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

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PERIYAR MANIAMMAI UNIVERSITY
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited
think • innovate • transform

# CURRICULUM & SYLLABUS
# FOR
# B.Sc. CHEMISTRY

**(FULL TIME – 3 Years)**

## REGULATION 2017

## PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY

**PERIYAR MANIAMMAI INSTITUTE OF SCIENCE & TECHNOLOGY**

## I. UNIVERSITY VISION AND MISSION

### VISION

- To be a world class innovative, competitive, up-to-date, academic institution providing technological and other inputs appropriate to the branch of study student has chosen to specialize.

### MISSION

**UM1:** Offering well balanced programmes with scholarly faculty and state of art facilities to impart high level of knowledge.

**UM2:** Providing student centric education and foster their growth in creativity and entrepreneurship, critical thinking and collaborative work.

**UM3:** Involving progressive and meaningful research with concern for sustainability and environment.

**UM4:** Enabling the students to acquire the skill sets for global competencies.

**UM5:** Inculcating social responsibilities and ethics along with imparting knowledge.

## II. DEPARTMENT VISION AND MISSION

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

**MISSION**

**DM 1:** To provide in-depth knowledge in Chemistry to impart technology.
**DM 2:** To create new idea to improve the technology by offering M.Phil. and Doctoral programme.
**DM 3:** To undertake project in thrust areas with societal requirements.
**DM 4:** To develop novel method for clean technology, Bio energy and drug development.

**Table1: Mapping of University Mission with Department Mission**

| | DM1 | DM2 | DM3 | DM4 | TOTAL |
|---|---|---|---|---|---|
| **UM1** | 3 | 3 | 2 | 1 | **9** |
| **UM2** | 3 | 2 | 3 | 1 | **9** |
| **UM3** | 2 | 2 | 3 | 3 | **10** |
| **UM4** | 3 | 2 | 3 | 2 | **10** |
| **UM5** | 2 | 2 | 3 | 3 | **10** |

3 - Highly related 2 - Medium 1 - Low

## III. PROGRAMME EDUCATIONAL OBJECTIVE (PEO's)

The Graduate will be

**PEO-1:** proficient in applying a broad understanding of the basic principles of chemistry to the solution of chemical problems

**PEO-2:** able to become a highly professional teacher/professor or renowned scientist

**PEO-3:** able to plan, coordinate, communicate, organize, make decision and lead a team to solve problems and develop application using chemistry.

**PEO-4:** professional, ethical, responsible and will contribute to society through active management.

**Table 2: Mapping of Department Mission (DM) with Program Educational Objectives (PEOs)**

| | PEO-1 | PEO-2 | PEO-3 | PEO-4 | Total |
|---|---|---|---|---|---|
| **DM1** | 3 | 2 | 1 | 0 | **6** |
| **DM2** | 3 | 1 | 1 | 1 | **6** |
| **DM3** | 2 | 2 | 1 | 3 | **8** |
| **DM4** | 0 | 2 | 0 | 3 | **5** |

3 - Highly related 2 - Medium 1 - Low

## IV. GRADUATE ATTRIBUTES

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The GAs are examples of the attributes expected of a graduate from an accredited programme. The Graduate Attributes of a Chemist are as follows:

**GA-1:** **Disciplinary Knowledge:** Apply knowledge of chemistry along with mathematics, physics and other domains appropriate to the programme.

**GA-2:** **Problem analysis and solution:** Identify, formulate, analyse and solve problems pertaining to chemistry by interdisciplinary approach

**GA-3:** **Design / Development of solutions:** Design and develop **s**olutions for problem with appropriate consideration to public health, safety, environment and society.

**GA-5:** **Tool usage:** Acquire, select, manipulate relevant techniques, resources and ICT tools to interpret solutions to the problems.

**GA-6:** **Ethics and Social responsibility:** Practice ethical codes as a chemistry professional and realize the responsibility to environment and society.

**GA-7:** **Effective Communication:** Professional communication with the society to comprehend and formulate reports, documentation, effective delivery of presentation and responsible to clear instructions.

**GA-8:** **Individual and teamwork:** Perform as an individual and as a leader in diverse teams and in multi-disciplinary environment.

**GA-9:** **Lifelong learning:** Recognize the need and have the ability to engage in independent learning for continual development as a chemist.

## V. PROGRAMME OUTCOMES (PO'S)

The Graduates will be able to

**PO-1:** understand how scientific and mathematical knowledge continually evolve and that is Course to change.

**PO-2:** identify and apply universal chemical laws to the problem.

**PO-3:** communicate effectively (written /oral) and work effectively as an individual or team.

**PO-4:** understand the impact and ethics of scientific discoveries on influencing society locally and globally.

**PO-5:** work effectively in bringing multidisciplinary ideas to diverse professional environment.

**PO-6:** find, collect and assess scientific-based information - its relevance and reliability.

**PO-7:** design and perform experiments and thereby analyse and interpret data.

**PO-8:** use techniques, tools and skills necessary for emerging technologies.

**Table 3: Mapping of Graduate Attributes (GA) with Program Outcomes (PO)**

| GA | PO-1 | PO-2 | PO-3 | PO-4 | PO-5 | PO-6 | PO-7 | PO-8 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **Disciplinary Knowledge** | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | **14** |
| **Problem analysis** | 3 | 2 | 0 | 0 | 1 | 1 | 3 | 2 | **12** |
| **Design / Development of solutions** | 2 | 1 | 0 | 1 | 2 | 3 | 3 | 2 | **14** |
| **Tool usage** | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 3 | **14** |
| **Environment and sustainability** | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | **14** |
| **Ethics and Social responsibility** | 1 | 1 | 1 | 3 | 2 | 2 | 1 | 1 | **12** |
| **Effective communication** | 1 | 1 | 3 | 1 | 2 | 1 | 2 | 2 | **13** |
| **Individual and teamwork** | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 | **14** |
| **Lifelong learning** | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | **15** |

**Table 4: Mapping of Program Educational Objectives (PEOs ) with Program Outcomes (POs)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | Total |
|---|---|---|---|---|---|---|---|---|---|
| **PEO-1** | 3 | 3 | 1 | 1 | 2 | 3 | 2 | 2 | **17** |
| **PEO-2** | 3 | 3 | 1 | 1 | 2 | 2 | 2 | 2 | **16** |
| **PEO-3** | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 2 | **14** |
| **PEO-4** | 1 | 2 | 1 | 3 | 1 | 3 | 2 | 1 | **14** |

3 - Highly related 2 - Medium 1 - Low

**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** | **H** | **C** |
| AECC 1 | XCY101 | Study Skills | 1 | 2 | 0 | 3 | 2 |
| UMAN 1 | XCY102 | Ariviyal Tamil | 3 | 0 | 0 | 3 | 3 |
| CC 1 | XCY103 | Algebra, Trigonometry and Transform | 3 | 2 | 0 | 5 | 4 |
| CC 2 (DSC 2A) | XCY104 | Fundamental Concepts of Chemistry | 3 | 1 | 0 | 4 | 4 |
| CC 3 (DSC 3A) | XCY105 | Inorganic Chemistry I | 3 | 1 | 0 | 4 | 4 |
| UMAN 2 | XUM106 | Human Ethics, Values, Rights and Gender Equality | 3 | 0 | 0 | 3 | 3 |
| CC 2 Lab | XCY107 | Volumetric Analysis, Practical -I | 0 | 0 | 3 | 3 | 2 |
| | | **Total** | **16** | **6** | **3** | **25** | **22** |

| SEMESTER II | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type** | **Course Code** | **Course Title** | **L** | **T** | **P** | **H** | **C** |
| AECC 2 | XCY201 | Environmental Studies | 2 | 1 | 0 | 3 | 2 |
| AECC 3 | XCY202 | Speech and Business Communication | 3 | 0 | 0 | 3 | 3 |
| CC4 | XCY203 | Calculus and Differential Equations | 3 | 2 | 0 | 5 | 4 |
| CC 5 (DSC 2B) | XCY204 | Organic Chemistry I | 3 | 1 | 0 | 4 | 4 |
| CC 6 (DSC 3B) | XCY205 | Physical Chemistry I | 3 | 1 | 0 | 4 | 4 |
| GE 1 | | *Open Elective - To be chosen by student | 3 | 0 | 0 | 3 | 3 |
| CC 5 Lab | XCY206 | Volumetric Analysis Practical- II | 0 | 0 | 3 | 3 | 2 |
| | | **Total** | **17** | **5** | **3** | **25** | **22** |

| SEMESTER III | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type** | **Course Code** | **Course Title** | **L** | **T** | **P** | **H** | **C** |
| SEC 1 | XCY301 | Water Quality Analysis | 0 | 2 | 2 | 4 | 2 |
| CC7 | XCY302 | Fundamental Physics I | 3 | 1 | 0 | 4 | 4 |
| CC 8 (DSC 2C) | XCY303 | Inorganic Chemistry II | 3 | 1 | 0 | 4 | 4 |
| CC 9 (DSC 3C) | XCY304 | Organic Chemistry II | 3 | 1 | 0 | 4 | 4 |
| GE 2 | | *Open Elective - To be chosen by student | 3 | 0 | 0 | 3 | 3 |
| CC lab | XCY305 | Fundamental Physics Practical | 0 | 0 | 3 | 3 | - |
| CC 8 Lab | XCY305 | Semi Micro Inorganic Qualitative Analysis Practical III | 0 | 0 | 3 | 3 | 2 |
| | | **Total** | **12** | **5** | **8** | **25** | **19** |

| SEMESTER IV | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Type** | **Course Code** | **Course Title** | **L** | **T** | **P** | **H** | **C** |
| SEC 2 | XCY401 | Pharmaceutical Chemistry | 0 | 2 | 2 | 4 | 2 |
| CC10 | XCY402 | Modern Physics | 3 | 1 | 0 | 4 | 4 |
| CC 11 (DSC 2D) | XCY403 | Physical Chemistry II | 3 | 1 | 0 | 4 | 4 |
| CC 12 (DSC 3D) | XCY404 | Inorganic Chemistry III | 3 | 1 | 0 | 4 | 4 |
| GE 3 | | *Open Elective - To be chosen by student | 3 | 0 | 0 | 3 | 3 |
| CC10 lab | XCY405 | Fundamental Physics Practical | 0 | 0 | 3 | 3 | 2 |
| CC11 Lab | XCY406 | Inorganic Quantitative Analysis Practical IV | 0 | 0 | 3 | 3 | 2 |
| | | **Total** | **12** | **5** | **8** | **25** | **21** |

| SEMESTER V |
|---|

| Type | Course Code | Course Title | L | T | P | H | C |
|---|---|---|---|---|---|---|---|
| SEC 3 | XCY501 | Clinical Chemistry | 0 | 2 | 2 | 4 | 2 |
| DSE 1A | XCY502A | Phyto Chemistry | 3 | 1 | 0 | 4 | 4 |
| | XCY502B | Forensic Science | | | | | |
| DSE 2A | XCY503A | Analytical Methods in Chemistry | 3 | 1 | 0 | 4 | 4 |
| | XCY503B | Agricultural Chemistry | | | | | |
| DSE 3A | XCY504A | Computer Applications in Chemistry | 3 | 1 | 0 | 4 | 4 |
| | XCY504B | Programming in C | | | | | |
| GE 4 | | *Open Elective - To be chosen by student | 3 | 0 | 0 | 3 | 3 |
| DSE1A Lab | XCY505 | Organic Qualitative Analysis Practical V | 0 | 0 | 3 | 3 | 2 |
| CC lab | XCY506 | Physical Chemistry Practical VA | 0 | 0 | 3 | 3 | 2 |
| * Extra credit | – | IPT (21 days) | | | | | 2* |
| | | **Total** | **12** | **5** | **8** | **25** | **21+2*** |
| **SEMESTER VI** | | | | | | | |
| **Type** | **Course Code** | **Course Title** | **L** | **T** | **P** | **H** | **C** |
| SEC 4 | XCY601 | Renewable Energy | 0 | 2 | 2 | 4 | 2 |
| DSE 1B | XCY602A | Industrial Chemistry | 3 | 1 | 0 | 4 | 4 |
| | XCY602B | Material Chemistry | | | | | |
| DSE 2B | XCY603A | Food Chemistry | 3 | 1 | 0 | 4 | 4 |
| | XCY603B | Polymer Chemistry | | | | | |
| DSE2B lab | XCY604 | Organic Qualitative Analysis Practical VI | 0 | 0 | 3 | 3 | 2 |
| CC lab | XCY605 | Physical Chemistry Practical VIA | 0 | 0 | 3 | 3 | 2 |
| DSE 3B | XCY606 | Project | 0 | 0 | 0 | 8 | 6 |
| * Extra credit | – | NSS/NCC/RRC.... | | | | | 1* |
| | | **Total** | **6** | **4** | **8** | **26** | **20+1*** |

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** **P – Practical** **C-Credit**

**Summary**

| Semester | S1 | S2 | S3 | S4 | S5 | S6 | P1 | P2 | Others |
|---|---|---|---|---|---|---|---|---|---|
| **I** | AECC1 | UMAN1 | CC1 | CC2 (DSC2A) | CC3 (DSC3A) | UMAN2 | CC2 Lab | | |
| **II** | AECC2 | AECC3 | CC4 | CC5 (DSC2B) | CC6 (DSC3B) | GE1 | | CC5 Lab | |
| **III** | SEC1 | CC7 | CC8 (DSC2C) | CC9 (DSC3C) | GE2 | | CC8 Lab | | |
| **IV** | SEC2 | CC10 | CC11 (DSC2D) | CC12 (DSC3D) | GE3 | | CC10 Lab | CC11 Lab | |
| **V** | SEC3 | DSE1A | DSE 2A | DSE3A | GE4 | | DSE1A Lab | CC lab | IPT* |
| **VI** | SEC4 | DSE1B | DSE 2B | DSE3B (PROJECT) | | | DSE2B 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 |
|---|---|---|---|
| 1 | AECC (Theory & Lab) | 03 | 07 |
| 2 | Core Course (Theory & Lab) | 12 | 62 |
| 3 | DSE (Theory & Lab) | 06 | 30 |
| 4 | SEC | 04 | 08 |
| 5 | GE | 04 | 12 |
| 6 | UMAN | 02 | 06 |
| | IPT & NSS / NCC... | 2* | 3* |
| | **Total** | **31 + 2*** | **125 + 3*** |

*Extra credit

| Branch | Total Credit | Core DSC (%) | DSE (%) | SEC (%) | AECC (%) | GE (%) | UMAN (%) | IPT& NSS/NCC.. |
|---|---|---|---|---|---|---|---|---|
| B.Sc.(Chemistry) | 125+3* | 62 (49.6%) | 30 (24%) | 8 (6.4%) | 7 (5.6%) | 12 (9.6%) | 6 (4.8%) | 3* (Extra Credit) |

* Extra Credit

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

| | SEMESTER I | L | T | P | C |
|---|---|---|---|---|---|
| **COURSE CODE** | **XCY101** | **1** | **2** | **0** | **2** |
| **COURSE NAME** | **STUDY SKILLS** | **L** | **T** | **P** | **H** |
| **C: P: A** | **1.8:0.6:0.6** | **1** | **2** | **0** | **3** |

| **COURSE OUTCOMES:** | | **Domain** | **Level** |
|---|---|---|---|
| CO1 | **Identif**y different strategies of reading and writing skills. | Cognitive | Remember |
| CO2 | **Revise** the library skills in their learning process. | Affective | Internalizing Values |
| CO3 | **Apply** different techniques to various types of material such as a novel, newspaper, poem, drama and other reading papers. | Cognitive | Apply |
| CO4 | **Use** visual aids to support verbal matters into language discourse. | Cognitive | Understanding |
| CO5 | **Prepare** to face the written exam with confidence and without any fear or tension. | Cognitive Psychomotor | Understanding Guided Response |

| **UNIT I - INTRODUCTION TO STUDY SKILLS** | **9** |
|---|---|
| Learning Skills and Strategies of Learning - Cognitive Study skills and physical study skills, Library skills (How to use Library), familiarization of library facilities by the librarian - familiarization of basic cataloguing techniques, how to ransack the library etc. | |
| **UNIT II - REFERENCE SKILLS** | **9** |
| How to use the library facilities for research and to write assignments - how to find out reference books, articles, journals and other e- learning materials - how to use a dictionary and thesaurus**.** | |
| **UNIT III - READING RELATED STUDY SKILLS** | **9** |
| Process of reading, various types of reading materials and varied reading techniques - familiarization to materials written by various authors - features of scientific writing and familiarization to scientific writing by renowned authors - note making skills. | |
| **UNIT IV - WRITING RELATED STUDY SKILLS** | **9** |
| Process of writing - characteristics of writing - discourse analysis - use of visual aids, and note making and note taking skills. | |
| **UNIT V - EXAM PREPARATION SKILLS** | **9** |
| Anxiety reduction skills - familiarization with various types of exam / evaluation techniques etc | |

| **LECTURE** | **TUTORIALS** | **PRACTICALS** | **TOTAL** |
|---|---|---|---|
| **15** | **30** | **-------** | **45** |

**Text books**

**Appropriate Chapters/Units from the following textbooks**


1. Narayanaswamy. Strengthen Your Writing. Orient Longman. New Delhi, 2006
2. **Sasikumar, Writing with A Purpose, Champa Tickoo, Oxford University Press.2009**
3. **Freeman, Sarah: Study Strategies. New Delhi: Oxford University Press, New Delhi 1979.**
4. Peter Viney. Streamline English: Destinations, Oxford University Press, 1992.

**References**


1. Susan Fawcett Evergreen: A Guide to Writing with Readings Paperback – 2013
2. **Raymond Murphy. English. Grammar in Use A reference and practice book for Intermediate, Third Edition, OUP, New Delhi, 2010**
3. Kiranmai Dutt and Geetha Rajeevan. A Course in Listening and Speaking I & II. New Delhi: Foundation Books, Cambridge House, 2006.
4. **David Bolton, English Grammar in Steps, Richmond Publishing, New Delhi,2000**


**Table 1: Mapping of Cos with POs:**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **CO2** | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **CO3** | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **CO4** | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **CO5** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | 7 | 0 | 0 | 0 | 0 | 0 | 6 | 0 |
| **Scaled Value** | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

1-5= 1, 6-10 = 2, 11-15= 3

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

**Table 2: Mapping of COs with GAs:**

| | GA1 | GA2 | GA3 | GA4 | GA5 | GA6 | GA7 | GA8 | GA9 |
|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **CO2** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO3** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO4** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO5** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **Total** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| **Scale** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |

1-5= 1, 6-10 = 2, 11-15= 3

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

| Course Code | XCY102 | L | T | P | C |
|---|---|---|---|---|---|
| Course Name | mwptpay; jkpo; | 3 | 1 | 0 | 4 |
| Prerequisite | Nil | L | T | P | H |
| C:P:A | 4:0:0 | 3 | 1 | 0 | 4 |

| COURSE OUTCOMES | | DOMAIN | LEVEL |
|---|---|---|---|
| After the completion of the course, students will be able to | | | |
| CO1 | *Recognize(milahsk; fhZjy;)*gy;NtWmwptpay; Jiwrhu;e;jEl;gq;fs;>fiyr; nrhy;yhf;fcj;jpfs; Nghd;wtw;iwj; jkpo;nkhop %yk; mwpe;Jnfhs;sy;. | Cognitive | Remember |
| CO2 | *Choose (njupTnra;jy;)*tlnkhopNtu;r;nrhw;fs;>Gtpapay;>epytpay; gw;wpg; goe;jkpo; ,yf;fpaq;fs; %yk; mwpe;Jnfhs;sy;. | Cognitive | Remember |
| CO3 | *Describe(tpsf;Fjy;)njhy;fhg;gpak; %yk; mwptpay; nra;jpfisczu;jy;.* | Cognitive | Understand |
| CO4 | *Apply (gad;gLj;Jjy;)gy;NtWfy;tpj;Jiwrhu;e;jgpupTfs;>gy;NtWfy;tpj; Jiwrhu;e;jgpupTfs; Fwpj;JnjspTngwy;.* | Cognitive | Apply |
| CO5 | *Analyze(gFj;jy;)mwptpay; rpWfijfspd; Njhw;wk; kw;Wk; tsu;r;rpepiyehlfq;fspd; gq;FFwpj;JnjspTngWjy;.* | Cognitive | Analyze |

| *myF 1* | ***mwptpay;jkpo; mwpKfk;*** | 9 |
|---|---|---|
| *mwptpay;jkpo; - nghwpapay;>njhopy;El;gk;>kUj;Jtk;>cotpay;. jkpopy; mwptpay; - jkpopy; El;gk;. gilg;Gg; gzp– nrhy;yhf;fcj;jpfs; - El;gkhdNtWghLfisczu;e;Jnrhy;yhf;fk; nra;jy; - fiyr;nrhw;fs; - ,e;jpankhopfSf;Fg; nghJthdfiyr; nrhw;fiscUthf;Fjy; - tlnkhopNtu;r;nrhw;fiskpFjpahff; nfhz;bUj;jiyg; gad;gLj;Jjy;.* | | |
| *myF 2* | ***gpwmwptpay; Jiwfs;*** | *9* |
| *Gtpapay;>epytpay; gw;wpgoe;jkpo; ,yf;fpak; Fwpg;gpLk; jfty;fs; - njhy;fhg;gpak; Fwpg;gpLk; capupay;>kz;zpay; gw;wpambg;gilr; nra;jpfs; - jkpo; kUj;Jtf; fy;tp - mwptpay; jkpOf;F ,jopay; cj;jpfs; - tsu; jkpo;.* | | |
| *myF 3* | ***gy;NtWfiyfspy; mwptpay;*** | 9 |
| *nkhopapay; fy;tp– fl;llf; fiyf;fy;tp– rKjhaf;fy;tp–Nra;ikf;fy;tp– kz;zpay;>Gtpapay;>fzf;fpay; Mfpait ,ize;jfy;tp - ,f;fhyf; fy;tpg; nghJepiy– fiy>mwptpay; - vd;gtw;wpd; tpsf;fq;fs;.* | | |
| *myF 4* | ***mwptpay; jkpopy; rpWfijfspd; gq;F*** | 9 |
| *rpWfij -,yf;fzk; cUthf;Fk; cj;jpfs; - rpwe;jrpWfijfs; - rpWfij tiffs; - ey;yrpWfijcUthf;fk; - tuyhW– r%fk; - nkhopngau;g;Gkw;Wk; mwptpay; rpWfijfs;.* | | |
| *myF 5* | ***mwptpay; jkpopy; ehlfq;fspd; gq;F*** | 9 |
| *ehlfk; - ehlf ,yf;fzk;> ,Utifehlfq;fs; - gbg;gjw;Fupaehlfk; - ebg;gjw;Fupaehlfk; - rupj;jpuehlfk;>r%fehlfk; - eifr;Ritehlfq;fs; - mnkr;#u; ehlfq;fs; - njhopy;Kiwehlfq;fs;.* | | |

| LECTURE | TUTORIAL | PRACTICAL | TOTAL |
|---|---|---|---|
| **45** | **---** | **---** | **45** |

| |
|---|
| *Nkw;ghu;itEhy;fs;:* |
| *1. mwptpay; jkpo; - lhf;lu; th.nr. Foe;ijr;rhkp*<br>*2. tsu; jkpo; - ,jo;fs;*<br>*3. ,yf;fpatuyhW– rpWfijgw;wpaJ*<br>*4. ,yf;fpatuyhW– Gjpdk; gw;wpaJ* |

**Table 1: CO Versus PO mapping.**

| CO's | PO | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
| **CO1** | | 1 | | | | | | |
| **CO2** | | 1 | | | | | | 1 |
| **CO3** | | 1 | | | | | 1 | |
| **CO4** | 1 | 2 | 2 | 1 | | 1 | 2 | |
| **CO5** | 2 | 2 | 2 | 2 | | 1 | 2 | 1 |
| **Total** | 3 | 7 | 4 | 3 | | 2 | 5 | 2 |
| **Scaled Value** | 1 | 1 | 1 | 1 | | | 1 | 1 |

1 – 5 -> 1  6 – 10 -> 2  11 – 15 -> 3

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

| COURSE CODE | XCY 103 | L | T | P | C |
|---|---|---|---|---|---|
| COURSE NAME | ALGEBRA, TRIGONOMETRY AND TRANSFORMS | 3 | 1 | 0 | 4 |
| PREREQUISITES | BASIC CONCEPTS OF MATRICES, DIFFERENTIATION AND INTEGRATION | L | T | P | H |
| C:P:A | 4:0:0 | 3 | 2 | 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 $\theta$ – 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** | **TOTAL** |
| **HOURS** | **45** | **15** | **-** | **60** |
| **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.<br>2. S. Narayan and T.K. Manicavachagam Pillay, Ancillary Mathematics, Viswanathan Publishers and Printers Pvt. Ltd. | | | | |
| **WEBSITE:**<br>1. **WWW. NPTEL .ac.in** | | | | |

**COs versus PO mapping**

**Table 1: Mapping of CO's with PO's:**

| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | | 1 | | 2 | | | 2 |
| **CO2** | 2 | | 1 | | 2 | | | 2 |
| **CO3** | 2 | | 1 | | 2 | | | 2 |
| **CO4** | 2 | | 1 | | 2 | | | 2 |
| **CO5** | 2 | | 1 | | 2 | | | 2 |

0 – No relation 1- Low relation 2- Medium relation 3 – High relation

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| XCY104 | FUNDAMENTAL CONCEPTS OF CHEMISTRY | 3 | 1 | 0 | 4 |
| | | | | | |
| C:P:A | 3.2:0:0.8 | L | T | P | H |
| | | 3 | 1 | 0 | 4 |

| COURSE OUTCOMES: *On the successful completion of the course, students will be able to* | | DOMAIN | LEVEL |
|---|---|---|---|
| CO1 | ***Explain*** the principle of atomic structure and basics of quantum mechanism | Cognitive | Understanding |
| 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 | Apply Remember |

**SYLLABUS:**

| | | |
|---|---|---|
| **UNIT I** | **ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS**<br>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.<br>Quantum theory – postulates of quantum mechanics - The Schrodinger wave equation, particle in a box, degeneracy - Zeeman effect - Physical significance of $\Psi$ and $\Psi^2$ – Quantum numbers. Aufbau principle – Hund's rule of maximum spin multiplicity – Pauli's exclusion principle – n + l rule – electronic configurations of elements. | **10+3** |
| **UNIT II** | **PERIODIC TABLE**<br>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. | **6+3** |
| **UNIT III** | **IUPAC** Nomenclature of organic compounds<br>Molecular weight determination of organic acids and bases – Silver salt and platonic chloride methods. Problems arriving empirical and molecular formula using percentage composition of elements and molecular weight.<br>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 | **9+3** |

| | | |
|---|---|---|
| | 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.**<br>Dipole moment: Definition – Experimental determination - Calculation of percentage of ionic character of HF and HCl – Dipole moment and molecular structure: $CO_2$, $H_2O$,$NH_3$ and $CH_4$.<br>Polarizability: Definition – polarization of a molecule – molar polarization – Clausius-Mosotti equation.<br>Magnetic properties: Paramagnetic, diamagnetic and ferro magnetic substances and their characteristics – magnetic permeability – magnetic susceptibility – specific and molar magnetic susceptibilities – determination of magnetic susceptibility by Gouy's method.<br>Applications of magnetic susceptibilities: number of unpaired electrons in a molecule – structure of co-ordination compounds – formation of free radicals. | **10+3** |
| **Unit V** | **ANALYTICAL METHODS**<br>Qualitative Inorganic Analysis – Dry Test, flame test, cobalt nitrate test– wet confirmatory test for acid radicals, interfering acid radicals – elimination of interfering acid radicals.<br>Solubility product, common ion effect, complexation, oxidation-reduction reactions involved in identification of anions and cations – separation of cations into groups – Semi micro analysis of simple salts.<br>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. | **10+3** |

| | **LECTURE** | **TUTORIAL** | **PRACTICAL** | **TOTAL HOURS** |
|---|---|---|---|---|
| **Hours** | **45** | **15** | **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, (23rd edition),

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 ($6^{th}$ edition), New York, Allyn & Bacon Ltd., (1976).
2. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, ($12^{th}$ edition), New Delhi, Sultan Chand & Co., (1997).
3. 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, ($5^{th}$ 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 |
| 5. http://ocw.mit.edu/courses/chemistry/ |

**Table 1: Mapping of COs with Pos**

| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | 2 | 3 | | | | |
| **CO2** | 3 | | 3 | 3 | | | | |
| **CO3** | 2 | | 3 | 3 | | | | |
| **CO4** | 3 | | 2 | 2 | | | | |
| **CO5** | 3 | | 2 | 3 | | | | |
| **Total** | 14 | | 12 | 14 | | | | |
| **Scaled value** | 3 | | 2 | 3 | | | | |

| COURSE CODE | XCY105 | L | T | P | C |
|---|---|---|---|---|---|
| COURSE NAME | INORGANIC CHEMISTRY | 3 | 1 | 0 | 4 |
| PREREQUISITES | Nil | L | T | P | H |
| C:P:A | 2.8:0.4:0.8 | 3 | 1 | 0 | 4 |

| COURSE OUTCOMES: *On the successful completion of the course, students will be able to* | | DOMAIN | LEVEL |
|---|---|---|---|
| CO1 | ***Recall*** and ***Explain*** the basic concepts of ionic bonding; ***Display*** the shapes of simple inorganic molecules using VSEPR theory | Cognitive<br>Psychomotor | Remember<br>Understand<br>Set |
| CO2 | ***Summarize and Report*** extraction, properties and uses of I A and IIA group s-block elements. | Cognitive<br>Affective | Understand<br>Respond |
| CO3 | ***Explain*** the extraction and purification process of various metals and **Interpret** their physical and chemical properties. | Cognitive<br>Affective | Understand<br>Apply<br>Respond |
| CO4 | ***Describe*** the concept of acids and bases and the application of various concepts. | Cognitive<br>Psychomotor | Analyze<br>Perception |
| CO5 | ***Identify*** the various radioactive process and their consequences. | Cognitive | Remember |

| **UNIT I – CHEMICAL BONDING** | **9+3** |
|---|---|

**Ionic 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** | **9+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 – Extraction of Lithium, Sodium and Potassium – 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 – Extraction of Beryllium, Magnesium and Calcium –Physical and Chemical properties – Uses – Preparation and uses of Mg: $MgCO_3$, $MgSO_4$, $MgCl_2$, Mg $(NH_4)PO_4.6H_2O$ – Cement manufacture – Types – Chemistry of setting of cement.

| **UNIT III- BASIC PRINCIPLES OF METALLURGY** | **9+3** |
|---|---|

Ores and minerals – concentrating the ore by gravity separation, froth flotation and magnetic separation – 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.

**Hydrazine:** Preparation, properties and uses

**Nitric Acid**: Manufacture of Nitric acid – Action of nitric acid on metals

**UNIT IV- ACIDS AND BASE** **9+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 in liquid sulphur dioxide.

**UNIT V- NUCLEAR CHEMISTRY** **9+3**

Constitution of nuclei – leptons and hadrons - 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. Particle accelerators: linear accelerator – cyclotron.

| | LECTURE | TUTORIAL | PRACTICAL | TOTAL |
|---|---|---|---|---|
| **HOURS** | **45** | **15** | **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, ($12^{th}$ edition), New Delhi, Sultan Chand & Co., (2007).


**REFERENCES**


1. Puri B.R..,Sharma L.R., Kalia K.K.,Principles of Inorganic Chemistry, ($23^{rd}$ edition), New Delhi, Shoban Lal Nagin Chand & Co., (2003).
2. Puri B.R..,Sharma L.R., Pathania M.S.,Principles of Physical Chemistry, ($23^{rd}$ 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 ($6^{th}$ edition), New York, Allyn & Bacon Ltd., (2003).
5. G.D. Tuli, R.D. Madan, S.K. Basu, Satya Prakash, Advanced Inorganic Chemistry, Volume 1, ($5^{th}$ edition), New Delhi, S. Chand & Company Ltd, (2014).
6. Peter Atkins, Tina Overton , Jonathan Rourke, Mark Weller , Fraser Armstrong, Inorganic Chemistry, ($4^{th}$ edition), (2010).
7. Huheey, James.E, Keiter, Ellen.A, Keiter, Richard.L, Inorganic Chemistry: principles of structure and reactivity, ($4^{th}$ edition), (1993).


**E-REFERENCES**

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://ocw.mit.edu/courses/chemistry/

**Table 1: Mapping of COs with Pos**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | **0** | 2 | 3 | **3** | **0** | **0** | **0** |
| **CO2** | 3 | **0** | 3 | 3 | **0** | **0** | **0** | **0** |
| **CO3** | 3 | **0** | 3 | 3 | **2** | **0** | **0** | **0** |
| **CO4** | 3 | **0** | 2 | 2 | **0** | **0** | **0** | **0** |
| **CO5** | 3 | **0** | 2 | 3 | **01** | **0** | **0** | **0** |
| **Total** | 15 | 0 | 12 | 14 | 0 | 0 | 0 | 0 |
| **Scaled value** | **3** | **0** | **2** | **3** | **0** | **0** | **0** | **0** |

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

| COURSE CODE | XUM 106 | L | T | P | C |
|---|---|---|---|---|---|
| COURSE NAME | HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY | 3 | 0 | 0 | 3 |
| PREREQUISITES | Not Required | L | T | P | H |
| C:P:A | 2.7:0:0.3 | 3 | 0 | 0 | 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**

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).
11. Planning Commission report on Occupational Health and Safety http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p
11. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.
12. Weblink of Transparency International: https://www.transparency.org/
13. Weblink Status report: https://www.hrw.org/world-report/2015/country-chapters/india


**Table 1: Mapping of COs with Pos**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | | | | | | | | 2 |
| **CO2** | | | | | | | | 3 |
| **CO3** | | | | | | | | 2 |
| **CO4** | | | | | | | | 3 |
| **CO5** | | | | | | | | 3 |
| **Total** | | 2 | | | | | | 13 |
| Scaled Value | | 1 | | | | | | 3 |

1 – 5 → 1, 6-10 → 2, 11 – 15→ 3

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

| COURSE NAME | Volumetric Analysis Practical-I | L | T | P | C |
|---|---|---|---|---|---|
| PREREQUISITE | Nil | 0 | 0 | 3 | 2 |
| C:P:A | 1: 0.8:0.2 | L | T | P | H |
| | | 0 | 0 | 3 | 3 |

| COURSE OUTCOMES | | DOMAIN | LEVEL |
|---|---|---|---|
| CO1 | ***Identify*** the various Metals in the solution. | Cognitive<br>Psychomotor | Remember<br>Perception |
| CO2 | ***Estimate*** the amount of acids using volumetric method. | Cognitive<br>Psychomotor | Understand<br>Set |
| CO3 | ***Estimate*** the amount of bases using volumetric method. | Cognitive<br>Psychomotor<br>Affective | Apply<br>Set<br>Receiving |
| | | | |

| VOLUMETRIC ANALYSIS LAB-1 | 3 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 | 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.


**REFERENCE BOOKS**


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** - 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

**Table 1: Mapping of COs with POs**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 0 | 0 | | | 0 | 0 | |
| **CO2** | 2 | 0 | 0 | | 0 | | 0 | 0 |
| **CO3** | 3 | 0 | 0 | | 0 | | 0 | 0 |
| **Total** | 8 | 0 | 0 | | 0 | | 0 | 0 |
| **Scaled value** | 3 | 0 | 0 | | 0 | | 0 | 0 |

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

## XCY201 ENVIRONMENTAL STUDIES

**COURSE OUTCOMES**

**CO1. Cog: (R and U**); ***Describe*** the significance of natural resources and ***explain*** anthropogenic impacts.

**CO2.Cog: U**; ***Illustrate*** the significance of ecosystem, biodiversity and natural geo bio chemical cycles for maintaining ecological balance.

**CO3. Cog: R, Aff: Receiving**; ***Identify*** the facts, consequences, preventive measures of major pollutions and ***recognize*** the disaster phenomenon

**CO4. Cog: (U & Anal)**: ***Explain*** the socio-economic, policy dynamics and ***practice*** the control measures of global issues for sustainable development.

**CO5. Cog: (U & App)**: ***Recognize*** the impact of population and the concept of various welfare programs, and ***apply*** the modern technology towards environmental protection. .

| COURSE CODE | COURSE NAME | L | T | P | C |
|---|---|---|---|---|---|
| XCY201 | ENVIRONMENTAL STUDIES | 2 | 1 | 0 | 2 |
| C:P:A | 1.5: 0 : 0.5 | | | | |
| | | L | T | P | H |
| | | 2 | 1 | 0 | 3 |

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

**UNIT - 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 (ponds, streams, lakes, rivers, oceans, estuaries) – 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: Causes, effects and control measures of urban and

industrial wastes – 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 – 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** | **TOTAL** |
|---|---|---|---|
| | **45** | **0** | **45** |

**TEXT BOOKS**


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


**REFERENCE BOOKS**


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


**E RESOURCES**

1. http://www.e-booksdirectory.com/details.php?ebook=10526
2. https://www.free-ebooks.net/ebook/Introduction-to-Environmental-Science
3. https://www.free-ebooks.net/ebook/What-is-Biodiversity
4. https://www.learner.org/courses/envsci/unit/unit_vis.php?unit=4
5. http://bookboon.com/en/pollution-prevention-and-control-ebook

6. http://www.e-booksdirectory.com/details.php?ebook=8557
7. http://www.e-booksdirectory.com/details.php?ebook=6804
8. http://bookboon.com/en/atmospheric-pollution-ebook
9. http://www.e-booksdirectory.com/details.php?ebook=3749
10. http://www.e-booksdirectory.com/details.php?ebook=2604
11. http://www.e-booksdirectory.com/details.php?ebook=2116
12. http://www.e-booksdirectory.com/details.php?ebook=1026
13. http://www.faadooengineers.com/threads/7894-Environmental-Science

**Mapping of CO's with GA's:**

| | **GA 1** | **GA2** | **GA 3** | **GA4** | **GA 5** | **GA6** | **GA7** | **GA8** | **GA9** |
|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 3 |
| **CO2** | 2 | 0 | 0 | 0 | 2 | 0 | 0 | | |
| **CO3** | 2 | 0 | 3 | 0 | 3 | 3 | 0 | 2 | 2 |
| **CO4** | 2 | 0 | 3 | 0 | 3 | 3 | 2 | 3 | 2 |
| **CO5** | 2 | 0 | | 1 | 2 | 2 | 0 | | 1 |
| | **10** | 0 | **6** | **1** | **12** | **10** | **2** | **10** | **9** |
| **Scaled to 0,1,2,3 scale** | **2** | 0 | | **1** | **2** | **2** | **1** | **2** | **2** |

*1 - Low, 2 – Medium, 3 – High*

| XCY202 SPEECH AND BUSINESS COMMUNICATION |
|---|
| |
| **COURSE OUTCOMES:** |
| |
| CO1. Cog: R; ***Define*** and ***Describe*** how to make effective speeches academically and in social situations |
| CO2. Psy ; ***Identify*** the forms of language used in different speeches and how to listen actively and critically. |
| CO3. Cog: R; ***Produce*** the proper tone of language required in writing and speaking in Business communication |
| CO4. Aff: Initializing Values, Display knowledge on grammar and other linguistic feature in writing various forms of business communication. |
| CO5. Cog: Appl, ***Comprehend*** and prepare how to write business reports, minutes, Proposals etc. |

| **Course Code** | **Course Name** | **L** | **T** | **P** | **C** |
|---|---|---|---|---|---|
| **XCY202** | **SPEECH AND BUSINESS COMMUNICATION** | **3** | **0** | **0** | **3** |
| **C:P:A** | **1:0.6:0.4** | | | | |
| | | **L** | **T** | **P** | **H** |
| | | **3** | **0** | **0** | **3** |

| **UNIT I - PUBLIC SPEECH** | **09** |
|---|---|
| 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** | **09** |
| 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** | **09** |
| 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** | **09** |
| The language used in memos/minutes/telephone memos/ letters/assignments; art of writing E-mail etc. | |
| **UNIT V- USE OF GRAMMAR** | **09** |
| 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** | **TOTAL** |
|---|---|---|---|---|
| | **45** | **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
   Freeman, Sarah: Study Strategies. New Delhi: Oxford University Press, 1979. 13.
4. Reading for Meaning, Paul Gunashekar M.L. Tickoo, Published by S. Chand & Company Ltd. Sultan Chand & Company

**REFERENCE BOOKS**

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.

## XCY203 CALCULUS AND DIFFERENTIAL EQUATIONS

| Course Code | Course Name | L | T | P | C |
|---|---|---|---|---|---|
| XCY203 | CALCULUS AND DIFFERENTIAL EQUATIONS | 3 | 1 | 0 | 4 |
| C :P:A | 3:0:0 | | | | |
| | | L | T | P | H |
| | | 3 | 2 | 0 | 5 |

**PREREQUISITE:** Basic concepts of Matrices, Numbers, Differentiation and Integration

**COURSE OUTCOMES:**

| 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 doubleintegral 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** | **TOTAL** |
| | **45** | **15** | **60** |

**TEXT**

1. Kandasamy. P, Thilagavathi. K "Mathematics for B.Sc. Branch I", Volume II, III and IV, S.Chand and Company Ltd, New Delhi, 2004.

**REFERENCES**

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

**Mapping of CO's with GA's:**

| | **GA1** | **GA2** | **GA3** | **GA4** | **GA5** | **GA6** | **GA7** | **GA8** | **GA9** |
|---|---|---|---|---|---|---|---|---|---|
| **CO 1** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 2** | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 3** | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **CO 4** | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| **CO 5** | 3 | 2 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | 15 | 6 | 0 | 0 | 2 | 0 | 0 | 0 | 0 |

***1 - Low , 2 – Medium , 3- high***

| SEMESTER II | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **L** | **T** | **P** | **C** |
| **XCY204** | **ORGANIC CHEMISTRY – I** | **3** | **1** | **0** | **4** |
| **C:P:A** | **2.8:0.4:0.8** | **L** | **T** | **P** | **H** |
| | | **3** | **1** | **0** | **4** |

| **OURSE 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** | **ALIPHATIC HYDROCARBONS:** 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: Preparation and applications of Westron and Freon. Halogen derivatives of unsaturated hydrocarbons: Preparation and uses of vinyl chloride, allyl chloride and allyl iodide. Organo metallic compounds: Synthetic applications of Grignard reagents. | **9+3** |
| **UNIT II** | **ALIPHATIC ALCOHOLS:** 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. | **9+3** |

| | | |
|---|---|---|
| **UNIT III** | **ALDEHYDES, KETONES AND CARBOXYLIC ACID**<br>Preparation of aldehydes and ketones from fatty acids – Rosenmund reduction – Stephen's method – Mechanism of nucleophilic addition to Carbonyl compounds – Hemiacetal and Acetal formations – yanohydrin 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 – Relative strengths of mono, di and tri chloro acetic acids. Hydroxy acids. Dicarboxylic acids: Preparation of Malonic acid and Malonic ester – Synthetic applications of diethyl malonate – Action of heat on dicarboxylic acids | **10+3** |
| **UNIT IV** | **COVALENT BONDING AND STRUCTURE**<br>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 | **7+3** |
| **UNIT V** | **CHEMISTRY OF CYCLOALKANES AND STREO ISOMERISM**<br>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. | **10+3** |

| **LECTURE** | **TUTORIAL** | **PRACTICAL** | **TOTAL** |
|---|---|---|---|
| **45** | **15** | **0** | **60** |

**TEXT BOOKS**


a. Morrison R.T. and Boyd R.N., Organic Chemistry ($6^{th}$ edition), New York, Allyn & Bacon Ltd., (1976).

b. Bahl B.S. and Arun Bahl, Advanced Organic Chemistry, ($12^{th}$ 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-REFERENCES**

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

**Table 1: Mapping of COs with Pos**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 0 | 0 | 1 | 2 | 3 | 2 |
| **CO2** | 3 | 1 | 0 | 0 | 1 | 2 | 3 | 1 |
| **CO3** | 3 | 2 | 0 | 0 | 1 | 2 | 2 | 2 |
| **CO4** | 2 | 1 | 0 | 0 | 1 | 1 | 3 | 1 |
| **CO5** | 3 | 2 | 0 | 0 | 1 | 2 | 3 | 2 |
| **Total** | 14 | 8 | 0 | 0 | 5 | 9 | 14 | 8 |
| **Scaled value** | **3** | **2** | **0** | **0** | **1** | **2** | **3** | **2** |

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

| SEMESTER II | | | | | |
|---|---|---|---|---|---|
| **Course Code** | **Course Name** | **L** | **T** | **P** | **C** |
| **XCY205** | **PHYSICAL CHEMISTRY - I** | **3** | **1** | **0** | **4** |
| **C:P:A** | **2.8:0.4:0.8** | **L** | **T** | **P** | **H** |
| | | **3** | **1** | **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 equliibrium and ***explain*** the theory behind the catalysis. | Cognitive: Affective: | Remember Receive |

**SYLLABUS:**

| | | |
|---|---|---|
| **UNIT I** | **GASEOUS STATE:**<br>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) | **9+3** |
| **UNIT II** | **SOLID STATE**<br>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 $H_2O$ – 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. | **9+3** |
| **UNIT III** | **LIQUID STATE, LIQUID CRYSTALS –AND ADSORPTION:** | |

| | | |
|---|---|---|
| | 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<br>Classification – Transformation into the mesomorphic states –<br>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. | **9+3** |
| **UNIT IV** | **COLLOIDAL STATE:** 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.<br>**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. | **10+3** |
| **UNIT V** | **CHEMICAL EQUILIBRIUM:** Reversible and irreversible reactions – statement of law of mass action – Derivation of law of mass action from kinetic theory – Relationship between Kp and Kc (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 $NH_3$.<br>**CATALYSIS:** Homogeneous and heterogeneous catalysis – promoters and catalytic poisons – auto catalysis – Acid-base catalysis – Enzyme catalysis –Kinetics of enzymed catalysed reaction. | **8+3** |

| | **LECTURE** | **TUTORIAL** | **PRACTICAL** | **TOTAL** |
|---|---|---|---|---|
| | **45** | **15** | **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-REFERENCES**

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

**Table 1: Mapping of COs with POs**

| COs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 0 | 0 | 2 | 3 | 3 | 2 |
| **CO2** | 3 | 1 | 0 | 0 | 1 | 2 | 3 | 2 |
| **CO3** | 3 | 2 | 0 | 0 | 2 | 3 | 2 | 2 |
| **CO4** | 2 | 2 | 0 | 0 | 2 | 1 | 2 | 2 |
| **CO5** | 3 | 2 | 0 | 0 | 1 | 2 | 3 | 2 |
| **Total** | | | | | | | | |
| **Scaled value** | **3** | **2** | **0** | **0** | **2** | **2** | **3** | **2** |

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

| COURSE NAME | Volumetric Analysis Practical-II XCY 206 | L | T | P | C |
|---|---|---|---|---|---|
| PREREQUISITE | Nil | 0 | 0 | 3 | 2 |
| C:P:A | 1: 0.8:0.2 | L | T | P | H |
| | | 0 | 0 | 3 | 3 |

| COURSE OUTCOMES | | DOMAIN | LEVEL |
|---|---|---|---|
| CO1 | ***Identify*** the various Metals in the solution. | Cognitive<br>Psychomotor | Remember<br>Perception |
| CO2 | ***Estimate*** the amount of metal ions using volumetric method by using various internal and external indicators. | Cognitive<br>Psychomotor | Understand<br>Set |
| CO3 | ***Estimate*** the amount of metal ions in terms of complex by complexometric titrations using volumetric method. | Cognitive<br>Psychomotor<br>Affective | Apply<br>Set<br>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. 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**

3. 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.
4. J. Bassett, R.C. Denney, G. H Jeffery and J. Mendham, " Vogel's text book of Quantitative Inorganic Analysis (revised)", (ELBS), 6th edn., 2007.

**REFERENCE BOOKS**

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 -** MOOCs:

1.http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques
2. https://www.youtube.com/watch?v=gzAgIIjHyqI
3. https://www.youtube.com/watch?v=3AS9Jwdpui4

**Table 1: Mapping of COs with POs**

| Cos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| **CO2** | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **CO3** | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| **Total** | | | | | | | | |
| **Scaled value** | 2 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |

1 – 5 →1, 6 – 10→ 2, 11 – 15→ 3

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

| 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, 17$^{th}$Edition, 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.<br>2. I B.Sc. Ancillary Physics - R. Murugesan, S. Chand & Co., 2010. | | | | | |
| **REFERENCES** | | | | | |
| 1. Sound - Saigal - S. Chand & Co., Delhi.<br>2. Elements of properties of matter - Brijlal and Subramanian, S. Chand Limited, 1974.<br>3. Heat and Thermodynamics by Brijlal and Subramanian, S. Chand Limited.<br>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<br>Affective | Apply<br>Receiving |
| CO4 | ***Identify*** the general characteristics and properties of Lanthanides and Actinides. | Cognitive<br>Affective | Remember<br>Responding |
| CO5 | ***Apply*** and ***Identify*** the various properties and bonding of organo metallic compounds. | Cognitive | Apply<br>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<br>2. "Inorganic Chemistry", Puri and Sharma<br>3. "Advanced Inorganic Chemistry", R.D.Madan | | | | | |
| **REFERENCES** | | | | | |
| 1. "Basic Inorganic Chemistry", F.A. Cotton and Wilkinosn<br>2. "In-organic Chemistry", Shriver and Atkins<br>3. "Inorganic Chemistry", James E.Huheey<br>4. "Concise Inorganic Chemistry", J.D.Lee<br>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<br>Affective | Apply<br>Receiving |
| **CO4** | ***Recognise*** the various structures of amino acids, peptides and proteins | Cognitive<br>Affective | Understanding<br>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.<br>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 disacharrides (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 : $CO_3^{2-}$ , $S^{2-}$, $SO^{2-}$, $S_2O_3^{2-}$, $NO_3^-$ , $CH_3COO^-$ , $Cl^-$ , $B^{r-}$ , $I^-$ , $NO3^-$ ,$SO_4^{2-}$, $PO_4^{3-}$, $BO_3^{3-}$, $C2O4^{2-}$, $F^-$ (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** |
|---|---|---|---|
| **CO 1** | ***Explain*** the basic concepts and aims of pharmaceutical chemistry | Cognitive | Understanding |
| **CO 2** | ***Identify*** the role of drugs and its preparation. | Cognitive Affective | Apply Receiving Responding |
| **CO 3** | ***Describe*** the antibiotics role pharmaceuticals in our life. | Cognitive | |
| **CO 4** | ***Recognise*** fermentation Aerobic and anaerobic fermentation in daily process. | Cognitive Affective | Understanding |
| **CO 5** | ***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

**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<br>Psychomotor | Remember<br>Understand<br>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<br>Apply |
| **CO3** | ***Understand***elementary particle, ***explain*** radioactive decay and fission, fusion. | Cognitive<br>Affective | Understand<br>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<br>Affective | Understand<br>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.<br>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.<br>2. Electricity and Magnetism - Narayanamoorthy and Nagarathinam<br>3. Modern Physics by R Murugesan, S. Chand & Co., 2004<br>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<br>Affective | Apply<br>Receiving |
| **CO3** | ***Describe*** the various concepts and laws of solutions. | Cognitive | Understanding |
| **CO4** | ***Identify*** the various component system and its equilibrium. | Cognitive<br>Affective | understanding |
| **CO5** | ***Describe*** the basic concepts in electro chemistry and ***application*** of conductance and for finding the emf of the cell**..** | Cognitive | Apply<br>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.<br>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.<br>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: $\Delta G$, $\Delta H$ and $\Delta S$ 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<br>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** |
|---|---|---|---|
| **CO 1** | ***Identify*** the stability of complexes and its isomerism. | Cognitive | Understanding |
| **CO 2** | ***Describe*** the various bonding and theroies of metal and ligands. | Cognitive<br>Affective | Understanding<br>Receiving |
| **CO 3** | ***Apply*** the concept of stability in metal carbonyls and understand the principle of complexometric titrations. | Cognitive<br>Affective | Apply<br>Receiving |
| **CO 4** | ***Identify*** the role of alkali, alkaline earth and transition metals in bio inorganic chemistry. | Cognitive<br>Affective | Understanding |
| **CO 5** | ***Describe*** the properties and applications of silicones and zeolites. | Cognitive | Apply<br>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 $\pi$ – 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.<br>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<br>2. Estimation of cholesterol using ferric chloride<br>3. Estimation of ferric ion by colorimetric method<br>4. Iodometric determination of vitamin C<br>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**

5. http://freevideolectures.com/Course/3218/Advance-Analytical-Course
6. 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, | Cognitive | Understand |

| | | | |
|---|---|---|---|
| | preserving and analyzing arson evidence | | |
| **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.<br>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.<br>Comparison<br>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.<br>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<br>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<br>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** |
|---|---|---|---|
| **CO 1** | ***Identify*** the monofunctional groups in various types of organic compound. | Cognitive Psychomotor | Remember Perception |
| **CO 2** | ***Estimate*** the extra elements in a combination of of two or more organic compounds. | Cognitive Psychomotor | Understand Set |
| **CO 3** | ***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<br>Affective | Remember<br>Receive |
| **CO5** | ***Examine*** the various pollutants and gain awareness about industrial pollution. | Cognitive<br>Affective | Analyze<br>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<br>Apply |
| CO3 | ***Recognize*** the significance of mechanical and electrical properties of materials. | Cognitive | Remember<br>Understand |
| CO4 | ***Describe*** the importance of magnetic, optical and thermal properties of materials. | Cognitive<br>Affective | Understand<br>Receive |
| CO5 | ***Interpret*** the various techniques used in the characterization of materials. | Cognitive<br>Affective | Remember<br>Apply<br>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


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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<br>Affective | Understand<br>Respond |
| CO3 | ***Interpret*** their physical properties of polymers and explain the molecular weight and size of polymers. | Cognitive<br><br>Affective | Understand<br>Apply<br>Respond |
| CO4 | ***Recognize*** the polymerization techniques and ***Classify*** the uses of polymers. | Cognitive | Analyze |
| CO5 | ***Summarize*** the processing of polymers | Cognitive | Remember<br>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 moudlings – 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**


8. M.P. Stevens, *Polymer Chemistry: An Introduction*, 3rd Edition, Oxford University Press, (1991).
9. H.R. Allcock, F.W. Lampe & J.E. Mark, *Contemporary Polymer Chemistry*, 3rd edition, (2003).
10. 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 | 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<br>Psychomotor | Remember<br>Perception |
| CO2 | ***Estimate*** relative strength of acids and partial coefficient. | Cognitive<br>Psychomotor | Understand<br>Set |
| CO3 | ***Interpret*** the electrochemistry and thermochemistry titrations and ***examine*** the complexometric titration. | Cognitive<br>Psychomotor<br>Affective | Apply<br>Set<br>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.