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

DEPARTMENT OF CHEMISTRY

CURRICULUM & SYLLABUS
(I-VI SEMESTER)

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

REGULATION 2018
PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

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 2018

(Applicable to the students admitted from the academic year 2018-2019 onwards)

CURRICULUM AND SYLLABUS FOR
B.Sc. (Chemistry) - BACHELOR OF SCIENCE
(THREE YEAR - FULL TIME)
REGULATION - 2017
(Applicable to the students admitted from the academic year 2017-2018 onwards)

SEMESTER I								
Type	**Course Code**	**Course Title**	**L**	**T**	**P**	**SS**	**H**	**C**
AECC 1	XGL101	Communication Skills in English	2	0	0	2	4	2
LAN 1	XGL102A / XGL102B	Ariviyal Tamil/Comprehensive English	3	0	0	0	3	3
CC 1	XMG103	Algebra, Trigonometry and Transform	4	1	0	0	5	5
CC 2 (DSC 2A)	XCY104	Fundamental Concepts of Chemistry	3	1	0	0	4	4
CC 3 (DSC 3A)	XCY105	Inorganic Chemistry I	3	1	0	0	4	4
UMAN 1	XUM106	Human Ethics, Values, Rights and Gender Equality	0	0	0	3	3	0
CC 2 Lab	XCY107	Volumetric Analysis, Practical -I	0	0	4	0	4	2
		Total	**15**	**3**	**4**	**5**	**27**	**21**

SEMESTER II								
Type	**Course Code**	**Course Title**	**L**	**T**	**P**	**SS**	**H**	**C**
AECC 2	XGL201	English for Effective Communication	2	0	0	2	4	2
AECC 3	XES202	Environmental Studies	2	0	0	1	3	2
CC4	XMG203	Calculus and Differential Equations	4	1	0	0	5	5
CC 5 (DSC 2B)	XCY204	Organic Chemistry I	3	1	0	0	4	4
CC 6 (DSC 3B)	XCY205	Physical Chemistry I	3	1	0	0	4	4
CC 5 Lab	XCY206	Volumetric Analysis Practical- II	0	0	4	0	4	2
		Total	**14**	**3**	**4**	**3**	**24**	**19**

		SEMESTER III						
Type	**Course Code**	**Course Title**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 1	XCY301	Water Quality Analysis	1	0	2	1	4	2
CC7	XCY302	Fundamental Physics	3	1	0	0	4	4
CC 8 (DSC 2C)	XCY303	Inorganic Chemistry II	3	1	0	0	4	4
CC 9 (DSC 3C)	XCY304	Organic Chemistry II	3	1	0	0	4	4
GE 1		*Open Elective - To be chosen by student	3	0	0	0	3	3
CC7 lab	XPG 305	Fundamental Physics Practical	0	0	4	0	4	2
UMAN 2	XUM306	Disaster Management	0	0	0	3	3	0
CC 8 Lab	XCY307	Semi Micro Inorganic Qualitative Analysis Practical III	0	0	4	0	4	2
Minor course 1 *Extra credit		Office Automation (15 Hours)						1*
		Total	**13**	**3**	**10**	**4**	**30**	**21+1***

		SEMESTER IV						
Type	**Course Code**	**Course Title**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 2	XCY401	Pharmaceutical Chemistry	1	0	2	1	4	2
CC10	XCY402	Modern Physics	3	1	0	0	4	4
CC 11 (DSC 2D)	XCY403	Physical Chemistry II	3	1	0	0	4	4
CC 12 (DSC 3D)	XCY404	Inorganic Chemistry III	3	1	0	0	4	4
GE 2		*Open Elective - To be chosen by student	3	0	0	0	3	3
CC10 lab	XPH405	Modern Physics Practical	0	0	4	0	4	2
CC11 Lab	XCY406	Inorganic Quantitative Analysis Practical IV	0	0	4	0	4	2
Minor course 2 *Extra credit		Animation Software I (15 Hours)						1*
		Total	**13**	**3**	**10**	**1**	**27**	**21+ 1***

SEMESTER V								
Type	**Course Code**	**Course Title**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 3	XCY501	Clinical Chemistry	1	0	2	1	4	2
DSE 1A	XCY502A	Phyto Chemistry	3	1	0	0	4	4
	XCY502B	Forensic Science						
DSE 2A	XCY503A	Analytical Methods in Chemistry	3	1	0	0	4	4
	XCY503B	Agricultural Chemistry						
DSE 3A	XCY504A	Computer Applications in Chemistry	3	1	0	0	4	4
	XCY504B	Programming in C						
GE 3		*Open Elective - To be chosen by student	3	0	0	0	3	3
DSE 1A Lab	XCY505	Organic Qualitative Analysis Practical VA	0	0	4	0	4	2
CC lab	XCY506	Physical Chemistry Practical VB	0	0	4	0	4	2
Minor course 3 *Extra credit		Animation Software II (15 Hours)						1*
* Extra credit	–	IPT (21 days)						2*
Total			**13**	**3**	**10**	**1**	**27**	**21+3***

SEMESTER VI								
Type	**Course Code**	**Course Title**	**L**	**T**	**P**	**SS**	**H**	**C**
SEC 4	XCY601	Renewable Energy	1	0	2	1	4	2
DSE 1B	XCY602A	Industrial Chemistry	3	1	0	0	4	4
	XCY602B	Material Chemistry						
DSE 2B	XCY603A	Food Chemistry	3	1	0	0	4	4
	XCY603B	Polymer Chemistry						
DSE2B lab	XCY604	Organic Qualitative Analysis Practical VI	0	0	4	0	4	2
CC lab	XCY605	Physical Chemistry Practical VIA	0	0	4	0	4	2
DSE 3B	XCY606	Project	0	0	0	0	8	6
		NSS/NCC/RRC....						
Total			**7**	**2**	**10**	**1**	**28**	**20**

DSC: Department Specific Core   DSE: Discipline Specific Elective   *Extra Credit
SEC: Skill Enhancement course   AECC: Ability Enhancement Compulsory Course
GE: Generic Elective   UMAN: University Mandatory

L - Lecture   **T- Tutorial**   **SS - Self Study**   **P – Practical**   **C-Credit**

Summary

Semester	S1	S2	S3	S4	S5	S6	P1	P2	Others
I	AECC1	LAN1	CC1	CC2 (DSC2A)	CC3 (DSC3A)	UMAN1	CC2 Lab		
II	AECC2	AECC3	CC4	CC5 (DSC2B)	CC6 (DSC3B)			CC5 Lab	
III	SEC1	CC7	CC8 (DSC2C)	CC9 (DSC3C)	GE1	UMAN2	CC7 Lab	CC8 Lab	*Minor Course
IV	SEC2	CC10	CC11 (DSC2D)	CC12 (DSC3D)	GE2		CC10 Lab	CC11 Lab	*Minor Course
V	SEC3	DSE1A	DSE 2A	DSE3A	GE3		CC Lab	CC lab	IPT* *Minor Course
VI	SEC4	DSE1B	DSE 2B	DSE3B (PROJECT)			CC Lab	CC lab	NSS/NCC....

* Extra Credit

Total Number of Courses proposed with the credits is given below:

S. No.	Type of Course	Numbers	Total Credit	Credits As per UGC norms
1	AECC (Theory & Lab)	03	06	04
2	Core Course (Theory & Lab)	12	66	72
3	DSE (Theory & Lab)	06	30	36
4	SEC	04	08	08
5	GE	03	09	-
6	UMAN	02	00	-
7	LAN	01	03	-
	IPT & Minor Courses /NSS/NCC…	4*	4*	-
Total		**31 + 4***	**122 + 4***	**120**

*Extra credit

Branch	Total Credit	Core DSC (%)	DSE (%)	SEC (%)	AECC (%)	GE (%)	UMAN (%)	IPT& NSS/NCC..
B.Sc.(Chemistry)	122+4*	66 (54.1%)	30 (24.6%)	8 (6.6%)	6 (4.9%)	9 (7.4%)	0 (0%)	4* (Extra Credit)

* Extra Credit
DSC: Department Specific Core   AECC: Ability Enhancement Compulsory Course
SEC: Skill Enhancement course   GE: Generic Elective
DSE: Discipline Specific Elective   UMAN: University Mandatory

COURSE CODE	XGL101			L	T	P	SS	H	C
COURSE NAME	**COMMUNICATION SKILLS IN ENGLISH**			2	0	0	2	4	2
C:P:A	**3:0:0**								

COURSE OUTCOMES:			Domain	Level
CO1	*Explain* the process of communication and its types		Cognitive	Understanding
CO2	*Recall* various sounds and use it in proper context		Cognitive	Remembering
CO3	*Organise* meeting events and recording it constructively		Cognitive	Applying
CO4	*Adapt* methods of framing questions and using punctuations		Cognitive	Creating
CO5	*Demonstrate* the basic skills at the time of interview and presentations		Cognitive	Understanding

SYLLABUS	HOURS
UNIT I **The Process of Communication**	
Communication- the process of communication - barriers of communication - different types of communication.	9
UNIT II **Phonetics**	
Pronunciation – Vowels – Consonants – Transcription of Words and Sentences.	9
UNIT III **Report Writing**	
Organizing successful meeting, One to one meeting, editing, criteria for successful meetings, memo, e mails.	9
UNIT IV **Grammar**	
Articles – Question Tag –Punctuation – Types of Sentences – Types of Questions, Cause and Effect.	9
UNIT V **Presentation Skills**	
Presentation skills, Importance of body language in presentations, Verbal and Non Verbal communication.	9
Total Hours	**45**

Text books
  1. Sanghita Sen. Communication and Language Skills.Cambridge Press, Chennai, 2015
  2. Sumant. *Technical English.*Vijay Nicole Imprints, Chennai, 2011
  3. Dorathy adams. Everyday English. Cengage Learning, New Delhi, 2009	

COURSE CODE	XMG 103	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:
1. **WWW. NPTEL .ac.in**

COURSE CODE	XCY104	L	T	P	SS	C
COURSE NAME	**FUNDAMENTAL CONCEPTS OF 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	*Explain* the principle of atomic structure and basics of quantum mechanism	Cognitive	Understand	
CO2	*Describe* the periodic properties of various elements	Cognitive	Remember	
CO3	*Interpret* IUPAC nomenclature of compounds.	Cognitive Affective	Apply Receiving	
CO4	*Describe* the physical properties of dipole moment, polarizability and magnetic properties.	Cognitive Affective	Remember Responding	
CO5	*Apply* and *Identify* the various analytical methods for quantitative analysis.	Cognitive	Remember Apply	

UNIT - I ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS	**10+3**

Atom, constituents of an atom – Bohr's postulates – Bohr's atom model – limitations of the Bohr's atom model - Sommerfeld atom model. Particle and wave character of electron – de-Broglie's equation and its derivation – The Davisson and Germer experiment – Heisenberg's uncertainity principle. Photoelectric effect - Einstein photoelectric equation – Compton effect. Quantum theory – postulates of quantum mechanics – The Schrodinger wave equation-Quantum numbers. Aufbau principle – Hund's rule of maximum spin multiplicity – Pauli's exclusion principle – n + l rule – electronic configurations of elements.

UNIT - II PERIODIC TABLE	**6+3**

Modern periodic law – modern periodic table – classification of elements based on electronic configuration. Fundamental properties like atomic size, valency, ionization energy, ionic radius, electron affinity, electronegativity, metallic and nonmetallic character - variation of the above fundamental properties – explanation for the periodic variation of the fundamental properties – diagonal relationship.

UNIT – III FUNDAMENTALS OF ORGANIC CHEMISTRY	**9+3**

IUPAC Nomenclature of organic compounds Molecular weight determination of simple organic acid and bases – Silver salt and platonic chloride methods. Calculation of empirical and molecular formula using percentage composition of elements and molecular weight. Fundamental concepts - Homolytic fission and Heterolytic fission of carbon-carbon bonds - Reaction intermediates: Formation and stability of Free radicals, carbonium ions and carbanions – nucleophilic and electrophilic reagents. Types of reactions-Substitution, addition, elimination, rearrangement and polymerization with suitable examples.Inductive effect and electromeric effect: explanation with suitable examples.

UNIT –IV PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTIONS.	10+3

Dipole moment: Definition – Experimental determination - Calculation of percentage of ionic character of HF and HCl –Dipole moment and molecular structure: CO_2, H_2O, NH3 and CH4.
Polarizability: Definition – polarization of a molecule – molar polarization – Clausius-Mosotti equation.
Magnetic properties: Paramagnetic, diamagnetic and ferromagnetic substances and their characteristics – magnetic permeability – magnetic susceptibility – specific and molar magnetic susceptibilities – determination of magnetic susceptibility by Gouy's method.

UNIT –V ANALYTICAL METHODS	
	10+3

Qualitative Inorganic Analysis – Dry Test, flame test, cobalt nitrate test–wet confirmatory test for acid radicals, interfering acid radicals – elimination of interfering acid radicals. Solubility product, common ion effect, complexation, oxidation reduction reactions involved in identification of anions and cations – separation of cations into groups – Volumetric analysis – preparation of standard solutions –normality, molarity and molality by titrimetric reactions – acid base, redox, precipitation and complex metric titrations –indicators – effect of change in pH – selection of suitable indicators.

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, (23rd 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, (23rdedition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
4. Glasstone S., Lewis D.,Elements of Physical Chemistry, London, Mac Millan & Co.Ltd.

REFERENCES

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. Frank J. Welcher and Richard B. Hahn, Semi micro Qualitative Analysis, New
Delhi, Affiliated East-west Press Pvt. Ltd. (1969).
4. G.D. Tuli, R.D. Madan, S.K. Basu, Satya Prakash, Advanced Inorganic Chemistry,Volume 1, (5th edition), New Delhi, S. Chand & Company Ltd, (2014

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	XCY105	L	T	P	SS	C
COURSE NAME	**INORGANIC CHEMISTRY I**	3	1	0	0	4
C: P: A	2.8:0.4:0.8	L	T	P	SS	H
		3	1	0	0	4

COURSE OUTCOMES:		Domain	Level
CO1	*Recall* and *Explain* the basic concepts of ionic bonding; Display the shapes of simple inorganic molecules usingVSEPR theory	Cognitive Psychomotor	Remember Understand Set
CO2	*Summarize* and *Report* extraction, properties and uses of I A and IIA group s-block elements.	Cognitive Affective	Understand Responding
CO3	*Explain* the extraction and purification process of various metals and Interpret their physical and chemical properties.	Cognitive Affective	Understand Apply Responding
CO4	*Describe* the concept of acids and bases and the application of various concepts.	Cognitive Psychomotor	Analysis Perception
CO5	*Identify* the various radioactive process and their consequences	Cognitive	Remember

UNIT - I CHEMICAL BONDING	**10+3**

lonic bond – Lattice Energy – Born – Haber Cycle – Pauling and Muliken's scales of electro negativity – Polarizing power and Polarisability – partial ionic character from electro negativity –
Transitions from ionic to covalent character and vice versa – Fajan's rule. VSEPR Theory – Shapes of simple inorganic molecules ($BeCl_2$, $SiCl_4$, PCl_5, SF_6,IF_7, NH_3, XeF_6, BF_3,H_2O) - VB Theory – Principles of hybridization – $BeCl_2$ – MO Theory – Bonding and antibonding orbitals – Application of MO Theory to H_2,He_2,N_2,O_2,HF and CO – Comparison of VB and MO theories.

UNIT - II CHEMISTRY OF S-BLOCK ELEMENTS	**6+3**

Position of Hydrogen in the Periodic Table, atomic hydrogen, nascent hydrogen, occluded hydrogen and uses of hydrogen. General characteristics of s-block elements – General characteristics of Group IA – diagonal relationship between Li and Mg – Physical and Chemical properties – Uses – Preparation of NaOH, Na_2CO_3, $NaHCO_3$ (Laboratory and Industrial methods) – Properties – Uses. General characteristics of Elements of Group II A – diagonal relationship between Be and Al ——Physical and Chemical properties –Uses – Preparation and uses of Mg: $MgCO_3$, $MgSO_4.$

UNIT – III BASIC PRINCIPLES OF METALLURGY	**9+3**

Ores and minerals – concentrating the ore by gravity separation, froth flotation and magnetic separation – Types of furnaces -Roasting– Calcination – Smelting – Flux – Purification by electrolytic refining, zone refining and Van-Arkel vapour phase refining with suitable examples– Alumino thermic process. Group–IA: Extraction of lithium and its uses - Diagonal relationship of Lithium with Magnesium Group–IIA: Extraction of Beryllium and its uses –Diagonal relationship of Beryllium with Aluminium Group–IB: Extraction of copper and its uses – Extraction of silver and its uses. Group-VA: Nitrogen: Ammonia – manufacture, properties, uses and structure.
Nitric Acid: Manufacture of Nitric acid – Action of nitric acid on metals

UNIT –IV ACIDS AND BASES	**10+3**

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. Neutralisation, 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. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan
   Chand & Co., (2007).

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. Puri B.R..,Sharma L.R., Pathania M.S.,Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal
   Nagin Chand & Co., (2005).

3. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.

4. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (2003).

COURSE CODE	XUM 106	L	T	P	SS	C
COURSE NAME	**HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY**	1	0	0	2	1
C:P:A	**2.7:0:0.3**	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

COURSE CODE	XCY107	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_2CO_3 by HCl using a standard Na_2CO_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 $K_2Cr_2O_7$ solution.

7. Estimation of hydrogen peroxide

8. Estimation of Iodine

	LECTURE	TUTORIAL	PRACTICAL	SELF STUDY	TOTAL
HOURS	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

	SEMESTER II					
COURSE CODE	**XGL201**	**L**	**T**	**P**	**SS**	**C**
COURSE NAME	**ENGLISH FOR EFFECTIVE COMMUNICATION**	**2**	**0**	**0**	**0**	**2**
C:P:A	**1:0.6:0.4**	**L**	**T**	**P**	**SS**	**H**
		2	**0**	**0**	**0**	**4**

COURSE OUTCOMES		**DOMAIN**	**LEVEL**
CO1	*Define* and *Describe* how to make effective speeches academically and in social situations	Cognitive	Remember
CO2	*Identify* the forms of language used in different speeches and how to listen actively and critically.	Psychomotor	
CO3	*Produce* the proper tone of language required in writing and speaking in Business communication	Cognitive	Remember
CO4	Initializing Values, Display knowledge on grammar and other linguistic features in writing various forms of business communication.	Affective	
CO5	*Comprehend* and prepare how to write business reports, minutes, Proposals etc.	Cognitive	Apply

UNIT I - PUBLIC SPEECH	**9**

Introduction to public speaking; functions of oral communication; skills and competencies needed for successful speech making; importance of public speaking skills in everyday life and in the area of business, social, political and all other places of group work.

UNIT II - TYPES OF SPEECH	**9**

Various types of Speeches**:** manuscript, impromptu, rememorized and extemporaneous speeches; analyzing the audience and occasion; Developing ideas; finding and using supporting materials; Developing speech out line; Organization of Speech; introduction, development and conclusion; language used in various types of speeches; Adapting the speech structures to the Audience; paralinguistic features

UNIT III - BUSINESS COMMUNICATION	**9**

Introduction to business communication; modern developments in the style of writing letters memos and reports: block letters, semi block letters, full block letters, simplified letters etc.

UNIT IV - USE OF LANGUAGE	**9**

The language used in memos/minutes/telephone memos/ letters/assignments; art of writing E-mail etc.

UNIT V - USE OF GRAMMAR	**9**

The use of active and passive voice; the use of grammar, propriety, accuracy , exactness , the tone & other elements of language used in these writings; The format of various types of Reports/ projects etc.

	LECTURE	**TUTORIAL**	**PRACTICAL**	**SELF STUDY**	**TOTAL**
HOURS	**45**	**0**	**0**	**0**	**45**

TEXT BOOKS

1. Strengthen Your Writing by V.R. Narayanaswamy (Orient Longman)
2. A course in written English: by Ghosh, R N; Inthira, S R [Author]; Moody, K W [Author].1978
3. Writing With A Purpose, Jaya Sasikumar, Champa Tickoo,Published by Oxford University Press , Paper Back , Language - English
4. Freeman, Sarah: Study Strategies. New Delhi: Oxford University Press, 1979. 13.

5. Reading for Meaning, Paul Gunashekar M.L. Tickoo, Published by S. Chand & Company Ltd. Sultan Chand & Company

REFERENCES
1. John Sealy, Writing and Speaking Author:, Oxford University Press, New Delhi Third Edition 2009.
2. Williams K S, Communicating in Business (8th Edition) Engage Learning India Pvt. Ltd.; 2012
3. John Sealy, Writing and Speaking, Oxford University Press, New Delhi Third Edition 2009.

COURSE CODE	XES 202	L	T	SS	P	C
COURSE NAME	**ENVIRONMENTAL STUDIES**	2	0	1	0	2
C:P:A	1.4: 0.3 : 0.3	L	T	SS	P	H
		2	0	1	0	3

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.
1. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
2. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.
3. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
4. Introduction to International disaster management, Butterworth Heinemann, 2006.
5. 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

COURSE CODE	XMG203	L	T	P	C
COURSE NAME	**CALCULUS AND DIFFERENTIAL EQUATIONS**	3	1	0	4
PREREQUISITE	**BASIC CONCEPTS OF MATRICES, NUMBERS, DIFFERENTIATION AND INTEGRATION**	L	T	P	H
C:P:A	**4:0:0**	3	2	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

www.nptel.ac.in

1. Advanced Engineering Mathematics Prof. Jitendra Kumar

   Department of Mathematics Indian Institute of Technology, Kharagpur

COURSE CODE	XCY204	L	T	P	SS	C
COURSE NAME	ORGANIC CHEMISTRY I	3	1	0	0	4
C:P:A	2.8:0.4:0.8	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 preparation with mechanism, properties and applications of alkocols, ethers and their derivatives. *Estimate* hydroxy and alkoxy groups.		Cognitive		Remember	
CO3	*Explain* the preparation with mechanism, properties and naming reactions of aldehydes, ketones & carboxylic acid and their derivatives.		Cognitive Affective		Apply Receiving	
CO4	*Describe* the concepts of covalent bonding and *explain the structure of hyb*ridization.		Cognitive		Remember Responding	
CO5	*Apply* and *Identify* the various stereo chemical concepts.		Cognitive		Apply Remember	

UNIT I - COVALENT BONDING AND STRUCTURE	9+3
Covalent bonding – Concept of hybridization – Structure of organic molecules based on sp^3, sp^2 and sp hybridization – Covalent bond properties of organic molecules: bond length, bond angle, bond energy, bond polarity, dipolemoment, inductive, mesomeric, electromeric, resonance and hyperconjugative effects.	

UNIT II - ALIPHATIC HYDROCARBONS AND ALKYL HALIDES	9+3
Alkenes: Ozonolysis, Hydroboration and polymerization with suitable examples. Dienes: Classification – preparation, properties and uses of Butadiene Alkynes: Acidity of alkynes Alkyl halides: S_N1 and S_N2 Mechanism – E_1 and E_2 Mechanism – Hofmann and Saytzeff's rule. Poly halogen derivatives: Halogen derivatives of unsaturated hydrocarbons: Preparation and uses of vinyl chloride, allyl chloride and allyl iodide. Synthetic applications of Grignard reagents.	

UNIT III - CHEMISTRY OF CYCLOALKANES AND STREO ISOMERISM	10+3
Alicyclic compounds – general methods of preparation of cycloalkanes – Baeyer's strain theory and its modifications. Conformational analysis: differences between configuration and conformation Fischer and Sawhorse and Newman projection formulae – conformational analysis of ethane, n-butane and 1,2-dichloro ethane Geometrical isomerism – maleic acid and fumaric acid – aldoximes and ketoximes E-Z notations. Optical isomerism: definition: optical activity and optical isomerism – optical isomerism of compounds containing asymmetric carbon atom – tartaric acid – enantiomers and diastereoisomers – racemic and meso forms – racemisation – resolution of racemic mixture – Walden inversion – asymmetric synthesis – chirality – specifications of absolute configurations by R and S notations.	

UNIT IV - ALIPHATIC ALCOHOLS	7+3
Definition: Rectified spirit – Absolute alcohol – Methylated spirit – Power alcohol.Preparation, properties and uses of allyl alcohol. Polyhydric alcohol: Estimation of number of hydroxyl groups in a polyhydric alcohol.Ethers:Estimation of alkoxy groups – Zeisel's method – preparation of chlorex and vinyl ether. Thioalcohols and thioethers: Preparation and uses of ethyl mercaptan, diethyl ether, sulphonal and mustard gas. Phosphorous ylides – preparation and properties –Wittig reaction.	

UNIT V - ALDEHYDES, KETONES AND CARBOXYLIC ACID	10+3
Preparation of aldehydes and ketones from fatty acids – Rosenmund reduction – Stephen's method – Mechanism of nucleophilic addition to Carbonyl compounds – Hemiacetal and Acetal formations – Cyanohydrin formation – Meerwein-Pondorf-Varleyreduction – Oppaenaur idation – preparation of Acrolein, Crotonaldehyde, Chloral , Hydroxy acetone and Acetylacetone Carboxylic acids and their derivatives: Structure of carboxylic acids – acidity of carboxylic acids – effect of subsituents on acidity – preparation of acrylic acid and crotonic acid. Halogensubstituted acids: Preparation and properties of mono, di and tri chloro carboxylic acids – Hydroxy acids. Dicarboxylic acids: Preparation of Malonic acid and Malonic ester – Synthetic applications of diethyl malonate – Action of heat on dicarboxylic acids	

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

TEXT BOOKS
a. Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
b. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).
c. Organic Chemistry – Volume I", I.L.Finar

d. Organic Chemistry – Volume II", I.L.Finar
e. Organic Chemistry – J.Clayden
f. Organic Chemistry – Jerry March
g. Organic Chemistry – Mc muray
h. Organic Chemistry", P.L.Soni
i. Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
j. Organic Chemistry", R.T.Morrison and R.W.Boyd

REFERENCES

1. Organic Chemistry, Paula, Yurkanis and Bruice
2.Mukul C. RayReaction Mechanisms in Organic Chemistry
3. P.L. Kalsi, Organic Reactions and Their Mechanisms

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	XCY205	L	T	P	SS	C
COURSE NAME	**PHYSICAL CHEMISTRY I**	3	1	0	0	4
C:P:A	**2.8:0.4:0.8**	L	T	P	SS	H
		3	1	0	0	4
COURSE OUTCOMES				**DOMAIN**	**LEVEL**	
CO1	*Classify* the types of Molecular velocity of gases and kinetic theory of gases; *Derive* vanderwalls equation of real gases.			Cognitive	Understand	
CO2	*Apply* and *Identify* the structure and properties of solid state.			Cognitive	Remember Apply	
CO3	*Apply* and *Identify* the structure and properties of liquid crystals and colloids			Cognitive Affective	Remember Apply	
CO4	*Describe* the concepts of colloidal state and *explain the types of Emulsions.*			Cognitive	Remember Responding	
CO5	*Identify* the principles of chemical equlibrium and *explain* the theory behind the catalysis.			Cognitive Affective	Remember Receive	

UNIT I - GASEOUS STATE <div align=right>**9+3**</div>

Kinetic theory of gases – equation of kinetic theory of gases – derivation of gas laws from the equation of kinetic theory of gases. Ideal gases and real gases – deviations of real gases from ideal behaviour – Van der waal's equation (Derivation) – Significances of van der Waal's constants. P-V isotherms – Andrew'sexperiment–critical states of gases – Definition and   determination of the critical constants – relation between van der Waal's constants and critical constants, Kinetic theory of gases: Mean free path – collision frequency – Definition and problems involving RMS velocity, Most probable velocity and Average velocity – Boltzman distribution of molecular velocities (No derivation)

UNIT II - SOLID STATE <div align=right>**9+3**</div>

Crystallography — Definition: unit cell, crystal lattice and interfacial angle Crystallographic systems: Bravis lattices – simple, cubic, face-centered cubic and   body-centered cubic systems. Types of

crystals: Ionic crystal – Structure of NaCl – Molecular crystals: Structure of Ice – Covalent crystals: structure of diamond and graphite – metallic crystals.Bonding in crystals – electrical properties - Conductors, semiconductors and insulators – super conductors – simple explanation with examples – Defects in crystals.

UNIT III - LIQUID STATE, LIQUID CRYSTALS –AND ADSORPTION	9+3

Theory of liquids – free volume of liquids – Vapour pressure – Surface ension, effect of temperature on surface tension, parachor – Viscosity,effect of temperature on viscosity – hole theory – Reynolds number – structure of liquids.Trouton's rule and its significance

Classification of Liquid crystals– Transformation into the mesomorphic states –

Definitions – Adsorbate, adsorbent and interface – Distinction between physisorption and chemisorption – Surfactants.Adsorption of gases on solids – Freundlich, Langmuir and BET adsorption isotherms Applications of adsorptions.

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 – thixotropyEmulsions: Definition – types of emulsions – emulsifiers – Bancroft's rule HLB number. Applications of colloids: Cottrel precipitator – Sewage disposals – detergent action of soaps – artificial rain – formation of delta – smoke screens.

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 $CuSO_4.5H_2O$. 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. Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
2. Principles of Physical Chemistry", B.R.Puri and L.R.Sharma
3. Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
4. Physical Chemistry", N.Kundu and SN.Jain
5. Physical Chemistry", Peter Atkins Julio de paula

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=gvq2QZ38n9U
3.https://www.mooc-list.com/course/Physical-chemistry-i-saylororg

COURSE CODE	XCY 206	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://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques
2. https://www.youtube.com/watch?
3. https://www.youtube.com/watch?

SEMESTER III							
COURSE CODE	**XCY301**	**L**	**T**	**P**	**SS**	**C**	
COURSE NAME	**WATER QUALITY ANALYSIS**	**1**	**0**	**2**	**1**	**2**	
C:P:A	**1:0.8:0.2**	**L**	**T**	**P**	**SS**	**H**	
		1	**0**	**2**	**1**	**4**	
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.

Any five experiments decided by the course teacher
1. Determination of pH, turbidity and conductivity.
2. Determination of the available chlorine in bleaching powder and estimation of the residual

chlorine.

3. Determination of optimum dosage of coagulant
4. Determination of Iron and Fluoride.
5. Determination of Phosphorous
6. Determination of hardness of water.
7. Determination of Total Solids and Suspended solids.
8. Determination of Biochemical Oxygen Demand.
9. Determination of Chemical Oxygen Demand.
10. Determination of Ammonia Nitrogen.

Demonstration of Bacteriological analysis of water.

	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, 17thEdition, WPCF, APHA and AWWA,USA,1989.

COURSE CODE	XPG302	L	T	P	SS	C
COURSE NAME	**FUNDAMENTAL PHYSICS**	3	1	0	0	4
C:P:A	3:0:0	L	T	P	SS	H
		3	1	0	0	4

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	*Recall* and *Explain* the basic principle simple harmonic motion and circular motion.	Cognitive	Remember , Understand, Analyze
CO2	*Understand*the properties of sound, reverberation time and methods of production of ultrasonic waves.	Cognitive	Remember , Analyze
CO3	*Understand and determine*Young's modulus,rigidity modulus, viscosity and explain surface tension and excess pressure inside a drop.	Cognitive	Analyze , Understand, Application
CO4	*Recall*the basic concepts and basic laws of thermal physics and *determine*the thermal conductivity of a bad conductor and solar constant.	Cognitive	Remember , Analyze, Application

CO5	*Acquire knowledge* 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 Poiseuelle'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	XCY303	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	*Explain* the various compounds of halogens and carbon.	Cognitive	Understanding
CO2	*Describe* the properties structure of peracids.	Cognitive	Remember
CO3	*Recognize* the general characteristics and properties of transition elements.	Cognitive Affective	Apply Receiving
CO4	*Identify* the general characteristics and properties of Lanthanides and Actinides.	Cognitive Affective	Remember Responding
CO5	*Apply* and *Identify* the various properties and bonding of organo metallic 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 **c**arbides - 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 - PERACIDS AND PERSALTS	6+3

preparation, properties and structure of permonosulphuric acid, perdisulphuric acid and potassium perdisulphate. Preparation and properties of permonocarbonic acid, perdicarbonic acid and perdicarbonates.

UNIT III - TRANSITION ELEMENTS - GROUP STUDY	9+3

Transition elements-position in the periodic table 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 (Latimer diagrams) for Mn, Fe and Cu. Chemistry of titanium dioxide, titanium tetrachloride, vanadium penta oxide-ammonium vanadate, ammonium molybdate, molybdenum blue, tungsten oxide, tungsten bronze, zirconium halide.

UNIT IV - LANTHANIDES AND ACTINIDES	10+3

Position of lanthanides actinides in the periodic table – Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction – actinide contraction.

Occurrence and general methods of extraction of lanthanides by reducing the trihalides, ion exchange and valence exchange methods. Isolation of thorium from monazite – Preparation properties and uses of oxides, oxy acids, hydrides and halides of cerium and lanthanum.

Organometallic compounds of lanthanoides – optical properties – magnetic properties of lanthanides - Applications of lanthanides and actinides.

UNIT V - ORGANO METALLIC COMPOUNDS					10+3

Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p-acceptor behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).

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

TEXT BOOKS
1. "Inorganic Chemistry", P.L.Soni
2. "Inorganic Chemistry", Puri and Sharma
3. "Advanced Inorganic Chemistry", R.D.Madan

REFERENCES
1. "Basic Inorganic Chemistry", F.A. Cotton and Wilkinosn
2. "In-organic Chemistry", Shriver and Atkins
3. "Inorganic Chemistry", James E.Huheey
4. "Concise Inorganic Chemistry", J.D.Lee
5. "Fundamentals of Inorganic Chemistry", Gilreath

COURSE CODE	XCY304	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	*Explain* the principle of atomic structure and and its substitution reaction.	Cognitive	Understanding
CO2	*Describe* the phenol, ethers and aryl halides reacrtions with some naming reactions.	Cognitive	Remember
CO3	*Identify* the compounds of amines and diazonium salts.	Cognitive Affective	Apply Receiving
CO4	*Recognise* the various structures of amino acids, peptides and proteins	Cognitive Affective	Understanding Responding
CO5	*Describe* the general properties of carbohydrates.	Cognitive	Remember

UNIT I - AROMATIC COMPOUNDS	9+3

Aromatic compounds: Aromatic hydrocarbons – aromaticity and Huckel's rule – Simple applications.Aromatic substitution: Electrophilic substitution with suitable examples – Mechanism of Halogenation, Nitration, Sulphonation and Friedel-Craft's reactions – nucleophilic and free radical substitution with suitable examples.
Directive influence of substituents: Orientation – Effect of substituents – activating and deactivating groups – Rules of disubstitution and trisubstitution in benzene – steric hinderance.

UNIT II - PHENOLS, ETHERS AND ARYL HALIDES	10+3

(Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. ReimerTiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction. Ethers (aromatic): Cleavage of ethers with HI.
Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer &

Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH_2/NH_3 (or $NaNH_2/NH_3$). Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides. preparation and uses of DDT.

UNIT III - AMINES AND DIAZONIUM SALTS	9+3

Amines (Aliphatic and Aromatic): (Upto 5 carbons) Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO_2. Electrophilic substitution (case aniline): nitration, bromination, sulphonation. Diazonium salts: Preparation: from aromatic amines. Reactions: conversion to benzene, phenol, dyes. Derivatives of phthalic acid: preparation and properties of phthalic anhydride and phthalimide. Preparation of the following compounds and their uses – phenylacetic acid, mandelic acid, cinnamic acid, aspirin and methyl salicylate.

UNIT IV - AMINO ACIDS, PEPTIDES AND PROTEINS	9+3

Amino Acids, Peptides and Proteins: Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis. Reactions of Amino acids: ester of –COOH group, acetylation of –NH2 group, complexation with Cu^{2+} ions, ninhydrin test. Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Synthesis of simple peptides (upto dipeptides) by N-protection (t-butyloxycarbonyl and phthaloyl) & C activating groups and Merrifield solid-phase synthesis.

UNIT V - CARBOHYDRATES	8+3

Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in monosaccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysacharrides (starch and cellulose) excluding their structure elucidation. Oils and fats: definition – determination and application – saponification value – iodine value – Reichert-Meissel value – acid value.

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

TEXT BOOKS

1. "Organic Chemistry", P.L.Soni
2. "Advanced Organic Chemistry", B.S.Bahl and Arun Bahl
3. "Organic Chemistry", R.T.Morrison and R.W.Boyd

REFERENCES

1. "Organic Chemistry – Volume I", I.L.Finar
2. "Organic Chemistry – Volume II", I.L.Finar
3. "Reaction Mechanism of Organic Compounds" – Jerry March
4. "Organic Chemistry" – J. Clayden
5. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
6. Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
7. Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.: New York (1985).
8. Nelson, D. L. & Cox, M. M. Lehninger's Principles of Biochemistry 7th Ed.,
9. W. H. Freeman. Berg, J.M., Tymoczko, J.L.& Stryer, L. Biochemistry, W.H. Freeman, 2002.

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 *usage* of laboratory instruments and *measure* the Young's modulus of Non – uniform pending	Cognitive Psychomotor	Understand Mechanism
CO2	*Explain* and *demonstrate* the behavior of rigidity modulus of a wire	Psychomotor Affective	Set Valuing
CO3	*Manipulate* and *measure* the thickness of a thin wire using Air wedge	Cognitive Psychomotor	Apply Mechanism
CO4	*Compare* and *explain* 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		XUM306		L	T	P	SS	C
COURSE NAME		**DISASTER MANAGEMENT**		3	0	0	0	3
C:P:A		3 : 0 : 0		L	T	P	SS	H
				3	0	0	0	3
COURSE OUTCOMES				DOMAIN		LEVEL		
CO1	*Understanding* the concepts of application of types of disaster preparedness			Cognitive		Apply		
CO2	*Infer* the end conditions & *Discuss* the failures due to disaster.			Cognitive		Analyse		
CO3	*understanding* of importance of seismic waves occurring globally			Cognitive		Analyse		
CO4	*Estimate* Disaster and mitigation problems.			Cognitive		Apply		
CO5	Keen *knowledge* 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 Leelakrisha 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	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 *Identify* the ions in a given Inorganic mixture	Cognitive Psychomotor		Remember Perception		
CO2	*Analyse* the individual cations and anions present in a given mixture and *explain* the characteristic properties of cations.	Cognitive Psychomotor Affective		Understand Analyse Perception Receive		
CO3	*Use* 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_2S 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-}, $S_2O_3^{2-}$, NO_3^-, CH_3COO^-, Cl^-, Br^-, I^-, $NO3^-$, SO_4^{2-}, PO_4^{3-}, BO_3^{3-}, $C2O4^{2-}$, 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, 2nd 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).

SEMESTER IV						
COURSE CODE	**XCY401**	**L**	**T**	**P**	**SS**	**C**
COURSE NAME	**PHARMACEUTICAL CHEMISTRY**	**1**	**0**	**2**	**1**	**2**
C:P:A	**0.6:0.8:0.6**	**L**	**T**	**P**	**SS**	**H**
		1	**0**	**2**	**1**	**4**

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

UNIT II - DRUGS	**6**

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

Practical

1. Preparation of Aspirin and its analysis.
2. Preparation of magnesium bisilicate (Antacid).
3. Preparation of Acetanilide

UNIT III - PHARMACEUTICALS	**6**

Antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir), Central Nervous System agents (Phenobarbital, Diazepam),Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine). **Practical :** Preparation of nitro benzene.

UNIT IV - FERMENTATION	**6**

Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Practical : Separation of Amino Acids **Fermentation**

Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, (iii) Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Practical : Separation of Amino Acids

UNIT V - MEDICINAL PLANTS	**6**

Medicinal plants origin, function and uses-Tulasi, Neem, Kizhanelli, Alovera, Semparuthi, Nilavembu, Adadodai and Thoothvelai.

Anticancer plants: harmine- taxol-colchicines.

Practical :separation of plant pigments

	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.

COURSE CODE	XCY402		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 *On the successful completion of the course, students will be able to*		DOMAIN	LEVEL
CO1	*Define, explain* Atom models *and demonstrate* Franck and Hertz method; *discuss* the phenomenon of Excitation and ionization potentials.	Cognitive Psychomotor	Remember Understand Mechanism
CO2	Acquire solid knowledge of crystal *Analyze* number of atoms, atomic radius coordination number in crystal structure and determine d spacing in cubic lattice *using* Miller indices.	Cognitive	Analyze Apply
CO3	*Understand* elementary particle, *explain* radioactive decay and fission, fusion.	Cognitive Affective	Understand Receive
CO4	*Identify* the basics of electric field, magnetic field, *explain* Ampere's circuital law and Faraday's law.	Cognitive	Remember
CO5	*Understand* the fundamental phenomena in electronics and *describe* 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 - 8th 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	XCY403	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 principle thermodynamics and its laws applications.	Cognitive	Understanding
CO2	*Apply* the rate and its half life for the chemical reactions..	Cognitive Affective	Apply Receiving
CO3	*Describe* the various concepts and laws of solutions.	Cognitive	Understanding
CO4	*Identify* the various component system and its equilibrium.	Cognitive Affective	understanding
CO5	*Describe* the basic concepts in electro chemistry and *application* of conductance and for finding the emf of the cell..	Cognitive	Apply Remember

UNIT I - THERMODYNAMICS

Chemical Energetics **-**Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

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 - SOLUTIONS	8 +3

Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature, composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes. Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids- Principle of steam distillation. Nernst distribution law and its applications, solvent extraction.

UNIT IV - IONIC EQUILIBRIUM AND PHASE EQUILIBRIUM	9+3

Ionic Equilibria: Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, Solubility and Solubility product-common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions.

Phase Equilibrium Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver only).

UNIT V - ELECTROCHEMISTRY AND CONDUCTANCE	9+3

Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: ΔG, ΔH and ΔS from EMF data. Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. Potentiometric titrations

Conductance Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte. Conductometric titrations (only acid base).

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

TEXT BOOKS
1. "Principles of Physical Chemistry", B.R.Puri and L.R.Sharma
2. "Principles of Physical Chemistry", B.R.Puri, L.R.Sharma and M.S.Pathania
3. "Physical Chemistry", N.Kundu and SN.Jain

REFERENCES
1. "Textbook of Physical Chemistry", S.Glasstone
2. "Physical Chemistry", G.M.Barrow
3. "Advanced Physical Chemistry", P.W. Atkins

4. "Chemical Kinetics ", K.J.Laidler
5. Glasstone S., Lewis D.,Elements of Physical Chemistry, London, Mac Millan & Co. Ltd
6. Barrow, G.M. Physical Chemistry Tata McGraw- Hill (2007).
7. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
8. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009).
9. Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998).
10. Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).
11. Cotton, F.A. & Wilkinson, G. Basic Inorganic Chemistry, Wiley.
12. Shriver, D.F. & Atkins, P.W. Inorganic Chemistry, Oxford University Press.
13. Wulfsberg, G. Inorganic Chemistry, Viva Books Pvt. Ltd.

COURSE CODE	XCY404	L	T	P	SS	C
COURSE NAME	INORGANIC CHEMISTRY III	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	*Identify* the stability of complexes and its isomerism.	Cognitive		Understanding		
CO2	*Describe* the various bonding and theroies of metal and ligands.	Cognitive Affective		Understanding Receiving		
CO3	*Apply* the concept of stability in metal carbonyls and understand the principle of complexometric titrations.	Cognitive Affective		Apply Receiving		
CO4	*Identify* the role of alkali, alkaline earth and transition metals in bio inorganic chemistry.	Cognitive Affective		Understanding		
CO5	*Describe* the properties and applications of silicones and zeolites.	Cognitive		Apply Remember		

UNIT I - CO-ORDINATION CHEMISTRY   **9+3**

Ligands, classification of ligands,IUPAC nomenclature of coordination compounds, Co-ordination number, Sidgwick's electronic interpretation of coordination compounds and the concept of effective atomic number (EAN).

Isomerism – geometric isomerism in coordination number 4 and 6 compounds, optical isomerism and conditions for optical isomerism, optical isomerism in coordination number 4 and 6 compounds.

Stability of complexes – definition of labile and inert complexes – factors affecting stability of complexes. Postulates- sp^3, dsp^2 & sp^3d^2 hybridisation with example and limitation.

UNIT II - THEORIES OF METAL – LIGAND BONDING IN COMPLEXES   **10+3**

Werner's coordination theory, limitations of Werner's theory.

Valence bond theory (VBT) – formation of inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). – application of VBT to octahedral complexes, square planar and tetrahedral complexes, limitations of VBT.

crystal field theory (CFT) – crystal field splitting in tetrahedral, square planar and octahedral complexes, strong and weak ligands, spectrochemical series – high – spin and

low – spin complexes, magnetic properties of octahedral and tetrahedral complexes, crystal field stabilization energy (CFSE) and its uses Comparison of CFSE for Oh and Td complexes, limitations of CFT - comparison of VBT and CFT. Ligand field theory – application of LFT to octahedral and tetrahedral complexes – metal ligand π – bonding. Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

UNIT III - METAL CARBONYLS, COMPLEXOMETRIC TITRATIONS AND CLUSTER COMPOUNDS	8+3

Metal carbonyls – classification with suitable examples – metal carbonyls and EAN rule – stability of metal carbonyls – applications.

Chelates – application of chelates.

Applications of co- ordination compounds in qualitative and quantitative analysis: Separation of silver and mercury ions, copper and cadmium ions, identification of aluminium, chromium, nickel, zinc, manganese and potassium, Complexometric titrations – principle and applications – quantitative estimation of   nickel using DMG, aluminium using oxine – structure of EDTA complexes.

Cluster compounds: Boranes – carbaboranes – carbonyl clusters.

UNIT IV - BIO – INORGANIC CHEMISTRY	9+3

Essentiality (significance) of metal and metal ions in biological systems. Role of alkaline and alkaline earth metal ions in biological systems.Na/K pump.

Role of iron in biological systems – structure of haemoglobin (structural elucidation not required) – oxygen transportation by haemoglobin (elementary study) Structure of chlorophyll – photosynthesis. Role of zinc in biological systems. Role of Ca^{2+} in blood clotting, stabilization of protein structures and structural role (bones). Hydrogenase- Metal poisoning – cadmium and mercury poisoning.

UNIT V - SILICONES (POLYSILOXANES) AND SILICATES	9+3

Types of silicones – structure of silicones – versatile properties of silicones.

Preparation and properties of dimethyl, methylphenyl and diphenyl siliconesanes.

Applications of silicones – desired properties – sealants and adhesives – rubber – paints and coatings – health care – Automotive – aerospace – household – defoaming drycleaning electronics lubricants personalcare – construction.

Zeolites – types of zeolites - uses like ion- exchangers water softeners, molecular sieves dehydrating agents, adsorbents and catalysts.

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

TEXT BOOKS

1. "Inorganic Chemistry", P.L.Soni
2. "Advanced Inorganic Chemistry", R.D.Madan
3. "Inorganic Chemistry", Puri and Sharma

REFERENCES

1. "Basic Inorganic Chemistry", F.A. Cotton and Wilkinosn
2. "A Textbook of quantitative Inorganic Analysis", Arthur.I.Vogel
3. "Inorganic Chemistry", James E.Huheey
4. "Concise Inorganic Chemistry", J.D.Lee
5. "Fundamentals of Inorganic Chemistry", Gilreath
6. "Engineering Chemistry", B.C.Jain and Monica Jain
7. "In-organic Chemistry", Shriver and Atkins

COURSE CODE	XPH405	L	T	P	SS	C
COURSE NAME	MODERN 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 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		XCY406		L	T	P	SS	C
COURSE NAME		INORGANIC QUANTITATIVE ANALYSIS PRACTICAL IV		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 *Identify* the various inorganic complexes			Cognitive Psychomotor		Remember Perception		
CO2	*Analyse* the quantity of individual metal present in a given mixture and *explain* the characteristic properties of the complexes.			Cognitive Psychomotor Affective		Understand Analyse Perception Receive		
CO3	*Use* the principle behind the gravimetric analysis.			Cognitive		Apply		
Inorganic Quantitative Analysis 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 of Copper as copper (I) thiocyanate
5. Estimation of Magnesium as magnesium oxinate
6. Estimation Calcium as calcium oxalate monohydrate
7. Estimation of Barium as barium sulphate.
8. Estimation of Iron as Iron (III) oxide.

	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, 2nd edition, New Delhi, Sultan Chand & sons (1997).

SEMESTER V							
COURSE CODE	XCY501	**L**	**T**	**P**	**SS**	**C**	
COURSE NAME	CLINICAL CHEMISTRY	**1**	**0**	**2**	**1**	**2**	
C:P:A		**L**	**T**	**P**	**SS**	**H**	
		1	**0**	**2**	**1**	**4**	

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
4. 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.

COURSE CODE	XCY502A	L	T	P	SS	C
COURSE NAME	**PHYTO CHEMISTRY**	3	1	0	0	4
C:P:A		L	T	P	SS	H
		3	1	0	0	4

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	*Identify* new biologically important molecular components from natural origin.	Cognitive	Remember
CO2	*Explain* various steps in isolation and separation of plant extracts from natural sources.	Cognitive	Understand
CO3	*Analyse* the various molecular entities in the plant extracts using various spectral and solvent extraction methods.	Cognitive	Analyze
CO4	*Interpret* the mode of action of various drugs extracted from herbals.	Cognitive	Understand
CO5	*Illustrate* 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 - TERPINOIDS ,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 stigmosterol 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. Macm illan 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	XCY502B	L	T	P	SS	C
COURSE NAME	FORENSIC SCIENCE	3	1	0	0	4
C:P:A		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, 6th Edition, Saunders College Publishing, Fort Worth (1992).
2. W. Kemp, Organic Spectroscopy, 3rd Edition, Macmillan, Hampshire (1991).
3. J.D. DeHaan, Kirk's Fire Investigation, 3rd 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, 5th 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, 4th Edition, The Foundation Press, Inc., New York (1995).
3. R. Saferstein, Criminalistics, 8th 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	XCY503A	L	T	P	SS	C
COURSE NAME	ANALYTICAL METHODS IN CHEMISTRY	3	1	0	0	4
C:P:A		L	T	P	SS	H
		3	1	0	0	4

COURSE OUTCOMES		DOMAIN	LEVEL
CO1	*Identify* the concepts of qualitative and quantitative analysis and also to find out the errors, accuracy and precision in data analysis.	Cognitive	Remember
CO2	*Explain* the principles and methods of analyzing chemical compounds with the help of various spectroscopies.	Cognitive	Understand
CO3	*Analyse* the various types of thermal methods of analysis including TGA, DTA, DSC etc.	Cognitive	Analyze
CO4	*Interpret* the importance of electroanalytical techniques in analysis of different parameters of chemical compounds and solutions..	Cognitive	Understand
CO5	*Illustrate* 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

Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law.

UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument;

Infrared Spectrometry: Basic principles of instrumentation (choice of source, monochromator & detector) for single and double beam instrument; sampling techniques. Structural illustration through interpretation of data, Effect and importance of isotope substitution.

Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromator, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.

UNIT III - THERMAL METHODS OF ANALYSIS	5+3

Theory of thermogravimetry (TG), basic principle of instrumentation. Principles, instrumentation and applications of TGA, DTA, DSC. Techniques for quantitative estimation of Ca and Mg from their mixture.

UNIT IV - ELECTROANALYTICAL METHODS	5+3

Classification of electroanalytical methods, basic principle of pH metric, potentiometric and conductometric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pKa values.

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	XCY503B	L	T	P	C
COURSE NAME	**AGRICULTURAL CHEMISTRY**	3	1	0	4
C:P:A	Nil	L	T	P	H
		3	1	0	4
COURSE OUTCOMES		DOMAIN		LEVEL	
CO1	*Identify* the chemical composition and soils of the earth's crust.	Cognitive		Remember	
CO2	*Explain* the concept of soil fertility, soil productivity and application of various types of fertilizers	Cognitive		Understand	
CO3	*Analyse* the various types of radioisotopes in soil and plants.	Cognitive		Analyze	
CO4	*Interpret* the importance of remote sensing and GIS techniques in agriculture.	Cognitive		Understand	

CO5	*Illustrate* 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 anlaysis. 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	XCY504A	L	T	P	SS	C
COURSE NAME	**COMPUTER APPLICATIONS IN CHEMISTRY**	3	1	0	0	4
C:P:A		L	T	P	SS	H
		3	1	0	0	4
COURSE OUTCOMES		DOMAIN		LEVEL		
CO1	*Identify* the components and formats of computer operations.	Cognitive		Remember		
CO2	*Explain* the elements, operators, programming of basic language.	Cognitive		Understand		
CO3	*Analyse* the various types of Numerical methods for roots of equations and simultaneous equation.	Cognitive		Analyze		
CO4	*Interpret* the importance of remote sensing and GIS techniques in agriculture.	Cognitive		Understand		
CO5	*Illustrate* 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	XCY504B	L	T	P	SS	C
COURSE NAME	**PROGRAMMING IN C**	3	1	0	0	4
C:P:A		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-Keywords–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	XCY505	L	T	P	SS	C
COURSE NAME	**ORGANIC QUALITATIVE ANALYSIS PRACTICAL VA**	0	0	4	0	2
C:P:A		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. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
2. Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

COURSE CODE	XCY506	L	T	P	SS	C
COURSE NAME	**PHYSICAL CHEMISTRY PRACTICAL VB**	0	0	4	0	2
C:P:A		L	T	P	SS	H
		0	0	4	0	4
COURSE OUTCOMES		DOMAIN		LEVEL		
CO1	*Identify* the surface tension of liquid or a detergent solution.	Cognitive Psychomotor		Remember Perception		
CO2	*Estimate* the viscosity of liquid and its variation with respect to concentration of a solute.	Cognitive Psychomotor		Understand Set		
CO3	*Estimate* 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. Electrochemistry practicals-Estimation of ferrous ion by potentiometric titration.
2. Study the kinetics of the following reactions.
   a) Initial rate method: Iodide-persulphate reaction
   b) Integrated rate method:
      (i) Acid hydrolysis of methyl acetate with hydrochloric acid.
      (ii) Saponification of ethyl acetate.
3. Compare the strengths of HCl and H2SO4 by studying kinetics of hydrolysis of methyl Acetate.

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

REFERENCE BOOKS

1. Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
2. Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009.
3. Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., *Textbook of Practical Organic Chemistry*, Prentice-Hall, 5th edition, 1996.
   Mann, F.G. & Saunders, B.C. *Practical Organic Chemistry* Orient-Longman, 1960.

SEMESTER VI			L	T	P	SS	C
COURSE CODE	**XCY601**		**1**	**0**	**2**	**1**	**2**
COURSE NAME	**RENEWABLE ENERGY**		**L**	**T**	**P**	**SS**	**H**
C: P: A	**1.4:0:0.6**		**1**	**0**	**2**	**1**	**4**

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	XCY602A	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

Electrothermal 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	XCY602B		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 coronation, 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 grain boundary 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 - MECHNICAL 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 fatigues, 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. Microscopictechniques – 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	XCY603B	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	*Explain* the chemistry of polymerization.	Cognitive			Understand	
CO2	*Describe* the preparation of individual polymers	Cognitive Affective			Understand Respond	
CO3	*Interpret* their physical properties of polymers and explain the molecular weight and size of polymers.	Cognitive			Understand Apply	

		Affective	Respond
CO4	*Recognize* the polymerization techniques and *Classify* the uses of polymers.	Cognitive	Analyze
CO5	*Summarize* 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).

COURSE CODE	XCY604		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

	LECTURE	TUTORIAL	PRACTICAL	TOTAL
HOURS	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	XCY605	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:
a. Simple eutectic
b. Compound formation
2. Determination of molecular weight:
a. Rast-macro method (using naphthalene as solvent)
b. Transition temperature (using sodium thio sulphate penta hydrate as salt hydrate)
3. Critical solution temperature
a. CST of phenol – water system
b. Estimation of sodium chloride by studying the CST of phenol-water system
4. Kinetics
Determination of relative strength of acids by acid catalysed hydrolysis of ester
5. Partition co-efficient
a. Study of equilibrium $KI + I_2 \rightleftharpoons KI_3$ by studying the partition co-efficient of iodine between water and carbon tetra chloride.
b. Determination of association factor of benzoic acid in benzene
6. Electrochemistry
 Conductometric titration between an acid and a base (HCl Vs NaOH)
b. Potentiometric method – Potentiometric titration between 1. an acid and a base (HCl Vs NaOH) and 2. $KMnO_4$ Vs FAS
VI. Complexometric Titrations
    Estimation of Zn, Mg and Ca ions using EDTA and estimation of silver by argentometry.

	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"6th Edn.,Goel Publications,Meerut, 1986.