, Intellectual, Emotional, Social Development, Moral & Spiritual development

Unit-IV Responsible Parenthood (6 Hours)

Human sexuality - Marriage and Family - Sex and Love - Characteristics of Responsible parent - Causes of Marriage disharmony - Art of wise parenting.

Unit-V Gender Equality and Empowerment (6 Hours)

Historical perspective - Women in Independence struggle - Women in Independent India - Education & Economic development - Crimes against Women - Women rights - Time-line of Women Achievements in India

Books for Study

Department of Human Excellence. *Essentials of Humanity*, St. Joseph's College, Tiruchirappali-02, 2021.

Books for Reference

1. Alphonse Xavier Dr SJ. *You Shall Overcome*, (6th Ed.) Chennai: ICRDCE Publication, 2012.
2. Alex K. *Soft Skills*, New Delhi: S. Chand, 2009.
3. Kalam Abdul APJ. *You Are Unique*, Bangalore: Punya Publishing, 2012.

Web Sources

<http://livingvalues.net>. Accessed 05 Mar. 2021.

<https://www.apa.org/topics/personality#>. Accessed 05 Mar. 2021.

<https://www.peacecorps.gov/educators/resources/global-issues-gender-equality-and-womens-empowerment/>. Accessed 05 Mar. 2021.

Semester	Course Code	Title of the Course	Hours	Credits
II	21UTA21GL02	General Tamil - II	4	3

CO No.	CO- Statement	Cognitive Level (K- level)
இப்பாடத்தின் நிறைவில் மாணவர்கள்		
CO-1	தமிழிலக்கிய வரலாற்றில் சைவ, வைணவ இலக்கியங்கள் பெறும் இடத்தை அறிந்துகொள்வர்	K 1
CO-2	அகப்பொருள், புறப்பொருள் இலக்கணங்களின் அடிப்படை அறிவைப் பெறுவர்.	K 1
CO-3	காப்பியச் சுவையை மாணவர்கள் புரிந்துகொள்வர்	K 2
CO-4	இஸ்லாமிய இலக்கியச் சிந்தனைகளைப் பெறுவர்	K 3
CO-5	கிறித்தவ மதிப்பீடுகளைச் சிற்றிலக்கிய வகைகளின் வழியாகத் திறனாய்வர்.	K 4

அலகு - 1

(12 மணிநேரம்)

- சிலப்பதிகாரம் - கனாத்திறம் உரைத்த காதை
மணிமேகலை - ஆபுத்திரன் திறம் அறிவித்த காதை
இலக்கிய வரலாறு - சைவம் வளர்த்த தமிழ் முதல் புராணங்கள் முடிய.
இலக்கணம் - அகப்பொருள் இலக்கணம்

அலகு - 2

(12 மணிநேரம்)

- திருவாசகம் - திருச்சாழல்
சிவவாக்கியார் பாடல்கள் - 25 பாடல்கள் (04, 14, 16, 22, 27, 33, 34, 35, 36,37, 38, 47, 81, 91, 225, 237, 242, 495, 504, 520,522, 533, 534, 536, 548.)

அலகு - 3

(12 மணிநேரம்)

- நாலாயிர திவ்வியப் பிரபந்தம்- அமலானாதிபிரான் (10 பாடல்கள்)
- பெருமாள் திருமொழி (11 பாடல்கள்)
கம்பராமாயணம் - கைகேயி சூழ்வினைப்படலம்
உரைநடை - 7 முதல் 9 முடிய உள்ள கட்டுரைகள்

அலகு - 4

(12 மணிநேரம்)

- சீறாப்புராணம் - உடும்பு பேசிய படலம்
இலக்கணம் - புறப்பொருள் இலக்கணம்
இலக்கிய வரலாறு - தமிழ் இலக்கண நூல்கள் முதல் சிற்றிலக்கியங்கள் முடிய

அலகு - 5

(12 மணிநேரம்)

- திருக்காவலூர்க் கலம்பகம் - சமூக உல்லாசம்
உரைநடை - 10 முதல் 12 வரையிலான கட்டுரைகள்

பாடநூல்கள்:

1. பொதுத்தமிழ் - செய்யுள் திரட்டு, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி. திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021
2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, பத்தாம் பதிப்பு, 2017
3. நற்றமிழ்க் கோவை (கட்டுரைத் தொகுப்பு). தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2021

Semester	Course Code	Title of the Course									Hours	Credit
II	21UTA21GL02	General Tamil - II									4	3
Course Outcomes (Cos)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5		
CO-1	2	2	1	2	3	2	2	2	3	2	2.1	
CO-2	2	1	2	2	3	3	2	2	3	2	2.2	
CO-3	2	1	2	2	3	3	2	2	3	2	2.2	
CO-4	1	1	2	2	3	3	2	2	3	2	2.1	
CO-5	1	1	2	2	3	2	2	3	3	2	2.1	
Mean Overall Score											2.14 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UFR21GL02	FRENCH – II	4	3

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO–1	relate pronominal verbs in expressing one’s day today activity.	K1
CO–2	compare the different types of articles.	K2
CO–3	construct texts using pronouns – passages and dialogues.	K3
CO–4	discover the food habits of the French culture.	K4
CO–5	appraise the French fashion.	K5

Unit - I (12 hours)

TITRE:LES LOISIRS

GRAMMAIRE : les adjectifs interrogatifs, les nombres ordinaux, les verbes pronominaux

LEXIQUE : les différentes activités quotidiennes,les loisirs, les activités quotidiennes, les matières

PRODUCTION ORALE : parler sur votre passe-temps

PRODUCTION ECRITE : décrire sa journée

Unit -II (12 hours)

TITRE:LA ROUTINE

GRAMMAIRE : les pronoms personnels COD, les verbes du premier groupe en e/er/eler/eter, le verbe prendre

LEXIQUE : exprimer ses goûts et ses préférences, le temps, l’heure, la fréquence

PRODUCTION ORALE : savoir comment dire l’heure

PRODUCTION ECRITE : écrire vos préférences en quelques lignes

Unit - III (12 hours)

TITRE:OU FAIRE SES COURSES?

GRAMMAIRE : les articles partitifs, le pronom en (la quantité), très ou beaucoup

LEXIQUE : inviter et répondre à une invitation, les commerces et les commerçants, demander et dire le prix, les quantités

PRODUCTION ORALE : faire des courses pour une soirée

PRODUCTION ECRITE : écrire un message en acceptant l’invitation

Unit - IV (12 hours)

TITRE:DECOUVREZ ET DEGUSTEZ

GRAMMAIRE : l’impératif, il faut, les verbes devoir, pouvoir, savoir,vouloir

LEXIQUE : Commander et commenter sur un plat de la carte,les aliments, les services, les moyens de paiement

PRODUCTION ORALE : Jeu de rôle – au restaurant (entre vous et le garçon)

PRODUCTION ECRITE : faire une comparaison avec la carte française et indienne

Unit - V**(12 hours)**

TITRE:TOUT LE MONDE S'AMUSE/ LES ADOS AU QUOTIDIEN

GRAMMAIRE : les adjectifs démonstratifs, le pronom indéfini on, le futur proche, le passé composé, les verbes en –yer, voir et sortir

LEXIQUE : connaître les marques connues sur les vêtements, les sorties, situer dans le temps, les vêtements et les accessoires

PRODUCTION ORALE : décrire une tenue

PRODUCTION ECRITE : écrire une lettre amicale, une carte postale

Book for StudyP.Dauda,L.Giachino and C.Baracco, *Generation A1*, Didier, Paris 2016.**Books for Reference**

1. J.Girardet and J.Pecheur, *Echo A1*, CLE International, 2^eedition,2017
2. Régine Mérieux and Yves Loiseau, *Latitudes A1*, Didier, 2012.
3. Isabelle Fournier, *Talk French*, Goyal Publishers, 2011

Web Resources

1. <https://www.frenchtoday.com/blog/french-verb-conjugation/french-reflexive-verbs-list-exercises/>
2. <https://www.fluentu.com/blog/french/french-subject-pronouns/>
3. <https://grammarist.com/french/french-partitive-article/>
4. <https://www.talkinfrench.com/guide-french-food-habits/>
5. <https://www.fluentu.com/blog/french/talking-about-clothes-in-french/>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
II	21UFR21GL02	FRENCH – II									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	3	3	1	3	1	2	2	2	2.2	
CO-2	2	1	2	3	2	3	1	2	2	2	2.0	
CO-3	3	2	3	2	2	3	3	1	3	2	2.4	
CO-4	3	2	2	1	3	3	3	1	1	3	2.2	
CO-5	2	1	2	2	3	3	3	2	2	2	2.2	
Mean overall Score											2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UHI21GL02	HINDI - II	4	3

CO No.	CO-Statements	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
CO -1	Find out the Terms & Expressions related to letter writing	K1
CO -2	Explain the works of Hindi writers	K2
CO -3	Complete the sentences in Hindi using basic grammar	K3
CO -4	Analyze the social & political conditions of Devotional period in Hindi Literature	K4
CO -5	Justify the human values stressed on the works of the following authors “Premchand, Nirala, etc.”	K5

Unit - I (12 Hours)

Kafan
Letter Writing - Chutti Patra
Bakthikal - Namakarn
Sarkari kariyalayom ka naam

Unit - II (12 Hours)

Baathcheeth - Dookan mein
kriya
Letter Writing - Rishthedarom ko patra
Bakthikal - Samajik Paristhithiyam

Unit - III (12 Hours)

Vah Thodthi patthar
Adverb
Letter Writing - Naukari keliye Avedan Patra
Bakthikal - Sahithiyik Paristhithiyam

Unit - IV (12 Hours)

Mukthi
Samas
Letter Writing - Kitab Maangne Keliye Patra
Bakthikal - Salient Features, Main Divisions

Unit - V**(12 Hours)**

Anuvad - 2

Sandhi

Letter writing - Nagarpalika ko Patra

Bakthikal - Visheshathayem

Books for Study

1. Viswanath Tripaty, *Kuchh Kahaniyan*, Rajkamal Prakashan Pvt. Ltd, New Delhi, 2018.

Unit-I Chapter 1

2. M.kamathaprasad Gupt, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020.

Unit-II, III and IV Chapter 2

3. Dr.Sadananth Bosalae, *kavya sarang*, Rajkamal Prakashan, New Delhi, 2020.

Unit-V Chapter 4**Books for Reference**

1. Adhunik Hindi Vyakaran our Rachana, bharati bhawan publishers & distributors, 2018.
2. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.
3. Krishnakumar Gosamy, Anuvad vigyan ki Bhumika, Rajkamal Prakashan, 2016.
4. Aravind Kumar, Sampurna Hindi Vyakaran our Rachana, Lucent publisher, 2019.
5. Lakshman prasad singh, Kavya ke sopan, Bharathy Bhavan Prakashan, 2017.

Web Resources

1. <https://youtu.be/tE2RHQcqlbI>
2. <https://youtu.be/Xxvco3qa284>
3. <https://youtu.be/1z8x95IFGi4>
4. <https://youtu.be/CBMYf8NRLW4>
5. <https://youtu.be/h31tMLeFtHs>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Paper									Hours	Credits
II	21UHI21GL02	HINDI - II									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	3	2	2	3	3	3	2	2	2.5	
CO-2	1	3	1	2	2	3	3	3	2	3	2.3	
CO-3	3	2	3	2	2	3	2	3	2	2	2.4	
CO-4	2	3	3	1	3	2	3	2	1	2	2.2	
CO-5	3	2	2	2	3	2	3	2	3	2	2.4	
Mean Overall Score											2.36	
											(High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21USA21GL02	SANSKRIT - II	4	3

CO No.	CO-Statements	Cognitive Levels (K -Levels)
	On successful completion of the course, the student will be able to	
CO-1	remembering names of different objects , remembering different verbal forms and sandhi.	K1
CO-2	contrast different verbal forms Explain good sayings , Relate good saying to life.	K2
CO-3	apply and build small sentences.	K3
CO-4	analyze different forms of Verbs and nouns.	K4
CO-5	appreciate subhashitas and Sanskrit poetry Expand Sanskrit vocabulary.	K5

Unit - I (12 Hours)

Asmath usmath tat kim (MFN)

Unit - II (12 Hours)

Sandhi Niyamaaha Abuyaasha (Guna , Visarga , Dirgha , Vrddhi)

Unit - III (12 Hours)

Lang lakaaraha Kriyapadaani

Unit - IV (12 Hours)

Raguvamsaha Pratama sargaha (1 –15)

Unit - V (12 Hours)

Suvachana Prayogha

Book for Study

SARALASAMKRITHAM SIKSHA, 2020 , K.M Saral sankrit Balabodh , Bharathiys Vidya Bhavan , Munshimarg Mumbai – 400007, 2018

Books for Reference

1. Paindrapuram Ashram , Srirangam – 620006 Gopalavimshanthi 2019
2. R.S.Vadhyar & Sons book Kulapthy , K.M Saral sankrit Balabodh , Bharathiys Vidya Bhavan , Munshimarg Mumbai – 400007, 2018

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
II	21USA21GL02	SANSKRIT -II									4	2
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	1	3	2	2	2	3	3	2	1	2.1	
CO-2	3	2	3	2	2	3	2	3	3	2	2.5	
CO-3	2	2	3	2	2	2	2	3	3	1	2.1	
CO-4	3	2	3	3	1	2	3	3	3	1	2.4	
CO-5	3	2	2	2	3	2	2	3	3	1	2.3	
Mean Overall Score											2.28	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UEN22GE02	GENERAL ENGLISH - II	5	3

CO No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	remember the use of suitable punctuation marks in appropriate places	K1
CO-2	describe their pictures with appropriate expressions	K2
CO-3	infer meaning from the given context	K3
CO-4	analyse real-life situations and ask open-ended questions	K4 & K5
CO-5	use polite expressions in appropriate ways	K6

Unit-I

(15 Hours)

01. Education Word Grid
02. Reading Problems and Solutions
03. Syllabification
04. Forms for Expressing Quality
05. Expressing Comparison
06. Monosyllabic Comparison
07. Di/polysyllabic Comparison
08. The Best Monosyllabic Comparison
09. The Best Di/Polysyllabic Comparison
10. Practising Quality Words

Unit –II

(15 Hours)

11. Wh Words
12. Yes/No Recollection
13. Unscramble Wh Questions
14. Wh Practice
15. Education and the Poor
16. Controlled Role Play
17. Debate on Education
18. Education in the Future
19. Entertainment Word Grid
20. Classify Entertainment Wordlist
21. Guess the Missing Letter
22. Proverb-Visual Description
23. Supply Wh Words
24. Rearrange Questions
25. Information Gap Questions

Unit-III**(15 Hours)**

26. Asking Questions
27. More about Actions
28. More about Actions and Uses
29. Crime Puzzle
30. Possessive Quiz
31. Humourous News Report
32. Debate on Media and Politics
33. Best Entertainment Source

Unit-IV**(15 Hours)**

34. Career Word Grid
35. Job-Related Wordlist
36. Who's Who?
37. People at Work
38. Humour at Workplace
39. Profession in Context
40. Functions and Expressions
41. Transition Fill-in
42. Transition Word Selection
43. Professional Qualities
44. Job Procedures
45. Preparing a Resume
46. Interview Questions
47. Job Cover Letter Format
48. Emailing an Application
49. Mock Interview

Unit-V**(15 Hours)**

50. Society Word Grid
51. Classify Society Wordlist
52. Rearrange the Story
53. Storytelling
54. Story Cluster
55. Words Denoting Time
56. Expressing Time
57. What Can You Buy?
58. Noise Pollution
59. Positive News Headlines
60. Negative News Headlines
61. Matching Conditions
62. What Would You Do?
63. If I were Elected
64. My Dream Country

Book for Study

Joy, J.L. & Peter, F.M. *Let's Communicate 2*, New Delhi: Trinity Press, 2014.

Books for Reference

1. Ahrens, Sönke. *How to Take Smart Notes: One Simple Technique to Boost Writing, Learning and Thinking*. New York: CreateSpace, 2017.
2. Aspinall, Tricia. *Test Your Listening*. London: Pearson, 2002.
3. Bailey, Stephen. *Academic Writing: A Practical Guide for Students*. New York: Routledge, 2004'
4. Fitikides, T.J. *Common Mistakes in English* (6th ed.). London: Longman, 2002
5. Wainwright, Gordon. *How to Read Faster and Recall More: Learn the Art of Speed Reading with Maximum Recall* (3rd ed.). Oxford: How to Books, 2007.

Web Resources

1. <https://learnenglish.britishcouncil.org/>
2. <https://oneminuteenglish.org/en/best-websites-learn-english/>
3. <https://www.dailywritingtips.com/best-websites-to-learn-english/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
II	21UEN22GE02	GENERAL ENGLISH - II									5	3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	2	3	2	2	3	2	3	2	3	2	2.4	
CO-2	2	2	3	2	3	3	2	3	2	2	2.3	
CO-3	2	3	2	3	2	2	3	2	3	2	2.4	
CO-4	2	2	3	2	3	3	2	3	2	3	2.5	
CO-5	2	2	2	3	2	2	2	3	2	2	2.2	
Mean Overall Score											2.36 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UCH23CC0 3	CORE 3: GENERAL CHEMISTRY- II	5	5

CO. No.	CO – Statements	Cognitive Levels (K –Level)
	On successful completion of this course, students will be able to	
CO-1	acquire knowledge on the structures and properties of ionic crystals.	K1
CO-2	comprehend the orientation and reactivity of mono and disubstituted aromatic compounds towards aromatic electrophilic substitution.	K2
CO-3	apply the Huckel's rule and predict the aromaticity of organic compounds	K3
CO-4	identify the nature of conductivity of different solids.	K4
CO-5	check and solve various problems based on chemical equilibrium and First and Zeroth law of thermodynamics.	K5

Unit –I Ionic Solids (15 Hours)

Three-dimensional close packing in solids (*ccp* and *hcp*) – tetrahedral and octahedral voids – radius ratio rule–ionic compounds of the type AX – NaCl, CsCl–ionic compounds of the type AX₂ – CaF₂ and TiO₂ – lattice energy– Born–Haber cycle and Born–Lande equation (derivation not required)–determination of lattice energy of NaCl and CaCl₂ using Born–Haber cycle–polarizing power and polarizability – Fajan's rules.

Unit– II Defects in Solids and Metallic Bond (15 Hours)

Stoichiometric defect – Schottky, Frenkel, non–stoichiometric defects – metal excess and metal deficiency defects–theories of bonding in metals – free electron theory, valence bond theory, molecular orbital or band theory–application of band theory to conductors, insulators and semiconductors–superconductivity.

Unit –III Aromatic compounds – I (15 Hours)

Criteria for aromaticity – Huckel's rule– aromatic hydrocarbons – cations and anions – annulenes – heterocyclic compounds – consequences of aromaticity: *pK_a*, solubility and dipole moment – molecular orbital description of aromaticity and anti–aromaticity. Electrophilic aromatic substitution– general mechanism – reaction coordinate diagram – mechanism of halogenation, nitration, sulphonation – principle of microscopic reversibility–Friedel–Craft's acylation – acylation followed by Clemmensen and Wolff–Kishner reductions – Gatterman– Koch carbonylation and Friedel–Craft's alkylation – Stille and Suzuki reactions.

Unit – IV Aromatic Compounds – II (15 Hours)

Nomenclature of substituted benzenes – mono–, di– and polysubstituted reactions – orientation and reactivity of aromatic electrophilic substitution reactions of mono – and disubstituted benzenes – activating and deactivating groups – *ortho/para* and *meta* directing groups – electrophilic aromatic substitution reactions of phenols and anilines – polynuclear

aromatic compounds – synthesis of naphthalene, anthracene, phenanthrene from benzene by multistep synthesis – orientation and reactivity.

Unit –V Chemical Equilibrium and Thermodynamics–I (15 Hours)

Gibbs energy– exergonic and endergonic reactions – description of equilibrium – nature of a reaction – relation between equilibrium constants – molecular interpretation of the equilibrium constant– the response to pressure and temperature– The Van't Hoff equation– the value of K at different temperatures.

Internal energy: work, heat, and energy – definitions– molecular interpretation of heat and work – molecular interpretation of internal energy– formulation of the First Law– expansion work – general expression for work – expansion against constant pressure– reversible expansion– isothermal reversible expansion– heat transactions – calorimetry – heat capacity– enthalpy– enthalpy change and heat transfer– variation of enthalpy with temperature – heat capacity at constant pressure and volume.

Quantifying w , q , dU and dH during the reversible and irreversible processes of expansion of ideal and real gases under isothermal and adiabatic conditions – Joule–Thomson effect – relationship between μ_{JT} and other thermodynamic quantities – calculation of Joule–Thomson coefficient for ideal and real gases – inversion temperature– zeroth law of thermodynamics – absolute scale of temperature.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.

Unit–I and II Chapter 3

2. Morrison R T and Boyd R N, *Organic Chemistry*, 7th Edition, New York, Allyn and Bacon Ltd., 2011.

Unit–III Chapter16

Unit–IV Chapter16

3. Atkins P W, *Physical Chemistry*, 10th Edition, Oxford University Press, 2014.

Unit–V Chapters 2, 3 and 9

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.

2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.

3. Cotton F A, Wilkinson G, Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Wiley and Sons. Inc., New York, 1995.

4. Bruice P Y, *Organic Chemistry*, 8th Edition University of California, Santa Barbara, Pearson Ltd, 2011

5. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, 2004.

6. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York, 2014.

Web Resources



Defects in crystals



Basics of Thermodynamics



Thermodynamics

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
II	21UCH23CC03	CORE 3: GENERAL CHEMISTRY – II									5	5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	1	2	3	1	2	3	2	3	3	2.1	
CO-2	1	1	3	3	4	2	4	1	2	3	2.4	
CO-3	1	2	2	3	2	2	2	2	1	1	1.8	
CO-4	2	1	1	3	1	2	1	3	1	3	1.8	
CO-5	1	3	1	2	3	2	2	3	3	1	2.1	
Mean overall Score											2.04 (Medium)	

Semester	Course code	Title of the course	Hours	Credits
I & II	21UCH23CP01	CHEMISTRY PRACTICAL-I (Inorganic Qualitative Analysis)	3	2

CO No.	CO-Statements	Cognitive level (K -Level)
On successful completion of the course, students will be able to		
CO-1	Know the lab safety and identify nature of chemicals	K 1
CO-2	understand the principles of qualitative analysis for detection of inorganic cations.	K 2
CO-3	apply the principles of qualitative analysis for detection of inorganic anions.	K 3
CO-4	illustrate the techniques of semi micro qualitative analysis of inorganic salt mixtures.	K 4
CO-5	eliminate the interfering acid radicals.	K 4

Unit- I Lab Safety, Chemicals and Glassware (3 Hours)

Philosophy of lab safety – first-aid techniques – general work culture inside the chemistry lab– importance of wearing lab coat, eye glasses.

Personal protection – nature of chemicals – toxic, corrosive, explosive, inflammable, carcinogenic, other hazardous chemicals – safe storing and handling of chemicals – disposal of chemical wastes – glassware – handling of glassware – handling of different types of equipment’s like Bunsen burner, centrifuger, Kipp’s apparatus, etc. – ventilation facilities.

Unit –II General Principles of Qualitative Analysis (3 Hours)

Principle of flame test – concept of solubility and solubility product – theory of acids and bases – concept of *pH* and buffer action – common ion effect – redox reactions – theory of testing acid radicals (simple and interfering) – principle of grouping of cations – theory of testing cations.

Unit- III Semi-micro Qualitative Analysis – I (28 Hours)

Analysis of simple acid radicals:

- Carbonate
- Sulphide
- Sulphate
- Chloride
- Bromide
- Iodide
- Nitrate

Analysis of interfering acid radicals:

- Fluoride
- Oxalate
- Borate
- Phosphate
- Chromate

- f) Arsenite
g)

Unit – IV Semi–micro Qualitative Analysis – II

(30 Hours)

Elimination of interfering acid radicals

- a) Fluoride
b) Oxalate
c) Borate
d) Phosphate
e) Chromate
f) Arsenite

Identifying the groups of basic radicals

Group I : Ag^+ , Hg^{2+} , Pb^{2+}

Group II : **IIA**– Cu^{2+} , Cd^{2+} , Hg^{2+} , Pb^{2+} , Bi^{3+} . **IIB**– Sn^{2+} , Sn^{4+} , Sb^{3+} , Sb^{5+} , As^{3+} , As^{5+}

Group III : Fe^{3+} , Al^{3+} , Cr^{3+} .

Group IV: Co^{2+} , Ni^{2+} , Mn^{2+} , Zn^{2+}

Group V : Ca^{2+} , Ba^{2+} , Sr^{2+} .

Group VI: Mg^{2+} , NH_4^+ .

Unit –V Semi–micro Qualitative Analysis – III

(26 Hours)

Analysis of basic radicals (group–wise): Lead, Copper, Bismuth, Cadmium, Antimony, Iron, Aluminium, Chromium, Zinc, Manganese, Nickel, Calcium, Strontium, Barium, Magnesium, Ammonium.

Analysis of a mixtures containing two cations and two anions (of which one is interfering type - max. 15 Mixtures).

Books for Study

1. Svehla G, *Vogel's Qualitative Analysis*, 7th Edition, Pearson Education, India, 2012.
2. *Lab manual*, Department of Chemistry, St. Joseph's College, Tiruchirappalli.
3. Venkateswaran V, Veeraswamy R, Kulandaivelu A R, *Basic Principles of Practical Chemistry*, 2nd Edition, New Delhi, Sultan Chand and Sons, 1997.

Web Resources



Systematic Qualitative Analysis



Qualitative Analysis of



Handling of Chemicals
Inorganic Salts

Scheme of Valuation

Chemistry Practical-I

Inorganic Qualitative Analysis

INTERNAL

CIA		100 Marks
	Cumulative mark of Regular Practical Classes	50 Marks
	Two CIA tests	50 Marks

For Each CIA Test 100 marks

Theory/Test	10 Marks
Record	10 Marks
Procedure	20 marks
Results/Analysis	60 Marks

Scheme of valuation

15 marks for each of the four radicals – $4 \times 15 = 60$ marks

10 marks for Identification of group only of a particular radical

EXTERNAL

Total	100 Marks
Theory	10 Marks
Procedure	10 Marks
Results/Analysis	80 Marks

Scheme of valuation

20 marks for each of the four radicals – $4 \times 20 = 80$ marks

15 marks for Identification of group only of a particular radical

Semester	Course code	Title of the course	Hours	Credits
I & II	21UCH23CP02	CHEMISTRY PRACTICAL-II	3	2

CO No.	CO-Statements	Cognitive levels (K-Level)
	On successful completion of the course, students will be able to	
CO -1	understand methods of preparation of solutions with different concentration	K1
CO -2	understand the principles of acid base titrations.	K2
CO -3	comprehens advanced titerimetric technics	K2
CO -4	applying techniques of tritrimetric analyses.	K3
CO -5	analysis to solve the enviroinmental probeloms	K4 & K6

Unit – I Principles of Quantitative Analysis (3 Hours)

Introduction – types of quantitative analyses – theory of significant figures– error analysis – apparatus used in titrimetric analysis – handling of digital balances and other apparatus – concept of molecular weight, formula weight, equivalent weight – concentrations of solutions – molarity, formality, normality, weight percentage.

Unit – II Principles of Titrimetry (3 Hours)

Principle of titrimetry – primary and secondary standards – preparing standard solutions – standardizing the secondary standard solutions –types of titrimetric analyses – principal reactions – concepts of acids, bases, oxidants, reductants – theory of indicators – calculations for strengths of solutions and the amount of substances in solution.

Unit –III Preparation of Solutions and Types of Titrimetric Methods (28 Hours)

1. Preparation of a standard solution.
2. Preparing a standard solution and doing a titration.
3. Making up a given solution and doing a titration.
4. Estimation of strength of a solution.
5. Types of titrimetric methods and indicators used.

Unit – IV Acid–Base and Redox titrations (28 Hours)

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of oxalic acid by NaOH using a standard oxalic acid solution.
3. Estimation of Na₂CO₃ by HCl using a standard Na₂CO₃ solution.
4. Estimation of Oxalic acid by KMnO₄ using a standard oxalic acid solution.
5. Estimation of K₂Cr₂O₇ by Thio solution.
6. Estimation of Iron (II) by KMnO₄ using a standard Mohr's salt solution.
7. Estimation of KMnO₄ by thio using a standard potassium dichromate solution.
8. Estimation of Iron (II) by K₂Cr₂O₇ using a standard Mohr's salt solution.
9. Estimation of Copper (II) sulphate by K₂Cr₂O₇ solution.
10. Estimation of Copper by standard CuSO₄ solution.

Unit – V Complexometric and applied titrations (28 Hours)

1. Estimation of magnesium(II) by EDTA.

2. Estimation of calcium(II) by EDTA.
3. Estimation of zinc(II) by EDTA.
4. Estimation of total hardness of water.
5. Estimation of antacid.
6. Estimation of bleaching powder.

Books for Study

1. Anna Coulling , *A Complete guide to Volumetric Analysis* , 1st Edition , Create Space Independent Publishing Platform, 2013.
Unit– I Chapter1 Unit– II Chapter 3
2. Schimpt Henry W, *Essential of Volumetric Analysis*, 1st Edition, Wentworth Press, 2019.
Unit– III Chapter 6
3. Peter McPherson, *Volumetric Analysis*, 1st Edition, Royal Society of Chemistry, 2014.
Unit– I Chapter12 Unit– I Chapter 9

Books for Reference

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A R., *Basic Principles of Practical Chemistry*, New Delhi, 2nd Edition, Sultan Chand and sons, 1997.
2. Bassett J, *Vogel's Textbook of Quantitative Inorganic Analysis*, 4th Edition, ELBS Longman, 1985.
3. Peter McPherson , *Volumetric Analysis* , 1st Edition , Royal Society of Chemistry , 2014.

Web Resources



Fundamentals of Volumetric Analysis

Preparation of Oxalic acid

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
I & II	21UCH23CP02	CHEMISTRY PRACTICAL–II									3	2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO–1	2	4	1	3	2	2	3	2	2	1	2.2	
CO–2	1	2	2	1	2	2	3	2	4	3	2.2	
CO–3	1	3	2	1	3	1	2	4	3	1	2.1	
CO–4	2	3	1	3	1	1	2	3	2	3	2.1	
CO–5	3	1	3	2	1	2	2	4	2	3	2.3	
Mean overall Score											2.18 (Medium)	

INTERNAL

CIA

Cumulative mark of Regular Practical Classes

Two CIA tests

100 Marks

50 Marks

50 Marks

For Each CIA Test 100 marks

Theory/Test 10 Marks

Record 10 Marks

Results 80 Marks

Scheme of valuation

<1% Error 80 Marks

2% 70 Marks

3% 60 Marks

4% 50 Marks

>4% 30 Marks

EXTERNAL

Total 100 Marks

Short Procedure 10 Marks

Test 10 Marks

Results/Analysis 80 Marks

Scheme of valuation

<1% Error 80 Marks

2% 70 Marks

3% 60 Marks

4% 50 Marks

>4% 30 Marks

Semester	Course Code	Title of the Course	Hours	Credits
II	21UCH23AC02	ALLIED: MATHEMATICS FOR CHEMISTRY-II	6	4

CO No.	CO- Statements	Cognitive Levels (K-levels)
	On successful completion of this course, students will be able to	
CO-1	acquire knowledge in integration, differential equations and Laplace transform.	K1
CO-2	understand the various methods of integration, differential equations and the concepts of Laplace transform.	K2
CO-3	solve problems in integration, differential equations and Laplace transform	K3
CO-4	identify the suitable methods to solve problems related to integration, differential equations and Laplace transform.	K4
CO-5	evaluate integrals, first and second order differential equations with constant coefficients, problems involving Laplace transforms and ordinary differential equations using Laplace transform.	K5

UNIT-I (18 Hours)

Integration – Integrals of functions containing linear functions of x – Integrals of functions involving $a^2 \pm x^2$ – Integrals of rational algebraic functions – Integration of irrational functions.

UNIT-II (18 Hours)

Properties of definite integrals – Simple applications – Integration by parts– Bernoulli's formula – Evaluation of double integrals (omit problems involving changing the order of Integration and applications).

UNIT-III (18 Hours)

Differential equations of first order – variable separable – Homogeneous equations – Non-homogeneous equations – Linear equation – Bernoulli's equation.

UNIT-IV (18 Hours)

Second order linear equations with constant coefficients – Particular Integrals for e^{kx} , $\sin kx$, $\cos kx$, x^n and $e^{kx}X$.

UNIT-V (18 Hours)

Laplace transforms – Definition – Some general theorems – Inverse transform - Solving ordinary differential equations using Laplace transformation.

Books for Study

1. S. Narayanan, R. Hanumantha Rao, T.K. Manicavachagom Pillay, P. Kandaswamy, "Ancillary Mathematics, Volume II", 2009 Edition, S. Viswanathan Pvt. Ltd.

Unit I: Chapter 1: Sec 6.1, 6.2, 7 (omit 7.4), 8 case (i) to (iv) only,

pages: 7–13, 23–31, 39–4.

Unit II: Chapter 1: Sec. 11, 12, 15, pages: 61 – 72, 93 and 94; Chapter 3: Sec. 2.2, pages: 163- 170.

Unit III: Chapter 4: Sec. 1- 5, pages 205 – 218.

Unit V: Chapter 7: Sec. 7.1 – 7.7, pages 289 – 315.

2. S. Narayanan, T. K. Manicavachagom Pillay, “**Ancillary Mathematics Book II**”, 2002 Edition, S. Viswanathan Pvt. Ltd.

Unit IV: Chapter 3: Sec. 1-4, pages: 42 – 60.

Books for Reference

1. M. K. Venkatraman, “Engineering Mathematics” National Publishing Company, 1996
2. S. Narayanan, T.K. Manicavachagom Pillay, “Differential Equations and its applications” S. Viswanathan Pvt. Ltd, 2009.
3. S. Narayanan, T.K. Manicavachagom Pillay “Calculus Volume I & II” S.Viswanathan Pvt. Ltd, 2009.

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course								Hours	Credits
II	21UCH23AC02	ALLIED: MATHEMATICS FOR CHEMISTRY-II								6	4
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)				Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	2	2	1	3	3	2	2	1	2.2
CO-2	3	3	2	1	2	3	3	2	1	2	2.2
CO-3	2	3	2	2	2	2	3	2	2	2	2.2
CO-4	3	3	2	2	1	3	3	2	2	1	2.2
CO-5	3	3	1	3	1	3	3	1	3	1	2.2
Mean Overall Score										2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
II	21UHE24AE02	Environmental Studies	2	2

CO No.	CO - Statements	Cognitive Levels (K-levels)
	On Completion of this course, the graduates will be able to	
CO-1	identify the concepts related to the environmental global scenario	K1
CO-2	comprehend the natural resources and environmental organizations	K2
CO-3	apply the acquired knowledge to sensitize individuals and public about the environmental crisis	K3
CO-4	analyze the causes and changes in the structure of biodiversity	K4
CO-5	enhance their skills in the society by solving the environmental problems and preserving nature by the acquired knowledge	K5

Unit I Introduction to Environmental Studies (6 Hours)

Introduction – Scope and Importance – Subsystems of Earth – Various recycling Methods – Environmental Movements in India – Eco- Feminism – Public awareness – Suggestions to conserve environment

Unit II Natural Resources (6 Hours)

Food Resources – Land Resources – Forest resources – Mineral Resources – Water Resources – Energy Resources

Unit III Ecosystems, Biodiversity and Conservation (6 Hours)

General structure of ecosystem - Functions of Ecosystem - Energy flow and Ecological pyramids – Levels of Biodiversity - Hot spots of Biodiversity - Endangered and Endemic Species - Value of Biodiversity - Threats to Biodiversity - Conservation of Biodiversity

Unit IV Environmental Pollution (6 Hours)

Air Pollution – Water Pollution – Oil Pollution – Soil Pollution – Marine Pollution – Noise Pollution - Thermal Pollution – Radiation Pollution

Unit V Environmental Organizations and Treatise (6 Hours)

United Nations Environment Program (UNEP) - International treaties on Environmental protection - Ministry of Environment, Forest and Climate Change - Important National Environmental Acts and rules– Environmental Impact Assessment.

Books for Study

Department of Human Excellence, *Environmental Studies*, St. Joseph's College, Tiruchirappali-02, 2021.

Books for Reference:

1. Rathor, V.S. and Rathor B. S. *Management of Natural Resources for Sustainable Development*. New Delhi: Daya Publishing House, 2013.
2. Sharma P.D, *Ecology and Environment*, 8 ed., Meerut: Rastogi Publications, 2010.
3. Agrawal, A and C.C. Gibson. *Introduction: The Role of Community in Natural Resource Conservation*. NJ: Rutgers University Press, 2001.

Web Sources:

<https://www.unep.org/>. Accessed 05 Mar. 2021.

<http://moef.gov.in/en/> Accessed 05 Mar. 2021.

<https://www.ipcc.ch/reports/>. Accessed 05 Mar.2021.

Semester	Course Code	Title of the Course	Hours	Credits
II	21UHE14VE02	TECHNIQUES OF SOCIAL ANALYSIS: FUNDAMENTALS OF HUMAN RIGHTS	2	1

CO No.	CO - Statements	Cognitive Levels (K-levels)
	On completion of this course, the graduates will be able to:	
CO-1	identify the importance and the values of human rights	K1
CO-2	understand the historical background and the development of Human Rights and the related organizations	K2
CO-3	apply the provisions of National and International human rights to themselves and the society	K3
CO-4	analyse the violations of human rights to the marginalized section in the society	K4
CO-5	animate the people to involve in the struggles and activities of the human rights organizations	K5

Unit-I Human Rights - An Introduction (6-Hours)

Introduction- Classification of Human Rights- Scope of Human Rights-Characteristics of Human Rights-NHRC-SHRC- Challenges for Human Rights in the 21st Century.

Unit-II Historical Development of Human Rights (6-Hours)

Human Rights in Pre-World War Era- Human Rights in Post-World War Era- Evolution of International Human Rights Law - the General Assembly Proclamation- Institution Building, Implementation and the Post- Cold War Period. The ICC.

Unit-III India and Human Rights (6-Hours)

Introduction-Classification of Fundamental Rights-Salient Features of Fundamental Rights- and Fundamental Duties.

Unit-IV Human Rights of Women and Children (6-Hours)

Women's Human Rights- Issues related to women's rights - and Rights of Women's and Children

Unit-V Human Rights Violations and Organizations (6-Hours)

Human Rights Violations - Human Rights Violations in India - the Human Rights Watch Report, January 2012- Human Rights Organizations.

Books for Study

The Department of Human Excellence, *Techniques of Social Analysis: Fundamentals of Human Rights*, St. Joseph's college, Tiruchirappalli -02, 2021.

Books for Reference

1. Venkatachalem. Dr. *The Constitution of India, Salem: Giri Law House, 2005.*

2. NaikVarunand Mukesh Shany. *Human rights education and training*, New Delhi: crescent Publishing Corporation, 2011.
3. BhathokeNeera. *Human Rights content and extent*,New Delhi: swastika publications, 2011.

Web Sources:

<https://www.un.org/en/universal-declaration-human-rights/>_Accessed 05 Mar. 2021.

<https://www.ilo.org/global/lang--en/index.htm>_Accessed 05 Mar. 2021.

<https://www.amnesty.org/en/>_Accessed 05 Mar. 2021.

Semester	Course Code	Title of the Course	Hours	Credits
III	21UTA31GL03	General Tamil - III	4	3

CO No.	CO- Statement	Cognitive Level (K- level)
இப்பாடத்தின் நிறைவில் மாணவர்கள்		
CO-1	சங்க இலக்கிய வகைகளை நினைவுகூருவர்	K 1
CO-2	இலக்கியத்தினை நுட்பமாக அறிதலின் வழியாக ஆற்றுப்படுத்தும் திறன் பெறுவர்	K 2
CO-3	இலக்கிய அறநெறிகளைத் தற்கால வாழ்வியலில் பயன்படுத்தும் திறன் பெறுவர்	K 3
CO-4	அகம் மற்றும் புற இலக்கியத் திணை, துறைகளைப் பகுத்தாராய்வர்	K 4
CO-5	யாப்பு, அணி இலக்கண நுட்பங்களை இலக்கியங்களில் மதிப்பிடுவர்	K 5

அலகு - 1 (12 மணிநேரம்)

பொருநராற்றுப்படை (முழுமையும்)

அலகு - 2 (12 மணிநேரம்)

நற்றிணை - 5 பாடல்கள் - (1, 19, 21, 70, 148)

ஐங்குறுநூறு - அன்னாய் வாழிப்பத்து.

யாப்பிலக்கணம் - வெண்பா, ஆசிரியப்பா

அலகு - 3 (12 மணிநேரம்)

கலித்தொகை - (குறிஞ்சிக்கலி- 62, பாலைக்கலி -22, மருதக்கலி- 87, நெய்தற்கலி-149, முல்லைக்கலி - 116)

இலக்கிய வரலாறு - முதற்பாகம் ('தமிழ் மொழியின் தொன்மையும் சிறப்பும்' முதல் 'சங்க தொகை நூல்கள்' முடிய),

புதினம் - குடும்ப அட்டை (2022-2023)

அலகு - 4 (12 மணிநேரம்)

பதிற்றுப்பத்து - 3 பாடல்கள் (14, 32, 61)

புறநானூறு - 5 பாடல்கள் (95, 121, 130, 204, 279)

அணியிலக்கணம்

அலகு - 5 (12 மணிநேரம்)

திருக்குறள் - புறங்கூறாமை, பழமை, புலவி நுணுக்கம் ஆகிய அதிகாரங்கள்

திரிகடுகம் - 5 பாடல்கள் (2, 6, 12, 15, 42)

இலக்கிய வரலாறு - சங்க இலக்கியங்களின் தனித்தன்மைகள் முதல் இரட்டைக் காப்பியங்கள் முடிய

பாடநூல்கள் :

1. பொதுத்தமிழ் செய்யுள் திரட்டு, தமிழாய்வுத்துறை வெளியீடு, தூய வளனார் கல்லூரி, திருச்சிராப்பள்ளி-2, முதற்பதிப்பு, 2021
2. சமூகவியல் நோக்கில் தமிழிலக்கிய வரலாறு, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி, திருச்சிராப்பள்ளி, பத்தாம் பதிப்பு, 2017
3. புதினம் (ஒவ்வொரு கல்வியாண்டிற்கும் ஒவ்வொரு புதினம்)
2022 – 2023 கல்வியாண்டுக்கு மட்டும் : வீ.செந்தில் குமார், குடும்ப அட்டை, தாமரை பப்ளிகேஷன்ஸ் பிரைவேட் லிமிடெட், சென்னை, முதற்பதிப்பு, 2009

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21UTA31GL03	General Tamil - III									4	3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5		
CO-1	3	2	2	3	2	3	2	3	3	2	2.5	
CO-2	2	2	2	3	3	2	2	3	3	2	2.4	
CO-3	3	3	2	3	3	2	2	3	3	3	2.7	
CO-4	3	2	2	3	2	3	2	3	2	3	2.5	
CO-5	2	3	2	3	2	3	2	3	2	3	2.5	
Mean Overall Score											2.52 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UFR31GL03	FRENCH – III	4	3

CO No.	CO-Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO-1	relate colours, materials and shapes to the french clothing.	K1
CO-2	select appropriate prepositions in giving directions.	K2
CO-3	construct a text in present tense using different verbs.	K3
CO-4	examine the travel manners and celebrations of the French.	K4
CO-5	justify the usage of past tense in a biography.	K5

Unit – I (12 hours)

TITRE:VIVRE LAVILLE

GRAMMAIRE : la comparaison, les prépositions avec les noms géographiques, les pronoms personnels COI, le pronom y (le lieu)

LEXIQUE : se repérer sur un plan de ville, la ville, les lieux de la ville

PRODUCTION ORALE : demander et indiquer une direction dans un dialogue

PRODUCTION ECRITE : décrire votre ville natale, créez les affiches en appréciant votre ville

Unit - II (12 hours)

TITRE:VISITER UNE VILLE

GRAMMAIRE : la position des pronoms compléments, les verbes du premier groupe en – ger et – cer, les verbes ouvrir et accueillir

LEXIQUE : dire les informations sur une ville de votre choix, les transports, les points cardinaux, les prépositions de lieu

PRODUCTION ORALE : Indiquer le chemin

PRODUCTION ECRITE : Demander des renseignements touristiques

Unit - III (12 hours)

TITRE:ON VEND OU ON GARDE

GRAMMAIRE : la formation du pluriel, les adjectifs de couleurs, l'adjectif beau, nouveau,vieux

LEXIQUE : savoir comment s'habiller des grandes occasions, les couleurs, les formes, les matériaux

PRODUCTION ORALE : comprendre une présentation de catalogues vestimentaires en France

PRODUCTION ECRITE : adresser des souhaits à quelqu'un

Unit - IV (12 hours)

TITRE:VENTES D'AUTREFOIS, VENTES D'AUJOURD'HUI

GRAMMAIRE : les pronoms relatifs qui et que, l'imparfait, les verbes connaître, écrire, mettre et vendre, la question avec inversion

LEXIQUE : comprendre la description de personnes dans un extrait de roman, les mesures, l'informatique

PRODUCTION ORALE : imaginez un dialogue avec un personnage célèbre. Utilisez l'inversion.

PRODUCTION ECRITE : écrire une biographie en utilisant les pronoms relatifs

Unit- V

(12 hours)

TITRE:FELICITATIONS ! / ON VOYAGE!

GRAMMAIRE : les pronoms démonstratifs, les articles : particularités, les pronoms interrogatifs variables : lequel, les adverbes de manières, les verbes recevoir et conduire

LEXIQUE : les moyens de transports, les voyages, les fêtes, l'aéroport et l'avion, la gare et le train, l'hôtel

PRODUCTION ORALE : Présenter ses vœux

PRODUCTION ECRITE : Faire une réservation

Book for Study

P.Dauda,L.Giachino and C.Baracco, *Generation A2*, Didier, Paris 2016.

Books for Reference

1. J.Girardet and J.Pecheur, *EchoA2*, CLE International, 2^eedition,2017
2. Régine Mérieux and Yves Loiseau, *Latitudes A2*, Didier, 2012.
3. Isabelle Fournier, *Talk French*, Goyal Publishers, 2011

Web Resources

1. <https://francais.lingolia.com/en/grammar/prepositions>
2. <https://www.lawlessfrench.com/grammar/present-tense/>
3. <https://www.thoughtco.com/textures-french-adjectives-and-expressions-1368980>
4. <https://study.com/academy/lesson/past-tense-in-french.html>
5. <https://absolutely-french.eu/french-celebrations/?lang=en>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
III	21UFR31GL03	FRENCH – III									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	1	2	2	3	2	3	1	2	3	2.1	
CO-2	3	2	3	3	1	2	1	2	2	3	2.2	
CO-3	2	1	3	2	2	3	1	3	2	2	2.1	
CO-4	3	1	3	2	3	3	3	1	2	3	2.4	
CO-5	3	2	3	2	2	3	3	2	2	1	2.3	
Mean overall Score											2.22 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UHI31GL03	HINDI - III	4	3

CO No.	CO-Statements	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
CO-1	find out the dialects of Hindi language.	K1
CO-2	compare the poems of Sumithra Nandanpanth, Prasad & Bachan in Context with their experience of life.	K2
CO-3	illustrate the importance given to family ethics by the youth in the modern period according to “Bahoo Ki vidha” One Act play.	K3
CO-4	categorize the poetries in some selective poems.	K4
CO-5	justify the social & political conditions of Devotional period in Hindi Literature.	K5

Unit - I

(12 Hours)

Tera sneh na khoon
Samband Bodak
Reethikal - Namakarn
Tense

Unit - II

(12 Hours)

Himadri Thung Sring Se
Paribakshik shabdavali
Samuchaya Bodak
Reethikal - Samajik Paristhithiyam

Unit - III

(12 Hours)

Insan our Kuthae
Vismayadi Bodak
Reethikal - Sahithyik Paristhithiyam
Reethikal - Salient Features

Unit - IV

(12 Hours)

Shokgeeth
Avikary shabdh
Reethikal - Main Divisions
Social media and modern world

Unit - V

(12 Hours)

Reethikal - Visheshathayem
Anuvad – 3
Bahoo ki vidha (one act play)

Books for Study

1. Dr. Sanjeev Kumar Jain, Anuwad: Siddhant Evam Vyavhar, Kailash Pustak Sadan, Madhya Pradesh, 2019.
Unit-I Chapter 1
2. M. Kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020.
Unit-II, III and IV Chapter 2
3. Dr. Sadananth Bosalae, *kavya sarang*, Rajkamal Prakashan, New Delhi, 2020.
Unit-V Chapter 4

Books for Reference

1. Ramdev, Vyakaran Pradeep, Hindi Bhavan, 2016.
2. Lakshman prasad singh, Kavya ke sopan, Bharathy Bhavan Prakashan, 2017.
3. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.
4. Hindi Niband Sangrah, V&S Publishers, 2015.
5. Krishnakumar Gosamy, Anuvad vigyan ki Bhumika, Rajkamal Prakashan, 2016.

Web Resources

1. <https://youtu.be/Xxvco3qa284>
2. <https://youtu.be/e9wK-pYfVPc>
3. https://youtu.be/75tHr53f5_o
4. https://youtu.be/eFNM6y_cpjY
5. <https://youtu.be/jHWXWLMxJtw>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
III	21UHI31GL03	HINDI - III									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	3	2	3	2	1	3	2	2.4	
CO-2	3	2	3	2	2	3	2	3	2	3	2.5	
CO-3	3	2	2	3	1	3	2	3	2	3	2.4	
CO-4	2	3	3	2	3	2	3	3	2	1	2.4	
CO-5	3	2	2	3	3	2	1	3	2	3	2.4	
Mean Overall Score											2.42	
											(High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21USA31GL03	SANSKRIT - III	4	3

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of the course, the student will be able to	
CO-1	remember Characters and events of Ramayana.	K1
CO-2	understand social ethics and moral duties.	K2
CO-3	apply the values learnt , in day to day life.	K3
CO-4	analyzing the Vedic Philosophy.	K4
CO-5	evaluate and create new words with upasargas.	K5

Unit - I (12 Hours)

Romodantam , Balakandam (1-15)

Unit - II (12 Hours)

Romodantam , Balakandam (15-30)

Unit - III (12 Hours)

Vedas – Vedangas vivaranam

Unit - IV (12 Hours)

Puranas .Upanishands

Unit - V (12 Hours)

Upasargas , Bhavishyat Kaalah

Book for Study

VEDIC LITERATURE, 2019

Books for Reference

1. Parameshwara, Ramodantam, LIFCO Chennai 2018
2. R.S.Vadhyar & Sons , Book – sellers and publishers , Kalpathu ,Palghat – 678003 , Kerala , south India , History of Sanskrit Literature 2019
3. Kulapathy , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007 2018

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
III	21USA31GL03	SANSKRIT-III									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	2	2	3	3	3	3	3	2	1	2.3	
CO-2	3	3	2	3	3	2	2	3	3	3	2.7	
CO-3	3	3	1	3	3	1	1	3	3	3	2.4	
CO-4	2	2	1	2	3	2	2	3	2	1	2.0	
CO-5	3	3	2	3	2	2	3	3	3	2	2.6	
Mean Overall Score											2.4	
Result # High												

Semester	Course Code	Title of the Course	Hours	Credits
III	21UEN32GE03	GENERAL ENGLISH - III	5	3

CO.No.	CO-Statements	Cognitive Levels (K-Levels)
	On successful completion of this course, students will be able to	
CO -1	recall the meaning of familiar words in different contexts	K1
CO-2	comprehend the complex written texts by guessing meaning of unfamiliar words using contextual clues	K2
CO-3	use tenses and punctuations appropriately in sentences	K3
CO-4	analyse formal and informal letters to rewrite them meaningfully	K4
CO-5	compare different genres of writing and construct paragraphs	K5 & K6

Unit-I (15 Hours)

1. Suggestions to Develop Your Reading Habit
2. General Writing Skill: Letter Writing – Informal
3. Grammar: Simple Present Tense

Unit-II (15 Hours)

4. The Secret of Success: An Anecdote
5. General Writing Skill: Letter Writing – Formal
6. Grammar: Present Continuous Tense

Unit-III (15 Hours)

7. The Impact of Liquor Consumption on the Society
8. General Writing Skill: Letter to Newspaper
9. Grammar: Simple Past Tense

Unit-IV (15 Hours)

10. Dr. A.P.J. Abdul Kalam: A Short Biography
11. General Writing Skill: Job Application Letter
12. Grammar: Past Continuous Tense

Unit-V (15 Hours)

13. Golden Rule: A Poem
14. General Writing Skill: Circular-Writing
15. Grammar: Simple Future Tense and Future Continuous Tense

Book for Study

Jayraj, S. Joseph Arul et al. *Trend-Setter: An Interactive General English Textbook for Undergraduate Students*. Trinity, 2016.

Books for Reference

1. Malkani, Neelam. *A comprehensive Guide on General English for Competitive Exams*. Agra: Oswal Publications, 2020.
2. Jain, B. B. *Compendium General English*. Agra: Upkar Prakashan, 2010.
3. Aggarwal, R.S. *Quick Learning Objective General English*. India: S Chand, 2006.
4. T. Ferrari, Bernard. *Power Listening: Mastering the Most Critical Business Skill of All*. USA: Penguin Publishers, 2012.
5. Barry, Marian. *Steps to Academic Writing*. USA: Cambridge University Press, 2011.

Web Resources

1. <https://www.nypl.org/events/classes/english>
2. https://www.waywordradio.org/listen/podcast-itunes/?gclid=EA1aIQobChMIRbeRtbP12AIVCYZpCh0-XwnvEAAAYAiAAEgLcjd_BwE
3. <https://eltlearningjourneys.com/2015/05/19/websites-for-learning-english/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
III	21UEN32GE03	GENERAL ENGLISH - III									5	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	2	3	2	2	3	2	3	2	3	2	2.4	
CO-2	2	2	3	2	3	3	2	3	2	2	2.3	
CO-3	2	3	2	3	2	2	3	2	3	2	2.4	
CO-4	2	2	3	2	3	3	2	3	2	3	2.5	
CO-5	2	2	2	3	2	2	2	3	2	2	2.2	
Mean Overall Score											2.36	
											(High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH33CC04	CORE-4: GENERAL CHEMISTRY – III	4	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of course, students will be able to	
CO-1	revise the basic introduction of hydrogen and the hydrides.	K1
CO-2	compare the different concepts of acids and bases.	K2
CO-3	examine the various systems and their coexistence in phase equilibrium.	K2
CO-4	apply the concepts of thermodynamics to natural and industrial processes	K3
CO-5	Analyze and determine the isolation aspects of metallurgy.	K4 & K5

Unit – I Redox Reactions and Metallurgical Processes (12 Hours)

Oxidation–reduction reactions– use of reduction potentials – the Latimer diagrams–the occurrence and isolation of the elements–mechanical separation–thermal decomposition methods – high temperature chemical reduction methods – reduction by carbon, reduction by another metal, self–reduction and reduction of oxides with hydrogen–electrolytic reduction – in aqueous solution, in other solvents and in fused melts–factors influencing the choice of extraction process – thermodynamics of reduction process – the Ellingham diagram.

Unit – II Hydrogen, Hydride and Acids and Bases (12 Hours)

Electronic structure–abundance–preparation and properties of molecular hydrogen–isotopes of hydrogen–*ortho* and *para* hydrogen.

Hydrides – ionic, covalent, metallic and intermediate hydrides–types of hydrogen bonding and its consequences.

Concepts of acids and bases – Arrhenius theory, Bronsted–Lowry theory – Lewis theory – the solvent system concept, Lux–Flood definition and Usanovich definition–hard soft acids and bases.

Unit – III Chemistry of Group 1 and Group 2 Elements (12 Hours)

Group 1 Elements

Differences between lithium and other group 1 elements–general characteristics –sizes of atoms and ions, density, ionization energy, electronegativity and bond type, hardness, melting and boiling points, flame colors and spectra– chemical properties – reaction with water, air and dinitrogen– oxides, hydroxides, peroxides and superoxides– solutions of metals in liquid ammonia – complexes, crowns, crypts and their biological importance.

Group 2 Elements

Differences between beryllium and other group 2 elements–general characteristics – sizes of atoms and ions– ionization energy– electronegativity–hydration energies–anomalous behaviour of beryllium–solubility and lattice energy–solutions of metals in liquid ammonia–chemical properties–hardness of water–structures and importances of compounds of group 2

elements – oxides, peroxides, sulphates, nitrates, hydrides, halides, nitrides and carbides, basic beryllium acetate–biological role of Ca^{2+} and Mg^{2+} .

Unit – IV Thermodynamics–II

(12 Hours)

The second law of thermodynamics – direction of spontaneous change – dispersal of energy – entropy – thermodynamic definition of entropy – entropy as a state function – carnot cycle – thermodynamic temperature – Clausius inequality – entropy changes accompanying specific processes: expansion, phase transitions, heating, measurement of entropy – third law – Nernst heat theorem – third law entropies – Helmholtz and Gibbs energies – criteria of spontaneity – some remarks on the Helmholtz energy – maximum work – some remarks on Gibbs energy – maximum non–expansion work – standard Gibbs energies of reaction – standard Gibbs energies of formation – Born equation – combining first and second laws –Fundamental equation – properties of internal energy – Maxwell relations – variation of internal energy with volume – properties of the Gibbs energy – variation of the Gibbs energy with temperature and pressure.

Unit – V Phase Equilibria

(12 Hours)

Concept of phases, components and degrees of freedom, derivation of Gibbs phase rule for nonreactive and reactive systems – stabilities of phases – phase, phase transition, transition temperature, meta stable phases – phase boundaries – vapour pressure, sublimation vapour pressure, boiling temperature, normal boiling point, standard boiling point, critical temperature, critical pressure, freezing temperature, normal freezing point, standard freezing point, triple point Clausius–Clapeyron derivation and its applications to solid–liquid, liquid–vapour and solid–vapour equilibria, phase diagram for one component systems, with applications– carbon dioxide, water, helium – phase stability and phase transition – thermodynamic criterion of equilibrium – dependence of stability on the conditions – temperature dependence of phase stability, response of melting to applied pressure, effect of applied pressure on vapour pressure – Ehrenfest classification of phase transitions – first order and second order phase transitions.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.

Unit–I Chapter 6

Unit–II Chapter 8

Unit–III Chapter 9 and 11

2. Atkins P W and Paula J D, *Atkins' Physical Chemistry*, 8th Edition, Oxford University Press, Oxford, 2006.

Unit–IV Chapter 3

Unit–V Chapter 4

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Willey and Sons. Inc, New York, 1995.
4. Castellan, G W, *Physical Chemistry*, 4th Edition, Narosa, 2004.
5. Mc Quarrie D A and Simon J D, *Molecular Thermodynamics*, University Science Books, California, 2004.
6. Shriver D, Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 6th Edition, W H Freeman and Company, New York, 2014.

Web Resources



Sulphur system-Phase Rule



Acid and Base Concept



Ortho vs Para Hydrogen

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits				
III	21UCH33CC04	CORE-4: GENERAL CHEMISTRY – III					4	3				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	2	2	3	2	1	2	2	3	2	2.0	
CO-2	2	2	3	2	2	2	2	3	2	2	2.2	
CO-3	1	2	2	3	2	1	2	2	3	2	2.0	
CO-4	2	2	2	2	3	2	2	2	2	3	2.2	
CO-5	3	2	2	2	2	3	2	2	2	2	2.2	
Mean overall Score											2.12 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH33CC05	CORE-5: ORGANIC CHEMISTRY – II	4	3

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	enumerate the structure, properties and relative reactivity of carboxylic acids and their derivatives.	K1
CO-2	understand the stereochemistry of nucleophilic addition reactions of carbonyl compounds.	K2
CO-3	predict the products of reduction reactions of carbonyl compounds using selective reducing agents.	K3
CO-4	deduce selective naming reactions of carbonyl compounds with mechanism.	K4
CO-5	compare the synthetic applications of different organometallic reagents.	K5

Unit-I Carbonyl Compounds I

(12 Hours)

Nomenclature of carboxylic acids, acyl halides, acid anhydrides, esters, lactones, amides, and lactams – structure of carboxylic acid and derivatives – preparation of carboxylic acid derivatives – physical properties – naturally occurring carboxylic acid and derivatives – acid strength of carboxylic acids and derivatives – nucleophilic substitution reactions – reaction coordinate diagram – relative reactivity of carbonyl compounds – mechanism of nucleophilic acyl substitution reactions – reactions acid halides – reactions of acid anhydrides – reactions of esters – acid catalyzed hydrolysis – transesterification – hydroxide ion promoted ester hydrolysis.

Unit – II Carbonyl Compounds II

(12 Hours)

Reactions of carboxylic acids – reactions of amides – acid catalyzed hydrolysis of amides – hydrolysis of imides – Gabriel synthesis – hydrolysis of nitriles – dicarboxylic acids and their derivatives – decarboxylation of β -keto acids – soaps detergents and micelles – reduction of carbonyl compounds – selectivity of LAH, NaBH₄ and its analogues, aluminium hydride and its analogues, sodium cyanoborohydride.

Unit-III Carbonyl Compounds III

(12 Hours)

Nomenclature of aldehydes and ketones –summary of IUPAC functional groups nomenclature –relative reactivities of carbonyl compounds – nucleophilic addition reactions – reactions of carbonyl compounds with carbon nucleophiles: Grignard reagents, acetylide ions, HCN – reaction with hydride ion – reactions with nitrogen nucleophiles: primary and secondary amines – formation of imine derivatives: oxime, hydrazine and semicarbazone – Wolff-Kishner reduction – addition of oxygen nucleophiles: water, alcohol – Protecting groups – addition sulphur nucleophiles – Wittig reaction – stereochemistry of nucleophilic addition reactions: Re and Si faces.

Unit-IV Carbonyl Compounds IV

(12 Hours)

Reactions at α -carbonyl carbons – acidity of α -hydrogens – pK_a values of carbon acids – keto-enol tautomerism – acid-catalyzed α -substitution reactions – base-catalyzed β -substitution reaction – acid catalyzed and base promoted – Halogenation of α -carbon – haloform reaction – Hell-Volhard-Zelinski reaction – halogenated carbonyl compounds in

synthesis – formation of enolates using LDA –alkylation of the α –carbon of carbonyl compounds – alkylation by enamine intermediates –alkylation of the β –carbon: the Michael reaction – the aldol addition – dehydration of aldol products – mixed aldol condensation – Claisen condensation – mixed Claisen condensation – Dieckmann condensation – intramolecular aldol condensation – Robinson annulations.

Unit–V Organometallic reagents (12 Hours)

Grignard reagent – preparation and synthetic applications – organolithium preparation and its applications – organocopper preparation and synthetic applications –Pd mediated coupling and cross coupling reactions – organosilicon compounds in organic synthesis.

Books for Study

1. Morrison R T and Boyd R T, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.

Unit–I Chapter 19

Unit–II Chapter 20

Unit–III Chapter 18

2. Bruice P Y, *Organic Chemistry*, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.

Unit–IV Chapter 19

Unit–V Chapter 12

Books for Reference

1. Pine S H, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.
2. Finar I L, *Organic Chemistry*, 6th Edition Addison Wesley Longman Ltd., England, 1996.
3. Graham Solomons T W, *Organic Chemistry*, 6th Edition, John Wiley and Sons, New York, 1996.
4. Wade L G, *Organic Chemistry*, 5th Edition, Pearson Ltd., University of California, Santa Barbara, 2003.
5. Carey F A, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 2000.

Web Resources



Chemistry of Carbonyl Compounds



Carbonyl derivatives



Aldehydes and Ketones

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
III	21UCH33CC05	CORE 5 ORGANIC CHEMISTRY – II									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	2	3	2	2	3	2	1	3	2	2.2	
CO-2	2	3	2	2	3	2	3	1	2	3	2.3	
CO-3	3	2	1	3	2	2	1	2	3	3	2.2	
CO-4	3	2	1	3	2	2	2	2	3	2	2.2	
CO-5	3	2	2	2	3	2	2	2	2	3	2.3	
Mean overall Score											2.24 (High)	

Semester	Course Code	Title of the Course	Hours	Credit
III	21UCH33AO03A	ALLIED OPTIONAL: PHYSICS – I	4	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to;	
CO-1	Acquire knowledge of physics fundamentals involved in waves, and oscillation, properties of materials, Thermal physics, electricity and magnetism, ray optics.	K1
CO-2	Understand the different properties of a physical matter and apply the longitudinal and transverse laws of vibration in strings and sonometer.	K2 & K3
CO-3	Describe the theories explaining thermal properties of gases, electric and magnetic induced effects, dispersive power of a prism.	K2
CO-4	Apply the concepts of ray optics and electricity and magnetism, wave oscillations in real life problems like defects in images, aberration in lenses, electrical circuits and acoustics of buildings.	K3
CO-5	Examine the physics knowledge learned from class room with real life problems.	K4

UNIT - I: WAVES AND OSCILLATIONS (12 Hours)

Simple harmonic motion and circular motion - composition of two simple harmonic motions at right angles (periods in the ratio 1:1) - Lissajou's figures - uses - Laws of transverse vibrations of strings - verification of Melde's string - transverse and longitudinal modes - determination of a.c. frequency using sonometer (steel and brass wires) - Ultrasonics - production - application and uses - Acoustics of buildings - reverberation - Absorption coefficient - Requirements for a good auditorium.

UNIT - II: PROPERTIES OF MATTER (12 Hours)

Elasticity: Elastic constants - energy stored in a stretched wire - bending of beams - expression for bending moment - Young's modulus by non-uniform bending - torsion in a wire - determination of rigidity modulus by torsional pendulum.

Viscosity: Streamline flow and turbulent flow- Coefficient of viscosity - Poissuelle's formula - Comparison of Viscosities - burette method - Stoke's law - terminal velocity - viscosity of highly viscous liquids.

Surface tension: Molecular theory of surface tension - excess pressure inside a drop and bubble - variation of surface tension with temperature.

UNIT - III: THERMAL PHYSICS (12 Hours)

Postulates of kinetic theory of gases - Joule-Kelvin effect - Porous plug experiment - theory of Porous plug Experiment - Liquefaction of gases - Linde's process - adiabatic demagnetization - Helium I and II - Thermodynamic equilibrium - laws of thermodynamics - entropy - change of entropy in reversible and irreversible processes.

UNIT - IV: ELECTRICITY AND MAGNETISM**(12 Hours)**

Capacitor - energy of charged capacitors - loss of energy due to sharing of charges – Biot - Savart’s law - magnetic induction at a point on the axis of a circular coil carrying current - EMF induced in a coil rotating in a magnetic field - Mean value of alternating current - RMS values of a ac current and voltage - Electric circuit - switch and its types - fuses - circuit breaker – Relays - P.O. Box: measurement of resistance - Potentiometer: calibration of ammeter.

UNIT - V: GEOMETRICAL OPTICS**(12 Hours)**

Refraction - Normal refraction - Refractive index by microscopy - air cell method - refraction through a prism and thin prism - Spectrometer - determination of refractive index - combination of two small angled prisms to produce dispersion without deviation and deviation without dispersion - direct vision spectroscope - defects of images - coma, Distortion - Aberrations - spherical aberration in lenses - methods of minimizing spherical aberration - Chromatic aberration in lenses - Expression for longitudinal chromatic aberrations.

Book for Study

1. R. Murugesan, “Allied Physics”, S Chand and Co. Publications, New Delhi, Reprint, 2015.

UNIT	BOOK	CHAPTER	SECTION
I	1	1	1.1, 1.3, 1.4, 1.7,1.8, 1.9, 1.10, 1.11, 1.12,1.13, 1.14, 1.15, 1.16, 1.17
II	1	2	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 2.12, 2.13, 2.14, 2.15, 2.17, 2.19, 2.20, 2.21, 2.22, 2.24, 2.25, 2.27, 2.28, 2.30
III	1	3	3.1, 3.4, 3.5, 3.6, 3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.15, 3.16, 3.17, 3.18, 3.20, 3.21, 3.22
IV	1	4	4.1, 4.2, 4.3, 4.5, 4.6, 4.7, 4.8, 4.9, 4.11, 4.12, 4.16, 4.17, 4.18, 4.19, 4.20
V	1	5	5.1, 5.2, 5.3, 5.5, 5.6, 5.10, 5.13, 5.14, 5.15, 5.16, 5.17, 5.18, 5.19, 5.22, 5.23, 5.24

Books for Reference

1. D. Halliday, R. Resnick, J. Walker, “Fundamental of Physics”, 9th Edition, John Wiley & Sons, 2010.
2. M.E. Schantz, “Grob’s Basic Electronics”, 11th Edition, McGraw Hill, 2011.
3. D.S. Mathur, “Elements of Properties of Matter”, S.Chand and Co. publications, New Delhi, Reprint 2016.
4. S. G. Garg, R.M. Bansal and C.K. Gosh, “Thermal Physics”, Tata-McGraw Hill Publications, 2012.

Semester	Course code	Title of the Course									Hours	Credit
III	21UCH33AO03A	ALLIED OPTIONAL: PHYSICS- I									4	4
Course outcomes COs	Programme Outcome (PO)					Programme specific outcome(PSO)					Mean Scores of CO	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	3	3	2	1	3	2	2	1	1	2.1	
CO2	3	2	3	3	2	2	3	2	2	1	2.3	
CO3	3	2	3	2	2	3	2	2	2	2	2.3	
CO4	3	3	2	3	2	3	3	3	2	2	2.6	
CO5	3	3	3	3	2	3	3	3	2	2	2.7	
	Mean Over all marks										2.4 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH33A003B	Allied-II PRINCIPLES OF ELECTRONICS	4	3

CO No.	CO statements	Cognitive Levels (K- levels)
	On completion of this course, students would be able to	
CO-1	Classify and interpret the semiconductor devices	K2
CO-2	Demonstrate and analyze the functionalities of various Electronic circuits	K3
CO-3	Distinguish and evaluate various sensors	K4
CO-4	Compare and estimate the operations of integrated sensors	K5
CO-5	Design and develop Electronic circuits for different applications	K6

UNIT I: SEMICONDUCTOR DEVICES (12 Hours)

Introduction to semiconductor devices-diode-Bipolar Junction Transistor- Field effect Transistor-Applications-Metal oxide Semiconductor - Enhancement mode- Depletion mode-MOSFET -Silicon controlled Rectifier- Laser diode- Photo diode-Optocoupler-Applications.

UNIT II: ELECTRONIC CIRCUITS (12 Hours)

Introduction to Linear Power supply- Voltage regulators-Relays-types-switching applications using relay-solid state relay - Opto-SCR and Opto-triac based switching for high power applications-Switch mode power supply-Block diagram-Applications- UPS - Capacitive power supply.

UNIT III: SENSORS (12 Hours)

Sensors and Transducers - Transducers-Resistive transducers-capacitive transducers- Inductive transducers- LVDT principle and applications. Measurement of non electrical quantity: humidity-flow rate-pH –pressure-thermal conductivity.

UNIT IV: INTEGRATED SENSORS (12 Hours)

Basic sensor signal conditioning networks for interfacing with PC- Integrated sensors overview- temperature module based on LM35-Hall effect sensor module-TSOP17 photo module-MOC 3042 opto-isolator module-kmz51 magnetic field module- ICM105A VGA CMOS sensor-MPXV5004G pressure sensor- 3 axis accelerometer module: MPU 6050 IMU sensor-wearable sensors.

UNIT V: PSPICE SIMULATION FOR ANALOG CIRCUITS (12 Hours)

Introduction to PSPICE-small circuit simulation-circuit examples for worst case design-DC sweep -plotting output-Sources and polynomially controlled sources- Transfer function analysis (one example).

Book for study

1. Albert Malvino, David Bates and Patrick Hoppe, “Electronic Principles” 9th edition ,2015
2. N. Mathivanan, “PC-BASED INSTRUMENTATION: CONCEPTS AND PRACTICE” 2007
3. Paul W. Tuinenga“SPICE- A guide to circuit simulation and Analysis using PSPICE” 2015.
4. Material Prepared by the Department.

Book(s) for Reference

1. Allen Mottershead, "Electronic Devices and Circuits: An Introduction" 1979.
2. Ian Sinclair, "Sensors and Transducers" 2000.
3. Rahid, "Introduction to Pspice Using Orcad for Circuits and Electronics", 2005

Unit	Book	Chapter	Sections
I	1	3,5,6,12	3.1,6.1,6.2,6.3,12.1,12.3,12.4,13.2,5.9
II	1,4	22	22.1,22.7
III	2	3	3.1.3,3.2.2,3.3,3.4,3.5
IV	2,4	3,4	3.1.4, Material prepared by the department
V	3,4	1,2,3,5,6	1.1,1.2.2.1-2.4,3.3,5.1,5.6,5.7

Relationship matrix for Course outcomes, Programme outcomes/ Programmes Specific outcomes

Semester	Course Code	Title of the Course									Hours	Credits
III	21UCH33AO03B	Allied-II PRINCIPLES OF ELECTRONICS									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO 1	2	2	1	2	2	2	3	3	2	2	2.1	
CO 2	3	3	2	3	2	3	3	3	2	2	2.6	
CO 3	2	3	2	2	2	3	2	3	2	3	2.4	
CO 4	3	3	2	3	2	3	3	2	2	3	2.6	
CO 5	3	3	2	3	2	3	3	2	2	3	2.6	
Mean Overall Score											2.5	
Result											High	

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH34SE01A	SEC-1 (WD): CHEMICAL INSTRUMENTATION – I	2	1

CO No.	CO – Statements	Cognitive Levels (K–Level)
	On successful completion of this course, students will be able to	
CO–1	recall the principles of UV– Visible and IR spectroscopy.	K1
CO–2	discuss the instrumentation of UV– Visible and IR spectroscopy.	K2
CO–3	use the principles of GC , TLC and HPLC.	K3
CO–4	demonstrate the separation and purification of organic compounds.	K4
CO–5	analyse the electroanalytical techniques.	K4

Unit– I Absorption Spectroscopy–I (6 Hours)

Principle of UV– Visible absorption spectroscopy – Beer–Lambert law – electronic transitions – instrumentation of UV – Visible spectrophotometer – calculation of lambda max (λ_{\max}) and concentration.

Unit– II Absorption Spectroscopy–II (6 Hours)

Absorption Spectroscopy – principles of IR spectroscopy – instrumentation of IR spectrophotometer – spectral analysis and interpretation of organic compounds – hydrogen bonding.

Unit– III Electroanalytical Techniques (6 Hours)

Electroanalytical methods – polarography – principles and instrumentation – principles of cyclic voltammetry – instrumentation of cyclic voltammetry – applications.

Unit– IV Separation and Purification (6 Hours)

Separation and purification of organic compounds – instrumental separation– solvent extraction– ion–exchange separation – fractional distillation, crystallization and precipitation.

Unit– V Chromatographic Techniques (6 Hours)

Chromatography – principle of chromatography – retardation factor– classification of chromatographic techniques– principles of TLC – preparation of TLC plates – development of chromatogram– principles and instrumentation of GC and HPLC.

Books for Study

1. Vogel A I, *Text book of Quantitative Chemical Analysis*, 6th Edition, Pearson Education Limited, London, 2008.

Unit– III Chapter 10 and 13

Unit–IV Chapter 6

2. Sharma Y R, *Elementary Organic Spectroscopy*, Revised Edition, S .Chand Pvt, Ltd., New Delhi, 2010.

Unit-I Chapter 2

Unit-II Chapter 3

2. Skoog, Holler, Crouch, *Instrumental Analysis*, Cengage Learning, 2007.

Unit-III Chapter 25

Unit- V Chapter 26, 28

Books for References

1. Gopalan R, Subramanian P S, Rengarajan K, *Elements of Analytical Chemistry*, 3rd Edition, Sultan Chand and sons, New Delhi, 2003.
2. Gary A Christian, *Analytical Chemistry*, 6th Edition, John Wiley and sons Ltd. 2003.
3. Willard and others, *Instrumental methods of analysis*, 3rd Edition, East west press, 1977.

Web Resources



Polarography



Chromatography



IR and UV-Visible



Instrumentation

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
III	21UCH34SE01A	SEC-1 (WD): CHEMICAL INSTRUMENTATION – I					2	1			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	3	1	3	3	3	3	1	2.6
CO-2	3	3	3	3	1	3	3	3	3	1	2.6
CO-3	3	3	3	2	2	3	3	3	2	2	2.6
CO-4	3	3	2	3	2	3	3	2	3	2	2.6
CO-5	3	3	2	3	2	3	3	2	3	3	2.7
Mean overall Score											2.62 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UCH34SE01B	SEC-1 (WD): CHEMICAL INSTRUMENTATION – II	2	1

CO No.	CO – Statements	Cognitive Levels (K–Level)
	On successful completion of this course, students will be able to	
CO–1	recall the principles of UV– Visible and IR Spectroscopy.	K1
CO–2	discuss the instrumentation of UV– Visible and IR spectroscopy.	K2
CO–3	use the principles of paper and column chromatography.	K3
CO–4	demonstrate the separation and purification of organic compounds.	K4
CO–5	analyse the electroanalytical techniques.	K4

Unit– I UV–Vis Spectrophotometer (6 Hours)

Principle of UV– Visible absorption spectroscopy – Beer–Lambert law – electronic transitions – instrumentation of UV – Visible spectrophotometer – calculation of λ_{\max} and concentration.

Unit– II FT–IR Spectrophotometer (6 Hours)

Absorption Spectroscopy – principles of IR spectroscopy – instrumentation of IR spectrophotometer – spectral analysis and interpretation of organic compounds – hydrogen bonding.

Unit – III Electroanalytical Techniques (6 Hours)

Electroanalytical methods – principles of cyclic voltammetry – instrumentation of cyclic voltammetry – applications – principles of amperometry – electrogravimetry.

Unit – IV Separation and Purification (6 Hours)

Separation and purification of organic compounds – solvent extraction– ion–exchange separation – fractional distillation, crystallization and precipitation.

Unit – V Chromatographic Techniques (6 Hours)

Principle of chromatography – retardation factor– classification of chromatographic techniques– paper chromatography – principles – development of chromatogram – column chromatography – column packing – separation of mixture.

Books for Study

1. Vogel A I, *Text book of Quantitative Chemical Analysis*, 6th Edition, Pearson education Limited, London, 2008.

Unit– III Chapter 10 and 13

Unit–IV Chapter 6

2. Sharma Y R, *Elementary Organic Spectroscopy*, Revised Edition, S .Chand Pvt, Ltd, New Delhi, 2010.

Unit–I Chapter 2

Unit–II Chapter 3

3. Skoog, Holler, Crouch, *Instrumental Analysis*, Cengage Learning, 2007.

Unit– V Chapter 26 and 28

Books for Reference

1. Gopalan R, Subramanian P S, Rengarajan K, *Elements of Analytical Chemistry*, 3rd Edition, Sultan Chand and sons, New Delhi, 2003.
2. Gary A Christian, *Analytical Chemistry*, 6th Edition, John Wiley and sons Ltd. 2003.
3. Willard, *Instrumental methods of Analysis*, 3rd Edition, East west press, 1977.

Web Resources



Spectroscopy



Separation Techniques



IR and UV-Visible Instrumentation



Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
III	21UCH34SE01B	SEC-1 (WD): CHEMICAL INSTRUMENTATION – II					2	1			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	3	3	3	3	1	3	3	3	3	1	2.6
CO-2	3	3	3	3	1	3	3	3	3	1	2.6
CO-3	3	3	3	2	2	3	3	3	2	2	2.6
CO-4	3	3	2	3	2	3	3	2	3	2	2.6
CO-5	3	3	2	3	2	3	3	2	3	3	2.7
Mean overall Score											2.62 (High)

Semester	Course Code	Title of the Course	Hours	Credits
III	21UHE24VE03 A	PROFESSIONAL ETHICS–I: SOCIAL ETHICS - I	2	1

CO No.	Co- Statements	Cognitive Levels (K–Level)
	On completion of this course the graduates will be able to:	
CO-1	know the responsibility of the educated youth.	K1
CO-2	understand the values prescribed under social ethics.	K2
CO-3	apply their minds critically to the various types of cyber crime.	K3
CO-4	analyse the various kinds of political systems.	K4
CO-5	analyse the behaviour of the elected representatives.	K4

Unit-I Introduction to Social Ethics (6-Hours)

Introduction to social ethics and social responsibility, important role of Social ethics on the various areas, religion influences social changes - secularism. Social ethics and corporate dynamics, forms of social ethics.

Unit-II The Economic and Political System of Today (6-Hours)

Planned economy and communism – market economy and capitalism- socialism - mixed economy -the emerging market economy - political system- totalitarian system- oligarchic system.

Unit-III Integrity in Public Life National Integration (6-Hours)

What is Integrity, Public Life, Integrity and Public Life, Integrity in a Democratic State, India as Democratic State, Behavior of a elected representative of India , Noticeable degradation acts of elected Representatives, Suggestions to stem this rot, Types of integrity, Transparency can be a guarantee for integrity.

Unit-IV Cyber Crime (6-Hours)

Business Ethics, Business ethics permeates the whole organization, Measuring business ethics , The Vital factors highlighting the importance of business ethics , Cyber crime, Strategies in committing Cyber Crimes, Factors aiding Cyber Crime, computer Hacking, Cyber Bullying, Telecommunications piracy, Counter Measures to Cyber Crime, Ethical Hacking.

Unit-V Social Integration (6-Hours)

Global challenges, The future is with the Educational Youth, Cost of the Sacrifice, Crusaders against corruption, Responsibility of the Educated Youth, Positive Global Scenario, Right to Education, Eradicating gender inequality, Sustainable Human Development , Social Integration, Elimination Crime, Integration with Global Market

Books for Study

Department of Human Excellence, *Formation of Youth*, St Joseph's College(Autonomous), Tiruchirappali -02, 2021

Books for Reference

1. Ramesh K. Arora, *Ethics, Integrity and Values* by Public Service Paperback ,– 1 January 2014
2. Cunningham, D. *There's something happening here: The new left, the Klan, and FBI counterintelligence*. Berkeley: University of California Press, 2004.
3. Adv. Prashant Mali, *Cyber law & Cyber Crimes simplified* by Cyber Info media Paperback – 1 January 2017.
4. Matthew Richardson, *Cyber Crime: Law and Practice Hardcover – Import*, Wildy publications, 29 November 2019

Web Sources

<https://cybercrime.gov.in/>

<https://open.lib.umn.edu/sociology/chapter/14-2-types-of-political-systems/>

<https://www.esv.org/resources/esv-global-study-bible/social-ethics/>

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

Semester	Course Code	Title of the Course	Hours	Credits
III	21UHE34VE03B	PROFESSIONAL ETHICS I: RELIGIOUS DOCTRINE- I	2	1

CO.No.	Co – Statements	Cognitive Levels (K–Level)
	On completion of this course, the graduates will be able to:	
CO-1	understand the history of the Catholic Church	K1
CO-2	examine and grasp the Sacraments of the Catholic Church	K2
CO-3	apply the Christian Prayer to their everyday life	K3
CO-4	analyze themselves in the light of Sacraments & Christian Prayer	K4
CO-5	create a harmonious society learning values from all religions	K5 & K6

Unit-I	God of salvation	(6 Hours)
Unit-II	Life & Mission of Jesus Christ	(6 Hours)
Unit-III	The Holy Spirit	(6 Hours)
Unit-IV	Biblical Values	(6 Hours)
Unit-V	Mother Mary	(6 Hours)

Book for Study

Department of Human Excellence, *Life in the Lord: Religious Doctrine*. St. Joseph's College, Trichirappalli-02, 2021.

Books for Reference

1. *Compendium: Catechism of the Catholic Church*. Bengaluru: Theological Publications in India, 1994.
2. Holy Bible (NRSV).

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UTA41GL04B	Scientific Tamil (SBS, SPS,SCS)	4	3

CO No.	CO- Statement	Cognitive Level (K- level)
இப்பாடத்தின் நிறைவில் மாணவர்கள்		
CO-1	பண்டைத் தமிழர்களின் அறிவியலறிவை அறிந்துகொள்வர்.	K 1
CO-2	பண்டைத் தமிழிலக்கியங்களுள் காணலாகும் அறிவியல் சிந்தனைகளைப் புரிந்துகொள்வர்.	K 2
CO-3	தமிழரின் அறிவியல் மருத்துவத்தையும், நீர் மேலாண்மை அறிவையும் அறிந்துகொள்வர்.	K 3
CO-4	இக்கால இலக்கியங்களுள் அறிவியல்துறை பெற்றுள்ள செல்வாக்கை அறிந்துகொள்வர்.	K 4
CO-5	அறிவியல் கலைச்சொற்களைத் தமிழில் கற்றுக் கொண்டு அறிவியல் தமிழ் வளரத் துணைபுரிவர்.	K 5

அலகு - 1

(12 மணிநேரம்)

தொல்காப்பியம் :

நிலம் தீ நீர் வளி விசும்போடு (தொல்.பொருள் 635)

ஒன்றறிவதுவே (தொல்.பொருள் 571)

புறநானூறு

மண் திணிந்த நிலனும் (புறம்.2)

செஞ்ஞா யிற்றுச் செலவும் (புறம். 30)

அகநானூறு

அம்ம வாழி, தோழி (அகம்.141)

பதிற்றுப்பத்து

நிலம் நீர் வளி விசும்பு என்ற நான்கின் (பதிற்று.14)

நெடுவயின் ஒளிறு மின்னுப் பரந்தாங்கு (பதிற்று.24)

உரைநடைக்கட்டுரை : வியக்க வைக்கும் தமிழரின் அறிவியல்

அலகு- 2

(12 மணிநேரம்)

சித்தர் பாடல்கள்

பதார்த்த குண சிந்தாமணி

குளத்து சலந்தானே கொடிதான (27)

ஏரிசலம் வாதமிகு மதுவே (31)

அருவிநீர் மேக மகற்றுங் (39)

மேவிய சீவன் வடிவது சொல்லிடல் (திருமூலர்)

அணுவில் அணுவினை ஆதிபிராணை (திருமூலர்)

நட்டகல்லைத் தெய்வமென்று (சிவவாக்கியர்)

உரைநடைக்கட்டுரை: தமிழர்களின் மருத்துவ அறிவியல்

அலகு - 3

(12 மணிநேரம்)

திருக்குறள் (2 அதிகாரங்கள்)

வான் சிறப்பு, மருந்து

வலைப்பூக்கள் உருவாக்கல், பராமரித்தல்

புதிய அறிவியல் கலைச்சொல்லாக்கங்களை உருவாக்குதல்

உரைநடைக்கட்டுரை: தமிழ் இலக்கியங்களில் நீர் மேலாண்மையியல்

அலகு- 4

(12 மணிநேரம்)

புதினம்: சொர்க்கத்தீவு – சுஜாதா

நூல் - திறனாய்வு

அறிவியல் புனைவு ஆவணப்படம், திரைப்படம் - திறனாய்வு

உரைநடைக்கட்டுரை: தமிழில் அறிவியல் புனைவுகள்

அலகு - 5

(12 மணிநேரம்)

அறிவியல் கலைச்சொற்கள்

அன்றாட வாழ்வில் அறிவியல் பழமொழிகளைத் தொகுத்தல்

மூலிகைகள், கீரைகள் ஆகியவற்றின் முக்கியத்துவத்தைக் காட்சிப்படுத்துதல்.

தமிழர் அறிவியல் கண்காட்சி நடத்துதல்

உரைநடைக்கட்டுரை: அறிவியல் தமிழின் வளர்ச்சி நிலைகள்

பாட நூல்கள்

1. **அறிவியல் தமிழ்**, தமிழாய்வுத்துறை, தூய வளனார் தன்னாட்சிக் கல்லூரி,

திருச்சிராப்பள்ளி, முதற்பதிப்பு, 2022

2. சுஜாதா, **சொர்க்கத்தீவு**, விசா பப்ளிகேஷன்ஸ், சென்னை-17, ஒன்பதாம் பதிப்பு, 2009

3. மூர்த்தி அ.கி., **அறிவியல் அகராதி**, மணிவாசகர் பதிப்பகம், சென்னை, 2001

பார்வை நூல்கள்

1. குழந்தைசாமி.வா.செ., **அறிவியல்தமிழ்**, பாரதி பதிப்பகம், சென்னை-17,

6ஆம்பதிப்பு, 2001

2. நெடுஞ்செழியன், **இன்னும் மீதமிழ்நாடு நம்பிக்கை**, புவலகின் நண்பர்கள்

வெளியீடு, சென்னை, முதற்பதிப்பு, 2017

3. பரிமேலழகர்(உரை.), திருக்குறள், பாரதி பதிப்பகம், சென்னை-17, ஏழாவது பதிப்பு, 2000.
4. வையாபுரிப்பிள்ளை, பாட்டும் தொகையும், பாரி நிலையம், சென்னை, இரண்டாம் பதிப்பு, 1967.

Semester	Course Code	Title of the Course									Hours	Credit
IV	21UTA41GL04B	Scientific Tamil (SBS, SPS,SCS)									4	3
Course Outcomes (COs)	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO-1	PO-2	PO-3	PO-4	PO-5	PSO-1	PSO-2	PSO-3	PSO-4	PSO-5		
CO-1	1	2	3	2	2	3	3	2	2	2	2.2	
CO-2	2	2	3	2	2	2	3	2	3	2	2.3	
CO-3	1	2	2	3	2	2	2	3	3	3	2.3	
CO-4	2	2	3	2	2	3	2	3	3	2	2.4	
CO-5	3	1	2	2	2	2	3	2	3	3	2.3	
Mean Overall Score											2.3 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UFR41GL04	FRENCH – IV	4	3

CO No.	CO–Statements	Cognitive Levels (K –Levels)
	On successful completion of this course, students will be able to	
CO–1	recall the vocabulary pertaining to dwelling place.	K1
CO–2	outline crisis management in France.	K2
CO–3	develop a travel diary of your own.	K3
CO–4	simplify the French education system.	K4
CO–5	interpret past tenses in a text.	K5

Unit- I (12 hours)

TITRE:ON FAIT LE MELANGE!

GRAMMAIRE : le présent progressif, les pronoms possessifs, la phrase négative

LEXIQUE : décrire les étapes d'une action, la maison, les tâches ménagères

PRODUCTION ORALE : comprendre le récit d'un voyage

PRODUCTION ECRITE : raconter ses actions quotidiennes

Unit – II (12 hours)

TITRE:A PROPOS DE LOGEMENT

GRAMMAIRE : quelques adjectifs et pronoms indéfinis, les verbes lire, rompre et se plaindre

LEXIQUE : la localisation et le logement, les pièces, meubles et équipement

PRODUCTION ORALE : jeu de rôle –votre ami et vous s'installe dans un nouveau meuble

PRODUCTION ECRITE : décrire votre maison/appartement

Unit- III (12 hours)

TITRE:TOUS EN FORME!

GRAMMAIRE : le passé composé et l'imparfait, le passé récent, l'expression de la durée

LEXIQUE : un souvenir et les événements du passés, le corps humain : extérieur, le corps humain : intérieur

PRODUCTION ORALE : échanger sur ses projets de vacances

PRODUCTION ECRITE : raconter un souvenir

Unit – IV (12 hours)

TITRE:ACCIDENTS ET CATASTROPHES

GRAMMAIRE : les adjectifs et les pronoms indéfinis : rien/ personne/aucun, les verbes dire, courir et mourir

LEXIQUE : savoir les mots et les expressions des catastrophes naturelles, les maladies et les remèdes, les accidents, les catastrophes naturelles

PRODUCTION ORALE : comprendre des personnes qui expriment leur accord ou leur désaccord selon un thème donné

PRODUCTION ECRITE : écrivez sur une catastrophe naturelle en articulant la cause et la conséquence

Unit –V (12 hours)

TITRE:FAIRE SES ETUDES A L'ETRANGER/ BON VOYAGE/ LA METEO

GRAMMAIRE : les pronoms démonstratifs neutres, le futur simple, situer dans le temps, moi aussi/non-plus – moi non/si, les verbes impersonnels, les verbes croire, suivre et pleuvoir
 LEXIQUE : savoir vivre en France, le système scolaire, les formalités pour partir à l'étranger.
 PRODUCTION ORALE : exprimer son opinion sur la météo/parler del'avenir
 PRODUCTION ECRITE: comparer le système scolaire français et indien

Book for Study

P.Dauda,L.Giachino and C.Baracco, *Generation A2*, Didier, Paris 2016.

Books for Reference

1. J.Girardet and J.Pecheur, *Echo A2*, CLE International, 2^eedition,2013
2. Régine Mérieux and Yves Loiseau, *Latitudes A2*, Didier, 2012.
3. Isabelle Fournier, *Talk French*, Goyal Publishers,2011

Web Resources

1. <https://www.frenchcourses-paris.com/french-travel-journal/>
2. <http://www.saberfrances.com.ar/vocabulary/house.html>
3. <https://www.thoughtco.com/different-past-tenses-in-french-1368902>
4. <https://www.youtube.com/watch?v=JZdwJM7sEY8>
5. <https://www.scholaro.com/pro/Countries/France/Education-System>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
IV	21UFR41GL04	FRENCH – IV									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	1	3	2	2	3	2	1	2	2	2.1	
CO-2	3	1	2	3	3	3	2	1	3	1	2.2	
CO-3	3	2	3	2	2	3	2	1	3	2	2.3	
CO-4	3	1	2	2	3	3	3	1	3	3	2.4	
CO-5	2	2	3	3	1	3	1	2	3	2	2.2	
Mean overall Score											2.24 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UHI41GL04	HINDI - IV	4	3

CO No.	CO-Statements	Cognitive Levels (K –Levels)
	On successful completion of the course, students will be able to	
CO-1	list out the social conditions prevailed in Modern Period which are depicted in Hindi Literature.	K1
CO-2	discuss the dialects of Hindi language.	K2
CO-3	illustrate the works of some eminent Hindi Writers related to society.	K3
CO-4	analyze the human values expressed in life and literature of Hindi Novelist “Mamatha Kaliyah”.	K4
CO-5	evaluate the film & Literary works in Hindi.	K5

Unit - I (12 Hours)

Computer ka yug
Prathyay
Adhunik Kal - Namakarn
Namakaran

Unit - II (12 Hours)

Vigyan hani/labh
Paryayvachy Shabdh
Adhunik Kal - Samajik Paristhithiyam
Samanarthy Shabdh

Unit - III (12 Hours)

Nari shiksha
Upasarg
Adhunik Kal – Sahithyik Paristhithiyam
Adhunik kal – Salient Features

Unit - IV (12 Hours)

Review- Book/Film
Paryavaran Pradookshan
Adhunik Kal - Main Divisions
Adhunik Kal - Visheshathayem

Unit - V**(12 Hours)**

Sapnom Kee Home Delivery (Novel)
Anuvad - 4

Books for Study

1. Dr. Sadananth Bosalae, *kavya sarang*, Rajkamal Prakashan, New Delhi, 2020.
Unit-I Chapters 4
2. M. Kamathaprasad Gupth, *Hindi Vyakaran*, Anand Prakashan, Kolkatta, 2020.
Unit-II, III and IV Chapter 2
3. Dr. Sanjeev Kumar Jain, *Anuwad: Siddhant Evam Vyavhar*, Kailash Pustak Sadan, MadhyaPradesh, 2019 **Unit-V** Chapter 2

Books for Reference

1. Hindi Niband Sangrah, V&S Publishers, 2015.
2. Rajeswar Prasad Chaturvedi, Hindi vyakarana, Upakar prakashan, 2015.
3. Ramdev, Vyakaran Pradeep, Hindi Bhavan, 2016.
4. Krishnakumar Gosamy, Anuvad vigyan ki Bhumika, Rajkamal Prakashan, 2016.
5. Acharya ramchandra shukla, Hindi Sahitya Ka Itihas, Prabhat Prakashan, 2021.

Web Resources

1. <https://youtu.be/xmr-DaQ3LhA>
2. <https://youtu.be/xIm-VEmgEg0>
3. <https://youtu.be/ZHuqxWbMtas>
4. <https://youtu.be/HGS63OJuHto>
5. <https://youtu.be/r-i3autqPug>

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
IV	21UHI41GL04	HINDI - IV									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	2	3	3	2	3	2	3	1	2.4	
CO-2	3	2	3	3	2	3	2	3	1	2	2.4	
CO-3	3	2	2	3	2	2	1	3	2	3	2.3	
CO-4	3	2	3	1	3	3	2	3	3	2	2.5	
CO-5	3	2	2	3	3	2	3	2	3	3	2.6	
Mean Overall Score											2.44 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21USA41GL04	SANSKRIT - IV	4	3

CO No.	CO-Statements	Cognitive Levels (K –Levels)
	On successful completion of the course, the student will be able to	
CO-1	remember and identifying Mahabharatha characters and events.	K1
CO-2	understand human behaviors by studying dramas.	K2
CO-3	apply the morals learnt in day to day life.	K3
CO-4	create new conversational sentences and to Improve self-character (Personality Development).	K4
CO-5	appreciate ancient Sanskrit dramas.	K5

Unit - I (12 Hours)

Samskrita Vyavahara sahasri vakiya Prayogaha

Unit - II (12 Hours)

Lot Lakaarah , Prqayaogh Kartari Vaakyaani

Unit - III (12 Hours)

Naatakasya Itihaasah Vivaranam, Thuva and Tum Prathiyaha

Unit - IV (12 Hours)

Karnabhaaram , Naatakasya Visistyam

Unit - V 12 Hours)

Samskrita Rachanani priyogaha

Book for Study

Karnabhavam & Literature Language, 2019 , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007

Books for Reference

1. R.S.Vadhyar & Sons , Book – sellers and publishers , Kalpathu ,Palghat – 678003 , Kerala , south India , History of Sanskrit Literature 2019
2. Kulapathy , K.M Saral Sanskrit Balabodh , Bharathita vidya bhavan , Munshimarg Mumbai – 400 007 2018
3. Samskrita Bharathi , Aksharam 8 th cross , 2nd phase Giri nagar Bangalore Vadatu sanskritam – Samaskara Binduhu 2019

Relationship matrix for Course outcomes, Programme outcomes /Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credit
IV	21USA41GL04	SANSKRIT-IV									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	2	2	3	2	3	2	3	3	2	2.5	
CO-2	2	2	3	2	3	3	3	3	3	2	2.4	
CO-3	3	3	2	3	2	1	1	3	3	3	2.4	
CO-4	2	3	3	3	2	1	3	3	3	2	2.5	
CO-5	2	2	3	2	3	3	3	3	2	3	2.6	
Mean Overall Score											2.48	
Result											# High	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UEN42GE04	GENERAL ENGLISH - IV	5	3

CO. No.	CO-Statements	Cognitive Levels (K- Levels)
	On successful completion of this course, students will be able to	
CO-1	identify different local and global issues in given passages	K1
CO-2	understand explicit and implicit information given in written texts	K2
CO-3	use appropriate words and punctuations in writing	K3
CO-4	analyse written texts and modify them for better clarity	K4
CO-5	assess the coherence and cohesion of written texts and rewrite them	K5 & K6

Unit-I (15 Hours)

1. Women through the Eyes of Media
2. General Writing Skill: Writing Minutes of a Meeting
3. Grammar: Present Perfect Tense

Unit-II (15 Hours)

4. Effects of Tobacco Smoking
5. General Writing Skill: Note-Taking
6. Grammar: Present Perfect Continuous Tense

Unit-III (15 Hours)

7. Short Message Service (SMS)
8. General Writing Skill: Note-Making
9. Grammar: Past Perfect Tense

Unit-IV (15 Hours)

10. An Engineer Kills Self as Crow Sat on his Head: A Newspaper Report
11. General Writing Skill: Précis Writing
12. Grammar: Past Perfect Continuous Tense

Unit-V (15 Hours)

13. Traffic Rules
14. General Writing Skill: Paragraph Writing
15. Grammar: Future Perfect Tense and Future Perfect Continuous Tense

Book for Study

Jayraj, S. Joseph Arul et al. *Trend-Setter: An Interactive General English Textbook for Under Graduate Students*. Trinity, 2016.

Books for Reference

1. Clark Peter, Roy. *Writing Tools: 50 Essential Strategies for Every writer*. USA: Little, Brown Spark Publishers, 2008.

2. Carnegie, Dale. *The Quick and Easy Way to Effective Speaking*. India: Fingerprint Publishers, 2018.
3. Vaughn, Steck. *Reading Comprehension*. USA: Steck-Vaughn Co, 2014.
4. Birkett, Julian. *Word Power: A Guide to Creative writing*. India: Bloomsburry Academic, 2016.
5. Knight, Dudley. *Speaking with Skill: An Introduction to Knight-Thompson Speechwork*. USA: Methuen Drama, 2016.

Web Resources

1. <https://blog.lingoda.com/en/10-news-sites-to-practice-your-english-reading-skills/>
2. <https://www.espressoenglish.net/how-to-learn-english-for-free-50-websites-for-free-english-lessons/>
3. <https://www.ef.com/wwen/english-resources/>

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes

Semester	Course Code	Title of the Course									Hours	Credits
IV	21UEN42GE04	GENERAL ENGLISH - IV									5	3
Course Outcome (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Scores of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	2	2	3	2	3	2	3	2	2.4	
CO-2	2	2	3	2	3	3	2	3	2	2	2.3	
CO-3	2	3	2	3	2	2	3	2	3	2	2.4	
CO-4	2	2	3	2	3	3	2	3	2	3	2.5	
CO-5	2	2	2	3	2	2	2	3	2	2	2.2	
Mean Overall Score											2.36 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UCH43CC06	CORE-6: GENERAL CHEMISTRY – IV	4	3

CO No.	CO – Statements	Cognitive Levels (K–Level)
	On successful completion of this course, students will be able to	
CO-1	identify the different crystal structures and colloids.	K1
CO-2	discuss the different types of colloids and their properties.	K2
CO-3	apply the concepts of colligative properties of dilute solutions in the determination of molecular weights.	K3
CO-4	understand the nucleophilic substitution reaction mechanisms and applications of colloids.	K4
CO-5	analyze the methods of X-ray diffraction and preparation of organo nitrogen compounds.	K4

Unit – I Solid State and polarization

(12 Hours)

Forms of solids – isotropic and anisotropic solids – interfacial angle – symmetry elements in crystal systems – Bravais lattices – unit cell – law of rational indices (Weiss indices), Miller indices – unit cell dimension – density – number of atoms per unit cell – X-ray diffraction by crystals – derivation of Bragg's equation – experimental methods of X-ray study – rotating crystal method – X-ray pattern by powder method – determination of Avogadro number – vitreous state. Polarization of molecules in an electric field – polarizability and dipole moment – induced and orientation polarization – Clausius Mosotti equation – applications of dipole moment measurement of molar polarization.

Unit – II Solutions

(12 Hours)

Kinds of solutions – definition of the ideal solution – analytical form of the chemical potential in ideal liquid solutions – changes in state with increase in temperature – fractional distillation – azeotropes – ideal dilute solution – chemical potentials in the ideal dilute solution – Henry's law and the solubility of gases – distribution of a solute between two solvents – chemical equilibrium in the ideal and non-ideal solutions – application of the Gibbs–Duhem equation – colligative properties – freezing–point depression – solubility – elevation of the boiling point – osmotic pressure – abnormal molecular mass – Van't Hoff factor – degree of dissociation and degree of association of solutes.

Unit – III Colloidal State

(12 Hours)

Colloids – types of colloidal solutions – classification – preparation – purification – properties – electrical and electro kinetic properties – determination of size of particles – hydrophile–lipophile balance– surfactants – micelle formation – factors affecting critical micelle concentration in aqueous media – micellar catalysis – emulsification by surfactants – macro emulsions – gels and their applications – application of colloids .

Unit– IV Nucleophilic Substitutions

(12 Hours)

Nucleophilic substitution mechanisms – S_N2 –Factors affecting S_N2 reactions: leaving group – nucleophilicity – basicity and nucleophilicity, effects of solvents and steric effect on nucleophilicity – reversibility of S_N2 reactions –mechanism of S_N1 reaction –factors affecting S_N1 reactions–leaving group – nucleophile – carbocation rearrangement – stereochemistry of S_N2 and S_N1 reactions –Walden inversion – racemization in S_N1 reactions – reactions of benzylic, allylic, vinylic and aryl halides – competition between S_N2 and S_N1 reactions –role of the solvent in S_N2

and S_N1 reactions – competition between substitution and elimination– $S_N2/E2$ conditions – $S_N1/E1$ conditions – substitution and elimination reactions in synthesis – S_Ni reaction – example and mechanism.

Unit –V Organo Nitrogen Compounds

(12 Hours)

Amines – nomenclature – preparation and structure of amines – basicity – reactions of amines – alkylation – Hoffmann elimination – conversion of amines to substituted amides and electrophilic substitution reactions – analysis of amines – Hinsberg test –diazonium salts – preparations – reactions and synthetic applications – aromatic nitro compounds – preparation and reductions in various medium – electrochemical reduction – Hoffmann, Curtius, Lossen, Schmidt and Beckmann rearrangements.

Books for Study

1. Puri B P and Sharma L R, *Principles of Physical Chemistry*, 47th Edition, Vishal Publication, 2018.

Unit–I Chapter 31 **Unit–III Chapter 32**

2. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, 2004.

Unit–II Chapter 13 and 14

3. Paula Yurkanis Bruice, *Organic Chemistry*, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.

Unit–IV Chapter 10–12 **Unit–V Chapter 21**

Books for Reference

1. Atkins P W, *Physical Chemistry*, 10th Edition, Oxford University Press, 2014.

2. Robert T Morrison and Robert T Boyd, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.

Web Resources



Organonitrogen Compounds



Solid State

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
IV	21UCH43CC06	CORE-6: GENERAL CHEMISTRY – IV									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	3	2	3	2	3	2	1	2.4	
CO-2	2	2	3	3	1	2	2	3	3	2	2.3	
CO-3	3	3	3	2	1	3	3	3	3	2	2.6	
CO-4	2	3	3	3	1	3	2	3	3	1	2.4	
CO-5	3	2	3	3	2	3	2	3	3	2	2.6	
Mean overall Score											2.46 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UCH43CC07	CORE-7: GENERAL CHEMISTRY – V	4	3

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	recite the fundamentals of nuclear chemistry.	K1
CO-2	understand the nature and periodic properties of <i>p</i> -block elements.	K2
CO-3	identify the important compounds formed by the <i>p</i> -block elements.	K2
CO-4	examine various reactions of alcohol, ethers and epoxides.	K3
CO-5	analyze the structures of non-metallic compounds.	K4

Unit – I Chemistry of Group-13 and Group-14 Elements (12 hours)

Inert-pair effect-general characteristics – melting and boiling points, sizes of atoms and ions, electropositive character, ionization energy-structure, properties and importance of compounds of group 13 elements – alums, boron sesquioxide, boric acid, structures of borates, borax, alumina, aluminates, halides, complexes, diborane and other higher boron hydrides, boron nitride and borazine.

Differences between carbon, silicon and the remaining elements-general characteristics – covalent radii, ionization energy, melting points, metallic and non-metallic character, allotropy of carbon, oxidation states-structure, properties and importance of compounds of group-14 elements – carbides, oxides of carbon and silicon, silicates, silicones and halides (stannous chloride).

Unit – II Chemistry of Group-15 and Group-16 Elements (12 hours)

General characteristics-a comparative study on hydrides, halides and oxides of nitrogen group elements. structure and basic character of ammonia –oxyacids of nitrogen (HNO₂, HNO₃) and phosphorous (H₃PO₃, H₃PO₄ and H₄P₂O₇) – preparation, properties and structure of hydrazine – nitrogen and phosphorous fertilizers.

General characteristics – oxidation states, allotropy-oxides – different types of oxides based on chemical behaviour and oxidation state-oxy acids of sulphur – sulfurous acid, sulphuric acid, Caro's acid and Marshall's acid.

Unit – III Chemistry of Group-17 and Group-18 Elements (12 hours)

Group-17 Elements

Bonding energy in X₂ molecules-oxidizing power-reaction with water-hydrogen halides (HF, HCl, HBr and HI)-Ionic halides-molecular halides and bridging halides-halogen oxides (OF₂, O₂F₂, Cl₂O, ClO₂, Cl₂O₆, Cl₂O₇) and oxoacids (HOX, HXO₂, HXO₃ and HXO₄)-preparation, and hydrolysis of inter-halogen compounds (AX, AX₃, AX₅ and AX₇)-polyhalide ions-basic properties of halogens-pseudohalogens and pseudohalide ions.

Group-18 Elements

Electronic structure-occurrence and recovery of the element-physical and chemical properties-Clathrates- chemistry of xenon-structure and bonding in xenon fluorides (XeF₂, XeF₄ and XeF₆) –Uses of noble gases.

Unit – IV Nuclear Chemistry (12 Hours)

The atomic nucleus – structure of the nucleus –liquid drop and shell models-forces in the nucleus-stability and the ratio of neutrons to protons-modes of decay – β emission, neutron

emission, positron emission, orbital or K–electron capture, proton emission, gamma radiation – half–life period–binding energy and nuclear stability– α decay–Soddy–Fajan’s law of radioactive displacement–radioactive decay series–nuclear fission, fusion, atom bomb and hydrogen bomb.

Unit – V Alcohols, Ethers, Epoxides and Sulphur Compounds (12 hours)

Alcohols as acids and bases – reactions of alcohols – substitution reactions of alcohols – conversion into sulphonate esters – tests for alcohols – Williamson synthesis – reactions of ethers – cleavage by acids – substitution reactions in ethers – analysis of ethers – reactions of epoxides – arene oxides – crown ethers – reactions of thiols, sulphides, and sulphonium salts – Pinacol–Pinacolone and Dienone–Phenol rearrangements.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.

Unit–I Chapter 12 and 13 **Unit–II** Chapter 14 and 15

Unit–III Chapter 16 and 17 **Unit–IV** Chapter 31

2. Bruice P Y, *Organic Chemistry*, 8th Edition., Pearson Ltd., University of California, Santa Barbara, 2011.

Unit– V Chapter 6 and 12

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Willey and Sons. Inc., New York, 1995.
4. Morrison R T and Boyd R N, *Organic Chemistry*, 7th edition, New York, Allyn and Bacon Ltd., 2011.

Web Resources



Group 13 elements



Nuclear Chemistry

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
IV	21UCH43CC07	CORE-7: GENERAL CHEMISTRY – V									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	1	2	3	2	3	1	2	3	2	2.1	
CO-2	3	1	2	2	3	3	2	1	3	2	2.2	
CO-3	2	2	1	3	2	2	1	2	3	2	2.0	
CO-4	3	3	2	1	2	2	2	3	2	2	2.2	
CO-5	3	2	2	3	3	2	3	2	2	3	2.5	
Mean overall Score											2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UCH43CP03	CHEMISTRY PRACTICAL – III (PHYSICAL CHEMISTRY)	3	2

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to;	
CO-1	describe the theoretical concepts while performing experiments.	K1
CO-2	acquire practical skill to estimate the strength of acid and base by conductometric method	K2
CO-3	learn the effective usage of chemicals.	K3
CO-4	acknowledge experimental errors and their possible sources.	K4
CO-5	design, carry out, record and analyze the results of chemical experiments	K4

Unit –I Theory of the Practical's

(10 Hours)

Theory of the practical's – critical solution temperature – transition temperature – heat of neutralization – kinetics of ester hydrolysis and persulfate oxidation – viscosity – phase diagram (simple eutectic) – polarimetry of inversion of sugar – potentiometry – conductometry – partition coefficient and equilibrium constant – calculation of parameters with units – drawing graphs – handling of various equipment used in physical chemistry practical.

Unit – II Cycle 1 A

(20 Hours)

1. Effect of impurities on critical solution temperature.
2. Heat of Neutralization.
3. Transition temperature of a salt hydrate.
4. Kinetics of acid catalyzed hydrolysis of an ester.
5. Conductometric Acid–Base Titration.

Unit – III Cycle 1 B

(20 Hours)

6. Determination of cell constant.
7. Determination of strength of a strong acid by potentiometric titration (HCl vs NaOH).
8. Determination of strength of a weak acid by potentiometric titration (CH₃COOH vs NaOH).
9. Determination of limiting molar conductance of a strong electrolyte (KCl) by conductometry.
10. Determination of single electrode potential.
11. Estimation of FAS by potentiometric titration

Unit – IV Cycle 2 A

(20 Hours)

1. Determination of molecular weight – Rast's method.
2. Phase diagram of a simple eutectic system and determination of unknown composition.
3. Critical Solution Temperature
4. Kinetics of persulphate – iodide reaction.
5. Conductometric Precipitation titration

Unit– V Cycle 2 B

(20 Hours)

6. Potentiometric Redox Titration.
7. Determination of solubility product of a sparingly soluble substance by potentiometric titration.

8. Determination of cell constant, specific conductance and equivalent conductance of strong electrolyte.
9. Verification of Onsager equation.
10. A study of weak electrolytes – Ostwald's dilution law.

Books for Study

1. Veeraswamy R, Venkateswaran V and Kulandaivelu A R, *Basic Principles of Practical Chemistry*, Sultan Chand and Sons, 2nd Edition, 2015.
2. Daniels et al., *Experimental Physical Chemistry*, 7th Edition, McGraw Hill, 1970.
3. Findlay, A., *Practical Physical Chemistry*, 7th Edition, Longman, 1989.

Web Resources



Conductometric (CST) of phenol–water system.



Precipitation Titration

Scheme for valuation
CORE 10: Chemistry Practical–III
(PHYSICAL CHEMISTRY)
INTERNAL

CIA		100 Marks
	Cumulative mark of Regular Practical Classes	50 Marks
	Two CIA tests	50 Marks
	<i>For Each CIA Test</i>	<i>100 marks</i>
	Theory/Test	10 Marks
	Record	10 Marks
	Principle & short procedure	10 marks
	Calculation & Tabulation	10 marks
	Graph	10
	Results	50 Marks

Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

EXTERNAL

Total		100 Marks
	Theory/Test	10 Marks
	Record	10 Marks
	Principle & short procedure	10 marks

Calculation & Tabulation	10 marks
Graph	10
Results	50 Marks

Scheme of valuation

<2% Error	50 Marks
3%	40 Marks
4%	30 Marks
>4%	20 Marks

Semester	Course code	Title of the Course									Hours	Credits
IV	21UCH43CP03	CHEMISTRY PRACTICAL – III (PHYSICAL CHEMISTRY)									3	2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	1	2	3	4	2	3	2	3	3	2.4	
CO-2	2	3	4	3	4	2	1	3	4	3	2.9	
CO-3	1	3	1	4	3	2	2	3	3	1	2.3	
CO-4	2	3	2	3	2	2	3	2	1	4	2.4	
CO-5	3	4	3	3	2	2	3	1	2	3	2.6	
Mean overall Score											2.52 (High)	

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UCH43AO04A	ALLIED OPTIONAL: PHYSICS – II	4	4

CO No.	CO- Statements	Cognitive Levels (K-Levels)
	On the successful completion of the course, student will be able to	
CO 1	Able to acquire knowledge about the fundamentals of physics discipline such as optics, atomic and nuclear physics, elements of relativity, quantum mechanics and electronics	K1
CO 2	Understand the concepts of interference, diffraction, polarization, structure of atom, nucleus and its properties.	K2
CO 3	Understand the significance of relativistic phenomena, quantum wavefunction and electrical circuits.	K2
CO 4	Apply the optical, electrical, atomic and nuclear concepts learned in the classroom for problem solving	K3
CO 5	Analyze the physics knowledge learned from class room with real life problems	K4

UNIT - I: PHYSICAL OPTICS

(12 Hours)

Velocity of light - Michelson's method - Interference: colours of thin films - Air wedge - Determination of diameter of a thin wire by air wedge - test for Optical flatness. Diffraction - Fresnel's explanation of rectilinear propagation of light - theory of diffraction and specific rotating power of transmission grating - Normal incidence - polarization - Brewster's law - double Refraction - optical activity - polarimeter.

UNIT - II: ATOMIC PHYSICS

(12 Hours)

Atom model - vector Atom model - quantum numbers associated with vector atom model - coupling schemes - Pauli's exclusive principle - magnetic dipole moment of electron due to orbital and spin motion - Bohr magneton - spatial quantization - Stern Gerlach experiment.

UNIT - III: NUCLEAR PHYSICS

(12 Hours)

Nuclear model - liquid drop model - magic numbers, shell model - nuclear Energy - mass defect - binding energy - Radiation detectors - ionization chambers - GM counter - nuclear fission - Bohr and wheeler theory - chain Reaction - atom bombs - nuclear fusion - calculation of energy released in a fusion - nuclear reactor - Source of solar energy: proton -proton cycle - Carbon-nitrogen cycle.

UNIT - IV: ELEMENTS OF RELATIVITY AND QUANTUM MECHANICS(12 Hours)

Frame of reference - Galilean transformation - Postulates of theory of relativity - Lorentz transformation equations - derivation - length contraction - time dilation - uncertainty principle - postulates of wave mechanics - wave nature of matter - types of operators - Schrodinger's time dependent and time independent equation - Eigen functions and Eigen values - The particle in a box (infinite Square well potential).

UNIT - V: ELECTRONICS

(12 Hours)

Basic Electronics: Semiconductors, *pn* junction diode - Zener diode and characteristics - voltage regulator - LED - Common emitter transistor amplifier (principle) - Transistor RC coupled amplifier

Digital electronics: Logic gates - NAND and NOR gates - Universal building blocks - Boolean algebra – De Morgan's theorem - verification.

Book for Study

1. R. Murugesan, "Allied Physics", S Chand and Co. Publications, New Delhi, Reprint, 2015.

UNIT	BOOK	CHAPTER	SECTION
I	1	6	6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.8, 6.9, 6.10, 6.11, 6.12, 6.13, 6.14, 6.17, 6.19, 6.20
II	1	7	7.1, 7.2, 7.3, 7.4, 7.7.6, 7.7, 7.8
III	1	8	8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.10, 8.11, 8.12, 8.13, 8.14, 8.16, 8.17, 8.18
IV	1	9	9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.10, 9.12, 9.13, 9.14, 9.15, 9.18, 9.19
V	1	10	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.11, 10.12, 10.13, 10.14, 10.15, 10.16, 10.17, 10.18, 10.19, 10.21

Books for References

1. D. Halliday, R. Resnick, J. Walker, "Fundamental of Physics", 9th Edition, John Wiley & Sons, 2010.
2. M.E. Schaltz, "Grob's Basic Electronics", 11th Edition, McGraw Hill, 2011.
3. Arthur Beiser, "Concepts of Modern Physics", Special Indian Edition, Tata McGraw Hill, 2009.
4. R.Murugesan and Kiruthiga Sivaprasath, "Modern Physics", 14th Edition, S Chand and Co, 2009.

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credit
IV	21UCH43AO04A	ALLIED OPTIONAL: PHYSICS II									4	4
Course outcome	Programme Outcome (PO)					Programme Specific Outcome (PSO)					Mean Scores of CO	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	3	2	2	1	2	3	2	1	2	2	2.0	
CO2	3	3	2	2	2	3	2	2	2	2	2.3	
CO3	3	3	2	3	2	3	3	3	2	2	2.6	
CO4	3	3	3	3	2	3	3	3	2	2	2.7	
CO5	3	3	3	2	2	3	3	3	2	2	2.6	
Mean overall Score											2.44 (High)	

Semester	Course Code	Title of the Course	Hours	Credit
IV	21UCH43AP01A	ALLIED: PHYSICS PRACTICAL	4	4

Any 16 of the following

1. Young's modulus – Non uniform bending – cantilever
2. Young's modulus – cantilever
3. S. T. – Method of drops
4. S. T. – Capillary rise
5. Viscosity – variable pressure head
6. Concave lens – f , R , μ
7. Air wedge – Thickness of wire
8. Newton's Rings R
9. Spectrometer – solid prism
10. Spectrometer – Grating (Normal Incidence)
11. M_1/M_2 – Tan A and Tan B simultaneous method
12. Absolute determination of M and H
13. P.O. Box – Temp. Coefficient
14. Potentiometer – Ammeter calibration
15. Potentiometer – R and ρ
16. Field along the axis of the coil
17. Sonometer – Frequency of tuning fork
18. Junction diode characteristics
19. Zener diode characteristics
20. Logic gates – ICs
21. Jolly's bulb

Semester	Course Code	Title of the Course	Hours	Credits
IV	21UCH43AO04B	Allied-II COMMUNICATION ELECTRONICS	4	2

CO No.	CO statements	Cognitive Levels (K- levels)
	On completion of this course, students would be able to	
CO-1	Understand serial and parallel Communication	K2
CO-2	Infer and Elaborate Optical Communication	K2
CO-3	Experiment and Perceive various optical sources and detectors	K2,K3
CO-4	Appraise various Wireless Networks	K4
CO-5	Apply and Analyze wireless networking using ESP 8266	K6

UNIT I: SERIAL AND PARALLEL PORT COMMUNICATION (12 Hours)

Basics of digital communication- Parallel port interfacing for simple I/O operations-Serial communication-UART-USART-Data transfer using serial port- USB port specifications-HID device –USB for data transfer applications-Communication protocols-SPI-IIC-Applications.

UNIT II: OPTICAL COMMUNICATION (12 Hours)

Basics of optical communication-Block diagram of Optical fibre communication-advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, single mode fiber, cutoff wave length, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

UNIT III: OPTICAL COMMUNICATION SOURCES AND DETECTORS (12 Hours)

Introduction, LEDs, Phototransistor characteristics- Photo detector noise, Response time, double hetero junction structure, comparison of photo detectors -LM393 light sensor module TCS3200 color sensor module.

UNIT IV: WIRELESS COMMUNICATION (12 Hours)

Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication-Third generation Cellular Networks- Fourth Generation, fifth generation wireless networks- Wireless Local Loop (WLL)-Wireless Local Area network(WLAN)- Bluetooth and Personal Area Networks.

UNIT V BASIC NETWORKING WITH ESP8266 (12 Hours)

Introduction to ESP8266 Wi-Fi Module- Wi-Fi library-Web server- installation- configuration- Posting sensor(s) data to web server-ThingSpeak API and MQTT.

Book(s) for Study

1. N. Mathivanan, “PC-BASED INSTRUMENTATION: CONCEPTS AND PRACTICE” 2007
2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002
3. Manoj R. Thakur, ”NodeMCU ESP8266 Communication Methods and Protocols : Programming with Arduino IDE”
4. Material prepared by the Department.

Book(s) for Reference

1. John Axelson, “USB Complete: The Developer’s Guide”, 4th Edition, 2012

2. Anita Gehlot, Rajesh singh, Praveen Kumar Malik, Lovi Raj Gupta, Bhupendra Singh, "Internet of things with 8051 and ESP8266", 2020

Unit	Book	Chapter	Sections
I	1	6	6.1,6.2,9.2,9.3,9.4,9.5
II	2	1,2,3,5	1.2,1.3,2.1,2.2,3.6,5.3
III	2	7,8	7.2,8.1.8.3,8.5,8.6,8.8
IV	4		Material prepared by the department.
V	3	4,5,21	4.1,4.2,4.3,5.2,21.1-21.3

Relationship matrix for Course outcomes, Programme outcomes/ Programmes Specific outcomes

Semester	Course Code	Title of the Course									Hours	Credits
IV	21UCH43AO04B	Allied-II COMMUNICATION ELECTRONICS									4	3
Course Outcomes↓	Programme Outcomes (PO)					Programme Specific Outcomes (PSO)					Mean Scores of COs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5		
CO-1	2	2	3	2	1	2	3	3	2	2	2.2	
CO-2	3	3	2	2	2	3	3	2	2	3	2.5	
CO-3	3	3	2	3	2	2	3	3	2	2	2.5	
CO-4	3	3	3	3	2	2	3	3	3	2	2.7	
CO-5	3	3	3	3	2	3	3	3	3	3	2.9	
Mean Overall Score											2.6	
Result											High	

Semester	Course Code	Title of the Course									Hours	Credits
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IV	21UCH43AP01B	Allied-II ELECTRONICS PRACTICAL	2	2
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ALLIED ELECTRONICS PRACTICALS (ANY 16 EXPERIMENTS)

1. Study of Opto-coupler characteristics and application.
2. Study of Photodiode and phototransistor characteristics
3. Study of Transducers for temperature measurements.
4. Study of MOSFET characteristics.
5. Study on Integrated sensors
6. Construction and study of Linear power supply
7. Construction of voltage regulators.
8. Pspice simulation of basic circuits with resistors and node voltage and branch current calculation.
9. Study on magnetic and solid state relay.
10. Study of SCR characteristics
11. DC to DC switching circuits using MOSFET
12. Pspice simulation of active devices.
13. Configuring ESP8266 based Web-server for data acquisition applications.
14. Digitizing temperature sensor data and uploading in thingspeak API.
15. Study of USB communication (HID device).
16. Study of software serial communication in ESP8266.
17. Study of fibre optic communication.
18. Hall effect sensor for current measurement
19. ESP 8266 I/O operations
20. Interfacing RFID module using Arduino.
21. Interfacing IIC memory module using Arduino.
22. Interfacing HC-05 bluetooth module with arduino
23. Study of Parallel port for I/O operations
24. Study of Serial port data transfer to hyper-terminal.
25. Study of Colour sensing using TCS3200.

Semester	Course Code	Title of the Course	Hours	Credits
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IV	21UCH44SE02A	SEC-2(BS): HEALTH CHEMISTRY	2	1
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CO No.	CO – Statements	Cognitive Levels (K–Level)
	On successful completion of this course, students will be able to	
CO–1	identify the roles played by proteins, vitamins, enzymes and hormones.	K1
CO–2	discuss the significance of nutritional supplements and drugs.	K2
CO–3	predict the causes for various diseases.	K2
CO–4	apply the knowledge of nutrition and drugs in curing diseases.	K3
CO–5	analyse the classifications of carbohydrates , proteins and vitamins.	K4

Unit– I Nutrition

(6 Hours)

Nutrition –definition – food pyramid – health – hygiene – nutritional foods– sources – significance of nutritional supplements– malnutrition– under nutrition and over nutrition – causes and remedies.

Unit– II Carbohydrates, Proteins and Vitamins

(6 Hours)

Carbohydrates – definition– classification– examples – simple qualitative analysis of carbohydrates – biological functions– proteins –definition– classification– examples – simple qualitative analysis of proteins – biological functions– vitamins– definition– classification– examples– biological functions.

Unit– III Enzymes and Hormones in Digestion

(6 Hours)

Enzymes and hormones –types of enzymes – enzyme action – hormones – types of hormones– action of hormones – examples of essential hormones– digestion in mouth, stomach , intestine and pancreas.

Unit– IV Common Diseases

(6 Hours)

Diseases – malaria, typhoid, dysentery, vomiting, jaundice, asthma, epilepsy, ulcer, anemia, diabetes and their causes.

Unit– V Drugs

(6 Hours)

Drugs – classification of drugs – definition and examples of antipyretics, antibiotics, antiseptics, analgesics, anti–convulsant agents, anaesthetics and cardiovascular drugs.

Books for Study

- Jayashree Ghosh, *Fundamental Concepts of Applied Chemistry*, 2nd Edition, S.Chand and Co. Ltd, New Delhi, 2006.

Unit–IV Chapter 1

Unit– V Chapter 1

- Alex V Ramani, *Food Chemistry*, MJP Publishers, Chennai, 2009.

Unit–I Chapter 1 Unit–II Chapters 2,3 and 5 Unit–III Chapter 1

Books for Reference

1. AshutoshKar, *Medicinal Chemistry*, Wiley Easterns limited New Delhi, 1993.
2. Bahl and Arun Bahl, *A text book of Organic Chemistry*, 22nd Edition, S. Chand Publishers, New Delhi, 2019.

Web Resources



Malnutrition



Overview of Nutrition

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
IV	21UCH44SE02A	SEC-2 (BS): HEALTH CHEMISTRY									2	1
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	2	1	3	2	3	2	1	2.2	
CO-2	3	2	3	2	2	3	2	2	3	1	2.3	
CO-3	3	2	3	3	2	3	2	3	2	2	2.5	
CO-4	3	3	3	3	2	3	2	3	3	1	2.6	
CO-5	3	3	3	3	2	3	3	3	2	1	2.6	
Mean overall Score											2.44 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
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IV	21UCH44SE02B	SEC-2 (BS): INDUSTRIAL CHEMISTRY	2	1
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CO No.	CO – Statements	Cognitive Levels (K–Level)
	On successful completion of this course, students will be able to	
CO-1	identify the types and composition of glasses, paints and cements.	K1
CO-2	compare the different methods of polymerisation.	K2
CO-3	utilize the manufacturing methods of cement, glass and paint.	K3
CO-4	apply the knowledge of drugs in treating diseases.	K3
CO-5	analyze the industrial applications of paint, glass and cement.	K4

Unit-I Glass (6 Hours)

Glasses – composition of glass – types of glasses – manufacturing methods – formation processes – melting, blowing, pressing, annealing and finishing – industrial applications of glasses .

Unit –II Cement (6 Hours)

Cement – composition of cement – raw materials – cement factories in india– types of cement – portland cement – composition, types – manufacturing methods– dry and wet processes –setting of cement–applications.

Unit–III Paints and Pigments (6 Hours)

Paints – composition of paint – types of paints, manufacturing methods– applications – pigments – classification of pigments and dyes – examples – industrial applications.

Unit –IV Drugs (6 Hours)

Drugs – classification of drugs – definition and examples of antipyretics, antibiotics, antiseptics, analgesics, anti-convulsant agents, anaesthetics and cardiovascular drugs.

Unit- V Polymers (6 Hours)

Monomers and polymers – definition of polymerisation– types– addition polymerisation and condensation polymerization– examples – uses – moulding types– injection and blow moulding – industrially important polymers.

Books for Study

1. Sharma B K, *Industrial Chemistry*, 15th Edition, Goel publishing house, Meerut,2006.

Unit-I Chapter 20 **Unit-II** Chapter 23

Unit-III Chapter 43 **Unit-V** Chapters 29 and 30

2. Jayashree Ghosh, *Fundamental Concepts of Applied Chemistry*, S.Chand and Co. Ltd, 2006.

Unit-IV Chapter 1

Books for Reference

1. Charkarabathy B N, *Industrial Chemistry*, Oxford and IBH Prb. Co., New Delhi, 1981.

2. AshutoshKar, *Medicinal Chemistry*, Wiley Eastern limited, New Delhi, 1993.

3. Gowariker V R, Viswanathan N V and Sreedhar J, *Polymer Science* , New Age International , New Delhi, 2011.

Web Resources



Polymerization



Polymer Additives

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
IV	21UCH44SE02B	SEC-2 (BS): INDUSTRIAL CHEMISTRY									2	1
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	3	1	3	3	2	2	2	2.3	
CO-2	3	2	3	3	2	3	3	2	2	1	2.4	
CO-3	3	3	2	3	2	3	3	2	3	1	2.5	
CO-4	3	3	2	3	2	3	3	1	3	2	2.5	
CO-5	2	3	2	2	3	2	2	2	3	2	2.3	
Mean overall Score											2.4 (High)	

Semester	Course Code	Title of the Course				Hours	Credits
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IV	21UHE44VE04A	PROFESSIONAL ETHICS–II: SOCIAL ETHICS - II	2	1
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Co. No.	CO – Statements	Cognitive Levels (K–Level)
	On completion of this course the graduates will be able to	
CO-1	know the value of natural resources and to live in a harmony with nature.	K1
CO-2	comprehend the importance of a healthy life.	K2
CO-3	apply the plans of disaster management in the society.	K3
CO-4	analyse the importance and differences of science and religion.	K3
CO-5	apply counseling skills and solve their problems.	K4

Unit-I Harmony with Nature (6-Hours)

What is environment, Why should we think of harmony, Principles to conserve environmental resources, Causes of disharmony, The fruits of harmony with nature, Natural Resources, Fruits of disharmony, Economic values and growth, Environmental Ethics, Guidelines to live in harmony with nature, Towards life-centered system for better quality of life. Harmony with animal kingdom.

Unit-II Issues Dealing with Science and Religion (6-Hours)

What is Science, Science and Religion, Social Relevance of Science and Technology, Science and technology for social justice, Difference caused by Science and Technology, Need for indigenous technology, Science and Technology Innovation Policy of India.

Unit-III Public Health (6-Hours)

Health related issues, Health Care in India vs Developed Countries, Health and Heredity, Public Health - Objectives of public health in India, Public Health System in India, Failure on the public health front, Role of the central government, Hospitals Services in India, Health and Abortion, Drug Addiction and Drug abuse

Unit-IV Disaster Management (6-Hours)

Disaster Management, Types of disaster, Plans of disaster management, Technology to manage natural disasters and catastrophes, Rehabilitation and Reconstruction, Human-induced disaster, First Aid, The importance of First-aid.

Unit-V Counselling for Adolescents (6-Hours)

High Risk Behaviours, Developmental Changes in Adolescents, Key Issues of the Adolescents, Need for Counselling, Nature of Counselling, Counselling Goals, Does helping help? The Good and the Bad news. Importance of Career Guidance Counselling.

Books for Study

Department of Human Excellence, *Formation of Youth*, St Joseph's College (Autonomous), Tiruchirappali 02, 2021.

Books for Reference

1. Albert, D. and Steinberg, L, *Judgment and decision making in adolescence: Journal of Research on Adolescence*, page no: 211-224. 2011
2. Larry R. Collins, *Disaster Management and Preparedness*, Lewis Publications, 22 November

2000.

3. Elizabeth B. Hurlock, *Developmental Psychology: A: Life-Span Approach*, New Delhi: Tata McGraw-Hill, 1981, 5th Edition, August 18, 2001.
4. Sangha, Kamaljit. *Ways to Live in Harmony with Nature: Living Sustainably and Working with Passion*. Australia, Woodslane Pty Limited, 2015.

Web Sources:

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

<https://ndma.gov.in/>

<https://talkitover.in/services/child-adolescent-counselling/>

<https://www.nipccd.nic.in/schemes/adolescent-guidance-centre-19#gsc.tab=0>

Semester	Course Code	Title of the Course	Hours	Credits
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IV	21UHE44VE04B	PROFESSIONAL ETHICS II: RELIGIOUS DOCTRINE - II	2	1
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CO.No.	CO-Statements	Cognitive levels (K-Level)
	On completion of this course, the graduates will be able to	
CO-1	Understand the history of the Catholic Church	K1
CO-2	Examine and grasp the Sacraments of the Catholic Church	K2
CO-3	Apply the Christian Prayer to their everyday life	K3
CO-4	Analyze themselves in the light of Sacraments & Christian Prayer	K4
CO-5	Create a harmonious society learning values from all religions	K5 & K6

Unit-I	The Catholic Church	(6 Hours)
Unit-II	Sacraments of Initiation	(6 Hours)
Unit-III	Sacraments of Healing & at the Service of Community	(6 Hours)
Unit-IV	Christian Prayer	(6 Hours)
Unit-V	Harmony of Religions	(6 Hours)

Books for Study

Department of Human Excellence, *Life in the Lord: Religious Doctrine*. St. Joseph's College, Trichirappalli 02, 2021.

Books for Reference

1. *Compendium: Catechism of the Catholic Church*. Bengaluru: Theological Publications in India, 1994.
2. Holy Bible (NRSV).

Semester	Course code	Title of the course	Hours	Credits
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V	21UCH53CC08	CORE-8: INORGANIC CHEMISTRY – I	6	5
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CO No.	CO-Statements	Cognitive levels (K-Level)
	On successful completion of the course, students will be able to	
CO-1	describe the properties of inner transition elements.	K 1
CO-2	outline the basics of coordination chemistry.	K 2
CO-3	predict the structure and stability of a complex.	K 3
CO-4	infer about the nature of transition elements.	K 3
CO-5	correlate the electronic transition and structure of complexes.	K 4

Unit-I Chemistry of Transition Elements

(18 Hours)

Electronic configurations–variation of atomic and ionic radii of transition elements across the period and down the group–variable oxidation state–magnetic properties–color–complexing tendency–alloy formation–catalytic properties.

Unit-II Chemistry of Inner-transition Elements

(18 Hours)

The Lanthanide Series

Abundance, extraction and uses–separation of the lanthanide elements – precipitation, thermal reaction, fractional crystallization, complex formation, solvent extraction, valency change, ion–exchange–electronic structure–oxidation states–solubility– color and spectra–magnetic properties– lanthanide contraction and complexes.

The Actinide Series

Electronic structure and position in the periodic table–actinide contraction–oxidation states–occurrence and preparation of the elements.

Unit-III Coordination Chemistry-I

(18 Hours)

Coordination compounds – coordinate bond, coordination number, coordination sphere, oxidation state of the metal ion, coordination number and geometries– ligands –types of ligands– nomenclature of coordination compounds–Isomerism in coordination compounds – polymerization, ionization, hydrate, linkage, coordination, coordination position and stereo isomerism (geometrical and optical)–chelate complexes and chelate effect–EAN rule–Werner’s theory–Valence bond theory (VBT).

Unit-IV Coordination Chemistry-II

(18 Hours)

Crystal field theory–splitting of d -orbitals in O_h , T_d and square planar environments–calculation of CFSE–effects of crystal field splitting – lattice energy, enthalpies of hydration–tetragonal – distortion in octahedral complexes (Jahn–Teller effect)–MO theory of complexes with and without π bonding – π acceptor ligands– π donor ligands.

Unit-V Electronic Spectra of Complexes

(18 Hours)

Energy levels in atoms – coupling of orbital momenta – coupling of spin momenta – spin-orbit coupling – terms and term symbols – determining the ground state terms– Hund’s rules – hole formulation – terms arising from p and d configurations (derivations of terms not required) – calculation of number of microstates.

Electronic spectra of transition metal complexes – selection rules and intensity – interpretation of electronic spectra of high–spin d^1 – d^9 systems with the help of Orgel diagrams.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd., Oxford, London, 1996.

Unit-I Chapter 18

Unit-III Chapter 29,30

Unit-III Chapter 7

Unit-IV Chapter 7

Unit-V Chapter 32

2. Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 7th Edition, Oxford University Press, Oxford, UK, 2018.

Unit-I Chapter 19

Unit-III Chapter 23

Unit-III Chapter 7,20

Unit-IV Chapter 20

Unit-V Chapter- 20

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.

2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.

3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John Wiley and Sons. Inc., New York, 1995.

Web Resources



Group 17 Elements



Coordination Compounds



Inner transition Elements

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
V	21UCH53CC08	CORE-8: INORGANIC CHEMISTRY – I									6	5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	1	1	3	3	3	2	1	2.2	
CO-2	3	3	3	2	1	3	2	2	2	1	2.2	
CO-3	3	2	2	1	1	3	2	2	2	1	1.9	
CO-4	3	2	3	2	1	3	2	2	1	2	2.1	
CO-5	3	2	1	2	1	3	1	2	2	2	1.9	
Mean overall Score											2.06 (Medium)	

Semester	Course code	Title of the course	Hours	Credits
V	21UCH53ES01A	DSE -1: ORGANIC SPECTROSCOPY	5	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of the course, students will be able to	
CO-1	describe the principle, instrumentation and applications of UV-Vis spectroscopy	K1
CO-2	outline the concepts of pericyclic and photochemical reactions	K2
CO-3	predict the stereochemistry of organic reactions	K2
CO-4	apply the principles of NMR in structural elucidation	K3
CO-5	identify the structure of the molecules using MS	K4

Unit – I UV-Visible and IR Spectroscopy

(15 Hours)

Electromagnetic spectrum– UV –Visible spectroscopy: Beer–Lambert law – electronic transitions – principle – instrumentation (only block diagram)– chromophores– auxochrome– factors influencing absorptions – conjugation – solvent effect – shifts in absorptions –Woodward–Fieser rules for the calculation of λ_{\max} of dienes and enones.

IR spectroscopy: Hooke’s Law– modes of vibrations in organic molecules– instrumentation (only block diagram)– –factors influencing stretching frequency – hybridization, tautomerism, H–bonding, electronic and steric and ring size effects –IR spectra of functional groups – hydrocarbon: methyl, methylene, methine C–H stretching in alkanes and cycloalkanes – alcohols, ethers, aldehydes, ketones, carboxylic acids, esters, amides and amines – NH stretching in primary and secondary amines.

Applications of UV–Visble and IR spectra in the structural analysis of simple organic molecules.

Unit – II NMR Spectroscopy

(15 Hours)

^1H NMR: Principle, instrumentation, number of signals, shielding and deshielding – chemical shift: calculation, factors influencing chemical shifts – hybridization and electronic effects – exchangeable protons – chemical shift values for different protons – integration and proton counting, spin – spin coupling and coupling constants – types of coupling constants – deuterated solvents – interpreting the NMR spectra of some organic molecules.

^{13}C NMR spectroscopy – types of carbon, splitting and chemical shift values for various types of carbons.

Unit – III Mass Spectrometry

(15 Hours)

Mass spectrometry: principle – instrumentation – ionization techniques – CI and EI – desorption techniques – m/z values – molecular ion peak – isotopic peaks – [M+1] and [M+2] and their importance – metastable ions –benzylic and allylic cleavages – nitrogen rule, McLafferty rearrangement – interpretation of the mass spectra of some organic molecules.

Combined approach to identify the structure of organic molecules.

Unit – IV Pericyclic and Photochemical Reactions

(15 Hours)

Pericyclic reactions: Characteristics and types – FMO of enes, dienes and polyenes – electrocyclic reactions – Woodward–Hoffman rules for thermal and photochemical reactions – cycloaddition reactions–[4+2] and [2+2] – stereo– and regiochemistry – inverse electron demand

and retro Diels–Alder reactions – sigmatropic rearrangements – types and examples – Alder–ene reactions and cheletropic reactions.

Photochemical reactions: Types of photochemical reactions– Norrish type I and II – Paterno – Buchi reaction – mechanism and stereochemistry.

Unit –V Selectivity in Organic Synthesis

(15 Hours)

Chemoselectivity, regioselectivity, and stereoselectivity – reactivity of carbonyl groups towards nucleophiles – selectivity of hydrides in reduction – selectivity in oxidations – protecting groups – hydroxyl, amino, carbonyl and carboxylic acid protecting groups.

Books for Study

1. Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, *Introduction to Spectroscopy*, 5th Edition, Cengage Learning, New Delhi, 2015.
Unit–I Chapter 2 & 7 **Unit–II** Chapter 3
2. Silverstein R M and Bassler G C, *Spectrometric Identification of Organic Compounds*, 4th Edition, John– Wiley and Sons, New York, 1993.
Unit–III Chapter 2
3. Clayden J, Greeves N and Warren S, *Organic Chemistry*, 1st Edition, Oxford University Press, New York, 2001.
Unit–IV Chapter 35 **Unit–V** Chapter 24

Books for Reference

1. Kemp W, *Organic Spectroscopy*, 3rd Edition, ELBS, London, 1987.
2. Fleming I, *Spectroscopic Methods in Organic Chemistry*, 4th Edition, Tata–McGraw Hill Publishing Company, New Delhi, 1988.
3. Sharma Y R, *Elementary Organic Spectroscopy*, 5th Edition, S. Chand & Company Pvt. Ltd, 2013.
4. Carey F A and Sundberg R J, *Advanced Organic Chemistry, Part A: Structure and Mechanisms*, 5th Edition, Springer Pvt. Ltd., New Delhi, 2007.
5. Carey F A and Sundberg R J, *Advanced Organic Chemistry, Part B: Structure and Mechanisms*, 5th Edition, Springer Pvt. Ltd., New Delhi, 2007.

Web Resources



Electromagnetic Spectrum



Fundamentals of Spectroscopy

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
V	21UCH53ES01A	DSE- 1: ORGANIC SPECTROSCOPY									5	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	2	1	2	3	3	3	1	2.3	
CO-2	3	3	3	2	1	3	3	3	2	1	2.4	
CO-3	1	1	1	3	2	2	3	1	1	1	1.6	
CO-4	3	2	3	3	2	1	3	2	3	1	2.3	
CO-5	2	1	2	1	2	3	1	2	2	2	1.8	
Mean overall Score											2.08 (Medium)	

Semester	Course code	Title of the course	Hours	Credits
V	21UCH53ES01B	DSE- 1: ORGANIC SYNTHESIS AND CHARACTERIZATION	5	3

CO No.	CO-Statements	Cognitive levels (K-Level)
	On successful completion of the course, students will be able to	
CO-1	understand the principle, instrumentation and applications of UV-Vis and IR.	K1
CO-2	comprehend the importance of NMR and ESR in structural elucidation	K1
CO-3	understand and carry out the stereoselective organic synthesis.	K2
CO-4	identify the structure of compounds from spectral data	K4
CO-5	analyze and design chemoselective organic synthesis	K4

Unit – I Pericyclic and Photochemical Reactions (15 Hours)

Pericyclic reactions: Characteristics and types – FMO of enes, dienes and polyenes – electrocyclic reactions – Woodward–Hoffman rules for thermal and photochemical reactions – cycloaddition reactions–[4+2] and [2+2] – stereo- and regiochemistry – inverse electron demand and retro Diels–Alder reactions – sigmatropic rearrangements – types and examples – Alder–ene reactions and cheletropic reactions.

Photochemical reactions: Types of photochemical reactions– Norrish type I and II – Paterno – Buchi reaction – mechanism and stereochemistry.

Unit– II Stereoselective Organic Synthesis (15 Hours)

Regioselectivity: Regioselectivity in electrophilic and nucleophilic aromatic substitution, regioselectivity in elimination reactions– electrophilic attack on alkenes– regioselectivity in radical reactions–nucleophilic attack on allylic compounds– electrophilic attack on conjugated dienes and conjugate addition.

Diastereoselectivity: Prochirality, Cram’s rule and chelation effect– diastereoselectivity in aldol reaction and diastereoselective epoxidation.

Unit– III UV–Visible and IR Spectroscopy (15 Hours)

UV–Visible spectroscopy: electronic transitions – principle – instrumentation – chromophores, auxochromes – factors influencing absorptions – conjugation – solvent effect – shifts in absorptions – absorption bands in carbonyl compounds – Woodward–Fieser rules for the calculation of λ_{max} of dienes and enones.

IR spectroscopy: Hooke’s Law – sample handling – modes of vibrations in organic molecules – factors influencing stretching frequency – hybridization, tautomerism, H–bonding, electronic and steric and ring size effects – IR spectra of functional groups – hydrocarbons: methyl, methylene, methine C–H stretching in alkanes and cycloalkanes – alcohols, ethers, halogen, aldehydes, ketones, amines, esters – comparison of stretching frequency in carbonyl compounds – NH stretching in primary and secondary amines

Unit– IV NMR Spectroscopy (15 Hours)

^1H NMR: principle, instrumentation, number of signals, shielding and deshielding – chemical shift: calculation, factors influencing chemical shifts – hybridization, electronic and steric effects peak – shielding and deshielding – exchangeable protons – integration and proton counting, spin–

spin coupling and coupling constants – deuteriated solvents – interpreting the NMR spectra of some organic molecules

^{13}C NMR spectroscopy – types of carbon, splitting and chemical shift values for various types carbons

Unit– V Mass Spectrometry and Combined Problems (15 Hours)

Mass spectrometry: principle – instrumentation – ionization techniques – CI and EI – desorption techniques – m/z values – molecular ion peak – isotopic peaks – $[M+1]$ and $[M+2]$ and their importance – metastable ions – factors affecting the fragmentation: branching, cyclic and acyclic compounds, benzylic and allylic cleavages – nitrogen rule, McLafferty rearrangement – interpretation of the mass spectra of some organic molecules.

Combined approach to identify the structure of organic molecules – minimum 10 problems from Bruice book.

Books for Study

1. Pavia D L, Lampman G M, Kriz G S and Vyvyan J R, *Introduction to Spectroscopy*, 5th Edition, Cengage Learning, Delhi, 2015.

Unit–III Chapter 7

Unit–IV Chapter 33

2. Silverstein R M and Bassler G C, *Spectrometric Identification of Organic Compounds*, 4th Edition, John– Wiley and Sons, New York, 1993.

Unit–III Chapter 2

3. Clayden J, Greeves N and Warren S, *Organic Chemistry*, 1st Edition, Oxford University Press, New York, 2001.

Unit–IV Chapter 35

Unit–V Chapter 24

Books for Reference

1. Kemp W, *Organic Spectroscopy*, 3rd Edition, ELBS, London, 1987.
2. Fleming I, *Spectroscopic Methods in Organic Chemistry*, 4th Edition, Tata–McGraw Hill Publishing Company, New Delhi, 1988.
3. Sharma Y R, *Elementary Organic Spectroscopy*, 5th Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2013.
4. Carey F A and Sundberg R J, *Advanced Organic Chemistry, Part A: Structure and mechanisms*, 5th Edition, Springer Pvt. Ltd, New Delhi, 2007.
5. Carey F A and Sundberg R J, *Advanced Organic Chemistry, Part B: Structure and Mechanisms*, 5th Edition, Springer India Pvt Ltd, New Delhi, 2007.
6. Morrison R T and Boyd R T, *Organic Chemistry*, 7th Edition, Allyn & Bacon Ltd., New York, 2011.
7. Bruice P Y, *Organic Chemistry*, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
8. Carey F A, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 2000.
9. Pine S H, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.

Web Resources



Pericyclic Reactions



Fundamentals of Spectroscopy

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
V	21UCH53ES01B	DSE -1: ORGANIC SYNTHESIS AND CHARACTERIZATION									5	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	1	1	2	3	3	2	2	2	2.2	
CO-2	2	1	2	1	2	2	2	1	3	1	1.7	
CO-3	3	3	2	2	1	3	3	1	3	1	2.2	
CO-4	3	3	3	2	1	3	3	1	3	2	2.4	
CO-5	3	3	3	3	1	3	2	1	3	1	2.3	
Mean overall Score											2.40 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH53ES02A	DSE- 2: PHYSICAL CHEMISTRY I	5	3

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	describe the principles of electronic spectroscopic techniques.	K1
CO-2	understand the basics of electrolytic processes.	K2
CO-3	apply the concepts of EMF in electrochemical reactions.	K3
CO-4	construct electrodes , galvanic cells and batteries.	K3
CO-5	analyze IR spectra based on knowledge of characteristic functional group frequencies.	K4

Unit- I Spectroscopy I

(15 Hours)

The absorption and emission of radiation– selection rules and transition moments–Beer–Lambert law– spectral line widths– Doppler broadening– experimental techniques– molecular rotation– moments of inertia– rotational energy levels– microwave spectroscopy– selection rules– appearance of microwave spectra .

UV–Visible spectroscopy– electronic spectra –types of electronic transitions – Frank–Condon principle – spectra of diatomic and polyatomic molecules– predissociation – dissociation energy– applications.

Unit – II Spectroscopy II

(15 Hours)

Infrared spectroscopy –vibrational motion– anharmonicity– vibration–rotation spectra– selection rules–vibrational spectroscopy of diatomic and polyatomic molecules– normal modes– Infrared absorption spectra– vibrational Raman spectra–, symmetry aspects of molecular.

Vibrations– rotational Raman spectroscopy– nuclear statistics and rotational states–Infrared activity of normal modes– Raman activity of normal modes– Applications of IR and Raman spectroscopy.

Unit – III Electrochemistry

(15 Hours)

Ohm’s law – conductance in metals and electrolytic solution – specific conductance – equivalent conductance – measurement of equivalent conductance – Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and its limitations– weak and strong electrolytes according to Arrhenius theory – Ostwald’s dilution law, its uses and its limitations – elementary treatment of Debye–Huckel theory of strong electrolytes– transport number– determination of transport number– Hittorf’s method and moving boundary method.

Unit –IV Conduction Measurement and Electromotive Force

(15 Hours)

Applications of conductance measurements– determination of degree of dissociation – determination of K_a of acid – determination of solubility of sparingly soluble salt– common ion effect– conductometric titrations (acid–base and precipitation)– electrochemical cells– electrolytic cell– reversible and irreversible cells– conventional representation of electrochemical cells– EMF and its measurements – Weston– Cadmium standard cell – computation of cell EMF– relation between free energy and EMF– Gibbs Helmholtz equation and ΔH , ΔG , ΔE – calculations of thermodynamic quantities of cell reaction (S and K).

Unit –V Nernst Equation and EMF Measurements

(15 Hours)

Nernst equation – types of reversible electrodes – gas/metal ion – metal/metal ion – metal/insoluble/anion – redox electrodes –electrode reaction – Nernst equation of electrode reaction – derivation of cell EMF – single electrode potential –reference electrodes – standard hydrogen electrode –standard electrode potential – sign conventions – electrochemical series and its significance – concentration cells with and without transference–liquid junction potential–application of EMF measurements– valency of ions, solubility product, activity coefficient– potentiometric titration – determination of pH using hydrogen, quinhydrone and glass electrodes – determination of pKa of acids by potentiometry– energy conversion – dry cell, lead acid storage battery, H₂–O₂ fuel cell.

Books for Study

1. Atkins P and Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press Great Britain, 2014.

Unit–I and II Chapter 12 Unit–IV and V Chapter 6

2. Glasstone S, *An Introduction to Electrochemistry*, Affiliated East–West Press Pvt. Ltd., New Delhi, 2008.

Unit III, IV and V Chapter 2,3,4,6 and 7

Books for Reference

1. Castellan G W, *Physical Chemistry*, 3rd Edition, Addison–Wesley Publishing Company, Sydney, 1983.
2. Puri B R , Pathania M S, Sharma L R, *Principles of Physical Chemistry* ,48th Edition, Vishal Publishing Co., India, 2020.
3. Banwell C N, Mc Cash E M, *Fundamentals of Molecular Spectroscopy*, 4th Edition, McGraw–Hill Publishing Company Limited, New Delhi, 2002.
4. Bockris J O'M, Reddy A K N, *Modern Electrochemistry I and 2A*, Kluwer Academic/Plenum Publishers, New York, 2000.

Web Resources



Arrhenius Theory of
Electrolytic Dissociation



Standard Hydrogen Electrode



Hydrogen Oxygen Fuel Cell

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits				
V	21UCH53ES02A	DSE-2: PHYSICAL CHEMISTRY I					5	3				
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	1	2	3	1	2	3	2	3	3	2.1	
CO-2	2	3	2	3	2	2	3	2	1	1	2.1	
CO-3	1	4	3	3	2	2	3	1	2	3	2.4	
CO-4	1	3	1	4	3	2	2	3	3	1	2.3	
CO-5	2	1	1	3	1	2	1	3	1	3	1.8	
Mean overall Score											2.14 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH53ES02B	DSE- 2: PHYSICAL CHEMISTRY- II	5	3

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	enumerate the basics of electrolytic processes.	K1
CO-2	understand the twelve principles of green chemistry.	K2
CO-3	construct electrodes , galvanic cells and batteries.	K3
CO-4	apply the concepts of EMF in electrochemical reactions.	K3
CO-5	evaluate nanomaterials and analyze their properties and applications.	K4

Unit –I Electrochemistry

(15 Hours)

Ohm's law – conductance in metals and electrolytic solution – specific conductance – equivalent conductance – measurement of equivalent conductance – Kohlrausch law and its applications – Arrhenius theory of electrolytic dissociation and limitations–weak and strong electrolytes according to Arrhenius theory – Ostwald's dilution law, its uses and its limitations – the elementary treatment of Debye–Huckel theory of strong electrolytes–transport number–determination of transport number, Hittorf's method and moving boundary method.

Unit– II Conduction Measurement and Electromotive Force

(15 Hours)

Applications of conductance measurements – determination of degree of dissociation – determination of K_a of acid – determination of solubility of sparingly soluble salt–common ion effect–conductometric titrations (acid–base and precipitation)–electrochemical cells–electrolytic cell–reversible and irreversible cells–conventional representation of electrochemical cells–EMF and its measurements – Weston – Cadmium standard cell – computation of cell EMF–relation between free energy and EMF–Gibbs Helmholtz equation and ΔH , ΔG , ΔE – calculations of thermodynamic quantities of cell reaction (S and K).

Unit – III Nernst Equation and EMF Measurements

(15 Hours)

Nernst equation – types of reversible electrodes – gas/metal ion – metal/metal ion – metal/insoluble/anion – redox electrodes – electrode reaction – Nernst equation of electrode reaction – derivation of cell EMF – single electrode potential – reference electrodes – standard hydrogen electrode – standard electrode potential – sign conventions – electrochemical series and its significance – concentration cells with and without transference–liquid junction potential–application of EMF measurements– valency of ions, solubility product, activity coefficient– potentiometric titration – determination of pH using hydrogen, quinhydrone and glass electrodes – determination of pKa of acids by potentiometry– energy conversion – dry cell and lead acid storage battery– H_2 – O_2 fuel cell.

Unit–IV Corrosion of Metals

(15 Hours)

Physical nature of electrodeposited metals–simultaneous discharge of cations– depolarization of metal deposition– separation of metals by electrolysis– electrochemical passivity– theories of passivity– mechanical passivity – corrosion of metals: mechanism–hydrogen evolution type–corrosion in presence of a depolarizer– differential oxygenation corrosion– electrolytic reduction and oxidation– reversible oxidation–reduction processes– non–reversible processes– electrolytic reduction and oxidation– methods for preventing corrosion– cathodic and anodic protection– anodic and cathodic inhibitors.

Unit–V Nanochemistry

(15 Hours)

Basics of nanoscience and nanotechnology – chemistry of nanoparticles– nanotechnology – methods of synthesis of nanomaterials (sol–gel, co–precipitation and plasma arching methods) – SEM and TEM – fullerene – carbon nanotubes – types – synthesis – catenanes and rotaxanes– preparation and properties – applications of nanomaterials.

Books for Study

1. Glasstone S, *An Introduction to Electrochemistry*, Affiliated East–West Press Pvt. Ltd., New Delhi, 2008.
Unit–I, II, III and IV Chapter 2,3,4,6, 7, 15 and 16
2. Atkins P W and Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press, Great Britian, 2014.
Unit–I and II Chapter 6
3. Pradeep T, *Nano: The Essentials*, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 2017.
Unit–IV Chapter 1,2,3,4 and 13
4. Bockris J O'M, Reddy A K N , *Modern Electrochemistry 2B*, Kluwer Academic/Plenum Publishers, New York, 2000.
Unit–V Chapter 12

Books for Reference

1. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, New Delhi, 2004.
2. Kapoor K L, *A Textbook of Physical Chemistry*, Vol. 3 Macmillan, India Ltd, 2013.
3. Bockris J O'M, Reddy A K N, *Modern Electrochemistry1 and 2A*, Kluwer Academic/Plenum Publishers, New York, 2000.
4. Sharma K K, Sharma L K, *A Textbook of Physical Chemistry*, 5th Edition, Vikas Publishing House, New Delhi, 2012.
5. Pradeep T, *A Textbook of Nanoscience and Nanotechnology*, McGrawhill, New Delhi, 2012.

Web Resources



Theory of Electrolytic
Dissociation



Reference Electrode



Fuel Cell

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
V	21UCH53ES02B	DSE-2: PHYSICAL CHEMISTRY II					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	1	1	2	3	1	2	3	2	3	3	2.1
CO-2	1	3	1	2	3	2	2	3	3	1	2.1
CO-3	2	3	2	3	2	2	3	2	1	1	2.1
CO-4	2	1	1	3	1	2	1	3	1	3	1.8
CO-5	1	1	3	3	2	2	3	1	2	3	2.1
Mean overall Score											2.04 (Medium)

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH53SP01	Self-Paced Learning: ESSENTIALS OF CHEMISTRY	–	2

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	describe advanced application of inorganic compounds in biological systems.	K1
CO-2	understand the utility of the synthetic organic reagents.	K1
CO-3	summarize the properties of zinc group metals and identify toxic behavior of the metals and related consequences.	K2
CO-4	relate the ability of the redox reagents and their reactions.	K3
CO-5	examine the building blocks for advanced inorganic materials	K4

Unit-I Group 12– The Zinc Group

Abundance, occurrence, extraction and uses of Zn, Cd and Hg–oxidation states– complexes– polycations– Hg(I) complexes–organometallic compounds–biological role of zinc–toxicity of Cd and Hg–bio–accumulation of heavy metals and its consequences.

Unit-II Advanced Inorganic Materials

Artificially layered materials– quantum wells–solid–state superlattices– artificially layered crystal structures– self–assembled nanostructures– supramolecular chemistry and morphosynthesis– dimensional control in nano structures– bio–inorganic nanomaterials– DNA and nanomaterials biomimetics– bionanocomposites– inorganic–organic nanocomposites.

Unit-III Bioinorganic Chemistry and Polymers

Bioinorganic catalysis– Zn enzymes, Mg enzymes and Fe enzymes–the reactions of Co containing enzymes–Mo and W enzymes– the nitrogen cycle– the hydrogen cycle– sensors– Fe proteins as sensors–Cu and Zn sensors– biomineralization– chelation therapy–cancer treatment–anti–arthritis drugs–imaging agents.

Rubber as a natural polymer – types of polymers – homopolymers, copolymers – addition and condensation polymers – polymerization reactions –vulcanization of rubber.

Unit-IV Organic Synthetic Reagents

Synthesis and applications of – BuLi, B₂H₆, CH₂Cl₂, DCC, Grignard reagent, NBS, Ph₃P, PCl₅, NaN₃, NaNO₂, SOCl₂, Me₂S and Me₂CuLi.

Unit-V Organic Redox Reagents

Structures and applications of the following oxidants– PCC, H₂O₂, m–Cpba, OsO₄, KMnO₄, HIO₄, and SeO₂. Reductants– LiAlH₄, NaBH₄, Raney nickel, Wilkinson catalyst, Lindlar's Catalyst, MPV, Clemmensen and Wolff–Kishner reductions and Birch reduction.

Books for Study

1. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Wiley–India, New Delhi, 2010.

Unit-I Chapter 28

2. Atkins P, Overton T, Rourke J, Weller M and Armstrong F, *Shriver and Atkins Inorganic Chemistry*, 4th Edition, 2010.

Unit-II Chapter 24

Unit-III Chapter 26

3. Ahluwalia V K and Prashar R K, *Organic Reaction Mechanisms*, 4th Edition, Narosa Publishing House, New Delhi, 2011.

Unit-IV Chapter 8

Unit-V Chapter 3 and 4

Books for Reference

1. Atkins P W, *Physical Chemistry*, 5th Edition, Oxford University Press, London 1994.
2. Finar I L, *Organic Chemistry*, Vol 1 and 2, 6th Edition, Addison Wesley Longman Ltd., England, 1996.
3. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry* 5th Edition, Pearson Education, Inc., New York, 2014.
4. Bruice, P Y *Organic Chemistry*, 8th Edition., Pearson Ltd., University of California, Santa Barbara, 2011.

Web Resources



Nano scale Therapeutic Drug



Role of Metals in Enzyme Activity

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
V	21UCH53SP01	Self-Paced Learning: ESSENTIALS OF CHEMISTRY									-	2
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	2	3	1	2	3	1	3	3	1	2	2.2	
CO-2	2	2	3	3	3	2	2	2	3	3	2.5	
CO-3	2	3	2	2	3	2	1	2	2	2	2.1	
CO-4	1	3	2	2	2	1	1	3	3	1	1.9	
CO-5	2	2	3	3	2	2	2	3	2	3	2.4	
Mean overall Score											2.22 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
V	21USS54SE03	SEC-3: SOFT SKILLS	2	1

PSOs (Programme Specific Outcomes)

After the successful completion of the course, students will learn:

- the various concepts of communication skills as job seekers
- to write a Professional resume as required by the employers
- to demonstrate interview skills and actively participate in GD preparations and presentations in peer groups
- to discover various aspects of self and set short term and long term goals for successful career and creates a congenial atmosphere
- to have access to solve simple and day to day Arithmetic problems and Verbal and Non-verbal reasoning formulas

Cos (Course Outcomes)

Upon completion of the course, Students will:

- be keen on developing and sustaining Soft Skills required of an educated youth
- be trained to present the best of themselves as job seekers to deal with any problem and conflict situations
- be able to transfer the skills learnt for concrete outcomes and increased productivity of companies
- be able to develop people skills, life skills that are required to be a good human in the long run and set a living standard
- be embedded with Employability skills such as “communication”, "teamwork" , "initiative , “enterprise” , the attributes of "reliability", "balance between work -life“, "commitment” and continuous learning

Module 1: Effective Communication

Definition of communication, Barriers of Communication, Verbal and Non-verbal Communication; Self introduction matrix, Conversation Techniques, Good manners and Etiquettes, Introduction to Professional Communication, Professional Grooming and Presentation Skills and exercises

Module II: Resume Writing & Interview skills

Resume Writing: Basic Resume Formats. Types of Resume - Chronological, Functional and Mixed Resume, Steps in preparation of Resume, Sample objectives, Model Resumes. **Interview Skills:** Preparation for interview, Common interview questions, Attitude, Body Language, Mock interviews and Practicum, Figuring out common interview questions and answers

Module III: Group Discussion: Definition of GD. The salient features of GD, Factors that influence GD, Outcome of GD, Tips for success in GD, Parameters of GD, Essential Points for GD preparation, GD Topics, Model GD and Practicum.

Module IV: Personal Effectiveness: Self Discovery: Personality, Traits of Personality; Personality Tests; Intelligence and Skill Assessment Form. **Goal Setting:** Goal setting Process, Questionnaires & Presentations

Module V: **Numerical Ability:** Average, Percentage; Profit and Loss, Area, Volume and Surface Area. (Simple Interest, Compound Interest; Time and Work, Pipes and Cisterns; Time and Distance, Problems on Trains, Illustrations, Boats and Streams; Illustrations-Optional)

Module VI: **Test of Reasoning - Verbal Reasoning:** Series Completion, Analogy. **Non-Verbal Reasoning**

Books for Study

Melchias G, Balaiah John, John Love Joy (Eds), 2018. Straight from the Traits: Securing Soft Skills, SJC, Trichy.

Books for References

Aggarwal, R.S. 2010. *A Modern Approach to Verbal and Non Verbal Reasoning*. S.Chand, New Delhi. Covey, Stephen. 2004. *7 Habits of Highly effective people*, Free Press. Egan, Gerard. (1994).

The Skilled Helper (5th Ed). Pacific Grove, Brooks/Cole.

Khera ,Shiv 2003. *You Can Win*. Macmillan Books , Revised Edition.

Melchias G, Balaiah John, John Love Joy (Eds), 2018. *Winners in the Making: A primer on soft skills*. SJC, Trichy.

Other books

Murphy, Raymond. 1998. *Essential English Grammar*. 2nd ed., Cambridge University Press. Sankaran, K., & Kumar, M. *Group Discussion and Public Speaking*. M.I. Pub, Agra, 5th ed., Adams, Media.

Trishna's 2006. *How to do well in GDs & Interviews*, Trishna Knowledge Systems.

Yate, Martin. 2005. *Hiring the Best: A Manager's Guide to Effective Interviewing and Recruiting**

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH54EG01A	GE-1: CHEMISTRY FOR COMPETITIVE EXAMINATIONS	4	3

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	describe the fundamental concepts of chemistry.	K1
CO-2	distinguish the periodic properties of various elements.	K2
CO-3	crack the UPSC, SSC, RRB, TNPSC Group examinations.	K3
CO-4	correlate the properties of Noble metals with Noble gases.	K4
CO-5	apply the knowledge of drugs to treat various human ailments.	K5

Unit –I Fundamentals of Chemistry (12 Hours)

Matter and its existence– solids, liquids and gases– atoms– constituents of an atom – proton, electron and neutron– elements–molecule–Avogadro number–acid– base and salt– pH and its importance.

Unit – II Periodic Table of Elements (12 Hours)

Periodic table – classification – old and modern periodic tables– extraction of metals, Fe, Au, Ag, Pt – role of metal ions in biological systems – hemoglobin– non–metals – oxygen–chemistry of respiration, nitrogen cycle and noble gases and their uses.

Unit – III Nuclear Energy (12 Hours)

Discovery of radioactivity – isotopes, isobars and isotones– uses of radioisotopes in the field of industry, agriculture and medicine – nuclear fission and nuclear fusion with examples –nuclear power stations in India– nuclear waste management.

Unit –IV Chemistry for Human Welfare (12 Hours)

Cements–types and manufacture, paints and pigments– types and manufacture, coal–formation and classification, petroleum– formation and fractional distillation – chemistry of steels in railways– food colorants and preservatives – Noble laureates in chemistry.

Unit – V Clinical Chemistry (12 Hours)

Drugs– classification and mode of action– antibiotics–analgesics– antipyretics– disinfectants– antiseptics– anticonvulsants– cardiovascular drugs– anticancer drugs.

Books for Study

- Puri B R, Sharma L R, Kalia K K, *Principles of Inorganic Chemistry*, 23rd Edition, New Delhi, Shoban Lal, Nagin Chand and Co., 1993.
Unit–I Chapter 9 Unit–II Chapter 2 Unit–III Chapter 39
- Jayashree Ghosh, *Fundamental Concepts of Applied Chemistry*, S. Chand and Co. Ltd, 2006.
Unit–IV Chapter 1
- Kirpal Singh, *Chemistry in Daily Life*, PHI Learning, 2012. (e–book)
Unit–IV Chapter 15 Unit–V Chapter 7

Books for References

1. Jeyashre Ghosh, *A Text book of Pharmaceutical Chemistry*, Tata McGraw Hill Publishing, New Delhi 1993.
2. Krishnamurthy N, Jayasubramanian K and Vallinayagam, *Applied Chemistry*, Prentice Hall of India, New Delhi, 1990.
3. Gem Mathew G D, *Chemistry in Everyday Life*, Vishal Publishing, Punjab, 2014.

Web Source



Noble Laureates



Food Colorants



Chemistry in Respiration

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
V	21UCH54EG01A	GE-1 CHEMISTRY FOR COMPETITIVE EXAMINATIONS									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	1	3	1	3	2	3	2	3	3	2.4	
CO-2	1	2	1	3	1	1	1	3	1	3	1.7	
CO-3	2	3	2	1	3	2	2	3	3	1	2.2	
CO-4	3	2	1	2	2	2	3	2	1	1	1.9	
CO-5	3	2	2	3	2	2	3	3	2	3	2.5	
Mean overall Score											2.14 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
V	21UCH54EG01B	GE-1: EVERYDAY CHEMISTRY	4	3

CO No.	CO – Statements	Cognitive Levels (K–Level)
	On successful completion of this course, students will be able to	
CO–1	identify the different food adulterants, sugar , oils and fats.	K1
CO–2	discuss the calorific values of various fuels and harmful effects of adulterants.	K2
CO–3	apply the knowledge of water chemistry in softening hard water.	K3
CO–4	demonstrate the preparation of simple cosmetics , sugar, oils and fats.	K4
CO–5	analyze the functioning of rocket fuel cells and fractional distillation of coal tar.	K4

Unit – I Water

(12 Hours)

Sources of water – quality characteristics of water – uses of water – water in human body – potability of water – hardness of water – types – determination of hardness – EDTA method – softening of water – zeolite process – demineralization – reverse osmosis – sea water as a source of drinking water – desalting– sterilization and disinfection of water – BOD and COD.

Unit – II Oils, Fats and Sugar

(12 Hours)

Distinction between oils and fats – properties – classification – edible oils – vegetable oils – animal oils – manufacture of oils by solvent extraction – refining of crude vegetable oils – processing of animal fats – manufacture of cane sugar – extraction and purification – defecation , sulphitation and carbonation – evaporation – crystallization – separation of crystals – refining – manufacture of sucrose from beet root.

Unit –III Adulterants in food

(12 Hours)

Food Adulteration and prevention – common food adulterants – food additives – food colorants– preservatives – flavourants – food poisoning – analysis of adultrants in edible oils, coffee powder, chilli powder, turmeric powder, meat , fish, ghee and milk – harmful effects of food adulterants.

Unit –IV Fuels and fuel cells

(12 Hours)

Modern concept of fuels – classification of fuels – criterion of selection of fuels – natural and artificial solid fuels – calorific value – properties of fuels – advantages of solid fuels over liquid and gaseous fuels – natural gas and LPG – coal and coke – fractional distillation of crude oil – chemistry of fuel cells – examples – hydrogen-oxygen fuel cells in manned spacecrafts – advantages – Fuel cells: The future of clean energy.

Unit – V Cosmetics

(12 Hours)

Cosmetics– definition – types of cosmetics – composition of cosmetics – methods of preparation of soap, detergent, face powder, nail polish, deodorants, hair dyes , shampoo, perfumes and face creams – their side effects.

Books for Study

1. Sharma B K , *Industrial Chemistry*, Goel publishing house, New Delhi, 2011.

Unit–I Chapter 1

Unit–II Chapter 38 and 39

Unit–IV Chapter 4 and 16

- Alex V Ramani, *Food Chemistry*, MJP Publishers, Chennai, 2009.
Unit–III Chapter 8 and 9
- Benson Heather A E, *Cosmetic Formulation: Principles and Practice*, Taylor and Francis, New York, 2019.
Unit–V Chapter 7 and 13

Books for Reference

- Ashutosh Kar, *Medicinal Chemistry*, Wiley Eastern limited , New Delhi, 1993.
- Maison G. De Navarre , *The chemistry and manufacture of Cosmetics*, Allured books, 2009.

Web Resources



Cosmetics



Food Adulteration

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
V	21UCH54EG01B	GE-1: EVERYDAY CHEMISTRY									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	3	2	2	3	3	2	3	2	2.5	
CO-2	3	2	3	3	1	3	3	3	3	2	2.6	
CO-3	3	2	3	3	3	3	2	2	3	2	2.6	
CO-4	3	3	2	2	1	3	3	2	3	2	2.4	
CO-5	3	3	3	3	1	3	3	3	2	2	2.6	
Mean overall Score											2.54 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH53CC09	CORE-9:CHEMISTRY OF BIOMOLECULES	6	5

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO-1	overview the chemistry of natural products and hormones.	K1
CO-2	recollect the classification, chemical reactions and structures of sugars.	K2
CO-3	summarize the chemistry of heterocyclics.	K2
CO-4	comprehend the structure, synthesis and analysis of amino acids and proteins.	K3
CO-5	classify and analyze the structure, composition and importance of nucleic acids and lipids.	K4 & K5

Unit –I Carbohydrates

(18 hours)

Introduction – classification – nomenclature –physical properties – glucose – cyclic structures – chemical properties – mutarotation – anomerism –epimerization –Kiliani–Fischer synthesis – Ruff degradation – fructose –cyclic structures–interconversion of ketose to aldose – conversion of glucose into ascorbic acid – disaccharides: lactose, maltose, cellobiose and sucrose (structures only) – structural differences between starch and cellulose –uses of cellulose and its derivatives.

Unit – II Amino acids and Proteins

(18 hours)

List of amino acids – structures – preparation of amino acids – reactions of amino acids – synthesis of dipeptides: protection, activation and deprotection – Merrifield solid phase synthesis – classification of proteins – terminal residue analysis: N-terminal (Edman Pehr method) – C-terminal analysis (enzymatic and chemical) – Sanger method of identification of amino acid sequence in a polypeptide – primary, secondary and tertiary structures of proteins.

Unit –III Nucleic acids, Lipids and Metabolism

(18 hours)

Nucleic acids: Types of bases – types of sugars – nucleosides and nucleotides – types of nucleic acids – structure and functions of DNA and RNA.

Lipids: Fatty acids –waxes – fats and oils – membranes – phospholipids – spingolipids – prostaglandins.

Metabolism – Coenzymes – haloenzymes – apoenzymes – overall view of metabolism – catabolism – anabolism –stages of catabolism – stages of glycolysis – citric acid cycle or tricarboxylic acid (TCA)cycle– NADP⁺/NADPH – FAD/FADH₂.

Unit –IV Heterocyclics

(18 hours)

Nomenclature – synthesis of pyrrole, furan and thiophene – molecular orbital pictures – basic strength – reactions of pyrrole, furan and thiophene – mechanism, orientation and reactivity – synthesis and reactions of indole, pyridine, quinoline and isoquinoline – heterocyclics containing two hetero atoms – N/O/S – macrocycles – polyaza, polyoxa and polythiamacrocycles – mixed donor macrocycles – application of macrocycles.

Unit –V Alkaloids, Terpenoids, and Steroids

(18 hours)

Introduction to alkaloids – classification – occurrence and isolation – structural elucidation of papaverine and nicotine only – only structures of alkaloids: quinine, morphine, atropine, nicotine, coniine, piperine and papaverine – classification and definition of terpenoids – isoprene rule – structure and uses of some essential oils – structural elucidation of geraniol only – structure and functions of steroids only – androgen, estrogen and cholesterol.

Books for Study

1. Morrison R T and Boyd R N, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.
Unit I Chapter 34 and 35 **Unit II** Chapter 36
Unit III Chapter 36, 33 **Unit IV** Chapter 30
2. Bruice P Y, *Organic Chemistry*, 8th Edition, Pearson Ltd., University of California, Santa Barbara, 2011.
Unit I Chapter 22 **Unit II** Chapter 23 **Unit III** Chapter 27, 28, 26
3. Finar I L, *Organic Chemistry*, Vol: 1 and 2, 6th Edition, Addison Wesley Longman Ltd. England, 1996.
Unit I vol. 2 Chapter 7 **Unit II** vol. 2 Chapter 13 **Unit III** vol.1 Chapter 16
Unit V vol. 2 Chapter 8 and 11 **Unit V** vol. 1 Chapter 14

Books for References

1. Stryer L, Berg J M, Tymoczko J L and Gatto G, *Biochemistry*, 9th Edition, W. H. Freeman and Company, New York, 2019.
2. Rodwell D, Bender D and Botham K, *Harper's Illustrated Biochemistry*, 31st Edition, McGraw Hill Professional, New York, 2018.

Web Resources



Biomolecules–Khan Academy



Biomolecules–PDF

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
VI	21UCH53CC09	CORE-9: CHEMISTRY OF BIOMOLECULES									6	5
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	2	1	2	2	2	3	2	1	2.1	
CO-2	3	1	2	2	3	3	2	1	3	2	2.2	
CO-3	2	1	2	3	2	3	1	2	3	2	2.1	
CO-4	2	2	1	3	2	2	1	2	3	2	2.0	
CO-5	3	2	2	3	3	2	3	2	2	3	2.5	
Mean overall Score											2.2 (High)	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63CP04	CHEMISTRY PRACTICAL-IV (Gravimetry and Organic Preparation)	4	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of the course, the students will be able to	
CO-1	relate organic preparatory methods with syntheses in pharmaceutical industries.	K1
CO-2	explain principles of precipitation and gravimetric analysis.	K2
CO-3	use organic chemicals and other equipments in laboratories.	K2
CO-4	communicate and explain the acquired analytical knowledge as team members.	K3
CO-5	investigate the metal content of some metals using thermogravimetry.	K4

Unit-I Theory of Gravimetry

(10 Hours)

Principles of quantitative precipitation – conditions for precipitation – methods of digestion – quantitative filtrations – techniques of drying – theory of weighing – scientific reporting.

Unit-II Theory of Organic Preparations

(10 Hours)

Principles of chemical conversions – Handling of organic chemicals and glassware – filtration techniques – drying techniques – distillation techniques– recrystallization techniques – scientific reporting.

Unit-III Gravimetric Estimations-I

(40 Hours)

1. Estimation of Lead as Lead Chromate
2. Estimation of Barium as Barium chromate
3. Estimation of Nickel as Nickel-DMG complex
4. Estimation of Copper as Copper (I) thiocyanate

Unit-IV Gravimetric Estimations-II

(40 Hours)

1. Estimation of Magnesium as Magnesium oxinate
2. Estimation of Calcium as Calcium oxalate
3. Estimation of Barium as Barium sulphate
4. Estimation of Iron as Iron (III) oxide

Unit-V Some Organic Preparations

(20 Hours)

Preparation of Organic compounds involving the following reactions:

1. Hydrolysis
2. Esterification
3. Nitration
4. Bromination
5. Oxidation
6. Diazotization
7. Osazone formation

Book for Study

1. *Laboratory Manual*, Department of Chemistry, St. Joseph's College (Autonomous), Tiruchirappalli-2

Books for Reference

1. Jeffery G H, Bassett J, Mendham J and Denney R C, *Vogel's Textbook of Quantitative Chemical Analysis*, 5th Edition, Longman Scientific and Technical, Essex, England 1989.
2. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edition, Longman Scientific and Technical, Essex, England 1989.
3. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002-3098, USA, 2014.

Web Resources



Practical Videos

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
VI	21UCH63CP04	Chemistry Practical-IV: (Gravimetry and Organic Preparation)					4	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	3	2	2	3	2	3	2	2.4
CO-2	2	2	2	2	2	2	2	2	2	2	2.0
CO-3	1	2	1	2	2	1	2	1	2	2	1.6
CO-4	2	2	1	2	2	2	2	1	2	2	1.8
CO-5	3	2	2	2	2	3	2	2	2	2	2.2
Mean overall Score											2.0 (Medium)

SCHEME OF VALUATION

Chemistry Practical–IV

Gravimetry and Preparation

INTERNAL

CIA

100 Marks

Cumulative mark of Regular Practical Classes	50 Marks
Two CIA tests	50 Marks

For Each CIA Test 100 marks

Test	10 marks
Record	10 Marks
Results	80 Marks (50 Marks for Gravimetry and 30 marks for Preparation)

Scheme of valuation

Gravimetry

Preparation

<2% Error	50 Marks	Crude	20 marks
3%	40 Marks	Recrystallization	10 marks
4%	30 Marks		
>4%	20 Marks		

EXTERNAL

Total 100 Marks

Short test	10 Marks
Results/Analysis	90 Marks (60 Marks for Gravimetry and 30 marks for Preparation)

Scheme of valuation

Gravimetry

Preparation

<2% Error	60 Marks	Crude	20 marks
3%	50 Marks	Recrystallization	10 marks
4%	40 Marks		
>4%	20 Marks		

A Minimum of 7 Gravimetric experiments, 5 melting and 5 boiling point determinations might have been done in regular classes

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63CP05	CHEMISTRY PRACTICAL–V: Organic Analysis and Determination of Physical Constants	4	3

CO No.	CO–Statements	Cognitive Levels (K –Level)
	On successful completion of this course, students will be able to	
CO–1	understand the preliminary tests of organic qualitative analysis.	K1
CO–2	determine the presence and absence of elements such as N/S/X.	K3
CO–3	identify the functional group of the compounds from characteristic reactions.	K3
CO–4	confirm the functional group by preparing a solid derivative.	K4
CO–5	report their results of the organic analysis in a scientific way.	K4

Unit I: Preliminary tests

(18 Hours)

Colour and appearance – solubility tests – acidic/basic/neutral nature – tests for aliphatic and aromatic compounds – tests for saturation/unsaturation

Unit II: Tests for elements like N/S/halogens

(18 Hours)

Preparation of sodium fusion extract –chemistry of converting organic N/S/halogens into inorganic ion in sodium fusion extract – tests for Nitrogen – tests for sulphur – tests for halogens such as chlorine, bromine and iodine – need for blank test

Unit III: Organic Analysis of Compounds

(18 Hours)

Tests for carbonyl functional groups – carboxylic acids, esters, aldehydes and ketones, phenol, sulphanilic acid, alcohol and hydrocarbon – Primary and secondary amines, amide, diamide, anilide, and nitro compounds

Unit IV: Preparation of Derivatives

(18 Hours)

Confirmation of the functional groups by preparation of solid derivatives/characteristic colour reactions for the functional groups – scientific reporting

Unit V: Determination of Physical constants

(18 Hours)

Determination of melting and boiling points of organic compounds of mp/bp below 200 degree celcius. (A minimum of 5 compounds each.)

Note:

1. Mono–functional compounds are given for analysis. In case of bifunctional compounds such as salicylic acid and sulphanilic acids students are required to report anyone of the functional groups.
2. Each student is expected to practice the analysis of at least 15 different organic substances.
3. Apart from the TWO CIA tests, one MODEL TEST comprising both Chemistry Practical IV and V for six hours is to be conducted to enable the students ready for semester examination.

Books for Reference

1. *Organic Chemistry Lab Manual for Micro Qualitative Analysis*, Department of Chemistry, St. Joseph's College, Tiruchirappalli 620002, 2021. (Private circulation)
2. Furniss B S, *et al.*, *Vogel's Textbook of Practical Organic Chemistry*, 7th Edition, ELBS Longman, London, 1984.
3. Ganapragasm N S and Ramamurthy G, *Organic Chemistry Lab Manual*, Second Edition, S. Vishwanathan Printers and Publishers (P) Ltd., Chennai, 2007.
4. Venkateswaran V, Veeraswamy R, Kulandaivelu A R, *Basic Principles of Practical Chemistry*, 2nd Edition, Sultan Chand and Sons, New Delhi, 1997.

Scheme of Valuation

Chemistry Practical–V: Organic Analysis and Determination of Physical Constants

(A) Internal continuous assessment		(100 marks)
1. Regular Practical Sessions		50 (Based on his observation and record notes)
2. CIA I + CIA II tests		50 (conducted for 100 marks each and converted to 25 each)
Scheme for CIA tests I and II		(100 mark each)
1. Analysis		50
a. Acid/base/neutral	5	
b. Aliphatic/aromatic	5	
c. Saturated/unsaturated	5	
d. Elements test		
i) Preparation	5	
ii) Test for N present/absent	5	
iii) Tests for S present/absent	5	
iv) Tests for X present/absent	5	
e. Functional group present	7.5	
f. Preparation of derivative	7.5	
2. Melting /Boiling point		30
3. Theory behind practicals – Test		10
4. Record note book		10
(B) Scheme for Semester examination		(100 mark)
1. Analysis		60
1. Acid/base/neutral	5	
2. Aliphatic/aromatic	5	
3. Saturated/unsaturated	5	
4. Tests for elements		
i) Preparation	10	
ii) Test for N present/absent	5	
iii) Tests for S present/absent	5	
iv) Tests for X present/absent	5	
5. Functional group present	10	
6. Preparation of derivative	10	
2. Melting/Boiling point		30
Mp/bp less than or equal to 2 degrees	30	
More than 2 and less than 5 degrees	20	
More than 5 degrees	10	
3. Theory behind practicals – Test		10

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
VI	21UCH53CP05	CHEMISTRY PRACTICAL–V: Organic Analysis and Determination of Physical Constants					4	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO–1	3	1	2	2	3	3	2	1	3	2	2.2
CO–2	2	2	2	3	2	2	1	3	3	2	2.2
CO–3	3	2	2	3	3	2	3	2	2	3	2.5
CO–4	2	3	2	3	2	3	3	2	3	2	2.5
CO–5	3	3	2	1	2	2	2	3	2	1	2.1
Mean overall Score											2.3 (High)

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63ES03A	DSE-3: INORGANIC CHEMISTRY-II	5	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO-1	list the thermal methods by which polymers and other minerals are characterized for their quality and composition.	K1
CO-2	predict the reactivities of complexes and compare the different pathways they follow when they react.	K2
CO-3	predict the role of different metal ions in biological systems.	K2
CO-4	use the spectrophotometric techniques to test the pollution level of various segments of the current environment.	K3
CO-5	explain the functioning of living systems and may pursue higher studies/research in related subjects.	K4

Unit-I Reaction mechanism in coordination complexes (15 Hours)

Ligand substitution reactions – rates of ligand substitutions – labile and inert complexes – classification of mechanisms – association, dissociation and interchange.

Ligand substitution in square planar complexes – the nucleophilicity of the entering group – the shape of the transition state – the trans effect – stereochemistry of substitution – pressure and temperature dependence of the substitution.

Ligand substitution in octahedral complexes – rate laws and their interpretation – the Eigen-Wilkins mechanism – the Fuoss-Eigen equation – the activation of octahedral complexes – leaving group effects – the effects of spectator ligands – steric effects – activation energetics – associative activation.

Base hydrolysis – redox reactions – the inner sphere and outer sphere mechanisms.

Unit-II Organometallic Chemistry (15 Hours)

Stable electron configurations – 18 electron compounds – 16 electron square planar compounds – electron count preference – electron counting and oxidation states – neutral ligand method – donor-pair method.

Nomenclature of organometallic compounds with special reference to hapticity.

Types of ligands – CO, phosphines, hydrides, dinitrogen, alkyl, alkenyl, alkynyl and aryl ligands, alkene and alkyne ligands, benzene and arene, cyclopentadiene.

Unit-III Bio-inorganic Chemistry (15 Hours)

Metal ions in biology and their vital role in the active site, structure and functions of metalloproteins and enzymes – ion transport mechanism in cell membrane – Na and K pumps – ionophores – structures and characteristic features of haemoglobin and myoglobin – Vitamin B₁₂ – blue copper proteins.

Unit-IV Gravimetric and Thermogravimetric Methods (15 Hours)

Gravimetric analysis: Mechanism of precipitation – solubility products – common ion effect – Types of precipitation – co-precipitation and post precipitation – homogeneous precipitation.

Thermal Analysis: Principle, Instrumentation and applications of TGA, DTA and DSC.

Unit–V Colorimetry, Spectrophotometry and Spectrofluorimetry (15 Hours)

General discussion – theory of spectrophotometry and colourimetry.

Classification of methods of 'colour' measurement or comparison – standard series method – balancing method – photoelectric photometer method – wavelength selection – radiation sources – cells – data presentation – layout of instruments – derivative spectrophotometry – the origins of absorption spectra. spectrofluorimetry – general discussion – instruments for fluorimetric analysis – some applications of fluorimetry.

Books for Study

1. Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 7th Edition, Oxford University Press, Oxford, UK, 2018.

Unit–I Chapter 21 Unit–II Chapter 22 Unit–III Chapter 26

2. Jeffery G H, Bassett J, Mendham J and Denney R C, *Vogel's Textbook of Quantitative Chemical Analysis*, 5th Edition, Longman Scientific and Technical, Essex, England, 1989.

Unit–IV Chapter 11 Unit–V Chapters 17 and 18

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John– Wiley and Sons. Inc., New York, 1995.
4. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002–3098, USA, 2014.

Web Resources



Coordination Chemistry–Swayam



Coordination Chemistry–Introduction

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
VI	21UCH63ES03A	DSE-3: INORGANIC CHEMISTRY-II					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	2	2	2	3	2	2	2	2.2
CO-2	2	3	1	3	2	2	3	1	3	2	2.2
CO-3	3	2	1	2	2	3	2	1	2	2	2.0
CO-4	3	2	2	2	3	3	2	2	2	3	2.4
CO-5	2	2	2	2	2	2	2	2	2	2	2.0
Mean overall Score											2.16 (Medium)

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63ES03B	DSE-3: INORGANIC CHEMISTRY-III	5	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of the course, the graduates will be able to	
CO-1	identify the chromatographic method by which separation or purification of materials are done.	K1
CO-2	predict the reactivities of complexes and compare the different pathways they follow when they react.	K2
CO-3	predict the role of different metal ions in biological systems.	K2
CO-4	use the chromatographic methods to test extent to which the various segments of the current environment are polluted.	K3
CO-5	explain and interpret the functioning of living systems and may pursue higher studies/research in related subjects.	K4 & K5

Unit-I Reaction Mechanism in Coordination Complexes (15 Hours)

Ligand substitution reactions – rates of ligand substitutions – labile and inert complexes – classification of mechanisms – association, dissociation and interchange.

Ligand substitution in square planar complexes – the nucleophilicity of the entering group – the shape of the transition state – the trans effect – stereochemistry of substitution – pressure and temperature dependence of the substitution.

Ligand substitution in octahedral complexes – rate laws and their interpretation – the Eigen-Wilkins mechanism – the Fuoss-Eigen equation – activation of octahedral complexes – leaving group effects – the effects of spectator ligands – steric effects – activation energetics – associative activation – base hydrolysis – redox reactions – the inner sphere and outer sphere mechanisms

Unit-II Organometallic Chemistry (15 Hours)

Stable electron configurations – 18 electron compounds – 16 electron square planar compounds – electron count preference – electron counting and oxidation states – neutral ligand method – donor-pair method.

Nomenclature of organometallic compounds with special reference to hapticity.

Types of ligands – CO, phosphines, hydrides, dinitrogen, alkyl, alkenyl, alkynyl and aryl ligands, alkene and alkyne ligands, benzene and arene, cyclopentadiene.

Unit-III Bio-inorganic Chemistry (15 Hours)

Metal ion in biology and their vital role in the active site – structure and functions of metallo proteins and enzymes. ion transport mechanism in cell membrane – Na and K pumps – ionophores – structures and characteristic features of haemoglobin and myoglobin – Vitamin B₁₂ – blue copper proteins.

Unit-IV Column and Thin-layer Chromatography (15 Hours)

Introduction – Types of liquid chromatography – Equipment for HPLC – Derivatization – Quantitative analysis – Thin-layer chromatography – High performance thin-layer

chromatography (HPTLC) –Determination of aspirin, phenacetin and caffeine in a mixture – Thin–layer chromatography – The recovery of separated substances by elution techniques.

Unit–V Gas Chromatography

(15 Hours)

Introduction –apparatus –programmed–temperature gas chromatography – quantitative analysis by GLC – elemental analysis using gas chromatography – determination of aluminium by gas chromatographic analysis of its tris(acetylacetonato) complex – analysis of a mixture using the internal normalization method – determination of sucrose as its trimethylsilyl derivative using GLC.

Books for Study

1. Weller M, Overton T, Rourke J and Armstrong F, *Inorganic Chemistry*, 7th Edition, Oxford University Press, Oxford, UK, 2018.

Unit–I Chapter 21

Unit–II Chapter 22

Unit–III Chapter 26

2. Jeffery G H, Bassett J, Mendham J and Denney R C, *Vogel's Textbook of Quantitative Chemical Analysis*, 5th Edition., Longman Scientific and Technical, Essex, England, 1989.

Unit–IV Chapter 8

Unit–V Chapter 9

Books for Reference

1. Miessler G L, Fischer P J and Tarr D A, *Inorganic Chemistry*, 5th Edition, Pearson Education, New York, 2014.
2. Housecroft C E and Sharpe A G, *Inorganic Chemistry*, 4th Edition, Pearson Education, New York, 2012.
3. Cotton F A, Wilkinson G and Gauss P L, *Basic Inorganic Chemistry*, 3rd Edition, John– Wiley and Sons. Inc., New York, 1995.
4. Skoog D A, West D M, Holler F J, and Crouch S R, *Fundamentals of Analytical Chemistry*, 9th Edition, Brooks/Cole Cengage Learning, Belmont, CA 94002–3098, USA, 2014.

Web Resources



Coordination Chemistry–Swayam



Coordination Chemistry–Introduction

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
VI	21UCH63ES03B	DSE-3: INORGANIC CHEMISTRY III					5	3			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO-1	2	3	2	2	2	2	3	2	2	2	2.2
CO-2	2	3	1	3	2	2	3	1	3	2	2.2
CO-3	3	2	1	2	2	3	2	1	2	2	2.0
CO-4	3	2	2	2	3	3	2	2	2	3	2.4
CO-5	2	2	2	2	2	2	2	2	2	2	2.0
Mean overall Score											2.16 (Medium)

Semester	Course Code	Course Title	Hours	Credits
VI	21UCH63ES04A	DSE- 4: PHYSICAL CHEMISTRY-III	5	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO-1	describe the kinetics of photochemical reactions	K1
CO-2	understand the theories of reaction rate	K2
CO-3	applying the concept of surface chemistry, distinguish unimolecular and bimolecular surface reactions.	K3
CO-4	analyze the symmetry of the molecules using group theory	K4
CO-5	explain and illustrate the rate and order of the reactions.	K4 & K5

Unit –I Chemical Kinetics I

(15 Hours)

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – factors influencing the rate of a reaction – derivations of rate constants for zero, first and second order reactions – fractional order reactions – half-life period – pseudo first order reactions and examples – methods of determination of order of a reaction (integration, graphical, half-life, Ostwald's dilution method and experimental).

Unit –II Chemical Kinetics II

(15 Hours)

Steady state approximation – chain reactions and explosion reaction – temperature dependence of reaction rates – Arrhenius parameters – theories of reaction rates – simple collision theory – limitations – Lindmann's hypothesis of unimolecular reactions – theory of absolute reaction rates – influence of ionic strength on reaction rate – types of complex reactions – reversible or opposing, consecutive and parallel reaction.

Unit– III Adsorption and Catalysis

(15 Hours)

Homogeneous and heterogeneous catalysis – acid–base catalysis, inversion of cane sugar–enzyme catalysis – Michaelis–Menten equation – adsorption – heat of adsorption – factors influencing adsorption – physical adsorption and chemical adsorption – adsorption of gas by solids –Langmuir theory of adsorption – unimolecular surface reaction – bimolecular surface reaction – Freundlich adsorption isotherm – Gibbs adsorption isotherm for adsorption of solutions.

UNIT –IV Kinetics of Photochemical Reactions

(15 Hours)

Thermal chain reactions – H_2-Br_2 reaction – dissociation of acetaldehyde – comparison of thermal and photochemical chain reactions. photochemical reaction – laws of photochemistry – quantum yield –primary and secondary process – HI decomposition – HBr decomposition – kinetics of hydrogen– bromine reaction – kinetics of hydrogen – chlorine reaction – photochemical equilibrium– photo dimerization of anthracene – photosensitizations – chemiluminescence –phosphorescence.

Unit–V Group Theory**(15 Hours)**

Symmetry operations and symmetry elements –the symmetry classification of molecules – groups –consequences of symmetry – polarity – chirality – symmetry operations – matrix representations –construction of character table.

Books for Study

1. Rajaram J and Kuriacose J C, *Kinetics and Mechanism of Chemical Transformation*, 1st Edition, Macmillan India Ltd., New Delhi, 1993.
Unit–I – IV Chapter 2,4,5,6,9,10 and11
2. Laidler K J, *Chemical Kinetics*, 3rd Edition, Pearson Publication, Chennai, 1987.
Unit–I – IV Chapter 1, 2, 4,5,7,8 and 10
3. Cotton F A, *Chemical Applications of Group Theory*, 3rd Edition, John Wiley and Sons, New York, 1990.
Unit–V Chapter 2 and 3

Books for Reference

1. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, New Delhi, 2004.
2. Bhattacharya P K, *Group Theory and its Chemical Applications*, Himalaya Publishing House, New Delhi, 1986.
3. Sharma K K and Sharma L K, *A Textbook of Physical Chemistry*, 5th Edition, Vikas Publishing House, New Delhi, 2012.
4. Atkins P, Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press Great Britain, 2014.

Web Resources

Symmetry elements and operations



Photochemistry

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
VI	21UCH63ES04A	DSE-4: PHYSICAL CHEMISTRY- III									5	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	1	3	3	2	2	1	1	2	3	1.9	
CO-2	2	1	1	3	1	2	1	3	1	3	1.8	
CO-3	2	2	2	3	2	2	2	2	1	1	1.9	
CO-4	1	3	1	2	3	2	2	3	3	1	2.1	
CO-5	1	1	2	3	1	2	3	2	3	3	2.1	
Mean overall Score											1.96 (Medium)	

Semester	Course Code	Course Title	Hours	Credits
VI	21UCH63ES04B	DSE-4: PHYSICAL CHEMISTRY - IV	5	3

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students should be able to	
CO-1	define rate, order and molecularity of reactions.	K1
CO-2	understand the basics of statistical thermodynamics	K2
CO-3	distinguish unimolecular and bimolecular surface reactions.	K2
CO-4	apply the concepts of thermo chemistry	K3
CO-5	understand the theories of reaction rate	K4

Unit – I Chemical Kinetics I

(15 Hours)

Rate of reaction – rate laws – rate constant – order and molecularity of reactions – factors influencing the rate of a reaction – derivations of rate constants for zero, first and second order reactions – fractional order reactions – half-life period – pseudo first order reactions and examples – methods of determination of order of a reaction (integration, graphical, half-life, Ostwald's dilution method and experimental).

Unit – II Chemical Kinetics II

(15 Hours)

Steady state approximation – chain reactions and explosion reaction – temperature dependence of reaction rates – Arrhenius parameters – theories of reaction rates – simple collision theory – limitations – Lindmann's hypothesis of unimolecular reactions – theory of absolute reaction rates – influence of ionic strength on reaction rate.

Unit – III Adsorption and Catalysis

(15 Hours)

Homogeneous and heterogeneous catalysis – acid-base catalysis, inversion of cane sugar – enzyme catalysis – Michaelis-Menten equation – adsorption – heat of adsorption – factors influencing adsorption – physical adsorption and chemical adsorption – adsorption of gas by solids – Langmuir theory of adsorption – unimolecular surface reaction – bimolecular surface reaction – Freundlich adsorption isotherm – Gibbs adsorption isotherm for adsorption of solutions.

Unit – IV Thermochemistry

(15 Hours)

Change of internal energy and enthalpy in chemical reactions – exothermic and endothermic reactions – relation between enthalpy of a reaction at constant volume and constant pressure – standard enthalpies of reactions, combustion, neutralization, solution, formation – determination of enthalpies of reactions – Kirchhoff equation – Hess's law – bomb calorimeter – bond energy and its applications.

Unit – V Statistical Thermodynamics

(15 Hours)

Permutation and combination – combinatory rule – probability theorems – micro and macrostates – phase space – thermodynamic probability – statistical equilibrium – Maxwell – Boltzmann statistics and its derivation – relation between entropy and probability.

Books for Study

1. Rajaram J and Kuriacose J C, *Kinetics and Mechanism of Chemical Transformation*, 1st Edition, Macmillan India Ltd., New Delhi, 1993.
Unit-I – IV Chapter 2,4,5,6,9,10 and 11
2. Laidler K J, *Chemical Kinetics*, 3rd Edition, Pearson Publication, Chennai, 1987.
Unit-I – IV Chapter 1, 2, 4,5,7,8 and 10
3. Cotton F A, *Chemical Applications of Group Theory*, 3rd Edition, John Wiley and Sons, New York, 1990.
Unit-V Chapter 2 and 3

Books for Reference

1. Castellan G W, *Physical Chemistry*, 4th Edition, Narosa, New Delhi, 2004.
2. Bhattacharya P K, *Group Theory and its Chemical Applications*, Himalaya Publishing House, New Delhi, 1986.
3. Sharma K K and Sharma L K, *A Textbook of Physical Chemistry*, 5th Edition, Vikas Publishing House, New Delhi, 2012.
4. Atkins P, Julio de Paula, *Physical Chemistry*, 10th Edition, Oxford University Press Great Britain, 2014.

Web Resources



Symmetry elements and operations



Photochemistry

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
VI	21UCH63ES04B	DSE –4: PHYSICAL CHEMISTRY -IV									5	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	1	1	2	3	1	2	3	2	3	3	2.1	
CO-2	1	3	1	2	3	2	2	3	3	1	2.1	
CO-3	2	2	2	3	2	2	2	2	1	1	1.9	
CO-4	1	1	3	3	2	2	1	1	2	3	1.9	
CO-5	2	1	1	3	1	2	1	3	1	3	1.8	
Mean overall Score											1.96 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH63CE01	COMPREHENSIVE EXAMINATIONS	–	2

CO No.	CO–Statements	Cognitive Level (K–Level)
	On successful completion of this course, students will be able to	
CO–1	recognize appropriate reaction mechanisms for the selective organic reactions	K1
CO–2	summarize the properties of elements and fundamentals of nuclear chemistry	K2
CO–3	identify the reactivity of organic molecules by electronic effects	K3
CO–4	simplify the basics of physical chemistry	K4
CO–5	evaluate various concepts of physical chemistry to minimize environmental problems	K5

Unit I Periodic Properties and Nuclear Chemistry

Periodic properties: Mendeleev’s periodic classification – modern periodic table – grouping of elements in to s, p, d and f blocks – periodic properties and their variations– ionization energy – factors influencing the IE – electron affinity – electronegativity, chemistry of s, p, d and f block elements.

Nuclear Chemistry: Isotopes, isobars and isotones – determination of nuclear masses by J J Thomson’s method– theory of radioactivity – radioactive series – radioactive isotopes – mass defect– binding energy– fusion and fission reactions – plutonium and hydrogen bombs – applications of radioactivity.

Unit – II Electronic Effects

Electronic Effects: inductive effect, mesomeric effect, electromeric effect, resonance effect, hyperconjugative effect – isomerism in organic molecules – structural and stereoisomerism with appropriate examples.

Unit III Concepts in Physical Chemistry

Gaseous State: Kinetic theory of gases – molecular velocities – root mean square, average and most probable velocities – Maxwell law for distribution of molecular speed – collision number – mean free path – fundamental gas laws – universal gas equation – the gas constant (R) and its units in different forms – deviation from ideal behaviour – van Der Waals equation for real gases – critical phenomenon – PV isotherm for real gases – critical temperature – critical volume.

Chemical Thermodynamics: Three laws in chemical thermodynamics and fundamentals of statistical thermodynamics.

Chemical Kinetics: Zero, first, second and third order reactions with examples–molecularity– derivation of rate law and half–life period.

Unit – IV Essentials of Physical Chemistry

	2.22 (High)
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Mean overall Score

2.22
(High)

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH64SE04A	SEC- 4 (WS): TRENDS IN CHEMISTRY	2	1

CO No.	CO-Statements	Cognitive Levels (K-Level)
	On successful completion of this course, students will be able to	
CO-1	recall the concepts of acids and bases, pH scale, pKa values and buffer solutions	K1
CO-2	understand the physics and chemistry of materials	K1
CO-3	discuss the design of drugs and their importance in biomedical fields	K2
CO-4	examine the applications of smart materials in various fields	K3
CO-5	Identify and evaluate the chromatographic techniques and their applications in various fields	K4 & K5

Unit – I Organic Acids, Bases and Solvents (6 Hours)

pKa and pH – carboxylic acids– alcohols– phenols – amines – approximate pKa values – effect of structure on pKa – electronegativity – inductive effect – resonance effect – effect of pH on structure – buffer solutions – Lewis acids and bases – polarity of solvents – solvent index.

Unit – II Isolation and Purification Techniques (6 Hours)

General considerations – filtration – recrystallization – sublimation – solvent extraction – drying of liquids or solution – distillation at atmospheric pressure – steam distillation – vacuum distillation – chromatography – TLC, column, GC and HPLC techniques.

Unit – III Discovery and Design of Drugs (6 Hours)

Naming of drugs – proprietary and generic names – lead compounds – molecular modifications – random screening – serendipity in drug discovery – receptors – drugs as enzyme inhibitors – drug resistance – therapeutic index – QSAR: Quantitative Structure Activity Relationship – molecular modeling – combinatorial organic synthesis – antiviral drugs – economics of drugs.

Unit – IV Material Science (6 Hours)

Conductors – insulators – semi-conductors – superconductors – capacitors – super-capacitors – organic conductors – optical materials – NLO – theory and processing – chemical and biosensors.

Unit – V Smart Materials (6 Hours)

Types of smart materials – piezoelectric and electrostrictive materials – magnetostrictive materials – electrorheological and magnetorheological effects – shape memory alloys – photochromosim – intelligent gels.

Books for Study

1. Bruice P Y, *Organic Chemistry*, 8th edition, Pearson Ltd, University of California, Santa Barbara, 2011.

Unit-I Chapter 1

Unit-III Chapter 30

2. Vogel A I, *Text book of Quantitative Chemical Analysis*, 6th Edition, Pearson Education Limited, London, 2008.

Unit-II Chapter 10 and 13

3. Lee J D, *Concise Inorganic Chemistry*, 5th Edition, Blackwell Science Ltd, Oxford, London, 1996.

Unit–IV Chapter 3

4. Newton D E, *Chemistry of New Materials*, Facts on File, Inc, New York.

Unit–V Chapter 5

Books for References

1. Furniss B S, Hannaford A J, Smith P W G and Tatchell A R, *Vogel's Textbook of Practical Organic Chemistry*, 5th Edition, Longman Scientific and Technical, Essex, England, 1989.
2. Rajendran V and Kani M, *Material Sciences*, 11th reprint, TATA McGraw Hill, New Delhi, 2010.
3. Ghosh J, *A Text Book of Pharmaceutical Chemistry*, Tata McGraw Hill publishing, New Delhi, 1993.

Web Resources



Purification of Organic Compounds



Gas chromatography



Super Capacitors

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
VI	21UCH64SE04A	SEC – 4 (WS): TRENDS IN CHEMISTRY									2	1
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	2	2	3	2	2	2	2	2.2	
CO-2	2	2	2	2	3	2	2	2	2	3	2.2	
CO-3	2	2	3	2	2	2	2	3	2	2	2.2	
CO-4	1	2	2	3	2	1	2	2	3	2	2.0	
CO-5	1	2	2	3	2	1	2	2	3	2	2.0	
Mean overall Score											2.12 (Medium)	

Semester	Course Code	Title of the Course	Hours	Credits
VI	21UCH64SE04B	SEC – (WS): ADVANCES IN CHEMISTRY	2	1

CO No.	CO-Statements	Cognitive Levels (K – level)
	On successful completion of this course, students will be able to	
CO-1	write the different sources of high energy radiations and explain the methods to detect radiations	K1 & K2
CO-2	list the twelve principles of green chemistry and categorize the microwave and sonication reactions	K1 & K4
CO-3	predict the different types of polymers and examine the processes in rubber industries	K2 & K4
CO-4	understand the concepts of stereochemistry and identify the configurational nomenclature	K2 & K4
CO-5	develop the preparation methods and determine the synthetic applications of active methylene compounds and α,β -unsaturated carbonyl compounds	K3 & K5

Unit-I Stereochemistry (6 Hours)

Stereoisomerism – types – geometrical isomerism – *cis-trans* and *Z* and *E* isomers – optical isomerism – chirality – optical activity – measurement of optical activity – polarimeter – concept of enantiomerism, diastereomerism – configurational nomenclature – *D-L*, *R-S*, erythro and threo conventions – meso and *d,l*- forms of tartaric acid – concepts of racemization and resolution.

Unit-II Active Methylene Compounds and α,β -unsaturated Carbonyl Compounds (6 Hours)

Malonic ester – synthetic applications – ethyl acetoacetate – preparation and synthetic applications – unsaturated carbonyl compounds – structure and properties – preparation – electrophilic and nucleophilic additions – Michael addition – Diels Alder reaction – quinones.

Unit-III Green Chemistry (6 Hours)

Emergence – twelve principles – planning of green synthesis – examples of green reactions from condensation, oxidation, reduction, rearrangement and addition reactions – microwave and sonication reactions.

Unit-IV Polymers (6 Hours)

Polymers – free radical vinyl polymers – ionic polymers – step-reaction polymers – copolymers – types of copolymers – stereochemistry of vinyl polymers – Ziegler-Natta catalyst – natural rubber – vulcanization – applications of polymers – processes in rubber industries – dendrimers – divergent and convergent synthesis – types of dendrimers – metallodendrimers – applications of dendrimers – fibres – elastomers – plastics.

Unit-V Radiation Chemistry (6 Hours)

Sources of high energy radiations – interaction of high energy radiations with matter – detection of radiations – dosimeters – primary and secondary processes – radiolysis of water – hydrated electron – G value.

Books for Study

- Morrison R T and Boyd R N, *Organic Chemistry*, 7th Edition, Allyn and Bacon Ltd., New York, 2011.
Unit–I Chapter 4 **Unit–II Chapter 27**
- Anastas P T, *Text Book on Green Chemistry*, Oxford University Press, United Kingdom, 2006.
Unit–III Chapter 1
- Huges G, *Radiation Chemistry*, Oxford series, United Kingdom, 1973.
Unit–V Chapter 2

Books for Reference

- Pine S H, *Organic Chemistry*, 4th Edition, McGraw–Hill International Book Company, New Delhi, 1986.
- Finar I L, *Organic Chemistry*, 6th Edition, Addison Wesley Longman Ltd., England, 1996.
- Ahluwalia V K, *Green Chemistry*, Ane books Ltd, Chennai, 2009.

Web Resources



Stereochemistry



Green Chemistry

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course					Hours	Credits			
VI	21UCH64SE04B	SEC –4 (WS): ADVANCES IN CHEMISTRY					2	1			
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5	
CO–1	3	3	2	1	2	2	2	3	2	1	2.1
CO–2	3	2	2	3	3	2	3	2	2	3	2.5
CO–3	2	1	2	3	2	3	1	2	3	2	2.1
CO–4	3	1	2	2	3	3	2	1	3	2	2.2
CO–5	2	2	1	3	2	2	1	2	3	2	2.0
Mean overall Score											2.2 (High)

Books for Reference

1. Alex Ramani V, *Food Chemistry*, MJP Publishers, Triplicane, Chennai, 2009.
2. Fennema O R, *Food Chemistry*, Marcel Dekker, Inc., New York, 1996.
3. Gopalan C, Rama Sastri B V, and Balasubramaniam S C, *Nutritive Value of Indian Foods*, National Institute of Nutrition, ICMR, Hyderabad, 1989.
4. Meyer L H, *Food Chemistry*, Reinhold Publications, Corporation, New York, 1976.

Web Resource



Food processing



Tests for Food Adulterants



Food Chemistry-Intro

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
VI	21UCH64EG02A	GENERIC ELECTIVE -2: FOOD AND NUTRITION									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of COs	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	3	1	2	1	2	2	3	2	1	2.0	
CO-2	2	2	3	2	2	3	2	2	3	2	2.3	
CO-3	2	2	1	3	2	2	1	2	3	2	2	
CO-4	3	2	2	3	2	2	3	2	2	3	2.4	
CO-5	2	1	2	3	2	3	3	2	1	2	2.1	
Mean overall Score											2.16 (Medium)	

Semester	Course code	Title of the course	Hours	Credits
VI	21UCH64EG02B	GE -2: WASTE MANAGEMENT	4	3

CO No.	CO-Statements	Cognitive levels (K-Level)
	On successful completion of the course, students will be able to	
CO -1	apply the knowledge of solid waste into useful	K1
CO -2	increase the consumer awareness of waste minimization issues	K1
CO -3	understand the protection of the environment through effective waste management measures	K2
CO -4	design and manufacture of products that avoid or minimize waste generation	K3
CO -5	analysis and recommend the people about the protection of health and wellbeing of people by providing an affordable waste collection service	K4 & K5

Unit – I Introduction to Environment (12 Hours)

Ecosystem –meaning– types –components– structure – functions, levels of organization in nature– food chain and trophic structure, biogeochemical cycles, energy flow.

Unit – II Municipal solid waste (12 Hours)

Definition – sources and types of solid waste– composition and its determinants of solid waste– factors influencing of municipal solid waste – generation–methods of sampling and characterization.

Unit – III Collection and Transfer (12 Hours)

Collection of solid waste – collection system, equipments – labour requirement – factors affecting collection–need for transfer operation – transfer stations – types – transport means and methods – location of transport stations – manpower requirement.

Unit – IV Processing Techniques and Recovery of Energy (12 Hours)

Processing techniques – purposes mechanical volume reduction – chemical volume reduction – components separation – methods – drying and dewatering–recovery of resources, conversion products and energy recovery– incineration with heat recovery.

Unit – V Disposal of Solid Wastes (12 Hours)

Disposal of municipal and bio-wastes– various methods – principal features of an incinerator – site selection and plant layout of an incinerator – sanitary landfill– methods of operation – advantages and disadvantages of sanitary land fill.

Books for Study

1. John Pichtel *Waste Management Practices* CRC Press, Taylor and Francis Group 2005.
Unit– 1 Chapter 1 Unit – II Chapter 4
2. LaGrega, M.D. Buckingham, P.L. and Evans, J.C. *Hazardous Waste Management*, McGraw Hill International Editions, New York, 1994.
Unit– III Chapter 2

3. Richard J. Watts, *Hazardous Wastes – Sources, Pathways, Receptors*, John Wiley and Sons, New York, 1997.

Unit– IV Chapter – 2.3 and 2.5

Unit– V Chapter – 7.1,7.2, 7.5

Book for Reference

1. George Tchobanoglous, *Integrated Solid Waste Management, 2nd Edition*, McGraw – Hill, New York, 1993.
2. Tchobanoglous Thiesen Ellasen, *Solid Waste Engineering Principles and Management*, McGraw – Hill, New York, 1997.
3. *Manual on Municipal Solid Waste Management*, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.

Web Resource:



Solid Waste Management

Environment

Solid & Hazardous waste Management

Relationship matrix for Course outcomes, Programme outcomes and Programme Specific Outcomes

Semester	Course code	Title of the Course									Hours	Credits
VI	21UCH64EG02B	GE-2: WASTE MANAGEMENT									4	3
Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)					Mean Score of Cos	
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	PSO5		
CO-1	3	2	2	3	2	2	3	2	2	3	2.4	
CO-2	3	3	1	2	1	2	2	3	2	1	2.0	
CO-3	2	1	3	2	2	3	2	1	3	2	2.1	
CO-4	2	1	2	3	2	3	3	2	1	2	2.1	
CO-5	2	2	1	3	2	2	1	2	3	2	2.0	
Mean overall Score											2.28 (High)	