

**FACULTY OF HUMANITIES, SCIENCES & MANAGEMENT
DEPARTMENT OF CHEMISTRY**

Periyar Nagar, Vallam, Thanjavur-613403, Tamilnadu

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**PERIYAR
MANIAMMAI**
INSTITUTE OF SCIENCE & TECHNOLOGY
(Deemed to be University)
Established Under Sec. 3 of UGC Act, 1956 • NAAC Accredited
think • innovate • transform

FACULTY OF HUMANITIES, SCIENCES & MANAGEMENT

DEPARTMENT OF CHEMISTRY

**CURRICULUM & SYLLABUS
(I-VI SEMESTER)**

**B.Sc. CHEMISTRY
(FULL TIME-3 Years)**

**REGULATION 2022
PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY**

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CURRICULUM & SYLLABUS

(I to VI SEMESTER)

FOR

B.Sc. CHEMISTRY

FULL TIME - 3 Years

**PERIYAR MANIAMMAI INSTITUTE OF
SCIENCE & TECHNOLOGY**

CURRICULUM AND SYLLABUS

FOR

BACHELOR OF SCIENCE

B.Sc. (Chemistry) – (THREE YEARS - FULL TIME)

REGULATION 2022

(Applicable to the students admitted from the academic year 2022-2023 onwards)

**PERIYAR MANIAMMAI INSTITUTE OF SCIENCE &
TECHNOLOGY**

VISION

To be a institution of global dynamism with excellence in knowledge and innovation ensuring social responsibility for creating an egalitarian society.

MISSION

- **UM1:** Offering well balanced programmes with scholarly faculty and state – of – art facilities to impart high level of knowledge.
- **UM2:** Providing student – centered education and foster their growth in critical thinking, creativity, entrepreneurship, problem solving and collaborative work.
- **UM3:** Involving progressive and meaningful research with concern for sustainable development.
- **UM4:** Enabling the students to acquire the skills for global competencies.
- **UM5:** Inculcating Universal values, Self-respect, Gender equality, Dignity and Ethics

DEPARTMENT OF CHEMISTRY

VISION

To prepare the students with basic scientific knowledge in Chemistry for technological development and to provide resources for industry and society through education and research to achieve environmental protection, energy generation and drug development.

MISSION

- **DM1.** To provide in-depth knowledge in Chemistry to impart technology.
- **DM2.** To create new idea to improve the technology by offering Doctoral programme.
- **DM3.** To undertake project in thrust areas with societal requirements.
- **DM4.** To develop novel method for clean technology, Bio energy and drug development.

Programme Educational Objectives (PEOs)

PEO1	Proficient in applying a broad understanding of the basic principles of chemistry to the solution of chemical problems
PEO2	Able to become a highly professional teacher/professor or renowned scientist
PEO3	Able to plan, coordinate, communicate, organize, make decision and lead a team to solve problems and develop application using chemistry.
PEO4	Professional, ethical, responsible and will contribute to society through active management.

Mapping of Department Mission with University Mission:

	DM1	DM2	DM3	DM4	Total
UM1	3	3	2	1	9
UM2	3	2	3	1	9
UM3	2	2	3	3	10
UM4	3	2	3	2	10
UM5	2	2	3	3	10

3–High Relation, 2–Medium Relation, 1–Low Relation, 0–No Relation

**CURRICULUM AND SYLLABUS FOR B.Sc. (CHEMISTRY) –
BACHELOR OF SCIENCE (THREE YEAR - FULL TIME) REGULATION - 2022**
(Applicable to the students admitted from the academic year 2022-2023 onwards)

SEMESTER I								
Type	Course Code	Course Name	L	T	P	SS	H	C
Language Part – I	XGL101	Tamil – I	2	1	0	0	3	3
English	XGE102	English – I	2	1	0	0	3	3
Core-1	XCY103	General Chemistry I	3	1	0	0	4	4
Core-2	XCY104	Inorganic Chemistry I	3	1	0	0	4	4
Core-3	XCY105	Volumetric Analysis, Practical -I	0	0	4	0	4	2
I Allied-1	XMG106	Algebra, Trigonometry and Transform	4	1	0	0	4	5
(VBE)UMAN1	XUM001	Human Ethics ,Values, Rights and Gender Equality	1	0	0	1	2	1
Total			14	5	4	1	24	22

SEMESTER II								
Type	Course Code	Course Name	L	T	P	SS	H	C
Part – I	XGL201	Tamil – II	2	1	0	0	3	3
English	XGE202	English – II	2	1	0	0	3	3
Core-4	XCY203	General Chemistry II	3	1	0	0	4	4
Core-5	XCY204	Physical Chemistry I	3	1	0	0	4	4
Core-6	XCY205	Volumetric Analysis Practical- II	0	0	4	0	4	2
II Allied-1	XMG206	Calculus and Differential Equations	4	1	0	0	4	5
(ES)UMAN2	XUM002	Environmental Studies	1	0	0	1	2	1
Core -7		Field visit	0	0	0	0	0	2
Total			14	5	4	1	24	24

SEMESTER III								
Type	Course Code	Course Name	L	T	P	SS	H	C
Core -8	XCY301	Organic Chemistry I	3	1	0	0	4	4
Core -9	XCY302	Inorganic Chemistry II	3	1	0	0	4	4
Core -10	XCY303	Semi Micro Inorganic Qualitative Analysis Practical III	0	0	4	0	4	2
III Allied -1	XPH304	Fundamental Physics	3	1	0	0	4	4
III Allied -2	XPH305	Fundamental Physics Practical	0	0	4	0	4	2
GS(UMAN3)	XUM003	Disaster Management	1	0	0	0	1	1
GE	OE-1	Open Elective- I	3	0	0	0	3	3
SBE -I	XCY307	Water Quality Analysis	2	0	0	0	2	2
Total			15	3	8	0	26	22

SEMESTER IV								
Type	Course Code	Course Name	L	T	P	SS	H	C
Core - 11	XCY401	Physical Chemistry II	3	1	0	0	4	4
Core - 12	XCY402	Organic Chemistry II	3	1	0	0	4	4
Core - 13	XCY403	Gravimetric Estimation Practical IV	0	0	3	0	3	2
IV Allied -1	XPH404	Modern Physics	3	1	0	0	4	4
IVAllied-2	XPH405	Modern Physics Practical	0	0	3	0	3	2
UVM(UMAN4)	XUM004	Introduction to Entrepreneurship Development	1	0	0	1	2	1
SBE – II	XCY407	Pharmaceutical Chemistry	2	0	0	0	2	2
GE	OE-2	Open Elective- II	3	0	0	0	3	3
Total			16	3	6	0	25	22

SEMESTER V								
Type	Course Code	Course Name	L	T	P	SS	H	C
Core -14	XCY501	Organic Qualitative Analysis Practical	0	0	4	0	4	2
Core-15	XCY502	Physical Chemistry Practical VB	0	0	4	0	4	2
Major Elective-I	XCY503A	Phyto Chemistry	3	1	0	0	4	4
	XCY503B	Forensic Science						
Major Elective - II	XCY504A	Analytical Chemistry	3	1	0	0	4	4
	XCY504B	Agricultural Chemistry						
NME	XCY505A	Computer Applications in Chemistry	3	1	0	0	4	4
	XCY505B	Programming in C						
GE	OE-3	Open Elective- III	3	0	0	0	3	3
SBE - III	XCY506	Clinical Chemistry	2	0	0		2	2
Core-16	XCY507	IPT (21 Days)	0	0	0	0	0	4
Total			14	3	8	1	25	25

SEMESTER VI								
Type	Course Code	Course Name	L	T	P	SS	H	C
Core -17	XCY601	Organic Qualitative Analysis Practical VI	0	0	4	0	4	2
Core -18	XCY602	Physical Chemistry Practical VIA	0	0	4	0	4	2
Major Elective-III	XCY603A	Industrial Chemistry	3	1	0	0	4	4
	XCY603B	Material Chemistry						
Major Elective-IV	XCY604A	Food Chemistry	3	1	0	0	4	4
	XCY604B	Polymer Chemistry						
SBE-IV	XCY605	Renewable Energy	2	0	0	0	2	2
UMAN5	XUM005	Cyber Security	1	0	0	1	2	1
Core-19	XCY607	Project					7	6
EA		Extension Activities (NSS,NCC,NSO,RRC and Swatch Bharath)	0	0	0	0	0	3
Total			10	2	8	1	27	24

Value Added course will be offered during the programme.

L - Lecture T- Tutorial P – Practical C-Credit

Skill Based Subject-Area Title (offered by Dept. of Chemistry) Semester III – Semester VI Water Quality Analysis Pharmaceutical Chemistry Renewable Energy Clinical Chemistry	Non-Major Elective-Title (Computer Science) V Semester: Programming in C
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ABBREVIATIONS

ES: Environmental Studies	GE: Generic Elective
VBE: Value Based Education	NME: Non-Major Elective
SBE: Skill Based Elective	EA: Extension Activities
GS: Gender Studies	SS: Self Study
ME: Major Elective	MOOC: Massive Open Online Course

B.Sc. CHEMISTRY (2022 - 2023)

Parts	Total No. Of courses	Total Marks	Total Credits	Classification
Part – I (Tamil I and II)	02	200	6	√
Part – II(English I and II)	02	200	6	√
Part – III Core Theory Core Practical Field visit IPT Project Allied Major Elective(ME)	08 08 01 01 01 06 04 29	800 800 100 100 100 600 400 2900	32 16 02 04 06 22 16 98	√
Part – IV Value based education(UMAN1)(VBE) ES(Environmental Studies)(UMAN2) Gender studies(UMAN3) Cyber Security (UMAN4) Skill Based Elective(4) Non-Major Elective UVM(Entrepreneurship DevelopmentUVM1)Vocational mandatory	1 1 1 1 4 1 1	100 100 100 100 400 100 100	1 1 1 1 8 4 1	√

GE(Open elective)	3 ----- 13	300 ----- 1300	9 ----- 26	
Part – V	Extension Activity		3	√
Total	46	4600	139	√

Field Visit / Industrial Visit / Hands on Training Programme having minimum 15 hours of contact time is introduced for II-year UG students to gain experiential learning. Evaluation of the visit report will be held at the end of IV Semester.

Components of Evaluation

1. CIA Marks - 50

Evaluation Scheme

1. Formative (FA) Marks 50

2. Summative (SA) Marks 50

Total Marks 100

Project is introduced for III-year students to cater for the needs of students to excel in higher studies and research.

Non – Major Elective Course offered by the Department of Computer Science

Skill Based Elective offered by the Department.

SEMESTER I

Course Code	XGT 101	L	T	P	C
Course Name	தமிழ் - I	3	0	0	3
Prerequisite		L	T	P	H
C:P:A	3:0:0	3	0	0	3
COURSE OUTCOMES		DOMAIN		LEVEL	
After the completion of the course, students will be able to					
CO1	Recognize (அடையாளம் காணுதல்) பல்வேறு அறிஞர் பெருமக்களின் தொண்டுகளை தமிழ்மொழி மூலம் அறிந்து கொள்ளல்.	Cognitive		Remember	
CO2	Choose (தெரிவு செய்தல்) பன்முக பரிமாணங்களின் கவிதைகளை இலக்கியங்கள் மூலம் அறிந்து கொள்ளல்.	Cognitive		Remember	
CO3	Describe (விளக்குதல்) தமிழ் மகளிரின் உரையாடல் சிறப்பு செய்திகளை உணர்தல்.	Cognitive		Understand	
CO4	Apply (விளக்குதல்) பல்வேறு கலைத்துறைச் சார்ந்த பிரிவுகள், மண்ணின் பாடல்கள் குறித்து தெளிவு பெறல்.	Cognitive		Apply	
CO5	Analyze (பகுத்தல்) சிறுகதைகளின் தோற்றம் மற்றும் வளர்ச்சி நிலை நாடகங்கள் - கவிதை குறித்து தெளிவு பெறுதல்.	Cognitive		Analyze	
அலகு- 1	தமிழ் அறிஞர்களும் தமிழ்த்தொண்டும்				9
பாரதியார், பாரதிதாசன், நாமக்கல் கவிஞர், சி.இலக்குவனார், உ.வே.சாமிநாத அய்யர், தெ.பொ.மீனாட்சிசுந்தரம், கவிமணி தேசிய விநாயகம் பிள்ளை தொடர்பான செய்திகள், சிறந்த தொடர்கள், சிறப்பு பெயர்கள்.					
அலகு- 2	கவிதைகள் (மரபுக்கவிதை, புதுக்கவிதை)				9
மரபுக்கவிதை : முடியரசன், வாணிதாசன், சுரதா, கண்ணதாசன், உடுமலை நாராயண கவி, பட்டுக்கோட்டை கல்யாண சுந்தரம், மருதகாசி தொடர்பான செய்திகள்.					
புதுக்கவிதை : ந.பிச்சமூர்த்தி, சி.க.செல்லப்பா, மு.மேத்தா, ஈரோடு தமிழன்பன், அப்துல் ரகுமான், ஞானசுத்தன், ஆலந்தூர் மோகனரங்கன் தொடர்பான செய்திகள்.					
அலகு- 3	உரையாடல்கள், தமிழ் மகளிரின் சிறப்பு				9
ஜி.யு.போப் மற்றும் வீரமா முனிவரின் தமிழ்ப்பணி, பெரியார், அண்ணா, முத்துராமலிங்க தேவர், அம்பேத்கர், காமராசர், மா.பொ.சிவஞானம், காயிதேமில்லத் சமுதாயத் தொண்டு.					
அன்னிபெசண்ட் அம்மையார், மூவாலூர் ராமாமிர்தம்மாள், டாக்டர் முத்துலட்சுமி ரெட்டி, வேலு நாச்சியார், வள்ளியம்மை, ராணி மங்கம்மாள்					
அலகு- 4	நாட்டுப்புறப்பாடல்				9
தாலாட்டுப்பாடல், தொழில் பாடல், ஒப்பாரி பாடல்.					

அலகு- 5	இலக்கிய வரலாறு	9
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உரைநடை, சிறுகதை, நாடகம், கவிதைகள்.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	---	---	45

பாடநூல்கள்:

- முனைவர் கா.செல்வகுமார் (தொ.ஆ), பொதுத்தமிழ், மார்ச்-2022, துறைகோ பதிப்பகம், அரும்பாக்கம், சென்னை - 106. 9884159972.
- முனைவர். மு.அருணாசலம் (ப.ஆ) - தமிழ் இலக்கிய வரலாறு - 2012, அருண் பதிப்பகம், தரைத்தளம், பாலாஜி நகர், SBI காலனி, கண்டோன்மெண்ட், திருச்சி-1. 9894440530
- சு.சக்திவேல் - நாட்டுப்புற இயல் ஆய்வு, மணிவாசகர் பதிப்பகம் - 12, மேலசன்னதி வீதி, சிதம்பரம்-1.
- முனைவர் கோ.பெரியண்ணன் - அடிப்படை எளிய தமிழ் இலக்கணம் - 2003 - வனிதா பதிப்பகம், 11- நானா தெரு, பாண்டி பஜார், தி.நகர், சென்னை-17.

பார்வை நூல்கள்:

- முனைவர் ந.லெனின், தாலாட்டுப்பாடல், பிப்ரவரி-2015, பிருந்தா பதிப்பகம். தஞ்சாவூர்-5.
- கோ. வெங்கடாசலம் (தொ.ஆ)- 2005, தமிழ் இலக்கிய கைவிளக்கு, அன்னை சரஸ்வதி பதிப்பகம், குடியாத்தம்.
- முனைவர் இராஜா வரதராஜா - பயன்முறைத் தமிழ் - ஜூன் 2015, சிவகுரு பதிப்பகம். 7/40, கிழக்கு செட்டித்தெரு, பரங்கிமலை, சென்னை-16

UG: B.A.,B.Sc.,B.Com., BBA.,	PO							PSO	
	1	2	3	4	5	6	7	1	2
CO1		1							
CO2		1							
CO3		1					1		
CO4	1	2	2	1		1	2		
CO5	2	2	2	2		1	2		
Total	3	7	4	3		2	5		
Scaled Value	1	1	1	1			1		

1 - 5 -> 1 6 - 10 -> 2 11 - 15 -> 3

3-Strong Correlation, 2-Medium Correlation, 1-Low Correlation, 0-No Correlation

COURSE CODE		XGE102		L	T	P	SS	H	C
COURSE NAME		English - I		3	0	0	0	3	3
C:P:A - 3:0:0									
COURSE OUTCOMES:				Domain		Level			
CO1	Recall the basic grammar and using it in proper context			Cognitive		Remembering			
CO2	Explain the process of listening and speaking			Cognitive		Understanding			
CO3	Adapt important methods of reading			Cognitive		Creating			
CO4	Demonstrate the basic writing skills			Cognitive		Understanding			
SYLLABUS								HOURS	
UNIT I	Grammar								
i. Major basic grammatical categories ii. Notion of correctness and attitude to error correction								9	
UNIT II	Listening and Speaking								
iii. Importance of listening skills iv. Problems of listening to unfamiliar dialects v. Aspects of pronunciation and fluency in speaking vi. Intelligibility in speaking								9	
UNIT III	Basics of Reading								
vii. Introduction to reading skills viii. Introducing different types of texts – narrative, descriptive, extrapolative								9	
UNIT IV	Basics of Writing								
ix. Introduction to writing skills x. Aspects of cohesion and coherence xi. Expanding a given sentence without affecting the structure xii. Reorganizing jumbled sentences into a coherent paragraph xiii. Drafting different types of letters (personal notes, notices, complaints, appreciation, conveying sympathies etc.)								9	
Total Hours								36	
Text books									
1. Acevedo and Gower M (1999) Reading and Writing Skills. London, Longman 2. Deuter, M et.al. (2015). Oxford Advanced Learner’s Dictionary of English (Ninth Edition). New Delhi, OUP 3. Eastwood, John (2008). Oxford Practice Grammar. Oxford, OUP 4. Hadeffield, Chris and J Hadeffield (2008). Reading Games. London, Longman 5. Hedge, T (2005). Writing. Oxford, OUP 6. Jolly, David (1984). Writing Tasks: Stuidents’ Book. Cambridge, CUP 7. Klippel and Swan (1984). Keep Talking. Oxford, OUP 8. Saraswati, V (2005). Organized Writing 1. Hyderabad, Orient Blackswan 9. Swan, Michael. (1980). Practical English Usage. Oxford, OUP 10. Walter and Swan (1997). How English Works. Oxford, OUP									

COURSE CODE		XCY103		L	T	P	SS	C
COURSE NAME		GENERAL CHEMISTRY I		3	1	0	0	4
C: P: A		3.2:0:0.8		L	T	P	SS	H
				3	1	0	0	4
COURSE OUTCOMES:				Domain		Level		
CO1	Explain the classification and IUPAC nomenclature of organic compounds.			Cognitive		Understand		
CO2	Recall the types of hybridization and describe geometry of organic molecules and the influence of electronic effects in bonding.			Cognitive		Remember Understand		
CO3	Interpret the type of chemical bonding, hybridization and geometry of inorganic molecules.			Cognitive Affective		Apply Receiving		
CO4	Recognize the periodic properties of elements and describe various types of Quantum numbers.			Cognitive Affective		Remember Responding		
CO5	Identify and apply the various atomic models and concept of Quantum chemistry to analyze the chemical molecules.			Cognitive		Remember Apply		
UNIT - I CLASSIFICATION AND NOMENCLATURE								10+3
Classification of organic compounds - based on the nature of carbon skeleton and functional groups - classification of C and H atoms of organic compounds (primary/secondary/tertiary) - IUPAC system of nomenclature of common organic compounds (upto C-10) - alkanes, alkenes, alkynes, cycloalkanes, bicycloalkanes with and without bridges and aromatic compounds - Naming of organic compounds with one functional group - halogen compounds, alcohols, phenol, aldehydes, ketones, carboxylic acids and its derivatives, cyano compounds, amines, nitro compounds (Both aliphatic and aromatic) - Naming of compounds with two functional groups - naming of compounds with more than one carbon chain - Naming of heterocyclic compounds containing one and two hetero atoms present in five/six membered rings.								
UNIT - II BONDING IN ORGANIC MOLECULES								6+3
Hybridization and geometry - bond angle, bond length, bond strength of C-H and C-C bonds -Van der Waal's interactions, Inter & Intra molecular forces and their effects on physical properties - Electronic effects - inductive effect, resonance effect - drawing of resonance structures - conditions for resonance - stability of resonance structures, hyper conjugation, electromeric effect, steric effect - steric overcrowding - steric inhibition of resonance - steric relief (with examples). Dissociation of bonds - homolysis and heterolysis - radicals, carbocations, carbanions - electrophiles and nucleophiles - Influence of electronic effects - dipole moment - relative strengths of acids and bases - stability of olefins - stability of radicals, carbocations and carbanions.								
UNIT – III CHEMICAL BONDING								9+3
Ionic bond – Properties of ionic compounds, factors favoring the ionic compounds ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle – Pauling and Mulliken’s scales of electronegativity – Polarizing power and Polarizability – Partial ionic character from electronegativity. Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan’s rules – Covalent bond – structure and bonding of homo and heteronuclear molecules – Hydrogen bonding – Its nature, types, effect on properties – Intermolecular forces – London forces and van der Waals forces – ion dipole-dipole interactions. VSEPR Theory – Principles and hybridization- Shapes of simple inorganic molecules (BeCl2, BF3, SiCl4, PCl5, SF6, IF7,H2O, NH3, XeF6) – MO Theory –Bonding and anti-bonding orbitals – Applications of MO theory H2, He, N2, O2, HF and CO molecules – Comparison of VB and MO Theories.								

UNIT –IV PERIODIC PROPERTIES				10+3
Atomic orbitals - Quantum numbers- Principal, Azimuthal, Magnetic and Spin quantum numbers and their significance - principles governing the occupancy of electrons in various quantum levels- Pauli's exclusion principle – Hund's rule- Aufbau Principle, (n+1) rule Stability of half-filled and completely filled orbitals- inert pair effect. Periodic properties – classification of elements as s, p, d and f-block elements – variation of atomic volume – atomic and ionic radii – ionization potential – electron affinity and electro negativity along period and groups – variation of metallic characters - Factors affecting the periodic properties. Periodic table anomalies and variations in atomic radius, ionic radius, electronic configuration, , electron affinity and electro negativity, ionization energy and metallic character of elements along the group and periods and their influences on stability, colour, coordination number, geometry, physical and chemical properties.				
UNIT –V ATOMIC STRUCTURE				10+3
Planck's quantum theory - Photoelectric effect, Compton effect, Bohr's model of hydrogen atom (no derivation), Wave particle duality, de Broglie equation, Heisenberg uncertainty principle - Eigen function and Eigen value - Postulates of Quantum mechanics - Schrodinger's time independent wave equation (no derivation), wave functions and its physical properties -Normalization and Orthogonal function.				
LECTURE	TUTORIALS	PRACTICALS	SELF STUDY	TOTAL
45	15	0	0	60
TEXT BOOKS				
1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23 rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993). 2. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006). 3. Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23 rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993). 4. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co.Ltd. 5. Arun Bahl and B.S. Bahl, A Text Book of Organic Chemistry, 22 nd edn, S Chand & Company, 2016.				
REFERENCES				
Reference Books: 1. R. T. Morrison, R. N. Boyd and S.K. Bhattacharjee, Organic chemistry, 7 th edn, Pearson Education 2. Asia, 2010. 2. F. A. Carey and R. J. Sundberg, Advanced Organic Chemistry, Part A and B, 5 th edn, Springer Publishers, 2008. . 3. I. L. Finar, Organic Chemistry Vol-1 & 2, 6 th edn, Pearson Education Asia, 2004. 4. P. Y. Bruice, Organic Chemistry, Vol-1 & 2, 7 th edn, Pearson Education Asia, 2012. 5. J. Clayden, N. Greeves, S. Warren, Organic Chemistry, 2 nd edn, Oxford, 2012. 6. R. D. Madan, Modern Inorganic Chemistry, 3 rd edn, S. Chand & Company Ltd., Reprint 2014. 7. P.L. Soni, Text book of Inorganic Chemistry, 20 th edn, Sultan chand & Sons, 2000. 8. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23 rd edn, New Delhi, Shoban Lal Nagin Chand & Co., 1993. 9. Sp. Banerjee, Advanced Inorganic Chemistry 2 nd edn, Vol-1, Arunabha Sen, Books and Allied (P)				
E RESOURCES				
1. http://www.mooc-list.com/course/chemistry-minor-saylororg 2. https://www.canvas.net/courses/exploring-chemistry 3. http://freevideolectures.com/Course/3001/Chemistry-I 4. http://freevideolectures.com/Course/3167/Chemistry-II				

COURSE CODE		XCY104	L	T	P	SS	C
COURSE NAME		INORGANIC CHEMISTRY I	3	1	0	0	4
C: P: A		3:0:1	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES:			Domain		Level		
CO1	<i>Recall</i> and <i>explain</i> the chemistry of d & f- block elements and its complexes		Cognitive Psychomotor		Remember Understand Set		
CO2	<i>Summarize</i> and <i>report</i> the nomenclature and theories of coordination compounds.		Cognitive Affective		Understand Responding		
CO3	<i>Explain</i> the extraction and purification process of various metals and Interpret their physical and chemical properties.		Cognitive Affective		Understand Apply Responding		
CO4	<i>Describe</i> the concept of acids and bases and the application of various concepts.		Cognitive Psychomotor		Analysis Perception		
CO5	<i>Identify</i> the various radioactive process and their consequences		Cognitive		Remember		
UNIT - I d-BLOCK & f-BLOCK ELEMENTS						10+3	
Chemistry of d-block elements –General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states Important uses of transition metals and their alloys. oxides, mixed oxides, halides, and oxohalides of transition metals. General characteristics of f-block elements – comparative account of lanthanides and actinides – lanthanide series – separation by ion exchange and solvent extraction methods – lanthanide contraction – actinide series – separation of actinides – oxidation states and general properties							
UNIT - II COORDINATION CHEMISTRY I						6+3	
IUPAC nomenclature - theories of coordination compounds -Werner, Sidgwick, valence bond, Crystal Field theory. Crystal field splitting in octahedral, tetrahedral and square planar fields – factors influencing the magnitude of crystal field splitting – CFSE in weak and strong fields calculations; pairing energy. Jahn-Teller distortion. Magnetism and Colour: Orbital and spin magnetic moments, spin only moments of dn ions and their correlation with effective magnetic moments, including orbital contribution; quenching of magnetic moment							
UNIT – III METALLURGY						9+3	
Occurrence of metals –basic metallurgical operations and metallurgy process – General methods involved in extraction of metals- concentration of ores – froth floatation, magnetic separation, calcination, roasting, smelting, flux, aluminothermic process. Extraction processes – Chemical reduction – electrolytic reduction – metal displacement – refining methods – distillation – fractional crystallization – electrolysis. Zone refining – van Arkel de Boer methods – electrolytic refining – ion exchange method – muffle furnace – chemical properties – important compounds and uses o Cr, Mn, Co, Ni and Zn.							
UNIT –IV ACIDS AND BASES						10+3	
Acid Base Chemistry: Theories of acids and bases – Arrhenius, Bronsted-Lowry theory proton donor - acceptor system, Usanovich concept, Lewis concept – Classification of Lewis acids – Lux-Flood concept – Hard-Soft acid base concept and its applications. Non- aqueous solvents- Classification of solvents- Neutralization reaction and solvolysis in liquid ammonia- Metal- ammonia solutions. Neutralization, solvolysis and redox reactions.							
UNIT –V NUCLEAR CHEMISTRY						10+3	
Constitution of nuclei – stability of nuclei and (n-p) ratio – magic number– mass defect and binding							

energy – mass – energy relationship. Radioactivity: Natural radioactivity — Soddy's group displacement law – Radioactivity equilibrium – Rate of radioactive disintegration – half life period and average life period– radioactive disintegration series. Nuclear fission: Theory – applications – principle of atom bomb. Nuclear fusion: Theory – Solar and Stellar energy – principle of hydrogen bomb Applications of radioactivity: medicine – agriculture – industry – structural elucidations– carbon dating– cyclotron.

LECTURE	TUTORIALS	PRACTICALS	SELFSTUDY	TOTAL
45	15	0	0	60

TEXT BOOKS

1. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
2. W. U. Malik, G. D. Tuli, and R. D. Madan: Selected Topic in Inorganic Chemistry, S. Chand & Company Ltd, New Delhi, 1998.

REFERENCES

1. Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (2003).
2. P.L. Soni, Text book of Inorganic Chemistry, 20th edn, Sultan chand & Sons, 2000
3. R. D. Madan, Modern Inorganic Chemistry, 3rd edn, S. Chand & Company Ltd., Reprint 2014.

COURSE CODE		XCY105		L	T	P	SS	C
COURSE NAME		Volumetric Analysis Practical I		0	0	4	0	2
C:P:A		1: 0.8:0.2		L	T	P	SS	H
				0	0	4	0	4
COURSE OUTCOMES					DOMAIN		LEVEL	
CO1	Identify the various Metals in the solution.				Cognitive Psychomotor		Remember Perception	
CO2	Estimate the amount of acids using volumetric method.				Cognitive Psychomotor		Understand Set	
CO3	Estimate the amount of bases using volumetric method.				Cognitive Psychomotor Affective		Apply Set Receiving	
VOLUMETRIC ANALYSIS LAB-1						2 hours each exp		
1. Estimation of HCl by NaOH using a standard oxalic acid solution 2. Estimation of Na ₂ CO ₃ by HCl using a standard Na ₂ CO ₃ solution 3. Estimation of oxalic acid by KMnO ₄ using a standard oxalic acid solution 4. Estimation of Iron (II) sulphate by KMnO ₄ using a standard Mohr's salt solution. 5. Estimation of Ca (II) by KMnO ₄ using a standard oxalic acid solution. 6. Estimation of KMnO ₄ by thio using a standard K ₂ Cr ₂ O ₇ solution. 7. Estimation of hydrogen peroxide 8. Estimation of Iodine								
HOURS		LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL		
		0	30	0	0	30		
TEXT BOOKS								
1. B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G Smith and A.R. Tatchell., "Vogel's Textbook of practical Organic Chemistry" , (ELBS), 5th edn., 2009. 2. J. Bassett, R.C. Denney, G. H Jeffery and J. Mendham, " Vogel's text book of Quantitative Inorganic Analysis (revised)", (ELBS), 6th edn., 2007.								
REFERENCES								
1. J.B. Yadav, "Advanced Practical Physical Chemistry" , (Goel Publishing House), 20th edn., 2001. 2. J.N. Gurtu and R. Kapoor, "Advanced Experimental Chemistry", Vol. I-Physical , (S. Chand & Co), 1st edn., 2000. 3. Sundaram, Krishnan, Raghavan, " Practical Chemistry (Part II)" , S. Viswanathan Co. Pvt., 1996.								
E RESOURCES								
1. http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques 2. http://freevideolectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011 3. http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques								

COURSE CODE		XMG 106		L	T	P	SS	C
COURSE NAME		ALGEBRA, TRIGONOMETRY AND TRANSFORM		4	1	0	0	5
PREREQUISITES		BASIC CONCEPTS OF MATRICES, DIFFERENTIATION AND INTEGRATION		L	T	P	SS	H
C:P:A		5:0:0		4	1	0	0	5
COURSE OUTCOMES					DOMAIN		LEVEL	
CO1	Find the roots of the polynomials equations with real coefficients. Explain the transformation of equation and to solve the reciprocal equation using Newton’s method.			Cognitive		Remembering Understanding Applying		
CO2	Find eigen values and eigen vectors of the matrices and Apply Cayley Hamilton theorem to find the inverse of a matrix.			Cognitive		Remembering Applying		
CO3	Expand the trigonometric functions, hyperbolic and inverse hyperbolic functions and to find the series of trigonometric functions.			Cognitive		Remembering Understanding		
CO4	Find the Laplace transforms and inverse Laplace transforms of standard functions and to find the Laplace transforms of $tf(t)$, $f(t)/t$ and derivatives.			Cognitive		Remembering		
CO5	Apply Laplace transforms to solve the differential equations of first and second order and to find Fourier series of a functions.			Cognitive		Remembering Applying		
UNIT I - THEORY OF EQUATIONS								15
Polynomial Equations with real coefficients irrational roots, complex roots - symmetric function of roots – Transformation of equations by increasing or decreasing roots by a constant – Reciprocal Equations - Newton’s method to find a root approximately.								
UNIT II - MATRICES								15
Eigen Values and eigen vectors, Cayley-Hamilton theorem (without proof) – Verification and computation of inverse.								
UNIT III - TRIGONOMETRY								15
Expansion in Series – Expansion of $\cos^n\theta$, $\sin^n\theta$, in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$ and $\sin n\theta$ in powers of sines and cosines - Hyperbolic functions and inverse hyperbolic functions.								
UNIT IV - LAPLACE TRANSFORMS								15
Definition – Laplace Transform of Standard functions – Linearity property – First shifting theorem – Transform of $tf(t)$, $f(t) / t$ and derivatives – Inverse Laplace transforms of standard functions.								
UNIT V - APPLICATIONS OF LAPLACE TRANSFORMS AND FOURIER SERIES								15
Applications of Laplace transforms of differential equations of first and second order – Finding the Fourier series of functions.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY		TOTAL		
HOURS	45	30	0	0		75		
TEXT BOOKS								
1. Kandasamy. P, Thilagavathi. K, Allied Mathematics, Volume I and II, S.Chand and Company Ltd, New Delhi, 2004.								
REFERENCES								
1. T.K. Manichavasagam Pillai and S.Narayanan, Trigonometry, Viswanathan Publishers and								

Printers Pvt. Ltd.
2. S. Narayan and T.K. Manicavachagam Pillay, Ancillary Mathematics, Viswanathan Publishers and Printers Pvt. Ltd.
WEBSITE: WWW. NPTEL .ac.in

COURSE CODE		XUM001				L	T	P	SS	C
COURSE NAME		HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY				1	0	0	2	1
C:P:A		0.7:0:0.3				L	T	P	SS	H
						1	0	0	2	3
COURSE OUTCOMES					Domain	Level				
CO1	Relate and Interpret the human ethics and human relationships				Cognitive	Remember, Understand				
CO2	Explain and Apply gender issues, equality and violence against women				Cognitive	Understand, Apply				
CO3	Classify and Develop the identify of women issues and challenges				Cognitive & Affective	Analyze Receive				
CO4	Classify and Dissect human rights and report on violations.				Cognitive	Understand, Analyze				
CO5	List and respond to family values, universal brotherhood, fight against corruption by common man and good governance.				Cognitive & Affective	Remember, Respond				
UNIT I - HUMAN ETHICS AND VALUES										7
Human Ethics and values - Understanding of oneself and others- motives and needs- Social service, Social Justice, Dignity and worth, Harmony in human relationship: Family and Society, Integrity and Competence, Caring and Sharing, Honesty and Courage, WHO’s holistic development - Valuing Time, Co-operation, Commitment, Sympathy and Empathy, Self respect, Self-Confidence, character building and Personality.										
UNIT II - GENDER EQUALITY										9
Gender Equality - Gender Vs Sex, Concepts, definition, Gender equity, equality, and empowerment. Status of Women in India Social, Economical, Education, Health, Employment, HDI, GDI, GEM. Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.										
UNIT III - WOMEN ISSUES AND CHALLENGES										9
Women Issues and Challenges- Female Infanticide, Female feticide, Violence against women, Domestic violence, Sexual Harassment, Trafficking, Access to education, Marriage. Remedial Measures – Acts related to women: Political Right, Property Rights, and Rights to Education, Medical Termination of Pregnancy Act, and Dowry Prohibition Act.										
UNIT IV - HUMAN RIGHTS										9
Human Rights Movement in India – The preamble to the Constitution of India, Human Rights and Duties, Universal Declaration of Human Rights (UDHR), Civil, Political, Economical, Social and Cultural Rights, Rights against torture, Discrimination and forced Labour, Rights and protection of children and elderly. National Human Rights Commission and other statutory Commissions, Creation of Human Rights Literacy and Awareness. - Intellectual Property Rights (IPR). National Policy on occupational safety, occupational health and working environment.										

UNIT V - GOOD GOVERNANCE AND ADDRESSING SOCIAL ISSUES			11
Good Governance - Democracy, People's Participation, Transparency in governance and audit, Corruption, Impact of corruption on society, whom to make corruption complaints, fight against corruption and related issues, Fairness in criminal justice administration, Government system of Redressal. Creation of People friendly environment and universal brotherhood.			
	LECTURE	SELF STUDY	TOTAL
	15	30	45
REFERENCES			
1. Aftab A, (Ed.), Human Rights in India: Issues and Challenges, (New Delhi: Raj Publications, 2012). 2. Bajwa, G.S. and Bajwa, D.K. Human Rights in India: Implementation and Violations (New Delhi: D.K. Publications, 1996). 3. Chatrath, K. J. S., (ed.), Education for Human Rights and Democracy (Shimala: Indian Institute of Advanced Studies, 1998). 4. Jagadeesan. P. Marriage and Social legislations in Tamil Nadu, Chennai: Elachiapen Publications, 1990). 5. Kaushal, Rachna, Women and Human Rights in India (New Delhi: Kaveri Books, 2000) 6. Mani. V. S., Human Rights in India: An Overview (New Delhi: Institute for the World Congress on Human Rights, 1998). 7. Singh, B. P. Sehgal, (ed) Human Rights in India: Problems and Perspectives (New Delhi: Deep and Deep, 1999). 8. Veeramani, K. (ed) Periyar on Women Right, (Chennai: Emerald Publishers, 1996) 9. Veeramani, K. (ed) Periyar Feminism, (Periyar Maniammai University, Vallam, Thanjavur: 2010). 10. Planning Commission report on Occupational Health and Safety			
E RESOURCES			
1. http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p 2. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html. 3. Weblink of Transparency International: https://www.transparency.org/ 4. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india			

SEMESTER - II

COURSE CODE		XGT201		L	T	P	SS	H	C
COURSENAME		தமிழ்-II		2	1	0	0	3	3
C:P:A- 3:0:0									
COURSE OUTCOMES:									
இப்படிப்பை முடித்த பிறகு, கற்பவர்கள் மென்மேலும் விரிவான திறன்களைப் பெற்றிட முடியும்.				களம்		நிலை			
CO1	அடையாளம் காணுதல் - பல்வேறு இலக்கணக் குறிப்புகள், கலைச்சொல்லாக்க உத்திகள் போன்றவற்றைத் தமிழ்மொழி மூலம் அறிந்து கொள்ளல்.			அறிதல்		அறிதல் நினைவு கூர்தல்			
CO2	தெரிவு செய்தல் - வேர்ச்சொற்கள், ஒலி வேறுபாடறிந்து, பழந்தமிழ் இலக்கியங்கள் மூலம் அறிந்து கொள்ளல்.			புரிதல்		அறிதல் நினைவு கூர்தல்			
CO3	விவரித்தல் - திருக்குறள் மூலம் அறச் செய்திகளை உணர்தல்.			உணர்தல்		அறிதல் நினைவு கூர்தல்			
CO4	பயனாக்கம் - பல்வேறு அலுவல் சார்ந்த கடிதப் பிரிவுகள், குறித்துத் தெளிவு பெறல்.			பயனாக்கம்		ஆக்கம் ஆளுமை			
CO5	விவரித்தல் - கலைகளின் தோற்றம் மற்றும் வளர்ச்சிநிலை சமுதாயப் பங்கு குறித்துத் தெளிவு பெறுதல்.			விவரித்தல்		அறிதல் நினைவு கூர்தல்			
SYLLABUS								HOURS	
அலகு-1		இலக்கணம்					6+3+0=9		
பொருத்துதல்: பொருத்தமான பொருளைத் தேர்வு செய்தல், புகழ் பெற்ற நூல் மற்றும் நூலாசிரியர், தொடரால் குறிக்கப்பெறும் சான்றோர், அடைமொழியால் குறிக்கப்பெறும் நூல்கள். பிரித்து எழுதுக: எதிர்ச்சொல்லை எடுத்து எழுதுக, பொருந்தாச் சொல்லைக் கண்டறிதல், பிழைத் திருத்தம். சந்திப்பிழையை நீக்குதல், ஒருமை பன்மை பிழைகளை நீக்குதல், மரபுப் பிழைகள் - வழுஉச்சொல் - பிறமொழிச் சொற்களை நீக்குதல்.									
அலகு-2		வேர்ச்சொல் அறிதல்					6+3+0=9		
ஆங்கிலச் சொல்லுக்கு நேரான தமிழ்ச் சொல்லை அறிதல் - ஒலி வேறுபாடறிந்து சரியான பொருளை அறிதல். ஒரெழுத்து ஒருமொழிக்குரிய பொருளைக் கண்டறிதல் - வேர்ச்சொல் வினைமுற்று-வினையெச்சம் - தொழிற்பெயர், அகர வரிசைப்படுத்துதல்.									
அலகு-3		இலக்கியம்					6+3+0=9		
திருக்குறள் தொடர்பான செய்திகள் மேற்கோள்கள் தொடரை நிரப்புதல், அன்பு, பண்பு, கல்வி, கேள்வி, அறிவு, அடக்கம், ஒழுக்கம், பொறை, நட்பு, கேள்வி - வாய்மை, காலம், ஊக்கமுடைமை, இன்னா செய்யாமை. அறநூல்கள்: நாலடியார், நான்மணிக்கடிகை, பழமொழி, திரிகடுகம், இன்னா நாற்பது பாடல்கள் தொடர்பான செய்திகள்									
அலகு-4		பயன்பாட்டுத்தமிழ்					6+3+0=9		

அலுவல்கள் கடிதம், ஆசிரியர் கடிதம், நூலாக்கப் பணி, மெய்ப்புத் திருத்தல், விளம்பரத் தமிழ்

அலகு-5	பல்வேறு கலைகளில் கல்விச் சிந்தனை	6+3+0=9
மொழியியல் கல்வி, சமுதாயக் கல்வி, சேய்மைக் கல்வி, இக்காலக் கல்வி, கலை அறிவியல் என்பனவற்றின் விளக்கங்கள்		
L=30 / T=15		Total Hours
		45
Tutorial Activities		
1) தமிழ் இலக்கண ஆளுமை பயிற்சி 2) பிழையின்றி கடிதம் எழுதும் பயிற்சி 3) பல்வேறு போட்டித்தேர்வுக்கான பயிற்சி		
பாட நூல்கள்		
1. கா.பட்டாபிராமன், மொழிப் பயண்பாடு, நியூ செஞ்சரி புக் ஹவுஸ் (பி) லிட்., 41,பி., சிட்கோ இண்டஸ்ட்ரியல் எஸ்டேட், அம்பத்தூர், சென்னை. 2. முனைவர் கா.செல்வகுமார், (தொ.) 2022. துரைகோ பதிப்பகம், அரும்பாக்கம், சென்னை - 106. 3. முனைவர் ந.லெனின், மார்ச் - 2016, முகில் தமிழ் இலக்கிய இலக்கண வினா-விடைகள், பிருந்தா பதிப்பகம், தஞ்சாவூர் - 5. 4. முனைவர் இராஜா வரதராஜா - பயன்முறைத் தமிழ் - ஜூன் 2015, சிவகுரு பதிப்பகம், 7/40, கிழக்குச் செட்டித்தெரு, பரங்கிமலை, சென்னை - 16		
பார்வை நூல்கள்:		
1. முனைவர் இராஜ.வரதராஜா - பயன்முறைத் தமிழ் 2. டாக்டர் வா.செ.குழந்தைசாமி - அறிவியல் தமிழ் - ஜூன் 2006 (ஏழாம் பதிப்பு) —பாரதி பதிப்பகம் - 126/108, உஸ்மான் சாலை, தி.நகர், சென்னை - 17. 3. முனைவர் கோ.பெரியண்ணன் - அடிப்படை எளிய தமிழ் இலக்கணம் - 2003 —வனிதா பதிப்பகம், 11- நானா தெரு, பாண்டி பஜார், தி.நகர், சென்னை - 17.		

COURSE CODE		XGE202		L	T	P	SS	H	C
COURSE NAME		ENGLISH II		3	0	0	0	3	3
C:P:A- 3:0:0									
COURSEOUTCOMES:				Domain		Level			
CO1	Explain the basic grammar and using it in proper context			Cognitive		Understand			
CO2	Categorize the process of listening and speaking			Cognitive		Analyze			
CO3	Examine the important methods of reading			Cognitive		Evaluate			
CO4	Compose the basic writing skills			Cognitive		Create			
SYLLABUS								HOURS	
UNIT-I	Advanced Reading								
i. Reading texts of different genres and of varying length ii. Different strategies of comprehension iii. Reading and interpreting non-linguistic texts iv. Reading and understanding in complete texts (Cloze of varying lengths and gaps; distorted texts.)								12	
UNIT-II	Advanced Writing								
v. Analysing a topic for an essay or a report vi. Editing the drafts arrived at and preparing the final draft vii. Re-draft a piece of text with a different perspective (Manipulation exercise) viii. Summarize a piece of prose or poetry ix. Using phrases, idioms and punctuation appropriately								11	
UNIT-III	Principles of communication and communicative competence								
x. Introduction to communication– principles and process xi. Types of communication–verbal and non-verbal xii. Identifying and overcoming problems of communication xiii. Communicative competence								11	
UNIT-IV	Cross Cultural Communication								
xiv. Cross-cultural communication								11	
Total Hours								45	

Textbooks

- 1) Bailey, Stephen(2003).Academic Writing. London and New York, Routledge.
- 2) Department of English, Delhi University (2006).Fluency in English Part II. New Delhi, OUP
- 3) Grellet,F (1981).Developing Reading Skills :A Practical Guide to Reading Skills. New York, CUP
- 4) Hedge,T.(2005). Writing. London, OUP
- 5) Kumar,S and Pushp Lata (2015).Communication Skills. New Delhi, OUP
- 6) Lazar,G.(2010).Literature and Language Teaching. Cambridge, CUP
- 7) Nuttall,C(1996).Teaching Reading Skills in a Foreign Language. London, Macmillan
- 8)Raman,Meenakshi and Sangeeta Sharma(2011).Technical Communication: Principles and Practice. New Delhi, OUP

COURSE CODE		XCY203	L	T	P	SS	C
COURSE NAME		GENERAL CHEMISTRY II	3	1	0	0	4
C:P:A		3:0:1	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL	
CO1	Explain the preparation, properties and applications of Alkenes, alkynes and their derivatives.			Cognitive		Understand	
CO2	Describe the synthesis, reactions, stability and significance of alicyclic compounds.			Cognitive		Remember	
CO3	Explain the chemistry of s & p - block elements and their compounds			Cognitive Affective		Apply Receiving	
CO4	Describe the gas laws , physical properties of liquids and the classification of liquid crystals.			Cognitive		Remember Responding	
CO5	Apply law of mass action to the equilibria involving in various chemical reactions			Cognitive		Apply Remember	
UNIT I – ALIPHATIC COMPOUNDS							9+3
Alkanes - preparations, physical properties, reactions, reactions with radical mechanism for substitution reaction - cracking - Alkenes: Preparation from alcohol, haloalkane, dihaloalkanes and alkynes - reactions of alkenes - mechanisms involved in addition of hydrogen, halogen, hydrogen halide, hypohalous acid, water, hydroboration, hydroxylation, ozonolysis and epoxidation - peroxide effect - allylic substitution, oxidation by KMnO4 and polymerization - Application in the synthesis of following molecules - Dibenzyl (from toluene), cis and trans 2-butene, propanal and 1-methyl cyclohexanol. Alkynes: preparation, reactions - addition of hydrogen, halogen, hydrogen halide, water, HCN, CH3COOH, hydroboration - dimerisation and cyclisation - acidity of terminal alkynes							
UNIT II - ALICYCLIC COMPOUNDS							9+3
Cycloalkanes: Preparation (small, medium & large ring compounds) - reactions - cycloaddition, dehalogenation, pyrolysis of calcium salt of dicarboxylic acid - Wurtz reaction - stability of cycloalkanes - Baeyer’s strain theory. Cycloalkenes: Preparation and reactions of cycloalkenes - Preparation of conjugate dienes - reactions - 1,2 and 1,4 addition, polymerization and Diels-Alder reaction - Application in the synthesis of following molecules - trans 2-chlorocyclopentanol, trans-2 methylcyclopentanol, cis and trans 1,2 cyclohexanediol, cyclohexene, 2,3-butanedione and adipic acid.							
UNIT III – S & P BLOCK ELEMENTS							10+3

General characteristics of s – block elements – Compounds of s-block metals – oxides, peroxides, superoxide's-preparation and properties –Anomalous behavior of Li and Be- General characteristics of p – block elements General characteristics of boron family –Physical and chemical properties of Boron, uses – compounds of boron – Borax and Diborane,. General characteristics of carbon family, uses – Allotropic forms of carbon – Chemistry of charcoal. General characteristics of nitrogen – uses – Chemistry of some compounds of nitrogen – hydrazine and hydroxylamine. General characteristics of oxygen. – Structure and allotropy of elements, ozone. Types of oxides, peroxides, suboxides, basic oxides, amphoteric oxides, acidic oxides, neutral oxides. Oxoacids of nitrogen, phosphorus and sulphur.					
UNIT I - GAS AND LIQUID STATE					9+3
Kinetic theory of gases - derivation of gas laws – Maxwell's distribution of molecular velocities - Types of molecular velocities - Expansivity and compressibility – collision diameter – collision frequency – mean free path. Behaviour of real gas – Vander Waals equation of state – Boyle temperature – Virial equation of state – critical constants of gas. Liquid state: Physical properties – vapour pressure – Trouton's rule – surface tension – Effect of temperature on surface tension – viscosity – effect of pressure and temperature – refraction – refractive index – specific and molar refraction. Liquid crystals: Vapour pressure temperature diagram – thermography – classification of thermotropic liquid crystals – nematic, smetic and cholesteric liquid crystals with examples					
UNIT V - CHEMICAL EQUILIBRIUM					8+3
Reversible and irreversible reactions – statement of law of mass action – Derivation of law of mass action from kinetic theory – Relationship between K _p and K _c (derivation). Applications of Law of mass action to the equilibria involving the formation of NH ₃ , dissociation of CaCO ₃ and the dehydration of CuSO ₄ .5H ₂ O. Lechatelier's principle: statement – application to the formation of NH ₃ . CATALYSIS: Homogeneous and heterogeneous catalysis – promoters and catalytic poisons – auto catalysis – Acid-base catalysis – Enzyme catalysis –Kinetics of enzymed catalysed reaction.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60
TEXT BOOKS					
1. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976). 2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997). 3. B.R.Puri, L.R.Sharma and M.S.Pathania, Principles of Physical Chemistry, 47th edition, Vishal Publishing Co, 2016. 4. B.R. Puri and L.R. Sharma and K.C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co, 1990					
REFERENCES					
1. I. L. Finar, Organic Chemistry Vol-1& 2, 6th edn, Pearson Education Asia, 2004 2. G.M.Barrow, Physical Chemistry, 6th edn, McGraw-Hill Inc., US, 1996. 3. R.D.Madan, "Advanced Inorganic Chemistry"					
E RESOURCES					

<https://www.mooc-list.com/course/organic-chemistry-i-saylororg>
<https://www.canvas.net/courses/exploring-chemistry>
<https://www.youtube.com/watch?v=nB9yqj-ZcAk>
<http://freevideolectures.com/Course/3001/Chemistry-I/3>
<https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/>
<http://freevideolectures.com/Course/3001/Chemistry-I>
<http://freevideolectures.com/Course/2384/Freshman-Organic-Chemistry>

COURSE CODE		XCY204	L	T	P	SS	C
COURSE NAME		PHYSICAL CHEMISTRY I	3	1	0	0	4
C:P:A		3:0:1	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL	
CO1	Classify the different phase rule systems and explain the physical properties of solutions			Cognitive		Understand	
CO2	Apply the first law of thermodynamics and Identify type of thermodynamic process exists in a system.			Cognitive		Remember Apply	
CO3	Apply and Identify the different types of adsorption mechanisms.			Cognitive Affective		Remember Apply	
CO4	Describe the concepts of colloidal state and explain the types of Emulsions.			Cognitive		Remember Responding	
CO5	Identify the nature of electrochemical conductance and the type of electrolytes.			Cognitive Affective		Remember Receive	
UNIT I PHASE RULE AND SOLUTION							
Phase Rule: Concepts of phase, component and degrees of freedom, with examples. Gibb’s phase rule – derivation. One-component system: Phase diagrams: Water and sulphur systems. Two component system: (i) Simple eutectic: Lead-silver system- Formation of compound with congruent melting point: Ferric chloride – water system. Ideal solutions: Ideal solutions and Raoult’s law, deviations from Raoult’s law – non-ideal solutions. Distillation of solutions. Azeotropes. Partial miscibility of liquids- Critical solution temperature; effect of impurity on partial miscibility of liquids - Principle of steam distillation. Nernst distribution law and its applications. Colligative properties- elevation of boiling point, depression in freezing point – Abnormal behavior of solutions of electrolytes.							
UNIT II - FIRST LAW OF THERMODYNAMICS AND ITS APPLICATIONS							9+3
-Intensive and extensive variables; state and path functions; isolated, closed and open systems-zeroth law of thermodynamics. First law of thermodynamics-mathematical form- Heat capacity, relation between CP and CV. Joule- Thomson effect-derivation of Joule- Thomson coefficient for ideal gases and real gases, inversion temperatures. Second law of thermodynamics –statements of Second law - Carnot theorem, Carnot cycle – Efficiency of heat engine. Concept of entropy –Gibbs free energy – Work function – Variation of free energy change with temperature and pressure. Criteria for spontaneity – Gibbs Helmholtz equation Third law of thermodynamics – Nernst heat theorem – statement of third law – Determination of absolute entropies of solids, liquids and gases.							
UNIT III – CATALYSIS AND ADSORPTION							9+3
Catalysis- characteristics- - different types-homogeneous-heterogeneous-acid-base catalysis auto catalysis-theories of catalysis-intermediate compound formation theory and adsorption theory- kinetics of enzyme catalysis - MichaelisMenton equation. – applications of catalysis Adsorption-definition- - physisorption and chemisorptions - factors influencing adsorption of gases on solids - Langmuir adsorption isotherm – BET theory - Applications of adsorption							
UNIT IV - COLLOIDAL STATE							10+3

Types of colloids – sols – Lyophilic sols and lyophobic sols – properties of colloids – optical property (Tyndall effect) – kinetic property (Brownian movement) – Electrical properties like electrical double layer, zeta potential, electrophoresis and electro-osmosis – stability of colloids – Coagulation – protective colloids – Gold number – flocculation values – Hofmeister series.

GELS: Elastic and non-elastic gels – imbibition – syneresis – thixotropy
Emulsions: Definition – types of emulsions – emulsifiers – Bancroft's rule HLB number. Applications of colloids: Cottrell precipitator – Sewage disposals – detergent action of soaps – artificial rain – formation of delta – smoke screens.

UNIT V ELECTRICAL CONDUCTANCE AND TRANSFERENCE

Metallic and electrolytic conductors – specific, equivalent and molar conductance – variation of conductance with dilution for strong and weak electrolytes. Transport number and its determination by Hittorff and moving boundary method – effect of temperature and concentration- Kohlrausch law and its applications – Applications of conductivity measurements – degree of hydrolysis, solubility product and conductometric titrations. Theory of strong electrolytes – Debye Huckel-Onsager theory.

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60

TEXT BOOKS

1. Puri B.R., Sharma L.R and Pathania M.S., Principles of Physical Chemistry, 47th ed., Vishal Publishing Company, 2016
2. Sharma .K.K, Sharma.L.K. A Text book on physical Chemistry, 6th ed., Sultan Chand, 2016.
3. Maron S.H. and Lando J.B. Fundamentals of Physical Chemistry, Macmillan.
4. Glasstone S. and Lewis. D., Elements of Physical Chemistry. Macmillan.

REFERENCES

1. Physical Chemistry: A Molecular Approach Donald A. McQuarrie
2. Physical Chemistry. G.W. Ball
3. Solid state and its applications, Anthony. R. West.
4. Physical Chemistry Volume-1, A. K. Nag.

E RESOURCES

1. https://www.youtube.com/watch?v=A1p4j_aHdbw
2. <https://www.youtube.com/watch?v=gvg2QZ38n9U>
3. <https://www.mooc-list.com/course/Physical-chemistry-i-saylororg>

COURSE CODE		XCY205	L	T	P	C
COURSE NAME		Volumetric Analysis Practical-II	0	0	4	2
C:P:A		1: 0.8:0.2	L	T	P	H
			0	0	4	4
COURSE OUTCOMES			DOMAIN		LEVEL	
CO1	Identify the various Metals in the solution.		Cognitive Psychomotor		Remember Perception	
CO2	Estimate the amount of metal ions using volumetric method by using various internal and external indicators.		Cognitive Psychomotor		Understand Set	
CO3	Estimate the amount of metal ions in terms of complex by complexometric titrations using volumetric method.		Cognitive Psychomotor Affective		Apply Set Receiving	
VOLUMETRIC ANALYSIS LAB-II					3 hours each exp	
I. Acidimetry and Alkalimetry						
II. Permanganimetry.						
1. Estimation of Ferrous iron in Mohr’s salt.						
2. Estimation of Ferrous and Ferric iron in a mixture.						
3. Estimation of Oxalic acid.						
4. Estimation of Calcium.						
III. Dichrometry						
5. Estimation of Ferrous Iron.						
6. Estimation of Ferric Iron – by using both internal and external indicators.						
IV. Iodo and Iodimetry.						
7. Estimation of Copper.						
8. Estimation of Potassium Dichromate.						
9. Estimation of Arsenious Oxide.						
V. Argentometry.						
10. Estimation of Chloride (in neutral and acid media)						
VI. Complexometric Titrations.						
11. Estimation of Zn, Mg and Ca ions using EDTA.						
	LECTURE	TUTORIAL	PRACTICAL		TOTAL	
HOURS	0	0	30		30	
TEXT BOOKS						
1. B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G Smith and A.R. Tatchell., “Vogel’s Textbook of practical Organic Chemistry” , (ELBS), 5th edn., 2009.						
2. J. Bassett, R.C. Denney, G. H Jeffery and J. Mendham, “ Vogel’s text book of Quantitative Inorganic Analysis (revised)”, (ELBS), 6th edn., 2007.						
REFERENCES						
4. J.B. Yadav, “Advanced Practical Physical Chemistry”(Goel Publishing House), 20th edn. 2001.						
5. J.N. Gurtu and R. Kapoor, “Advanced Experimental Chemistry”, Vol. I-Physical , (S. Chand & Co), 1st edn., 2000.						
6. Sundaram, Krishnan, Raghavan, “ Practical Chemistry (Part II)” , S. Viswanathan Co. Pvt.1996						
E RESOURCES						

1. <http://freevidelectures.com/Course/2380/Chemistry-Laboratory-Techniques>
2. <https://www.youtube.com/watch?>
3. <https://www.youtube.com/watch?>

COURSE CODE	XMG206	L	T	P	C
COURSE NAME	CALCULUS AND DIFFERENTIAL EQUATIONS	4	1	0	5
PREREQUISITE	BASIC CONCEPTS OF MATRICES, NUMBERS, DIFFERENTIATION AND INTEGRATION	L	T	P	H
C:P:A	4:0:0	4	1	0	5
COURSE OUTCOMES		Domain	Level		
After the completion of the course, students will be able to					
CO1: Compute radius of curvature, centre of curvature and circle of curvature. Change the order of integration and to compute the double integral. Apply double to find the area between curves.		Cognitive	Understanding Applying		
CO2. Use Beta and Gamma function computing the multiple integrals and explain the relation between them.		Cognitive	Understanding Applying		
CO3.Solve the linear homogeneous and non-homogeneous differential equation with constant and variable coefficients.		Cognitive	Applying		
CO4:Define general, complete and particular solutions and to solve standard forms of partial differential equations.		Cognitive	Understanding Applying		
CO5: Compute gradient, divergence and curl of vectors. Apply theorem to evaluate line, surface and volume integral.		Cognitive	Remembering Understanding Applying		
UNIT I					15
Curvature – Radius of curvature – center of curvature – circle of curvature – Evaluation of double integrals - change of order of integration in double integrals- Application of double integral to find the area between curves.					
UNIT II					15
Evaluation of triple integrals – Beta and Gamma functions – relations between them – Evaluation of multiple integrals using Beta and Gamma functions.					
UNIT III					15
Solving second order linear differential equations with constant coefficients whose R.H.S is of the form ve^{mx} , where v is any function of x - Linear equations with variable coefficients.					
UNIT IV					15
Formation of partial differential equations by elimination of arbitrary constants and functions -Definitions of general, particular and complete solutions-solving standard forms $f(p,q) = 0, f(x,p,q) = 0, f(y,p,q) = 0, f(z, p, q) = 0, f(x,p) = f(y,q), z = px + qy + f(p,q)$ - Lagrange's					

Differential equations $Pp+Qq = R$.					
UNIT V					15
Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl – Integration of vectors – line integral – surface integral – Green’s theorem in the plane – Gauss divergence theorem – Stokes theorem – (Statements only).					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	30	0	0	75
TEXT BOOKS					
1. Kandasamy. P, Thilagavathi. K “Mathematics for B.Sc. Branch I”, Volume II, III and IV, S.Chand and Company Ltd, New Delhi, 2004.					
REFERENCE					
1. Narayan .S and Manicavachagam Pillay T.K. “Ancillary Mathematics”, Viswanathan Publishers and Printers, 2004.					
E REFERENCES					
<u>www.nptel.ac.in</u>					
1. Advanced Engineering Mathematics Prof. Jitendra Kumar Department of Mathematics Indian Institute of Technology, Kharagpur					

COURSE CODE		XUM002	L	T	SS	P	C
COURSE NAME		ENVIRONMENTAL STUDIES	1	0	1	0	1
C:P:A		0.7: 0 : 0.3	L	T	SS	P	H
			1	0	1	0	2
COURSE OUTCOMES				DOMAIN		LEVEL	
CO1	Describe the significance of natural resources and explain anthropogenic impacts.			Cognitive		Remember Understand	
CO2	Illustrate the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.			Cognitive		Understand	
CO3	Identify the facts, consequences, preventive measures of major pollutions and recognize the disaster phenomenon			Cognitive Affective		Remember Receive	
CO4	Explain the socio-economic, policy dynamics and practice the control measures of global issues for sustainable development.			Cognitive		Understand Apply	
CO5	Recognize the impact of population and the concept of various welfare programs, and apply the modern technology towards environmental protection.			Cognitive		Understand Analysis	
UNIT - I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY							12

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies – Water resources: Use and over-utilization of surface and ground water, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: renewable and non-renewable energy sources – Land resources: Land as a resource, land degradation, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.					
UNIT – II ECOSYSTEMS AND BIODIVERSITY					7
Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystem – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.					
UNIT – III ENVIRONMENTAL POLLUTION					10
Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Solid waste management – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: flood, earthquake, cyclone and landslide.					
UNIT –IV SOCIAL ISSUES AND THE ENVIRONMENT					10
Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.					
UNIT –V HUMAN POPULATION AND THE ENVIRONMENT					6
Population growth, variation among nations – Population explosion– Environment and human health – HIV / AIDS– Role of Information Technology in Environment and human health. Population growth, variation among nations – Population explosion – Family welfare programme – Environment and human health – Human rights – Value education - HIV / AIDS – Women and Child welfare programme– Role of Information Technology in Environment and human health – Case studies.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	30	0	0	15	45
TEXT BOOKS					

1. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.
2. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
3. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.
4. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
5. Introduction to International disaster management, Butterworth Heinemann, 2006.
6. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

REFERENCE BOOKS

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.
4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.
5. Sundar, Disaster Management, Sarup & Sons, New Delhi, 2007.
6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

E RESOURCES

1. <http://www.e-booksdirectory.com/details.php?ebook=10526>
2. <https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science>
3. <https://www.free-ebooks.net/ebook/What-is-Biodiversity>
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. <http://bookboon.com/en/pollution-prevention-and-control-ebook>
6. <http://www.e-booksdirectory.com/details.php?ebook=8557>
7. <http://www.e-booksdirectory.com/details.php?ebook=6804>
8. <http://bookboon.com/en/atmospheric-pollution-ebook>
9. <http://www.e-booksdirectory.com/details.php?ebook=3749>
10. <http://www.e-booksdirectory.com/details.php?ebook=2604>
11. <http://www.e-booksdirectory.com/details.php?ebook=2116>
12. <http://www.e-booksdirectory.com/details.php?ebook=1026>
13. <http://www.faadooengineers.com/threads/7894-Environmental-Science>

SEMESTER - III							
COURSE CODE		XCY301	L	T	P	SS	C
COURSE NAME		ORGANIC CHEMISTRY I	3	1	0	0	4
C:P:A		3:0:1	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL	
CO1	Explain stereochemistry, symmetry elements, optical activity and conformational analysis of acyclic and cyclic compounds .			Cognitive		Understand	
CO2	Describe the preparation with mechanism, properties and naming reactions of aldehydes, ketones & carboxylic acid and their derivatives.			Cognitive		Remember	
CO3	Explain preparation, properties and applications of N-containing compounds.			Cognitive Affective		Apply Receiving	
CO4	Describe basic concepts, characteristic features, preparation and reaction of heterocyclic compounds. .			Cognitive		Remember Responding	
CO5	Apply and Identify the types of rearrangement reactions and its synthetic applications			Cognitive		Apply Remember	
UNIT I - Isomerism							9+3
Structural isomerism - types with examples – tautomerism – keto-enol. Stereochemistry - Representation of molecules in saw horse, Fischer, flying-wedge and Newman formulae. Symmetry elements - chirality – asymmetric molecules. Optical rotation – specific rotation -optical purity - Optical isomers - enantiomers - diastereomers – epimers - notation of optical isomers - Cahn-Ingold-Prelog rules, R and S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations - D and L representations - Stereo selectivity, stereo specificity - asymmetric synthesis. Geometrical isomerism – nomenclature of geometrical isomers – cis/trans, E-Z notation- Methods to assign configurations - Conformational Analysis - Conformation - Conformational nomenclature: eclipsed, staggered, gauche and potential energy diagram. -Conformational analysis of ethane and cyclohexane							
UNIT II - Carbonyl Compounds and their Derivatives:							9+3
Common methods for the synthesis of aldehydes and ketones - Grignard reagents - Aldol, Perkin, and Benzoin condensations, Wittig reaction, Mannich reaction, Reformatsky reaction and Cannizaro reaction. Preparation of carboxylic acids,Synthesis of acid chlorides, esters and amides, Preparation and reactivity of carboxylic acid derivatives - acid chlorides, esters, amides and anhydrides - Mechanisms of esterification and hydrolysis (acid and base catalysed reactions) - Oxidation by Tollen’s reagent, KMnO4, hypohalite, SeO2 and peracids. Reduction by H2/Ni, H2-Pd-C, NaBH4, LiAlH4, MPV, Clemmenson and Wolff-Kischner reductions. α, β unsaturated aldehydes and Ketones – preparation and reactions.							
UNIT III - NITROGEN CONTAINING COMPOUNDS							10+3

Preparation of nitroalkanes and nitroarenes - Chemical reactions of nitroalkanes and nitroarenes -. Methods of preparation of alkyl and aryl amines - Gabriel phthalimide reaction and Hofmann reaction - Structural features effecting basicity of amines - basicity of aliphatic and aromatic amines -reactions of amines. Aryl diazonium salts - preparation, stability, reactions and synthetic transformations. Amino acids - essential and nonessential - zwitterions formation - isoelectric point - chemical reactions of amino acid. Polypeptides and proteins - primary, secondary, tertiary and quaternary structure of proteins - determination of primary structure with end group analysis.					
UNIT IV - HETEROCYCLIC COMPOUNDS					7+3
Aromatic characteristics of pyrrole, furan, thiophene and pyridine - Comparison between basicity of pyridine, piperidine and pyrrole. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution and mechanism of nucleophilic substitution reaction in pyridine derivatives. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis.					
UNIT V - REARRANGEMENTS					10+3
Rearrangement to electron-deficient carbon - 1,2 shift (Wagner-Meerwein rearrangement, pinacol rearrangement, Wolff rearrangement, benzil-benzilic acid rearrangement). Aromatic rearrangements from oxygen to ring carbon – Fries, Claisen and benzidine rearrangement. Rearrangement to electron-deficient nitrogen – Beckmann, Schmidt, Hofmann, Lossen, Curtius rearrangement). Rearrangement to electron-deficient oxygen: Baeyer-Villiger oxidation, Dakin reaction					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60
TEXT BOOKS					
1. Morrison R.T. and Boyd R.N., Organic Chemistry (6 th edition), New York, Allyn & Bacon Ltd., (1976). 2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12 th edition), New Delhi, Sultan Chand & Co., (1997). 3. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004. 4. G.Marc loudan, Organic Chemistry, 5th edition, Roberts and company, 2009					
REFERENCES					
1. F A Carey and R J Sundberg, Advanced Organic Chemistry, Part A: Structure and Mechanisms, 5th edition, Springer, 2007. 2. P. Y.Bruice, Organic Chemistry, Vol-1 & 2, 7thedn, Pearson Education Asia, 2012. 3. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2012.					
E RESOURCES					
https://www.mooc-list.com/course/organic-chemistry-i-saylororg https://www.canvas.net/courses/exploring-chemistry https://www.youtube.com/watch?v=nB9yqj-ZcAk http://freevidelectures.com/Course/3001/Chemistry-I/3 https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/ http://freevidelectures.com/Course/3001/Chemistry-I http://freevidelectures.com/Course/2384/Freshman-Organic-Chemistry					

COURSE CODE		XCY302	L	T	P	SS	C
COURSE NAME		INORGANIC CHEMISTRY II	3	1	0	0	4
C:P:A		3.2:0:0.8	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	<i>Explain</i> the various compounds of halogens and carbon.		Cognitive		Understanding		
CO2	<i>Describe</i> the objective of this unit is to expose the students to the basic concepts of structure of solids, electrical and magnetic properties of solids..		Cognitive		Remember		
CO3	<i>Recognize</i> role of metal ions in biological systems.		Cognitive Affective		Apply Receiving		
CO4	<i>Identify</i> the suitable coordination complexes for inorganic analysis.		Cognitive Affective		Remember Responding		
CO5	<i>Apply</i> and <i>Identify</i> the various properties and bonding of organometallic compounds.		Cognitive		Apply Remember		
UNIT I - HALOGENS, CARBON AND NOBLE GAS COMPOUNDS						10+3	
Halogens -General trends in the properties of halogens – deviation of fluorine from other elements of the group. Preparation of fluorine – properties of fluorine – hydrogen fluoride – oxides of halogens – preparation properties and uses of hydrogen halides, oxy acids of halogens – freons. Interhalogen Compounds: XY, XY ₃ , XY ₅ and XY ₇ types and their structure. Pseudohalogens and pseudohalides definition with exmples.							
Inorganic Carbon Compounds: Types of carbides - Covalent, ionic and interstitial carbides with suitable examples – oxides of carbon – oxy acids of carbon – carbonates – fullerenes.							
Noble gas compounds: preparation and properties of xenon fluorides and oxyfluoride and kryptonfluoride.							
UNIT II – SOLID STATE CHEMISTRY						6+3	
Ionic bonding – lattice energy – Born equation and its derivation, radius ratio rules – structures of some ionic crystals – derivation of Bragg’s equation. Spinel and inverse spinels – defects in solids, non-stoichiometric compounds – Electrical, Magnetic and optical properties of solids – band theory – semiconductors – superconductors. Classification of solids – amorphous and crystalline solids – Van der waals crystals – covalent crystals – Laws of crystallography – Elements of symmetry – Weiss and Miller indices – Crystal systems and Bravais lattices. Structure of ionic solids – crystal structures – Sodium chloride, Zinc blende, wurtzite, Crystal defects – Schottky and Frenkel defects – F-centre							
UNIT III - BIOINORGANIC CHEMISTRY						9+3	
Metal ions in biology and their vital role in the active site, Structure and functions of Metallo proteins and enzymes. Structures and characteristic features of Haemoglobin and myoglobin – Vitamin B12. Biological functions of haemoglobin and myoglobin, cytochromes and ferredoxins, carbonate bicarbonate buffering system and carbonic anhydrase. Biological nitrogen fixation, Photosynthesis: Photosystem-I							
UNIT IV – COORDINATION CHEMISTRY-II						10+3	

Stability of complexes -factors affecting the stability of complexes - Stability constants of coordination compounds and their importance in inorganic analysis. Kinetic verses thermodynamic stability. Experimental determination of stability constant and composition of complexes. Isomerism, reactivity and stability: Determination of configuration of cis- and trans- isomers by chemical methods. Labile and inert complexes, substitution reaction on square planar complexes, trans effect– theories (example and applications). Reaction mechanism – substitution reactions in octahedral complexes – Acid hydrolysis: SN1 and SN2 mechanism					
UNIT V - ORGANO METALLIC COMPOUNDS					10+3
Introduction - Structure and application -metal carbonyls -mono and poly nuclear carbonyls of Ni, Fe, Cr, Co and Mn structure -nitrosyl compounds -classification and properties - Nomenclature of organometallic compounds, 16- and 18- electron rule. transition metal alkyls, carbenes, and carbynes, and metallocenes. Photochemistry of organometallic compounds -Wilkinson's catalyst and alkene hydrogenation, hydroformylation, Monsanto acetic acid process, Ziegler – Natta catalyst and polymerization of olefins					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60
TEXT BOOKS					
1. Lee J.D.,Concise Inorganic Chemistry, UK, Black well science (2006). 2. W. U. Malik, G. D. Tuli, and R. D. Madan: Selected Topic in Inorganic Chemistry, S. Chand & Company Ltd, New Delhi, 1998. 3. Puri B.R.,Sharma L.R., Kalia K.K.,Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (2003). 4. P.L. Soni, Text book of Inorganic Chemistry, 20th edn, Sultan chand& Sons, 2000 5. R. D. Madan, Modern Inorganic Chemistry, 3rd edn, S. Chand & Company Ltd., Reprint 2014.					
REFERENCES					
1. Day,J.SelbinandH.H.Sisler,Theoretical Inorganic Chemistry; Literary Licensing(LLC), Montana, 2012. 2. N. H. Ray, Inorganic Polymers, Academic Press, 1978. 3. F.A.Cotton and G.Wilkinson, C.A.Murillo and M.Bochmann, Advanced Inorganic Chemistry; 6thEd., A Wiley - Interscience Publications, John Wiley and Sons,USA, 1999. 4. J.E.Huheey,Inorganic Chemistry;4th Ed.,Harper and Row publisher, Singapore,2006.					

COURSE CODE		XCY303		L	T	P	SS	C
COURSE NAME		SEMI MICRO INORGANIC QUALITATIVE ANALYSIS – PRACTICAL-III		0	0	4	0	2
C:P:A		1.0: 0.8:0.2		L	T	P	SS	H
				0	0	4	0	4
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Ability to <i>Identify</i> the ions in a given Inorganic mixture			Cognitive Psychomot or		Remember Perception		
CO2	<i>Analyse</i> the individual cations and anions present in a given mixture and <i>explain</i> the characteristic properties of cations.			Cognitive Psychomot or Affective		Understand Analyse Perception Receive		
CO3	<i>Use</i> the principle behind the analysis of ions.			Cognitive		Apply		
SEMI MICRO INORGANIC QUALITATIVE ANALYSIS PRACTICAL-III					3 hours for each experiment			
Semi-micro qualitative analysis using H ₂ S of mixtures - not more than four ionic species (two anions and two cations and excluding insoluble salts) out of the following:								
Cations : NH ₄ ⁺ , Pb ²⁺ , Ag ⁺ , Bi ³⁺ , Cu ²⁺ , Cd ²⁺ , Sn ²⁺ , Fe ³⁺ , Al ³⁺ , Co ²⁺ , Cr ³⁺ , Ni ²⁺ , Mn ²⁺ , Zn ²⁺ , Ba ²⁺ , Sr ²⁺ , Ca ²⁺ , K ⁺								
Anions : CO ₃ ²⁻ , S ²⁻ , SO ²⁻ , S ₂ O ₃ ²⁻ , NO ₃ ⁻ , CH ₃ COO ⁻ , Cl ⁻ , B ⁻ , I ⁻ , NO ₃ ⁻ , SO ₄ ²⁻ , PO ₄ ³⁻ , BO ₃ ³⁻ , C ₂ O ₄ ²⁻ , F ⁻ (Spot tests should be carried out wherever feasible)								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY		TOTAL		
HOURS	0	0	30	0		30		
TEXT BOOKS								
1. Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry, 2 nd edition, New Delhi, Sultan Chand & sons (1997)								
2. Frank J. Welcher and Richard B. Hahn, Semi micro Qualitative Analysis, New Delhi, Affiliated East-west Press Pvt. Ltd. (1969).								

COURSE CODE		XPH304		L	T	P	SS	C
COURSE NAME		FUNDAMENTAL PHYSICS		3	1	0	0	4
C:P:A		4:0:0		L	T	P	SS	H
				3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	<i>Recall</i> and <i>Explain</i> the basic principle simple harmonic motion and circular motion.			Cognitive		Remember , Understand, Analyze		
CO2	<i>Understand</i> the properties of sound, reverberation time and methods of production of ultrasonic waves.			Cognitive		Remember , Analyze		
CO3	<i>Understand and determine</i> Young's modulus,rigidity modulus, viscosity and explain surface tension and excess pressure inside a drop.			Cognitive		Analyze , Understand, Application		
CO4	<i>Recall</i> the basic concepts and basic laws of thermal physics and <i>determinethe</i> thermal conductivity of a bad conductor and solar constant.			Cognitive		Remember , Analyze, Application		
CO5	<i>Acquire knowledge</i> on interference, diffraction; be able to determine wavelength of mercury source; understand LASER action and production; propagation of fibre optics.			Cognitive		Understand, evaluation		
UNIT I - Simple Harmonic Motion and Circular Motion							9+3	
Time period - Amplitude - Phase - Spring mass system - Simple pendulum - Composition of two simple harmonic motions along a straight line and at right angles - Lissajous figures - Damping force - Damped harmonic oscillator - Uniform circular motion - Acceleration of a particle in a circle - Centripetal and centrifugal forces - Banking on curved tracks - Motion of a bicycle and a car around a circle.								
UNIT II - Sound Uniform circular motion							9+3	
Classification of sound - Characteristics of musical sound - Loudness - Weber Fechner law - Decibel - Absorption co-efficient - Reverberation - Reverberation time - Ultrasonic waves - Properties - Production : Magnetostriction and Piezo-electric method and uses.								
UNIT III - Properties of Matter							9+3	
Elasticity - Elastic constants - Bending of beams - Young's modulus by non-uniform bending - Torsion in a wire - Determination of rigidity modulus of torsional pendulum - Viscosity - Coefficient of viscosity by Poiseuille's method - Stoke's law - Terminal velocity - Surface Tension - Molecular theory of surface tension - Excess pressure inside a drop and bubble - Surface tension by drop weight method.								
UNIT IV - Thermal Physics							9+3	
Kinetic theory of gases - Basic postulates - Ideal gas equation - Vanderwaal's equation of states - Laws of thermodynamics - Entropy - Change of entropy in reversible and irreversible processes - Lee's disc method for conductivity of bad conductor - Stefan's law of radiation - Solar Constant - temperature of the sun.								
UNIT V - Optics							9+3	
Interference in thin films - Air wedge - Diffraction - Theory of plane transmission grating (normal incidence only) - LASER - Population inversion - Pumping - Laser action - Nd-YAG laser - CO ₂ laser - Fibre optics - Principle and propagation of light in optic fibres - Numerical aperture and acceptance angle.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL			

HOURS	45	15	0	0	60
TEXT					
1. Allied Physics I - A Sundaravelusamy - Priya Publications, 2009. 2. I B.Sc. Ancillary Physics - R. Murugesan, S. Chand & Co., 2010.					
REFERENCES					
1. Sound - Saigal - S. Chand & Co., Delhi. 2. Elements of properties of matter - Brijlal and Subramanian, S. Chand Limited, 1974. 3. Heat and Thermodynamics by Brijlal and Subramanian, S. Chand Limited. 4. Optics - Brijlal and Subramanian, S. Chand Limited.					

COURSE CODE		XPG 305		L	T	P	SS	C
COURSE NAME		FUNDAMENTAL PHYSICS PRACTICAL		0	0	4	0	2
C:P:A		0.4:1:0.6		L	T	P	SS	H
				0	0	4	0	4
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Recall the <i>usage</i> of laboratory instruments and <i>measure</i> the Young’s modulus of Non – uniform pending			Cognitive Psychomotor		Understand Mechanism		
CO2	Explain and <i>demonstrate</i> the behavior of rigidity modulus of a wire			Psychomotor Affective		Set Valuing		
CO3	Manipulate and <i>measure</i> the thickness of a thin wire using Air wedge			Cognitive Psychomotor		Apply Mechanism		
CO4	Compare and <i>explain</i> the Calibration of voltmeter			Affective Psychomotor		Organization Set		
CO5	Describe the Band gap of the semiconductor			Psychomotor Affective		Perception Organization		
FUNDAMENTAL PHYSICS PRACTICAL					3 hours for each experiment			
1. Non-uniform Bending - Pin and Microscope Method. 2. Torsional pendulum - Determination of rigidity modulus of a wire 3. Co-efficient of viscosity of Liquid using graduated burette. 4. Spectrometer - Refractive index of solid prism (A, D and μ) 5. Post Office Box - Determination of Band gap of a semi-conductor. 6. Air wedge - determination of thickness of thin wire. 7. Potentiometer - Calibration of voltmeter 8. LASER grating - Determination of wavelength of LASER and size of the micro-particle.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY		TOTAL		
HOURS	0	0	30	0		30		
TEXT BOOKS								

1. BSc Practical Physics, C. L. Arora, (S. Chand)
2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency)
3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper.
4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006.
5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.

REFERENCE BOOKS

1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001.
2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001.
3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007.
4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007.
5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

COURSE CODE		XUM003	L	T	P	SS	C
COURSE NAME		DISASTER MANAGEMENT	1	0	0	0	1
C:P:A		0.8 : 0 : 0.2	L	T	P	SS	H
			1	0	0	0	1
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	<i>Understanding</i> the concepts of application of types of disaster preparedness		Cognitive		Apply		
CO2	<i>Infer</i> the end conditions & <i>Discuss</i> the failures due to disaster.		Cognitive		Analyse		
CO3	<i>understanding</i> of importance of seismic waves occurring globally		Cognitive		Analyse		
CO4	<i>Estimate</i> Disaster and mitigation problems.		Cognitive		Apply		
CO5	Keen <i>knowledge</i> on essentials of risk reduction		Cognitive		Apply		
UNIT I - INTRODUCTION							9
Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management–Alternative to dominant approach – disaster – development linkages - Principle of risk partnership.							
UNIT II - APPLICATION OF TECHNOLOGY IN DISASTER RISK REDUCTION							9
Application of various technologies: Data bases – RDBMS – Management Information systems – Decision support system and other systems – Geographic information systems – Intranets and extranets – video teleconferencing. Trigger mechanism – Remote sensing-an insight – contribution of remote sensing and GIS - Case study.							
UNIT III - AWARENESS OF RISK REDUCTION							9

Trigger mechanism – constitution of trigger mechanism – risk reduction by education – disaster information network – risk reduction by public awareness.					
UNIT IV - DEVELOPMENT PLANNING ON DISASTER					9
Implication of development planning – Financial arrangements – Areas of improvement – Disaster preparedness – Community based disaster management – Emergency response.					
UNIT V - SEISMICITY					9
Seismic waves – Earthquakes and faults – measures of an earthquake, magnitude and intensity – ground damage – Tsunamis and earthquakes.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	0	0	0	45
TEXT BOOKS					
1. Siddhartha Gautam and K Leelakrishna Rao, “Disaster Management Programmes and Policies”, Vista International Pub House, 2012 Arun Kumar, “Global Disaster Management”, SBS Publishers, 2008					
REFERENCES					
1. Encyclopaedia Of Disaster Management, Neha Publishers & Distributors, 2008 2. Pardeep Sahni, Madhavi malalgoda and ariyabandu, “Disaster risk reduction in south asia”, PHI, 2002 3. Amita sinvhal, “Understanding earthquake disasters” TMH, 2010. 4. Pardeep Sahni, Alka Dhameja and Uma medury, “Disaster mitigation: Experiences and reflections”, PHI, 2000					

COURSE CODE		XCY307		L	T	P	SS	C
COURSE NAME		WATER QUALITY ANALYSIS		2	0	0	0	2
C:P:A		1.5:0:0.5		L	T	P	SS	H
				2	0	0	0	2
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Ensure the quantity and quality of water with respect to standards and their relation to public health.			Cognitive Psychomotor Affective		Understanding Manipulation Responding		
CO2	Identify the sources of water and illustrate the water transport and distribution			Cognitive		Understanding Applying		
CO3	Classify the cycles of decomposition of sewage and Examine the characteristics of sewage			Cognitive Psychomotor		Understanding Manipulation		
CO4	Describe the function and principles of various water and waste water treatment units.			Cognitive Affective		Understanding Responding		
CO5	Select the disposal methods for sewage and classify the different treatment methods for sludge.			Cognitive		Understanding		
UNIT I - WATER TECHNOLOGY								6
Hardness of Water: types and estimation of hardness (problems) - internal treatment, external treatment – Demineralization process – desalination using reverse osmosis.								
UNIT II - SOURCES AND TRANSMISSION OF WATER								6

Public water supply schemes, Forms and properties of water –per capita demand - population forecasts - variation in demand pattern – water quality – BIS and ISO specifications– water borne diseases – planning of public water supplies.					
UNIT III - WATER TREATMENT					6
Layout of Treatment plants for conventional water treatment plant. Principles and Functions of Screen, Flash Mixer, Flocculator, Sedimentation Tank, Slow and Rapid Sand Filters, and Disinfection Process-advanced water treatment techniques.					
UNIT IV - WASTE WATER TREATMENT					6
oxidation Characteristics and composition of sewage - cycles of decomposition of organic wastes - D.O, BOD and COD and their significance. Treatment methods - Layout of waste water treatment plant- Activated sludge process and its modifications; Tricking filters and Rotating biological pond.					
UNIT V - DISPOSAL OPTIONS					6
Land disposal - sewage farming practice - dilution - discharge into rivers, - oxygen sag - self-purification - eutrophication. - sludge treatment - properties and characteristics of sludge - sludge digestion and drying beds.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	15	0	30	15	60
TEXT BOOKS					
1. Gurucharan Singh,” Water supply and Sanitary Engineering”, Standard Publishers Distributors, 2009 2. Garg, S.K., “Environmental Engineering I & II”, Khanna Publishers, New Delhi 2007 3. S.K. Garg, Wastewater Engineering, Khanna Publishers, New Delhi, 2007 4. CPHEEO Manual on Water Supply And Treatment,1999 5. CPHEEO Manual on Sewerage And Sewage Treatment,1993					
REFERENCES					
1. Karia G L & Christian R A, “Wastewater Treatment”, Prentice Hall of India, New Delhi, 2013. 2. Rangwala, “ Water Supply and Sanitary Engineering PB,24/e, Charotar Publishing house Pvt. Ltd.-Anand, 2011. 3. B.C. Punmia, Wastewater Engineering, Volume – II, Laxmi Publication 2008. 4. LinvilG.Rich, Unit operations of Sanitary Engineering, Tata Mcgraw Hill, New Delhi, 2007. 5. Standard methods for the Examination of Water and wastewater, 17 th Edition, WPCF, APHA and AWWA,USA,1989.					

SEMESTER - IV								
COURSE CODE		XCY401		L	T	P	SS	C
COURSE NAME		PHYSICAL CHEMISTRY II		3	1	0	0	4
C:P:A		3.6:0:0.4		L	T	P	SS	H
				3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Explain the laws of photochemistry and mechanisms of various photochemical reactions			Cognitive		Understanding		
CO2	Apply the rate and its half- life for the chemical reactions..			Cognitive Affective		Apply Receiving		
CO3	Describe the basic concepts in electro chemistry and application of various electrochemical cells			Cognitive		Understanding		
CO4	Identify the symmetry elements and the point group of the chemical molecules			Cognitive Affective		understanding		
CO5	Describe general basic principles of spectroscopy. students can acquire knowledge on IR, Raman and NMR spectroscopies and on their applications.			Cognitive		Apply Remember		
UNIT I - PHOTOCHEMISTRY								
Laws of photochemistry - Grothus-Drapper law – Stark-Einstein law of photochemical equivalence – Quantum efficiency – determination of quantum efficiency – chemical actinometry – consequence of light absorption – Jablonski diagram – radiative and nonradiative transitions – photochemical reactions – kinetics of photochemical combination of H ₂ -Cl ₂ , H ₂ -Br ₂ and decomposition of HI – Energy transfer in photochemical reactions – photosensitization - photosynthesis in plants – Theory of Fluorescence and Phosphorescence – Chemiluminescence and bioluminescence.								
UNIT II - CHEMICAL KINETICS								
Rate of reactions – rate constant – order and molecularity of reactions – first order and pseudo unimolecular reactions (definition and examples) – derivation of rate constant for the inversion of cane sugar. Second order reactions – definition – examples – derivation of rate constant (same concentration and different concentration) and half-life period – application to saponification of ester. Third order reactions: definition and examples. Methods of determination of order of reactions.Zero order reactions – definition and examples – derivation of rate constant. Theory of reaction rates – collision theory of bimolecular reactions – unimolecular reactions – Lindemann’s hypothesis – theory of absolute reaction rates.								
UNIT III - ELECTROCHEMISTRY							8 +3	
Galvanic cells – reversible and irreversible electrodes-emf and its measurement – types of electrodes –Derivation of Nernstt equation for electrode potential and cell emf-electrochemical series and its applications – liquid junction potential -Applications of emf measurement – determination of pH using glass electrodes – potentiometric titrations. Applications of concentration cells – storage cells : lead acid battery, Ni-Cd, Li-Fe battery – mechanism of discharging and recharging – fuel cells (H ₂ -O ₂)								
UNIT IV – GROUP THEORY							9+3	

Symmetry elements – symmetry operations – various point groups with examples – point groups – identification and determination – comparison of molecular and crystallographic symmetry-group multiplication table-Matrix representation of symmetry operations					
UNIT V - SPECTROSCOPY					9+3
Regions of electromagnetic spectrum - concept of frequency, wavelength, wave number, energy, energy levels. Interaction of electromagnetic radiation with matter. Basic principles of atomic and molecular spectroscopy. Statement of Born-Oppenheimer approximation. IR Spectroscopy; Principle, selection rules, Hooke's law, fundamental vibrational frequency and overtone, vibrational modes of CO ₂ and H ₂ O, Raman spectroscopy: Rayleigh and Raman Scattering – Stokes and Anti- stokes lines –mutual exclusion principle- applications. NMR Spectroscopy: Principle,– Chemical Shift – number of signals and splitting of signals- NMR spectrum of ethanol, anisole, benzyl chloride.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60
TEXT BOOKS					
1. Puri B.R., Sharma L.R and Pathania M.S., Principles of Physical Chemistry, 47thed., Vishal Publishing Company, 2016 2. Sharma .K.K, Sharma.L.K. A Text book on physical Chemistry, 6thed., Sultan Chand, 2016. 3. Maron S.H.and Lando J.B. Fundamentals of Physical Chemistry, Macmillan. 4. Glasstone S. and Lewis. D., Elements of Physical Chemistry. Macmillan					
REFERENCES					
1. J. N. Gurtu and A. Gurtu, Advanced Physical Chemistry; 5th Ed., Pragathi Prakashan, Meerut, 2006. 2. J. I. Steinfeld, J. S. Francisco and W. L. Hase, Chemical Kinetics and Dynamics; 2nd Ed., Prentice Hall, New Jersey, 1999. 3. P. W. Atkins, Physical Chemistry; 7th Ed 4. D. A. McQuarrie, Text Book of Physical Chemistry, University Science Books, Mill Valley, California, 1983. 5. R. A. Alberty and R. J. Silbey, Physical Chemistry, John Wiley and Sons, New York, 1992.					

COURSE CODE		XC Y402	L	T	P	SS	C
COURSE NAME		ORGANIC CHEMISTRY II	3	1	0	0	4
C:P:A		3.2:0:0.8	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	<i>Explain</i> the green synthesis of Dyes and Rubbers in the Industry; and also give an idea towards Microwave and ultrasound methods.		Cognitive		Understanding		
CO2	<i>Describe</i> various synthetic strategies and terminologies involved in organic synthesis and the role of important reagents in organic synthesis.		Cognitive		Remember		
CO3	<i>Identify</i> the basic concepts involved in spectroscopic techniques of UV, IR, NMR and Mass spectroscopy and apply techniques for characterization of molecules.		Cognitive Affective		Apply Receiving		
CO4	<i>Recognise</i> the classification, structure and properties of Alkaloids, Terpenoids and Steroids.		Cognitive Affective		Understanding Responding		
CO5	<i>Describe</i> the general properties of carbohydrates.		Cognitive		Remember		
UNIT I - Industrial Organic Chemistry						9+3	
Dyes -theory of color and constitution-classification-preparation and uses of azo dyes -methyl orange -malachite green, indigo dyes -Indigotin, anthraquinone dyes -alizarin, phthalein dyes – fluorescein. Polymers-definition-classification-preparation of Nylon 66, Nylon 6, Bakelite, and biodegradable polymers - Green Chemistry -Definition, need and basic principles of green chemistry -green synthesis -Aqueous phase reactions, reactions in ionic liquids, -Green catalysts - Phase transfer catalysts (PTC) and Biocatalysts. Microwave and Ultrasound assisted green synthesis							
UNIT II - Synthetic methodology and reagents						10+3	
Synthetic terminology -Disconnection, synthon, synthetic equivalent (SE), Functional group interconversion (FGI), Target molecule (TM).-retro synthetic analysis - List of Nucleophilic reagents and electrophilic reagents. Synthetic applications of malonic ester and ethylacetoacetate in the synthesis of a monocarboxylic acids (propionic acid and n-butyric acid). b) dicarboxylic acids (succinic acid and adipic acid). Retrosynthesis of the following molecules 4-methyl acetophenone, 2-methylcyclopentane and 2-allyl phenol. Role of following reagents in organic synthesis: DIBAL Gilmann reagent, DCC.							
UNIT III - Applications of Spectroscopy						9+3	
UV and Visible Spectroscopy: types of electronic transitions Selection rule. Chromophore and auxochromes. Various types of shifts in λ max and in ϵ max. Woodward fisher rule of Calculation of λ max. Infrared spectroscopy: types of vibrations and number of vibrational degrees of freedom. Selection Rules- The characteristic ranges of absorption of IR radiation of various functional groups. NMR Spectroscopy: NMR active nuclei. Equivalent and non-equivalent protons and number of signals. TMS. Chemical shift and coupling constant-NMR spectrum of simple molecules. Mass Spectrometry: principles- Molecular ion- peak, base peak- - meta stable peak. General fragmentation – McLafferty rearrangement - Retro-Diels-Alder rearrangement.							
UNIT IV - Natural Products						9+3	
Alkaloids: Definition - classification - properties - structural determination - Sources, isolation, physiological activities and structure of conine, cocaine and quinine. Terpenoids: definition, isoprene rule and classification with suitable examples - Steroids and Hormones: definition - classification -Occurrence, structure and physiological activities of cholesterol, estrogens and testosterone.							

UNIT V - CARBOHYDRATES					8+3
Carbohydrates: Definition - Classification - Classification of sugars as reducing and nonreducing sugars - D- and L- configurations - Erythro and threo diastereomers - Anomers and epimers with suitable examples - Monosaccharides: Classification- Glucose - properties of glucose - Fructose and its properties - Conversion glucose into fructose and vice-versa - Formation of osazone and glycosides - Fischer open structure - Haworth projection cyclic structures (pyranose and furanose) - Disaccharides: α - and β - glucosidic linkages with suitable examples - 1,4' and 1,6' linkages with suitable examples - Structure and properties of sucrose- Polysaccharides: Cellulose,					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60
TEXT BOOKS					
1. P.T.Anatas and J.C. Warner, Green Chemistry Theory and Practice, New York : Oxford University Press, 1998. 2. I. L. Finar, Organic Chemistry Vol-1, 6th edn, Pearson Education Asia, 2004. 3. J.Clayden, N. Greeves, S. Warren, Organic Chemistry, 2ndedn, Oxford, 2012 4. W. Kemp, Organic Spectroscopy, Palgrave, 1991 5. S.Warren, Designing Organic Synthesis, Wiley India, 2009 6. B. G. Davis, A. J..Fairbanks, Carbohydrate Chemistry, Oxford Chemistry Primer, Oxford University Press, 2002. 7. P. Ghosh, Polymer Science & Technology, Tata McGraw-Hill Education, 1991.					
REFERENCES					
1. V.K. Ahluwalia, Green Chemistry, Narosa Publishing House Pvt. Ltd., New Delhi, Reprint 2013. 2. R. Silverstein, M., Bassler, G. C., Morrill, T. C. Spectrometric Identification of Organic Compounds , John Wiley and Sons, INC, Fifth edition, 1991. 3. W.Carruthers, Modern methods of Organic Synthesis, 4th edition, Cambridge University Press, 2004. 4. R.B. Seymour & C.E. Carraher, Polymer Chemistry: An Introduction, Marcel Dekker,Inc. New York, 1981. 5. D. L. Pavia et al, Introduction to Spectroscopy, 5th Edition, Cengage Learning India Ed. 2015.					

COURSE CODE		XCY403		L	T	P	SS	C
COURSE NAME		GRAVIMETRIC ESTIMATION PRACTICAL IV		0	0	3	0	2
C:P:A		1.0: 0.8:0.2		L	T	P	SS	H
				0	0	3	0	3
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Ability to <i>Identify</i> the various inorganic complexes			Cognitive Psychomotor		Remember Perception		
CO2	<i>Analyse</i> the quantity of individual metal present in a given mixture and <i>explain</i> the characteristic properties of the complexes.			Cognitive Psychomot orAffective		Understand Analyse Perception Receive		
CO3	<i>Use</i> the principle behind the gravimetric analysis.			Cognitive		Apply		
Gravimetric Estimation Practical IV						2 hours each expt		
1. Estimation of Lead as lead chromate. 2. Estimation of Barium as barium chromate. 3. Estimation of Nickel as Nickel - DMG complex. 4. Estimation Calcium as calcium oxalate 5. Estimation of sulphate as barium sulphate.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY		TOTAL		
HOURS	0	0	30	0		30		
TEXT BOOKS								
Venkateswaran V. Veerasamy R. Kulandaivelu A.R., Basic principles of Practical Chemistry,2 nd edition, New Delhi, Sultan Chand & sons (1997).								

COURSE CODE		XPH404		L	T	P	SS	C
COURSE NAME		MODERN PHYSICS		3	1	0	0	4
C:P:A		2.8:0.4:0.8		L	T	P	SS	H
PREREQUISITE:		Basic Physics at School level		3	1	0	0	4
COURSE OUTCOMES <i>On the successful completion of the course, students will be able to</i>				DOMAIN		LEVEL		
CO1	<i>Define, explain</i> Atom models <i>and demonstrate</i> Franck and Hertz method; <i>discuss</i> the phenomenon of Excitation and ionization potentials.			Cognitive Psychomotor		Remember Understand Mechanism		
CO2	Acquire solid knowledge of crystal <i>Analyze</i> number of atoms, atomic radius coordination number in crystal structure and determine d spacing in cubic lattice <i>using</i> Miller indices.			Cognitive		Analyze Apply		
CO3	<i>Understand</i> elementary particle, <i>explain</i> radioactive decay and fission, fusion.			Cognitive Affective		Understand Receive		
CO4	<i>Identify</i> the basics of electric field, magnetic field, <i>explain</i> Ampere's circuital law and Faraday's law.			Cognitive		Remember		
CO5	<i>Understand</i> the fundamental phenomena in electronics and <i>describe</i> the working principle and application of IC's.			Cognitive Affective		Understand Receive		
UNIT - I ATOMIC PHYSICS							7+ 3	
Atom models - Sommerfield and Vector atom models - Electron, spin quantum numbers - Pauli's exclusion principle - Excitation and ionization potentials - Experimental determination - Franck and Hertz method.								
UNIT -II CRYSTAL PHYSICS							8 + 3	
Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in a cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing factor for SC, BCC, FCC and HCP structures.								
UNIT –III NUCLEAR PHYSICS							10 + 3	
Nucleus - Nuclear size - Charge - Nuclear energy - Mass defect - Binding energy - Radioactivity - Alpha, Beta, Gamma radiation - Law of radioactive decay - Decay constant - Half life - Mean life - Fission and Fusion - Elementary particles and their classifications.								
UNIT –IV ELECTRICITY AND MAGNETISM							10 + 3	
Kirchoff's laws - Wheatstone network - Condition for bridge balance - potentiometer - internal resistance of a cell and thermo emf measurement - Magnetic field due to a current carrying conductor - Biot Savart's law - field along the axis of a coil - Force on a current carrying conductor in a magnetic field - Ampere's circuital law - Faraday's law - Maxwell equations in free space.								
UNIT- IV ELECTRONICS							10+3	
Basic electronics - Junction diode - Voltage regulation - Zener diode - Junction transistor (PNP) - Digital electronics - AND, OR, NOT gates - NAND and NOR universal gates - Boolean algebra - De Morgan's theorem - verification - Elementary ideas of IC's.								
TEXT BOOKS								

1. Allied Physics I - A Sundaravelusamy, Priya Publications, 2009. 2. I B.Sc. Ancillary Physics - R Murugesan, S. Chand & Co., 2010.					
REFERENCE BOOKS					
1. Introduction to Solid State Physics - C Kittel - 8 th edition, Wiley Eastern Ltd., 2005. 2. Electricity and Magnetism - Narayanamoorthy and Nagarathinam 3. Modern Physics by R Murugesan, S. Chand & Co., 2004 4. Digital principles and their applications - Malvino and Leach, Tata Mc Graw Hill, 2010.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60

COURSE CODE		XPH405		L	T	P	SS	C
COURSE NAME		MODERN PHYSICS PRACTICAL		0	0	3	0	2
C:P:A		0.4:1:0.6		L	T	P	SS	H
				0	0	3	0	3
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Recall the usage of laboratory instruments and measure the young’s modules of uniform bending.			Cognitive Psychomotor		Understand Mechanism		
CO2	Explain and demonstrate the thermal conductivity of bad conductor.			Psychomotor Affective		Set Valuing		
CO3	Manipulate and measure resistance and specific resistance of a wire.			Cognitive Psychomotor		Apply Mechanism		
CO4	Compare and explain the calibration of ammeter.			Affective Psychomotor		Organization Set		
CO5	Describe the characteristics of the semi- conductor diode.			Psychomotor Affective		Perception Organization		
MODERN PHYSICS PRACTICAL							3 hours each experiment	
1. Uniform Bending - Pin and Microscope Method. 2. Lee's Disc - Thermal Conductivity of Bad Conductor. 3. Spectrometer - Grating- Normal incidence method. 4. Spectrometer - id curve. 5. AND, OR and NOT logic gates - verification of truth table. 6. Potentiometer - Calibration of ammeter. 7. Semiconductor Diode - Forward and Reverse bias characteristics. 8. Metre Bridge - Determination of resistance and specific resistance of a wire.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY			TOTAL	
HOURS	0	0	30	0			30	
TEXT BOOKS								

1. BSc Practical Physics, C. L. Arora, (S. Chand) 2. An Advanced Course in Practical Physics, D. Chattopadhyay and P. C. Rakshit, (New Central Book Agency) 3. A Text Book of Advanced Practical Physics, S. Ghosh, (New Central Book Agency) 7 Semester 1 - Physics (Honours) Theory Paper. 4. Shukla R. K. and Anchal Srivastava, Practical Physics, New Age International (P) Ltd, Publishers, 2006. 5. Arora C. L., B.Sc Practical Physics, S. Chand and Company Ltd, 2007.
REFERENCE BOOKS
1. Squires G. L., Practical Physics, 4 th Edition, Cambridge University Press, 2001. 2. Halliday D., Resnick R. and Walker J., Fundamentals of Physics, 6th Edition, John Wiley and Sons, 2001. 3. Jenkins F.A. and White H.E., Fundamentals of Optics, 4th Edition, Mc Graw Hill Book Company, 2007. 4. Geeta Sanon, B. Sc., Practical Physics, 1st Edition, S. Chand and Company, 2007. 5. Benenson, Walter, and Horst Stocker, Handbook of Physics, Springer, 2002.

COURSE CODE	COURSE NAME	L	T	P	SS	C
XUM004	INTRODUCTION TO ENTREPRENEURSHIP	1	0	0	1	1
PREREQUISITES	NIL	L	T	P	SS	H
C:P:A	0.8:0:0.2	1	0	0	1	2
COURSE OUTCOMES						
Cos	Outcome	Domain	Level			
CO1	Discuss the concept of Entrepreneurship	Cognitive	Remember			
CO2	Explain about an Entrepreneur	Cognitive	Remember and Understand			
CO3	<i>List</i> the characteristics of Entrepreneur	Cognitive	Remember			
CO4	<i>Understand</i> the ways to acquire skills of Entrepreneur	Cognitive	Remember and Understand			
CO5	<i>Understand</i> the concept of Intrapreneurship	Cognitive	Remember and Understand			
UNIT I INTRODUCTION TO ENTREPRENEURSHIP						3+3
Meaning and Concept of Entrepreneurship, History of Entrepreneurship Development, Role of Entrepreneurship in Economic Development, Myths about Entrepreneurs, Agencies in Entrepreneurship Management and Future of Entrepreneurship						
UNIT II THE ENTREPRENEUR						3+3
Gender Discrimination in society and in family, Gender equity, equality, and empowerment. Social and Economic Status of Women in India in Education, Health, Employment, Definition of HDI, GDI and GEM. Contributions of Dr.B.R. Ambethkar, Thanthai Periyar and Phule to Women Empowerment.						
UNIT III CHARACTERISTICS OF AN ENTREPRENEUR						3+3
Introduction - Characteristic Features of Successful Indian Entrepreneurs - Differences between an Entrepreneur and a Manager - Difference between an Entrepreneur and an Intrapreneur - Relationship						

between the terms Entrepreneur, Entrepreneurial and Entrepreneurship - Difference between a Scientist, Inventor and Entrepreneur - Relationship between Entrepreneur and Enterprise - Difference between Entrepreneur and Enterprise - Difference between a Self-employed person and Entrepreneur - Common Myths on Entrepreneur.			
UNIT IV SKILLS FOR AN ENTREPRENEUR			3+3
Business Management Skills - Communication and active listening skills - Risk-taking skills – Networking Skills – Critical Thinking Skills – Problem Solving Skills – Creative Thinking Skills – Customer Service Skills – Financial Skills – Leadership Skills – Time Management and Organizational Skills – Technical Skills			
UNIT V INTRAPRENEURSHIP			3+3
What is Intrapreneurship – Understanding Intrapreneurship – Types of Intrapreneurs – Characteristics of Intrapreneurs – Examples of Intrapreneurship			
	LECTURE	SELF STUDY	TOTAL
	15	15	30
TEXT BOOK			
1. Jayashree Suresh, Entrepreneurial Development, Margham Publications.			
REFERENCE BOOKS			
1. Essentials of Entrepreneurship and Small Business Management (6th Edition) by Norman M. Scarborough (Paperback - Jan 13, 2010)			
2. Entrepreneurship and Small Business Management, Student Edition by Glencoe McGraw-Hill (Hardcover - Feb 24, 2005)			
3. Vasant Desai, Dynamics of Entrepreneurship Development, Star Publication, New Delhi.			
E-RESOURCES			
1. https://in.indeed.com/career-advice/career-development/entrepreneur-skills			
2. https://www.investopedia.com/terms/i/intrapreneurship.asp			

COURSE CODE		XCY407	L	T	P	SS	C
COURSE NAME		PHARMACEUTICAL CHEMISTRY	2	0	0	0	2
C:P:A		1.5:0:0.5	L	T	P	SS	H
			2	0	0	0	2
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	Explain the basic concepts and aims of pharmaceutical chemistry		Cognitive		Understanding		
CO2	Identify the role of drugs and its preparation.		Cognitive Affective		Apply Receiving Responding		
CO3	Describe the antibiotics role pharmaceuticals in our life.		Cognitive				
CO4	Recognise fermentation Aerobic and anaerobic fermentation in daily process.		Cognitive Affective		Understanding		
CO5	Describe the important medicinal plant and its actions.		Cognitive		Remember Understanding		
UNIT I - BASIC CONCEPTS OF PHARMACEUTICAL CHEMISTRY						6	
Basic concepts and aims of pharmaceutical chemistry- Terms and Definitions -drug, pharmacophore, pharmacology, pharmacopoeia, chemotherapy – Biological activities and examples -bacteria, virus, and vaccine Causes, symptoms and drug for anemia, jaundice, cholera, alaria and filarial. Indian Medicinal plants and uses – Tulasi, Neem, Kizhanelli, Mango, Semparuthi, Adadodai and Thoothvelai.							
UNIT II - ANTIBACTERIALS						6	
Sulpha drugs-examples and actions-prontosil, sulphathiazole, sulphafurazole. Antibiotics-definition and action of penicillin, streptomycin, chloramphenicol, erythromycin-tetracyclin –Antiseptics and disinfectans – definition and distinction – phenolic compounds, chlorocompounds and cationic surfactant							
UNIT III - ANALGESICS AND CNS STIMULANTS						6	
Analgesics: Definition and Actions – narcotic and non narcotic – morphine and its derivatives, Antipyretic analgesics - salicylic derivative, paracetamol, ibuprofen. Drugs affecting CNS – Definition, distinction and examples for tranquilisers, sedatives, hypnotics, psychedelic drugs – LSD, Hashish – their effects.							
UNIT IV - ANASTHETICS AND DRUGS FOR CHRONIC DISEASES						6	
Anaesthetics - definition – local and general – volatile nitrous oxide, ether, Chloroform, cyclo propane – uses and disadvantages – non – volatile intravenous – thiopental sodium, methohexitone, Causes, medicines and their mode of action for the treatment of cancer – antineoplastics – diabetes –Blood: Grouping, composition, Rh factor, blood pressure, hyper tension and hypotension. COVID19							

UNIT V - VITAMINS, HARMONES AND ENZYMES					6
Vitamins – fat soluble vitamins – (i) vitamin A; (ii) vitamin D; (iii) vitamin B complex; (iv) vitamin C; (V) vitamin E; (vi) vitamin K; (vii) vitamin P. Hormones – Introduction, properties, Physiological function of some hormones:, oxytoxin, insulin, Enzymes – Chemical nature of enzymes, classification of enzymes, properties of enzymes, mechanism of enzyme action. Action of Co-enzymes.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	15	0	30	15	60
TEXT BOOKS					
1. G.L. Patrick: Introduction to Medicinal Chemistry, Oxford University Press, UK. 2. Hakishan, V.K. Kapoor: Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Pitampura, New Delhi.					
REFERENCES					
1. William O. Foye, Thomas L., Lemke , David A. William: Principles of Medicinal Chemistry, B.I. Waverly Pvt. Ltd. New Delhi.					

SEMESTER - V							
COURSE CODE	XCY501		L	T	P	SS	C
COURSE NAME	ORGANIC QUALITATIVE ANALYSIS PRACTICAL VA		0	0	4	0	2
C:P:A	1 : 0.8: 0.2		L	T	P	SS	H
			0	0	4	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	Identify the monofunctional groups in various types of organic compound.		Cognitive Psychomotor		Remember Perception		
CO2	Estimate the extra elements in a combination of of two or more organic compounds.		Cognitive Psychomotor		Understand Set		
CO3	Estimate the R _f value by separating the mixtures of organic compounds by chromatography and effect of different parameters on amino acids and carbohydrates.		Cognitive Psychomotor Affective		Apply Set Receiving		
Organic qualitative analysis practical VA						60 hours	
1. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.							
2. Detection of extra elements (N, S, Cl, Br, I) in organic compounds (containing upto two extra elements)							
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL		
HOURS	0	0	60	0	60		
REFERENCE BOOKS							
1. Svehla, G. <i>Vogel's Qualitative Inorganic Analysis</i> , Pearson Education, 2012.							
2. Mendham, J. <i>Vogel's Quantitative Chemical Analysis</i> , Pearson, 2009.							
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., <i>Textbook of Practical Organic Chemistry</i> , Prentice-Hall, 5th edition, 1996.							
Mann, F.G. & Saunders, B.C. <i>Practical Organic Chemistry</i> Orient-Longman, 1960.							

COURSE CODE		XCY502	L	T	P	SS	C
COURSE NAME		PHYSICAL CHEMISTRY PRACTICAL VB	0	0	4	0	2
C:P:A		1:0.8:0.2	L	T	P	SS	H
			0	0	4	0	4
COURSE OUTCOMES			DOMAIN			LEVEL	
CO1	<i>Identify</i> the surface tension of liquid or a detergent solution.		Cognitive Psychomotor			Remember Perception	
CO2	<i>Estimate</i> the viscosity of liquid and its variation with respect to concentration of a solute.		Cognitive Psychomotor			Understand Set	
CO3	<i>Estimate</i> the kinetics of different reactions using Initial rate method and Integrated rate method.		Cognitive Psychomotor Affective			Apply Set Receiving	
Physical chemistry practical VB							60 hours
1. Determination of partition coefficient of Iodine between carbon tetra chloride and Water. 2. Determination of rate constant of acid-catalysed hydrolysis of an ester (Methyl acetate or Ethyl acetate). 3. Determination of kf / molecular weight by Rast’s macro method-Naphthalene, Diphenyl and diphenylamine. 4. Determination of critical solution temperature of Phenol-Water system. 5. Determination of concentration of an electrolyte (NaCl/KCl/succinic acid). 6. Critical solution temperature-CST of phenol – water system 7. Estimation of sodium chloride by studying the CST of phenol-water system							
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY		TOTAL	
HOURS	0	0	60	0		60	
REFERENCE BOOKS							
1. Svehla, G. <i>Vogel’s Qualitative Inorganic Analysis</i>, Pearson Education, 2012. 2. Mendham, J. <i>Vogel’s Quantitative Chemical Analysis</i>, Pearson, 2009. 3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., <i>Textbook of Practical Organic Chemistry</i>, Prentice-Hall, 5th edition, 1996. Mann, F.G. & Saunders, B.C. <i>Practical Organic Chemistry</i> Orient-Longman, 1960.							

COURSE CODE		XCY503A	L	T	P	SS	C
COURSE NAME		PHYTO CHEMISTRY	3	1	0	0	4
C:P:A		3.2 : 0 : 0.8	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	<i>Identify</i> new biologically important molecular components from natural origin.		Cognitive		Remember		
CO2	<i>Explain</i> various steps in isolation and separation of plant extracts from natural sources.		Cognitive		Understand		
CO3	<i>Analyse</i> the various molecular entities in the plant extracts using various spectral and solvent extraction methods.		Cognitive		Analyze		
CO4	<i>Interpret</i> the mode of action of various drugs extracted from herbals.		Cognitive		Understand		
CO5	<i>Illustrate</i> the structure- functional activities of various herbs to make attempt to cure challengeable disease.		Cognitive		Analyze		
UNIT I - NATURAL PRODUCTS						9+3	
Natural products – importance-phytochemicals- classification- diversity of structures- preliminary phytochemical screening- bioassay- in vitro and in vivo studies- antimicrobial activity- pharmacological studies like anti-inflammatory, anti-diabetic, analgesic and hepato protective.							
UNIT II - PHYTOCHEMICAL ISOLATION TECHNIQUES						9+3	
Phytochemical isolation techniques- solvent extraction- qualitative chemical examination- detection of phyto constituents- use of chromatographic techniques- TLC, HPLC and GC- detection of volatile oils by hydrodistillation methods.							
UNIT III - PHYTOCHEMICAL IMPORTANCE OF DRUGS						7+3	
Sources, chemical structures (structure only), chemical test for identification, phytochemical and pharmacological importance - nicotine, caffeine, theophilline, theobromine and cocaine- Flavonoids -quercetin and kaempferol.							
UNIT IV - TERPINOID,STEROIDS AND ANTI-CANCER PLANTS						11+3	
Sources, chemical structures (structure only), chemical test for identification, - Terpinoids menthol, camphor, citral, limonene - carotenoids lycopene and beta carotene – Steroids stigmasterol and cholesterol – anti-cancer plants – cytostatics- harmine, taxol and colchicines.							
UNIT V - SPECTROSCOPIC TECHNIQUES						9+3	
Structural elucidation of the compounds by spectroscopic techniques like UV, IR, MS, NMR (¹ H, ¹³ C) for simple organic compounds.							
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL		

HOURS	45	15	0	0	60
TEXT BOOKS					
1. Kalsi, P.S., Spectroscopy of organic compounds, New age publishers, New Delhi, 2000. 2. Lindsey, K. , Transgenic Plant Research, Harwood Acad. Pub. 1997. 3. D. L. Pavia, G. M. Lampmann, G. S. Kriz, Introduction to Spectroscopy, Thomson, 3rd edition, 2001. 4. Silverstein and Webster, Spectrometric Identification of Organic Compounds, Sixth Edition, Wiley, 1998.					
REFERENCES					
1. W C Evans, Pharmacognosy , 15th edition, 2002. 2. Gunnar Samuelsson ,A Textbook of Pharmacognosy, English edition, Swedish Pharmaceutical Press, Stockholm,1992. 3. Gupta, P.K., Cytogenetics, Rastogi and Company , Meerut. 1995. 4. Swanson, C.P.. Cytology and Cytogenetics. Macmillan India Ltd. New Delhi, 1972. 5. Gupta, P.K. Elements of Biotechnology, Rastogi , Meerut,1972.					
E RESOURCES					
1. http://freevideolectures.com/Course/3218/Advance-Analytical-Course 2. http://freevideolectures.com/Course/2908/Green-Chemistry-An-Interdisciplinary-Approach-to-Sustainability .					

COURSE CODE		XCY503B	L	T	P	SS	C
COURSE NAME		FORENSIC SCIENCE	3	1	0	0	4
C:P:A		3.5 : 0 : 0.5	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	Identify the methods of analyzing trace amounts of petroleum products in crime scene evidence.		Cognitive		Remember		
CO2	Explain the method of searching, collecting, preserving and analyzing arson evidence		Cognitive		Understand		
CO3	Analyse the various types of explosives, including the synthesis and characterization of representative analogs and the techniques of locating hidden explosives.		Cognitive		Analyze		
CO4	Interpret the importance of chromatographic and spectroscopic techniques in processing crime scene evidence.		Cognitive		Understand		
CO5	Illustrate the significance of microscopy in visualizing trace evidence and comparing it with control samples.		Cognitive		Analyze		
UNIT I - PETROLEUM AND PETROLEUM PRODUCTS						9+3	
Distillation and fractionation of petroleum. Commercial uses of different petroleum fractions. Analysis of petroleum products. Analysis of traces of petroleum products in forensic exhibits. Comparison of petroleum products. Adulteration of petroleum products.							

UNIT II - CASES INVOLVING ARSON					9+3
Chemistry of fire. Conditions for fire. Fire scene patterns. Location of point of ignition. Recognition of type of fire. Searching the fire scene. Collection and preservation of arson evidence. Analysis of fire debris. Analysis of ignitable liquid residue. Post-flashover burning. Scientific investigation and evaluation of clue materials. Information from smoke staining.					
UNIT III - EXPLOSIVES					7+3
Classification of explosives –low explosives and high explosives. Homemade explosives. Military explosives. Blasting agents. Synthesis and characteristics of TNT, PETN and RDX. Explosion process. Blast waves. Bomb scene management. Searching the scene of explosion. Mechanism of explosion. Post blast residue collection and analysis. Blast injuries. Detection of hidden explosives.					
UNIT IV - INSTRUMENTATION					15+3
Sample preparation for chromatographic and spectroscopic evidence. Chromatographic methods. Fundamental principles and forensic applications of thin layer chromatography, gas chromatography and liquid chromatography. Spectroscopic methods. Fundamental principles and forensic applications of Ultraviolet-visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy, atomic emission spectroscopy and mass spectroscopy. X-ray spectrometry. Colorimetric analysis and Lambert-Beer law. Electrophoresis –fundamental principles and forensic applications. Neutron activation analysis – fundamental principles and forensic applications.					
UNIT V - MICROSCOPY					5+3
Fundamental principles. Different types of microscopes. Electron microscope. Comparison Microscope. Forensic applications of microscopy.					
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	0	15	0	60
TEXT BOOKS					
1. D.A. Skoog, D.M. West and F.J. Holler, Fundamentals of Analytical Chemistry, 6 th Edition, Saunders College Publishing, Fort Worth (1992). 2. W. Kemp, Organic Spectroscopy, 3 rd Edition, Macmillan, Hampshire (1991). 3. J.D. DeHaan, Kirk's Fire Investigation, 3 rd Edition, Prentice Hall, New Jersey (1991). 4. W.J. Tilstone, M.L. Hastrup and C. Hald, Fisher's, Techniques of Crime Scene Investigation, CRC Press, Boca Raton (2013). 5. S. Ballou, M. Houck, J.A. Siegel, C.A. Crouse, J.J. Lentini and S. Palenik in Forensic Science, D.H. Ubelaker (Ed.), Wiley-Blackwell, Chichester (2013)					
REFERENCES					
1. J.W. Robinson, Undergraduate Instrumental Analysis, 5 th Edition, Marcel Dekker, Inc., New York (1995) 2. A.A. Moenssens, J. Starrs, C.E. Henderson and F.E. Inbau, Scientific Evidence in Civil and Criminal Cases, 4 th Edition, The Foundation Press, Inc., New York (1995). 3. R. Saferstein, Criminalistics, 8 th Edition, Prentice Hall, New Jersey (2004).					
E RESOURCES					
1. https://www.mooc-list.com/course/introduction-forensic-science-futurelearn 2. https://www.mooc-list.com/course/forensic-engineering-learning-failures-edx					

COURSE CODE		XCY504A	L	T	P	SS	C
COURSE NAME		ANALYTICAL CHEMISTRY	3	1	0	0	4
C:P:A		3.2 : 0 : 0.8	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	<i>Identify</i> the concepts of qualitative and quantitative analysis and also to find out the errors, accuracy and precision in data analysis.		Cognitive		Remember		
CO2	<i>Explain</i> the principles and methods of analyzing chemical compounds with the help of various spectroscopies.		Cognitive		Understand		
CO3	<i>Analyse</i> the various types of thermal methods of analysis including TGA, DTA, DSC etc.		Cognitive		Analyze		
CO4	<i>Interpret</i> the importance of electroanalytical techniques in analysis of different parameters of chemical compounds and solutions..		Cognitive		Understand		
CO5	<i>Illustrate</i> the significance of separation techniques in visualizing trace elements and comparing it with control samples.		Cognitive		Analyze		
UNIT I - QUALITATIVE AND QUANTITATIVE ASPECTS OF ANALYSIS						5+3	
Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.							
UNIT II - OPTICAL METHODS OF ANALYSIS						15+3	
Principle, Instrumentation and Applications of UV-Visible Spectrometry and principle, Instrumentation and Applications of Infrared Spectrometry, importance of isotope substitution. Principle, Instrumentation and application of Flame Atomic Absorption and Emission Spectrometry - Quantitative estimation of trace metal ions from water samples.							
UNIT III - THERMAL AND ELETROANALYTICAL METHODS						5+3	
Theory of thermogravimetry (TG), Principles, Instrumentation and applications of TGA, DTA, DSC. Quantitative estimation of Ca and Mg from their mixture. Electroanalytical methods, classifications, instrumentation, basic principle of pH metric, potentiometric and conductometric titrations.							
UNIT IV - TITRIMETRIC AND GRAVIMETRIC ANALYSIS						5+3	
Titrimetric Analysis: Standard solutions – concentration units– Neutralisation indicators – Neutralisation curves – mixture of strong and weak acids. precipitation titrations, redox titrations, self - indicators, external indicators, Complexometric titration, murexide indicator. Gravimetric Analysis ; Principles, characteristics of precipitating agents – specific and selective precipitants – DMG, cupferron, salicyladehyde, ethylene diamine – use of sequestering agents – co precipitation – post precipitation – peptisation							
UNIT V - SEPARATION TECHNIQUES						15+3	

Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and nonaqueous media.

Chromatography: Classification, principle and efficiency of the technique. Mechanism of separation: adsorption, partition & ion exchange. Paper, column, Thin layer chromatography and HPLC.

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60

TEXT BOOKS

1. Jeffery, G.H., Bassett, J., Mendham, J. & Denney, R.C. *Vogel's Textbook of Quantitative Chemical Analysis*, John Wiley & Sons, 1989.
2. Willard, H.H., Merritt, L.L., Dean, J. & Settoe, F.A. *Instrumental Methods of Analysis*, 7th Ed. Wadsworth Publishing Company Ltd., Belmont, California, USA, 1988.
3. Christian, G.D; *Analytical Chemistry*, 6th Ed. John Wiley & Sons, New York, 2004.
4. Harris, D. C. *Exploring Chemical Analysis*, Ed. New York, W.H. Freeman, 2001.

REFERENCES

1. Khopkar, S.M. *Basic Concepts of Analytical Chemistry*. New Age, International Publisher, 2009.
2. Skoog, D.A. Holler F.J. & Nieman, T.A. *Principles of Instrumental Analysis*, Cengage Learning India Ed.
3. Mikes, O. *Laboratory Hand Book of Chromatographic & Allied Methods*, Elles Harwood Series on Analytical Chemistry, John Wiley & Sons, 1979.

E RESOURCES

1. <https://www.mooc-list.com/course/basic-analytical-chemistry-edx>
2. <https://www.mooc-list.com/course/analytical-chemistry-instrumental-analysis-coursera>
3. <https://www.mooc-list.com/course/analytical-chemistry-saylororg>

COURSE CODE		XCY504B	L	T	P	C
COURSE NAME		AGRICULTURAL CHEMISTRY	3	1	0	4
C:P:A		3.2 : 0 : 0.8	L	T	P	H
			3	1	0	4
COURSE OUTCOMES			DOMAIN		LEVEL	
CO1	<i>Identify</i> the chemical composition and soils of the earth's crust.		Cognitive		Remember	
CO2	<i>Explain</i> the concept of soil fertility, soil productivity and application of various types of fertilizers		Cognitive		Understand	
CO3	<i>Analyse</i> the various types of radioisotopes in soil and plants.		Cognitive		Analyze	
CO4	<i>Interpret</i> the importance of remote sensing and GIS techniques in agriculture.		Cognitive		Understand	
CO5	<i>Illustrate</i> the significance of Analysis of soil extracts, nutrients, plants extracts and irrigation waters and interpretation of results.		Cognitive		Analyze	
UNIT I - SOIL CHEMISTRY					7+3	
Chemical (elemental) composition of the earth's crust and soils. Elements of equilibrium thermodynamics, chemical equilibria, electrochemistry and chemical kinetics. Soil organic matter – classification, fractionation of soil organic matter and different fractions, genesis and nature of soil organic matter and humus formation, humus decomposition, separation of humus from soil particles, clay-organic interactions.						
UNIT II - SOIL FERTILITY AND FERTILIZER USE					8+3	
Soil fertility and soil productivity; nutrient sources – fertilizers and manures; essential plant nutrients - functions and deficiency symptoms. Law of soil fertility soil and fertilizer nitrogen – sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation; nitrogenous fertilizers and their fate in soils; management of nitrogenous fertilizers.						
UNIT III - RADIOISOTOPES IN SOIL AND PLANT STUDIES					7+3	
Principles and use of radiation monitoring instruments - proportional, Geiger Muller counter, solid and liquid scintillation counters; neutron moisture meter. Isotopic dilution techniques used in soil and plant research; use of stable isotopes; application of isotopes in studies on organic matter, nutrient transformations, ion transport, rooting pattern and fertilizer use efficiency; carbon dating.						
UNIT IV - TECHNIQUES FOR SOIL, WATER AND CROP STUDIES					8+3	
Introduction and history of remote sensing; sources, propagation of radiations in atmosphere; interactions with matter. Sensor systems - camera, microwave radiometers and scanners; fundamentals of aerial photographs and image processing and interpretations. Application of remote sensing techniques - land use soil surveys, crop stress and yield forecasting, prioritization in watershed and drought management, land identification and management.						
UNIT V - ANALYTICAL TECHNIQUES IN SOIL AND PLANT ANALYSIS					15+3	

Preparation of solutions for standard curves, analytical and qualitative reagents, indicators and standard solutions for acid-base, oxidation-reduction titration; soil, water and plant sampling techniques their processing and handling. Nutrient potentials and potential buffering capacities of soils. Determination of lime and gypsum requirement of soil.

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
HOURS	45	0	15	60

TEXT BOOKS

1. Agricultural Chemistry V.V Publications.
2. Soil analysis. Beckmann
3. Bear RE. 1964. Chemistry of the Soil. Oxford and IBH.
4. Bolt GH & Bruggenwert MGM. 1978. Soil Chemistry. Elsevier.
5. Comer CL. 1955. Radioisotopes in Biology and Agriculture: Principles and Practice. Tata McGraw Hill. Elangovan K. 2006. GIS Fundamentals, Applications and Implementations. New India Publ. Agency. Lillesand TM & Kiefer RW. 1994. Remote Sensing and Image Interpretation. 3rd Ed. Wiley
6. Hesse P. 1971. Textbook of Soil Chemical Analysis. William Clowes & Sons.
7. Jackson, M.L. 1967. Soil Chemical Analysis. Prentice Hall of India.

REFERENCES

1. Greenland DJ & Hayes MHB. 1981. Chemistry of Soil Processes. John Wiley & Sons
2. Glasstone S. 1967. Source Book on Atomic Energy. East West Press.
3. Michael FL & Annunziata. 2003. Handbook of Radioactivity Analysis. Academic Press.
4. Kenneth Helrich 1990. Official Methods of Analysis. Association of Official Analytical Chemists.
5. Page, A.L., Miller RH & Keeney DR. 1982. Methods of Soil Analysis. Part II. SSSA, Madison.
6. Piper CS. Soil and Plant Analysis. Hans Publ.

E RESOURCES

1. <http://nptel.ac.in/courses/126104002/>

COURSE CODE		XCY505A		L	T	P	SS	C
COURSE NAME		COMPUTER APPLICATIONS IN CHEMISTRY		3	1	0	0	4
C:P:A		3.2 : 0 : 0.8		L	T	P	SS	H
				3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	<i>Identify</i> the components and formats of computer operations.			Cognitive		Remember		
CO2	<i>Explain</i> the elements, operators, programming of basic language.			Cognitive		Understand		
CO3	<i>Analyse</i> the various types of Numerical methods for roots of equations and simultaneous equation.			Cognitive		Analyze		
CO4	<i>Interpret</i> the importance of remote sensing and GIS techniques in agriculture.			Cognitive		Understand		
CO5	<i>Illustrate</i> the significance of molecular modeling and data handling.			Cognitive		Analyze		
UNIT I - INTRODUCTION TO COMPUTERS APPLICATIONS							7+3	
Constants, variables, bits, bytes, binary and ASCII formats, arithmetic expressions, hierarchy of operations, inbuilt functions.								
UNIT II - ELEMENTS OF THE BASIC LANGUAGE							7+3	
Elements of the BASIC language. BASIC keywords and commands. Logical and relative operators. Strings and graphics. Compiled versus interpreted languages. Debugging. Simple programs using these concepts. Matrix addition and multiplication. Statistical analysis.								
UNIT III - ROOTS OF EQUATIONS AND SIMULTANEOUS EQUATIONS							7+3	
Numerical methods for roots of equations: Quadratic formula, iterative method, Newton-Raphson method, Binary bisection and Regula-Falsi. Matrix manipulation: addition, multiplication. Gauss-Siedal method.								
UNIT IV - DIFFERENTIAL AND INTEGRAL CALCULUS							12+3	
Numerical differentiation, Numerical integration (Trapezoidal and Simpson’s rule), probability distributions and mean values.								
UNIT V - CONCEPTUAL BACKGROUND OF MOLECULAR MODELLING							12+3	
Handling of experimental data. Potential energy surfaces. Elementary ideas of molecular mechanics and practical MO methods.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY		TOTAL		
HOURS	45	15	0	0		60		
TEXT BOOKS								
1. Harris, D. C. Quantitative Chemical Analysis. 6th Ed., Freeman (2007) Chapters 3-5. 2. Levie, R. de, How to use Excel in analytical chemistry and in general scientific data analysis, Cambridge Univ. Press (2001) 487 pages. 3. Noggle, J. H. Physical chemistry on a Microcomputer. Little Brown & Co. (1985). 4. Venit, S.M. Programming in BASIC: Problem solving with structure and style. Jaico Publishing, House: Delhi (1996).								

COURSE CODE		XCY505B	L	T	P	SS	C
COURSE NAME		PROGRAMMING IN C	3	1	0	0	4
C:P:A		3 : 0.2 : 0.8	L	T	P	SS	H
			3	1	0	0	4
COURSE OUTCOMES			DOMAIN		LEVEL		
CO1	Identify simple applications in C using basic constructs		Cognitive		Remember		
CO2	Explain the design and implement applications using arrays and strings		Cognitive		Understand		
CO3	Analyse the development and implementation applications in C using functions and pointers		Cognitive		Analyze		
CO4	Interpret the importance of structures in developing applications in C.		Cognitive		Understand		
CO5	Illustrate the designing of applications using sequential and random access file processing.		Cognitive		Analyze		
UNIT I - BASICS OF C PROGRAMMING							9+3
Introduction to programming paradigms -Structure of C program -C programming: Data Types – Storage classes-Constants–Enumeration Constants-Keywods–Operators: Precedence and Associativity-Expressions Input/ Output statements, Assignment statements–Decision making statements-Switch statement-Looping statements – Pre-processor directives -Compilation process.							
UNIT II - ARRAYS AND STRINGS							9+3
Introduction to Arrays: Declaration, Initialization – One dimensional array–Example Program: Computing Mean, Median and Mode-Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search.							
UNIT III - FUNCTIONS AND POINTERS							9+3
Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers –Pointer operators –Pointer arithmetic – Arrays and pointers –Array of pointers –Example Program: Sorting of names –Parameter passing: Pass by value, Pass by reference –Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.							
UNIT IV - STRUCTURES							6+3
Structure -Nested structures –Pointer and Structures –Array of structures –Example Program using structures and pointers –Self referential structures –Dynamic memory allocation-Singly linked list.							
UNIT V - FILE PROCESSING							12+3
Files –Types of file processing: Sequential access, Random access –Sequential access file – Example Program: Finding average of numbers stored in sequential access file -Random access file –Example Program: Transaction processing using random access files –Command line arguments.							

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60
TEXT BOOKS					
1. Reema Thareja, —Programming in C++, Oxford University Press, Second Edition, 2016. 2. Kernighan, B.W and Ritchie, D.M, —The C Programming language, Second Edition, Pearson Education, 2006					
REFERENCES					
1. Paul Deitel and Harvey Deitel, —C How to Program, Seventh edition, Pearson Publication 2. Juneja, B. L and Anita Seth, —Programming in C++, CENGAGE Learning India pvt. Ltd., 2011 3. Pradip Dey, Manas Ghosh, —Fundamentals of Computing and Programming in C++, First Edition, Oxford University Press, 2009. 4. Anita Goel and Ajay Mittal, —Computer Fundamentals and Programming in C++, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011. 5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with C", McGraw-Hill Education, 1996					

COURSE CODE		XCY506		L	T	P	SS	C
COURSE NAME		CLINICAL CHEMISTRY		2	0	0	0	2
C:P:A		1.2 : 0 : 0.8		L	T	P	SS	H
				2	0	0	0	2
COURSE OUTCOMESS				DOMAIN			LEVEL	
CO1	Identify the mechanism of different types of metabolism.			Cognitive			Remember	
CO2	Explain the important concepts of various techniques used in clinical chemistry.			Cognitive			Understand	
CO3	Analyse the various molecular entities known as vitamins and nutrition values.			Cognitive			Analyze	
CO4	Interpret the methods of testing of various organs of body and the diagnostic roles of related enzymes.			Cognitive			Understand	
CO5	Illustrate the various methods for cardiac profile, glucose and cholesterol estimation.			Cognitive			Analyze	
UNIT I - METABOLISM							3+3	
Distribution of fluids in the body, ECF & ICF, water metabolism, de hydration, mineral metabolism, macronutrients (principal mineral elements) & trace elements. Carbohydrate metabolism, Protein metabolism, Lipid metabolism, Bile pigment metabolism.								
UNIT II - TECHNIQUES USED IN CLINICAL CHEMISTRY							3+3	
Photometry- Definition, laws of photometry, absorbance, transmittance, absorption maxima, instruments, parts of photometer, types of photometry–colorimetry, spectrophotometry, flame photometry, fluorometry, choice of appropriate filter, measurements of solution, calculation of formula, applications.								
UNIT III - VITAMINS AND NUTRITION							2+3	

Classification of vitamins, Chemistry, properties, biological importance and deficiency manifestations of fat soluble vitamins. Chemistry, properties, biological importance, deficiency manifestations and coenzyme functions of water soluble vitamins.					
UNIT IV - ORGAN FUNCTION TESTS AND DIAGNOSTIC ENZYMES					5+3
Organ function tests: Evaluation of organ function tests: Assessment and clinical manifestations of renal, pancreatic, gastric and intestinal functions. Clinical importance of bilirubin. Enzyme tests in determination of myocardial infarction. Enzymes of pancreatic origin and biliary tract.					
UNIT V - APPLICATIONS OF CLINICAL CHEMISTRY					2+3
Cardiac Profile - In brief Hypertension, Angina, Myocardial Infarction, Pattern of Cardiac Enzymes in heart diseases, Different methods of Glucose Estimation and Cholesterol Estimation, Principle advantage and disadvantage of different methods.					
PRACTICALS					30 hrs
1. Estimation of glucose using Fehling's solution 2. Estimation of cholesterol using ferric chloride 3. Estimation of ferric ion by colorimetric method 4. Iodometric determination of vitamin C 5. Estimation of carbohydrate in mixture by qualitative method.					
	LECTURE	TUTORIAL	SELF STUDY	PRACTICAL	TOTAL
HOURS	15	0	15	30	60
TEXT BOOKS					
1. Lehninger Principles of Biochemistry 4th Ed By David L. Nelson and Michael M. Cox, WH Freeman and Company. 2. Principles of Biochemistry (Hardcover) By Geoffrey Zubay. Publisher: McGraw Hill College. 3. Harper's Biochemistry (Lange Medical Books) (Paperback) By Robert K. Murray, Daryl K. Granner, Peter A. Mayes and Victor W. Rodwell. Publisher: Appelton and Lange. 5. Bioenergetics By David G. Nicholls and Stuart J. Ferguson. Academic Press. 6. Bioenergetics at a Glance: An Illustrated Introduction (At a Glance) By D.A. Harris. Publisher: Wiley Blackwell					
REFERENCES					
1. Biochemistry By Lubert Stryer. WH Freeman and Co. 2. Principles of Biochemistry By Robert Horton, Laurence A Moran, Gray Scrimgeour, Marc Perry and David Rawn. Pearson Education. 3. Harper's Biochemistry By RK Murray, DK Granner, PA Mayes and VW Rodwell. Appelton and Lange, Stanford.					

SEMESTER - VI									
COURSE CODE		XCY601		L	T	P	SS	C	
COURSE NAME		ORGANIC QUALITATIVE ANALYSIS PRACTICAL VI		0	0	4	0	2	
C:P:A		1: 0.8 :0.2		L	T	P	SS	H	
				0	0	4	0	4	
COURSE OUTCOMES				DOMAIN			LEVEL		
CO1	Identify the various Metals in the present in the given organic mixture and analyses the respective groups.			Cognitive Psychomotor			Remember Perception		
CO2	Estimate the amount of acids using volumetric method the fundamentals of group separation and chemical reaction takes place in the confirmation test.			Cognitive Psychomotor			Understand Set		
CO3	Estimate the amount of bases using volumetric method and Interpret the results and differentiate the various groups and cations/ aniond present in the mixture.			Cognitive Psychomotor Affective			Apply Set Receiving		
Organic qualitative analysis practical VI							3 hours each exp		
I. Organic Estimation									
1. Estimation of phenol									
2. Estimation of aniline									
3. Estimation of glucose									
II. Organic Analysis									
Substances to be analysed:									
1. Aromatic acid (mono carboxylic acid)									
2. Aromatic ester (mono functional group)									
3. Aromatic aldehyde									
4. Aromatic ketone									
5. Phenol									
6. Carbohydrate (Glucose only)									
7. Aliphatic amide (urea)									
8. Aromatic amide									
9. Aromatic amine (Aniline)									
10. Aromatic nitro compound									
HOURS				LECTURE		TUTORIAL		PRACTICAL	TOTAL
				0		0		60	60
TEXT BOOKS									
1. B.S. Furniss, A.J. Hannaford, V. Rogers, P.W.G Smith and A.R. Tatchell., “Vogel’s Textbook of practical Organic Chemistry” , (ELBS), 5th edn., 2009.									
2. J. Bassett, R.C. Denney, G. H Jeffery and J. Mendham, “ Vogel’s text book of Quantitative Inorganic Analysis (revised)”, (ELBS), 6th edn., 2007.									

E Resources - MOOCs:

1. <http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques>
2. <http://freevideolectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011>
3. <http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques>

COURSE CODE		XCY602		L	T	P	SS	C
COURSE NAME		PHYSICAL CHEMISTRY PRACTICAL VIA		0	0	4	0	2
C:P:A		1: 0.8:0.2		L	T	P	SS	H
				0	0	4	0	4
COURSE OUTCOMES				DOMAIN			LEVEL	
CO1	Determine the molecular weight and critical solution temperature.			Cognitive Psychomotor			Remember Perception	
CO2	Estimate relative strength of acids and partial coefficient.			Cognitive Psychomotor			Understand Set	
CO3	Interpret the electrochemistry and thermochemistry titrations and examine the complexometric titration.			Cognitive Psychomotor Affective			Apply Set Receiving	
PHYSICAL CHEMISTRY PRACTICAL VIA							3 hours each exp	
1. Phase diagram:Simple eutectic								
2. Determination of molecular weight-Rast-macro method (using naphthalene as solvent)								
3. Transition temperature (using sodium thio sulphate penta hydrate as salt hydrate)								
4. Determination of cell constant, specific conductivity and equivalent conductivity of strong electrolyte.								
5. Determination of dissociation constant of a weak acid (acetic acid).								
6. Conductometric titrations, strong-acid-strong base.								
	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL			
HOURS	0	0	60	0	60			
TEXT BOOKS								
1. Venkateswaran V, Veeraswamy R., Kulandaively A.R.,Basic principles of practical chemistry, 2nd edition, New Delhi, sultan chand & sons, (1997).								
REFERENCE								
1. J.B.Yadav;“Advanced Practical Physical Chemistry”6 th Edn.,Goel Publications,Meerut, 1986.								

COURSE CODE		XCY603A		L	T	P	SS	C
COURSE NAME		INDUSTRIAL CHEMISTRY		3	1	0	0	4
PREREQUISITE		NIL		L	T	P	SS	H
C:P:A		3.2:0:0.8		3	1	0	0	4
COURSE OUTCOMES				DOMAIN			LEVEL	
CO1	Describe the utilization of the raw materials in chemical industry.			Cognitive			Remember	
CO2	Explain the manufacturing process of cement, ceramics, glass and fertilizers.			Cognitive			Understand	
CO3	Recognize the technologies used in small scale chemical industries.			Cognitive			Understand	
CO4	Interpret the various toxic chemicals used in agro industries and synthesis of sugar			Cognitive Affective			Remember Receive	
CO5	Examine the various pollutants and gain awareness about industrial pollution.			Cognitive Affective			Analyze Respond	
UNIT I		RAW MATERIALS AND ENERGY FOR CHEMICAL INDUSTRY						9+3
Raw materials – Characteristics of raw materials and their resources – methods of raw material concentrations – integral utilization of raw materials.Energy for chemical industry – Fuels – classification of fuels – coal – fuel gases and liquid fuels – petroleum – cracking – Octane number – cetane number – composition and uses of coal gas, water gas, producer gas, oil gas and gobar gas.								
UNIT II		CEMENT, CERAMICS, GLASS AND FERTILIZERS						9+3
Cement: Manufacture – Wet Process and Dry process. Types, Analysis of major constituents, setting of cement, reinforced concrete. Cement industries in India. Ceramics: Important clays and feldspar, glazing and verification.Glass: Types, Composition, manufacture of Optical glass, colored glasses, lead glass and neutron absorbing glass. Fertilizers: Fertilizer industries in India, Manufacture of ammonia, ammonium salts, urea, superphosphate, triple superphosphate and nitrate salts.								
UNIT III		SMALL SCALE CHEMICAL INDUSTRIES						9+3
Electro thermal and electrochemical industries: electroplating – surface coating industries – oils, fats and waxes – Textiles industry-soaps and detergents – cosmetics. Match industries and fire works: manufacture of some industrially important chemicals like potassium chlorate, and red phosphorus – metal powders.								
UNIT IV		SUGAR AND AGRO CHEMICAL						9+3
Sugar: Cane sugar manufacture, recovery of sugar from molasses, sugar estimation, sugar industries in India. Agrochemical industries: Important categories of insecticides, fungicides, herbicides. Mode of action and synthesis of common pesticides like Gammexane, DDT, alathrin, Parathion, Malathion, Baygon, DDVP, Warfarin.								
UNIT V		INDUSTRIAL POLLUTION & CHEMICAL TOXICOLOGY						9+3

Introduction – causes of industrial pollution – thermal power plants – nuclear power reactors– fertilizers and chemical industry – pulp and paper industries – agro based industries – cement industry.Toxic Chemicals in the environment – biochemical effects of arsenic, cadmium, lead, mercury and cyanide.

LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
45	15	0	0	60

TEXT BOOKS

1. B.K Sharma – Industrial chemistry – Goel publishing house.
2. B.N.Chakrabarty,Industrial Chemistry,Oxford&IBH Publishing Co.,New Delhi, (1981).
3. P.P.Singh, T.M.Joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya Publishing House, Bombay, 4th edn., (1983).

REFERENCES

1. I.Mukhlyonov(ed.),Chemical Technology,Vol.1,Mir publication, Moscow, III edn., (1979).
2. A.K.De., Environmental Chemistry, Wiley Eastern Ltd.,11 edn., Meerut (1989).
3. R.Norris Shreve and J.A.Brink, Jr. Chemical Process Industries. IV edn., McGraw Hill, Tokyo, (1977).
4. B.K.Sharma and H.Kaur,Environmental Chemistry, Krishna Prakashan,Meerut, 1997.
5. A.K. De, Envionment Chemistry, Wiley Eastern Ltd., Meerut 1994,
6. A.K. Mukherjee, Environmental Pollution and Health Hazards – Causes and Control Galgotia Press, New Delhi 1986.

COURSE CODE		XCY603B		L	T	P	SS	C
COURSE NAME		MATERIAL CHEMISTRY		3	1	0	0	4
PREREQUISITES		Nil		L	T	P	SS	H
C:P:A		3.4:0:0.6		3	1	0	0	4
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	Explain the basic concept of Structure of matter and their various properties.			Cognitive		Understand		
CO2	Recall the laws and rules in the diffusion and phase behavior of materials.			Cognitive		Remember Apply		
CO3	Recognize the significance of mechanical and electrical properties of materials.			Cognitive		Remember Understand		
CO4	Describe the importance of magnetic, optical and thermal properties of materials.			Cognitive Affective		Understand Receive		
CO5	Interpret the various techniques used in the characterization of materials.			Cognitive Affective		Remember Apply Respond		
UNIT I - STRUCTURE OF MATTER						9+3		

Atomic structure: Electronic configurations; ionic, covalent, metallic, and secondary bond. Space lattices and crystallographic systems; influence of radius ratio on coordination, structure of crystalline materials (metallic, semi conducting, ionic, and ceramic materials) and non- crystalline materials (amorphous, glasses, polymers materials) Defects and dislocations: Point, line, and surface defects ; Edge, and screw dislocations ; Burger's vector ; Grain and twin boundaries. Brief on experimental techniques, such as X-ray diffraction, SEM, TEM, etc., for determining crystalline structures and their defects.	
UNIT II - BEHAVIOUR OF MATERIALS	9+3
Diffusion Behaviour Mechanism of diffusion Fick's laws, solution to Fick's second law; surface and grainboundary diffusion; experimental determination of diffusion coefficient. Phase behavior Solid Solutions: Intermediate phases and intermetallic compounds, phase rule, binary phase diagrams like Cu-Ni, Pb-Sn, Cu-Zn and Fe-C, transformation in steels. Nucleation and growth phenomena, solidification including directional solidification, crystal growth, zone melting and purification.	
UNIT III - MECHANICAL AND ELECTRICAL PROPERTIES OF MATERIALS	9+3
Mechanical properties Ductility, brittleness; Work hardening: Tempering, and Annealing ; Fracture toughness ; Stiffness: Elastic, anelastic and viscoelastic behaviours of materials ; Failure of materials due to creep, and fatigue, deformation of behaviours of polymers, and ceramics Electrical Properties Types of Electrical / Electronic behaviours of materials viz., Insulators, Semi-conductors, and Conductors ; electronic and ionic conductivity; free electron and band theory of solids; intrinsic and extrinsic semiconductors, conduction mechanisms, junctions and devices, viz- diodes, rectifiers, transistors and solar cells; super conductivity.	
Dielectric behaviours of materials Polarization phenomena, polarizability, frequency and temperature dependence of dielectric constant.	
UNIT IV - MAGNETIC, OPTICAL AND THERMAL PROPERTIES OF MATERIALS	9+3
Magnetic properties Magnetic behaviours of materials: dia, para, ferro and ferri magnetisms, soft and hard magnetic materials ; magnetic storage materials Optical Properties Optical properties of materials, elementary ideas about absorption, transmissions and reflection refractive index, lasers and their application, optoelectronic devices. Thermal properties Thermal properties of materials, specific heat, thermal conductivity and thermal expansions	
UNIT V - TECHNIQUES	9+3

Thin film deposition techniques

Introduction – CVD, PVD, Spray pyrolysis, Sputtering, Molecular beam epitaxy Electro- plating and Electroless plating methods.

Materials characterization techniques

Materials characterization techniques such as XRD, ESC A, XPS, AES, FTIR and Laser Raman spectroscopy. Microscopic techniques – SEM, AFM and TEM. Thermal analysis – TG/DTA and DSC.

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60

TEXT BOOKS

1. Shriver, D. F, and Atkins, P. W, Inorganic Chemistry, Oxford University Press
2. Ashcroft, N. W, and Mermin, N. D, Solid State Physics, Harcourt College Publishers
3. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons

REFERENCES

3. T.K. Manichavasagam Pillai and S.Narayanan, Trigonometry, Viswanathan Publishers and Printers Pvt. Ltd.
4. S. Narayan and T.K. Manicavachagam Pillay, Ancillary Mathematics, Viswanathan Publishers and Printers Pvt. Ltd.

E REFERENCES

1. WWW. NPTEL .ac.in

COURSE CODE		XCY604A	L	T	P	SS	C
COURSE NAME		FOOD CHEMISTRY	2	0	0	0	2
C: P: A		1.6:0:0.4	L	T	P	SS	H
			2	0	0	0	2
COURSE OUTCOMES:			Domain			Level	
CO1	Explain about Food adulteration - contamination of Wheat, Rice, Milk, Butter.		Cognitive		Understand		
CO2	Express the awareness about food poisons like natural poisons (alkaloids - nephrotoxin) pesticides, DDT, BHC, Malathion		Cognitive		Understand		
CO3	Outline the level of exposure on food additives, artificial sweeteners, Saccharin, Cyclamate and Aspartate in the food industries.		Cognitive Affective		Understand Receive		
CO4	Analyze beverages, soft drinks, soda, fruit juices and alcoholic beverages examples.		Cognitive Affective		Analyze Receive		
CO5	Describe about fats and oils - Sources of oils - production of refined vegetable oils - preservation. Saturated and unsaturated fats –MUFA and PUFA		Cognitive		Understand		
UNIT - I FOOD ADULTERATION							7

Sources of food, types, advantages and disadvantages. Food adulteration - contamination of wheat, rice, milk, butter etc. with clay stones, water and toxic chemicals -Common adulterants, Ghee adulterants and their detection.Detection of adulterated foods by simple analytical techniques.				
UNIT - II FOOD POISON				6
Food poisons - natural poisons (alkaloids - nephrotoxin) - pesticides, (DDT, BHC, Malathion) - Chemical poisons - First aid for poison consumed victims.				
UNIT – III FOOD ADDITIVES				3
Food additives -artificial sweeteners – Saccharin - Cyclamate a n d AspartateFood flavours -esters, aldehydes and heterocyclic compounds – Food colours– Emulsifying agents – preservatives -leavening agents. Baking powder – yeast – tastemakers – MSG - vinegar.				
UNIT –IV BEVERAGES				6
Beverages-softdrinks-soda-fruitjuices-alcoholicbeverages-examples. Carbonation-addictionto alcohol– diseases ofliver andsocial problems.				
UNIT –V EDIBLE OILS				8
Fats and oils - Sources of oils - production of refined vegetable oils - preservation.Saturated and unsaturated fats - iodine value - role of MUFA and PUFA in preventing heartdiseases-determination of iodine value,RM value,saponification values and their significance				
LECTURE	TUTORIALS	PRACTICALS	SELF STUDY	TOTAL
30	0	0	0	30
TEXT BOOKS				
1.Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishing house, 2010. 2.Jayashree Ghosh, Fundamental Concepts of Applied Chemistry, S. Chand & Co.Publishers, second edition, 2006. 3. Food chemistry, H. K. Chopra, P. S. Panesar, Narosa publishning house,2010. 4. Food Chemistry, Dr. L. Rakesh Sharma, Evincepub publishing, 2022. 5. Food processing and preservation, G. Subbulakshmi, Shobha A Udipi,Pdmini S Ghugre, New age international publishers, second edition, 2021.				
REFERENCES				
1. H.-D. Belitz, Werner Grosch, Food Chemistry Springer Science & Business Media, 4th Edition, 2009. 2. M.Swaminathan, Food Science and Experimental Foods, Ganesh and Company,1979. 3. Hasenhuettl, Gerard. L.; Hartel, Richard. W. Food Emulsifiers and their applications Springer New York 2nd ed. 2008. 4. Food Chemistry, H.-D. Belitz, W. Grosch, P. Schieberle, Springer, fourth revised and extended edition, 2009. 5. Principles of food chemistry, John M. deMan, John W. Finley, W. Jefferey Hurst, Chang Yong Lee, Springer, Fourth edition, 2018.				
E RESOURCES				
1. http://www.khake.com/page75.html 2. Net.foxsm/list/284				

COURSE CODE		XCY604B	L	T	P	SS	C
COURSE NAME		POLYMER CHEMISTRY	3	1	0	0	4
PREREQUISITES		NIL	L	T	P	SS	H
C:P:A		3.4:0:0.6	3	1	0	0	4
COURSE OUTCOMES			DOMAIN			LEVEL	
CO1	<i>Explain</i> the chemistry of polymerization.		Cognitive			Understand	
CO2	<i>Describe</i> the preparation of individual polymers		Cognitive Affective			Understand Respond	
CO3	<i>Interpret</i> their physical properties of polymers and explain the molecular weight and size of polymers.		Cognitive			Understand Apply	
			Affective			Respond	
CO4	<i>Recognize</i> the polymerization techniques and <i>Classify</i> the uses of polymers.		Cognitive			Analyze	
CO5	<i>Summarize</i> the processing of polymers		Cognitive			Remember Understand	
UNIT I - CLASSIFICATION OF POLYMERS AND CHEMISTRY OF POLYMERISATION							10+3
Classification of Polymers, linear polymers, non-linear or branched polymers, cross – linked polymers, homo chain hetero chain, homopolymers co-polymers block polymers and graft polymers. Chemistry of polymerization: Types of polymerization – mechanism – chain, growth, co-ordination, ring opening, metathetical, group transfer, polyaddition and polycondensation polymerizations.							
UNIT II - INDIVIDUAL POLYMERS							10+3
Individual Polymers: Monomers required general methods of preparation, repeat units and uses of the following polymers and resins, polystyrene, polyacrylonitrile, polymethyl, methacrylate, Polytetra – fluoroethylene, polybutadienes and polychloroprene, polyesters, polycarbonates, polyimides, polyamides (Kevlar), polyurethanes, polyethylene, glycols, phenol – formaldehyde, urea – formaldehyde, melamine – formaldehyde and epoxy resins.							
UNIT III - PROPERTIES OF POLYMERS							10+3
Intrinsic properties – processing properties – basic idea of isomerism of polymers – configuration of polymer chain – geometrical structure – syndiotatic, isotatic and atatic polymers. Glass transition temperature: Definition – factors affecting glass transition temperature – relationships between glass transition temperature and (a) molecular weight, (b) melting point and (c) plasticizer – importance of glass transition temperature – heat distortion temperature. Molecular weight and size of polymers: Number average, weight average, sedimentation and viscosity average molecular weights – molecular weights and degree of polymerization – poly dispersity – molecular weight distribution in polymers – size of polymer molecules – kinetics of polymerization.							
UNIT IV - POLYMERISATION TECHNIQUES DEGRADATION AND USES OF POLYMERS							8+3
Polymerisation Techniques: Bulk, solution, suspension, emulsion, melt condensation and interfacial polycondensation polymerizations, Degradation: Types of degradation – thermal, mechanical, ultrasonic and photodegradation – photo stabilizers – oxidative degradation – antioxidants – hydrolytic degradation. Uses of polymers in electronics and biomedicine.							
UNIT V - POLYMER PROCESSING							7+3

Polymer processing: Plastics (thermo and thermosetting), elastomers, fibres, compounding, plasticizers, colorants, flame retardants. Compression and injection mouldings – film extrusion and calendaring – die casting and rotational casting – thermofoaming – reinforcing.

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	45	15	0	0	60

TEXT BOOKS

1. Seymour, R.B. & Carraher, C.E. *Polymer Chemistry: An Introduction*, Inc. New York, (1981).
2. Odian, G. *Principles of Polymerization*, 4th Ed. Wiley, (2004).
3. Billmeyer, F.W. *Textbook of Polymer Science*, 2nd Ed. Wiley Interscience, (1971)..
4. Ghosh, P. *Polymer Science & Technology*, Tata McGraw-Hill Education, (1991).
5. Lenz, R.W. *Organic Chemistry of Synthetic High Polymers*, Interscience Publishers, New York, (1967).

REFERENCES

1. M.P. Stevens, *Polymer Chemistry: An Introduction*, 3rd Edition, Oxford University Press, (1991).
2. H.R. Allcock, F.W. Lampe & J.E. Mark, *Contemporary Polymer Chemistry*, 3rd edition, (2003).
3. F.W. Billmeyer, *Textbook of Polymer Science*, 3rd ed. Wiley-Interscience, (1984).
4. J.R. Fried, *Polymer Science and Technology*, 2nd ed. Prentice-Hall (2003)
5. P. Munk & T.M. Aminabhavi, *Introduction to Macromolecular Science*, 2nd ed. John Wiley & Sons (2002).
6. L. H. Sperling, *Introduction to Physical Polymer Science*, 4th ed. John Wiley & Sons (2005).
7. M.P. Stevens, *Polymer Chemistry: An Introduction* 3rd ed. Oxford University Press, (2005).
8. Seymour/ Carraher's *Polymer Chemistry*, 9th ed. by Charles E. Carraher, Jr. (2013).

		L	T	P	SS	C
COURSE CODE	XCY605	2	0	0	0	2
COURSE NAME	RENEWABLE ENERGY	L	T	P	SS	H
C: P: A	1.4:0:0.6	2	0	0	0	2
COURSE OUTCOMES		Domain		Level		
CO1	Describe the reserves of renewable energy and demand of energy needs. methodologies / technologies for effective utilization of renewable energy sources.	Cognitive		Remember		
CO2	Explain the methodology to harness solar energy and its applications.	Cognitive Affective		Understand Apply Receive		
CO3	Examine the potential of wind energy and its techniques.	Cognitive Affective		Understand Receive		
CO4	Recognize the significance of bio energy generation .	Cognitive Affective		Apply Respond		

CO5	Interpret the effective technology of various renewable energy resources.			Cognitive	Understand
UNIT I	INTRODUCTION TO ENERGY				3+6+3
World Energy Use – Reserves of Energy Resources – Environmental Aspects of Energy Utilisation – Renewable Energy Scenario in Tamil nadu, India and around the World – Potentials – Achievements / Applications – Economics of renewable energy systems.					
UNIT II	SOLAR ENERGY				3+6+3
Solar Radiation – Measurements of Solar Radiation – Flat Plate and Concentrating Collectors – Solar direct Thermal Applications – Solar thermal Power Generation – Fundamentals of Solar Photo Voltaic Conversion – Solar Cells – Solar PV Power Generation – Solar PV Applications.					
UNIT III - WIND ENERGY					3+6+3
Wind Data and Energy Estimation – Types of Wind Energy Systems – Performance – Site Selection – Details of Wind Turbine Generator – Safety and Environmental Aspects.					
UNIT IV - BIO – ENERGY					3+6+3
Biomass direct combustion – Biomass gasifiers – Biogas plants – Digesters – Ethanol production – Bio diesel – Cogeneration – Biomass Applications					
UNIT V - OTHER RENEWABLE ENERGY SOURCES					3+6+3
Tidal energy – Wave Energy – Open and Closed OTEC Cycles – Small Hydro-Geothermal Energy – Hydrogen and Storage – Fuel Cell Systems – Hybrid Systems.					
LECTURE	TUTORIALS	SELF STUDY	PRACTICALS	TOTAL	
15	0	15	30	60	
TEXT BOOKS					
1. Rai. G.D., “Non Conventional Energy Sources”, Khanna Publishers, New Delhi, (2011). 2. Twidell, J.W. & Weir, A., “Renewable Energy Sources”, EFN Spon Ltd., UK, (2006).					
REFERENCES					
1. Sukhatme. S.P., “Solar Energy”, Tata McGraw Hill Publishing Company Ltd., New Delhi, (1997). 2. Godfrey Boyle, “Renewable Energy, Power for a Sustainable Future”, Oxford University Press, U.K., (1996). 3. Tiwari. G.N., Solar Energy – “Fundamentals Design, Modelling & Applications”, Narosa Publishing House, New Delhi, (2002). 4. Freris. L.L., “Wind Energy Conversion Systems”, Prentice Hall, UK, (1990). 5. Johnson Gary, L. “Wind Energy Systems”, Prentice Hall, New York, (1985). 6. David M. Mousdale – “Introduction to Biofuels”, CRC Press, Taylor & Francis Group, USA, (2010). 7. Chetan Singh Solanki, Solar Photovoltaics, “Fundamentals, Technologies and Applications”, PHI Learning Private Limited, New Delhi, (2009).					

COURSE CODE		XUM005	L	T	SS	C
COURSE NAME		CYBER SECURITY	1	0	1	1
C:P:A		0.8:0:0.2	L	T	SS	H
			1	0	1	2
COURSE OUTCOMES						
On the successful completion of this course students would able to			Domain		Level	
CO1	<i>Understand</i> the fundamentals of Cyber Security and the technologies.		Cognitive		Understand	
CO2	<i>Understand</i> the organizational structure of Cyber security		Cognitive		Understand	
CO3	<i>Understand</i> the Cyber Security policy development		Cognitive		Understand	
CO4	<i>Understand</i> the Indian IT act and the initiatives		Cognitive		Understand	
CO5	<i>Understand</i> and <i>Apply</i> the Cyber security practices		Cognitive		Understand and Apply	
UNIT – I: INTRODUCTION					6	
Cyber Security – Cyber Security policy – Domain of Cyber Security Policy – Laws and Regulations – Enterprise Policy – Technology Operations – Technology Configuration – Strategy Versus Policy – Cyber Security Evolution – Productivity – Internet – E commerce – Counter Measures – Challenges						
UNIT – II: CYBER SECURITY OBJECTIVES AND GUIDANCE					6	
Cyber Security Metrics – Security Management Goals – Counting Vulnerabilities – Security Frameworks – E Commerce Systems – Industrial Control Systems – Personal Mobile Devices – Security Policy Objectives – Guidance for Decision Makers – Tone at the Top – Policy as a Project– Cyber Security Management – Arriving at Goals – Cyber Security Documentation – The Catalog Approach – Catalog Format – Cyber Security Policy Taxonomy.						
UNIT – III: CYBER SECURITY POLICY CATALOG					6	
Cyber Governance Issues – Net Neutrality – Internet Names and Numbers – Copyright and Trademarks – Email and Messaging – Cyber User Issues – Malvertising – Impersonation – Appropriate Use – Cyber Crime – Geo location – Privacy – Cyber Conflict Issues – Intellectual property Theft – Cyber Espionage – Cyber Sabotage – Cyber Welfare– Computer Forensics – Steganography						
UNIT – IV:CYBER SECURITY INITIATIVES AND IT ACT					6	
Counter Cyber Security Initiatives in India, Cyber Security Excerssie, Cyber Security Incident Handling, Cyber Security Assurance, IT Act, Hackers–Attacker–Counter measures ,Web Application Security , Digital Infrastructure Security ,Defensive Programming. Traditional Problems Associated with Computer Crime, Introduction to Incident Response.						
UNIT – V: SECURITY PRACTICES					6	
Guidelines to choose web browsers, Securing web browser ,Antivirus ,Email security ,Guidelines for setting up a Secure password ,Two–steps authentication ,Password Manager ,Wi–Fi Security ,Guidelines for social media security ,Tips and best practices for safer Social Networking. Basic Security for Windows, User Account Password Introduction to mobile Smartphone Security ,Android Security ,IOS Security Online Banking Security ,Mobile Banking Security ,Security of Debit and Credit Card ,UPI Security Security of Micro ATMs e–wallet Security Guidelines Security Guidelines for Point of Sales(POS)						

	LECTURE	TUTORIAL	TOTAL
HOURS	30	0	30
TEXT BOOKS			
1. Jennifer L. Bayuk, J. Healey, P. Rohmeyer, Marcus Sachs , Jeffrey Schmidt, Joseph Weiss “Cyber Security Policy Guidebook” John Wiley & Sons 2012. 2. Rick Howard “Cyber Security Essentials” Auerbach Publications 2011. 3. Cyber Laws & Information Technology, JothiRathan,VijayRathan,Bhrath Publishers,7 th Edition January 2019.			
REFERENCE BOOKS			
1.Modern Cyber security Practices by Pascal Ackerman, BPB Publications,2020 2. Dan Shoemaker Cyber security The Essential Body Of Knowledge, 1st ed. Cengage Learning 2011 3. Rhodes–Ousley, Mark, “Information Security: The Complete Reference”, Second Edition, McGraw–Hill, 2013.			
E–REFERENCES			
1. https://www.coursera.org/specializations/cyber-security 2. www. nptel.ac.in 3. http://professional.mit.edu/programs/short-programs/applied-cybersecurity https://us.norton.com/internetsecurity-how-to-cyber-security-best-practices-for-employees. html 4. https://www.meity.gov.in/content/cyber-laws			