

**FATIMA MATA NATIONAL COLLEGE
(AUTONOMOUS)
KOLLAM**



**SCHEME & SYLLABUS OF
B.Sc. Chemistry
2015 Admission Onwards**



**FIRST DEGREE PROGRAMME IN CHEMISTRY
UNDER CHOICE BASED CREDIT AND SEMESTER SYSTEM
FOR 2015 ADMISSIONS ONWARDS**

PROGRAMME STRUCTURE

The Bachelor of Science (B.Sc.) Under Graduate Degree Programme in Chemistry covers three academic years consisting of six semesters each with a total of 450 teaching hours in 18 weeks; 25 hours of work per week. The syllabus will be in effect for admissions in 2015 -16 academic year onwards.

The Programme consists of a total of 37 Courses which are:

- i. 9 Language Courses;
- ii. 2 Foundation Courses;
- iii. 9 Complementary Courses;
- iv. 14 Core Courses;
- v. 1 Open Course
- vi. 1 Elective Course and
- vii. 1 Project

The total minimum credits, that should be accrued for successful completion of the programme are 120. This minimum number of credits is distributed in the 1st to the 6th semesters

| | | |
|--------------|---|----|
| Semester I | = | 18 |
| Semester II | = | 18 |
| Semester III | = | 18 |
| Semester IV | = | 24 |
| Semester V | = | 19 |
| Semester VI | = | 23 |

The details of the programme structure, course structure, and scheme of instruction and evaluation are given in the following Tables

Course structure, Scheme of Instruction & Evaluation

| Semester I | | | | | | | | |
|------------------|-------------------------|------------------------------|---|----------|----------------------|------------|-----|----------------|
| Course Code | Course Title | Instructional Hours per Week | | Cred-its | Duration of ESE Exam | Evaluation | | Total Cred-its |
| | | T | P | | | CE | ESE | |
| 15UEN111.1 | Language Course I | 5 | | 4 | 3 hrs | 25% | 75% | 18 |
| 15UML/HN/FR111.1 | Language Course II | 4 | | 3 | 3 hrs | 25% | 75% | |
| 15UCH141 | Core course I | 2 | 2 | 4 | 3 hrs | 25% | 75% | |
| 15UEN121 | Foundation course I | 4 | | 2 | 3 hrs | 25% | 75% | |
| 15UMM131.2 | Complementary course I | 4 | | 3 | 3 hrs | 25% | 75% | |
| 15UPY131.2 | Complementary course II | 2 | 2 | 2 | 3 hrs | 25% | 75% | |

| Semester II | | | | | | | | |
|------------------|--------------------------|------------------------------|---|----------|----------------------|------------|-----|----------------|
| Course Code | Course Title | Instructional Hours per Week | | Cred-its | Duration of ESE Exam | Evaluation | | Total Cred-its |
| | | T | P | | | CE | ESE | |
| 15UEN211.1 | Language Course III | 4 | | 3 | 3 hrs | 25% | 75% | 18 |
| 15UEN212.1 | Language Course IV | 5 | | 4 | 3 hrs | 25% | 75% | |
| 15UML/HN/FR211.1 | Language Course V | 4 | | 3 | 3 hrs | 25% | 75% | |
| 15UCH221 | Foundation course II | 2 | | 3 | 3 hrs | 25% | 75% | |
| 15UMM231.2 | Complementary course III | 4 | | 3 | 3 hrs | 25% | 75% | |
| 15UPY231.2 | Complementary course IV | 2 | 2 | 2 | 3 hrs | 25% | 75% | |

| Semester III | | | | | | | | |
|------------------|-------------------------|-------------------------------|---|----------|----------------------|------------|-----|----------------|
| Course Code | Course Title | Instruc-tional Hours per Week | | Cred-its | Duration of ESE Exam | Evaluation | | Total Cred-its |
| | | T | P | | | CE | ESE | |
| 15UEN311.1 | Language Course VI | 5 | | 4 | 3 hrs | 25% | 75% | 18 |
| 15UML/HN/FR311.1 | Language Course VII | 5 | | 4 | 3 hrs | 25% | 75% | |
| 15UCH341 | Core course II | 3 | 2 | 3 | 3 hrs | 25% | 75% | |
| 15UMM331.2 | Complementary course V | 5 | | 4 | 3 hrs | 25% | 75% | |
| 15UPY331.2 | Complementary Course VI | 3 | 2 | 3 | 3 hrs | 25% | 75% | |

| Semester IV | | | | | | | | |
|--------------------|---|------------------------------|---|----------|----------------------|------------|-----|----------------|
| Course Code | Course Title | Instructional Hours per Week | | Cred-its | Duration of ESE Exam | Evaluation | | Total Cred-its |
| | | T | P | | | CE | ESE | |
| 15UEN411.1 | Language Course VIII | 5 | | 4 | 3 hrs | 25% | 75% | 24 |
| 15UML/HN/FR411.1 | Language Course IX | 5 | | 4 | 3 hrs | 25% | 75% | |
| 15UCH441 | Core course III | 3 | | 3 | 3 hrs | 25% | 75% | |
| 15UCH442 | Core course IV | | 2 | 2 | 3 hrs | 25% | 75% | |
| 15UMM431.2 | Complementary Course VII | 5 | | 4 | 3 hrs | 25% | 75% | |
| 15UPY431.2 | Complementary Course VIII | 3 | | 3 | 3 hrs | 25% | 75% | |
| 15UPY432.2 | Complementary Lab Course of 15UPY131.2, 15UPY231.2 15UPY331.2, 15UPY431.2 | | 2 | 4 | 3 hrs | 25% | 75% | |

| Semester V | | | | | | | | |
|-------------------|------------------|------------------------------|---|----------|----------------------|------------|-----|----------------|
| Course Code | Course Title | Instructional Hours per Week | | Cred-its | Duration of ESE Exam | Evaluation | | Total Cred-its |
| | | T | P | | | CE | ESE | |
| 15UCH541 | Core course V | 3 | | 4 | 3 hrs | 25% | 75% | 19 |
| 15UCH542 | Core course VI | 4 | | 4 | 3 hrs | 25% | 75% | |
| 15UCH543 | Core course VII | 4 | | 4 | 3 hrs | 25% | 75% | |
| 15UCH544 | Core Course VIII | | 5 | 3 | 3 hrs | 25% | 75% | |
| 15UCH545 | Core Course IX | | 4 | 2 | 3 hrs | 25% | 75% | |
| | Open Course | 3 | | 2 | 3 hrs | 25% | 75% | |
| | Project | | 2 | | 3 hrs | 25% | 75% | |

| Semester VI | | | | | | | | |
|-------------|---------------------------|------------------------------|---|---------|----------------------|------------|------|---------------|
| Course Code | Course Title | Instructional Hours per Week | | Credits | Duration of ESE Exam | Evaluation | | Total Credits |
| | | T | P | | | CE | ESE | |
| 15UCH641 | Core course X | 3 | | 4 | 3 hrs | 25% | 75% | 23 |
| 15UCH642 | Core course XI | 4 | | 4 | 3 hrs | 25% | 75% | |
| 15UCH643 | Core course XII | 4 | | 4 | 3 hrs | 25% | 75% | |
| 15UCH644 | Core Course XIII | | 5 | 3 | 3 hrs | 25% | 75% | |
| 15UCH645 | Core Course XIV | | 3 | 2 | 3 hrs | 25% | 75% | |
| 15UCH661.2 | Elective Course | 3 | | 2 | 3 hrs | 25% | 75% | |
| 15UCH646 | Project and Factory Visit | | 3 | 4 | | | 100% | |

| Open Courses | | | | |
|--------------|------------|------------------------|---|---|
| Open Course | 15UCH551.1 | Essential of Chemistry | 3 | 2 |

Total Credits- 120

No Course shall carry more than 4 Credits. Audit Courses will carry Zero Credit.

| | B.A. / B.Sc. | B. Com | Career related 2(b) |
|---|---------------|-------------|---------------------|
| Accumulated minimum Credits required for Successful completion of the Programme | 120 Credits | 120 Credits | 120 Credits |
| Minimum Credits for Language Courses | 33 Credits | 22 Credits | 4 Credits |
| Minimum Credits required for Foundation Courses | 5 Credits | 5 Credits | 5 Credits |
| Credits required for Core Courses including Dissertation | 50-56 Credits | 61 Credits | 78-102 Credits |
| Credits required for Complementary Courses | 22-28 Credits | 12 Credits | 0-12 Credits |
| Minimum Credits required for Vocational Courses | | | |
| Minimum Credits required for Open Courses | 2 Credits | 2 Credits | 2 Credits |
| Minimum Credits required for Elective Courses | 2 Credits | 18 Credits | 2-22 Credits |
| Minimum Credits for Social Service / Extension Activities | 1 Credits | 1 Credits | 1 Credits |

Attendance:

Students who secure a minimum of 75% attendance in the aggregate for all the Courses of a semester taken together alone will be allowed to register for End Semester Evaluation. Others have to repeat the semester along with the next batch, unless they could make up the shortage of attendance through condonation. However the award of Grade for attendance in CE shall be made course-wise. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of two times during the whole period of a Degree Programme shall be granted by the College on valid grounds. This condonation shall not be considered for awarding marks for CE. Benefits of attendance for a maximum of 10 days in a semester shall be granted to students who participate/attend University Union activities, meetings of the University Bodies and Extra Curricular Activities, on production of participation/attendance certificate by the University Authorities/Principals as the case may be. But in such cases, condonation will be considered for award of marks for CE.

The Boards of Studies (in each subject) shall design all the Courses and syllabi for each Course in that subject offered in the First Degree Programme. The Board shall design and introduce new Courses, modify or redesign existing Courses or replace any Course/Courses with new/modified Courses to ensure better exposure and training to students.

The syllabus for a Course shall include: Course Code, the title of the Course the statement of the aims and objectives of the Course and the number of Credits; instructional hours in terms of lectures, tutorials, and laboratory session with the pre-requisites if any, for taking the Course. The Course content shall be given in a unitized manner along with a list of reading materials.

The syllabus for each Course shall include the mode of transacting that Course in terms of lectures, tutorials, seminars, laboratory sessions, field work, projects and such other activities.

The syllabus for each Course shall also indicate the scheme of evaluation/ examination.

Evaluation and Grading

The Evaluation of each Course shall consists of two parts

- 1) Continuous Evaluation (CE)
- 2) End Semester Evaluation (ESE)

The CE and ESE ratio shall be 1:3 for both Courses with or without practical. There shall be a maximum of 75 marks for ESE and maximum of 25 marks for CE. For all Courses (Theory and Practical). Grades are given on a 7-point scale based on the total percentage of mark (CE+ESE) as given below.

Criteria for Grading

| Percentage of marks | CCPA | Letter Grade |
|---------------------|----------|----------------|
| 90 and above | > or = 9 | A+ outstanding |
| 80 to < 90 | 8 to < 9 | A Excellent |
| 70 to < 80 | 7 to < 8 | B Very Good |
| 60 to < 70 | 6 to < 7 | C Good |
| 50 to < 60 | 5 to < 6 | D Satisfactory |
| 40 to < 50 | 4 to < 5 | E Adequate |
| Below 40 | < 4 | F Failure |

Continuous Evaluation (CE)

All records of Continuous Evaluation shall be kept in the Department and shall be made available for verification, if and when necessary.

Attendance (Max. marks 5):

The allotment of marks for attendance shall be as follows:

| | |
|--------------------------|---------|
| Attendance less than 75% | 1 Mark |
| 75% & less than 80% | 2 Marks |
| 80% & less than 85% | 3 Marks |
| 85% & less than 90% | 4 Marks |
| 90% & above | 5 Marks |

Assignments or Seminars: (Max. marks 5)

Each student shall be required to do one assignment or one seminar for each Course. Valued assignments shall be returned to the students. The seminars shall be organized by the teacher/teachers in charge of CE and the same shall be assessed by a group of teachers including the teacher/ teachers in charge of that Course. Assignments/Seminars shall be evaluated on the basis of their quality. The teacher shall define the expected quality of an assignment in terms of structure, content,

presentation etc. and inform the same to the students. Due weight shall be given for punctuality in submission. Seminar shall be similarly evaluated in terms of structure, content, presentation, interaction etc.

Tests: (Max. marks 15)

For each Course there shall be two (average of two) tests during a semester. Valued answer scripts shall be made available to the students for perusal within 10 working days from the date of the test.

End Semester Evaluation (ESE):

End Semester Evaluation of all the Courses in all the semesters shall be conducted. The results of the ESE, which shall not exceed 45 days from the last day of the examination.

Project/Dissertation Work:

For each First Degree Programme there shall be a Project/Dissertation Work. The Project/Dissertation work can be done either individually or by a group not exceeding five students. However, Viva-Voce based on the Project/Dissertation work shall be conducted individually.

The topics shall either be allotted by the supervising teacher or be selected by the students in consultation with the supervising teacher.

The report of the Project/ Dissertation shall be submitted to the Department in duplicate before the completion of the sixth semester. There shall be no continuous assessment for Dissertation / Project work.

The detailed guidelines regarding the conduct and evaluation of the Project/ Dissertation will be framed by the Boards of Studies concerned.

Social Service/Extension Activity:

It is mandatory for a student to participate in any one of the following Social Service/Extension Activities for not less than forty hours, during the 3rd and 4th semesters, for successful completion of the Programme.

- 1) Health Education
- 2) Peoples Planning Programme
- 3) Debate Club
- 4) Environmental Activities
- 5) Human Rights Forum

- 6) Community Health Activity
- 7) Kerala State Literacy Mission
- 8) Performing Arts Club-Folklore
- 9) Media Club
- 10) Community Based activities of CACEE
- 11) NSS
- 12) NCC
- 13) Sports Club
- 14) Science Club
- 15) Nature Club/Eco Club
- 16) Theatre Club
- 17) Planning Forum
- 18) Literary Club
- 19) Women's Study Unit
- 20) Anti-Ragging Cell
- 21) State Library Council Affiliated of CACEE Rural Public Libraries

A statement testifying the participation of the students shall be forwarded to the Controller of Examinations along with the statement of CE results of the 4th semester.

Grading System

Both CE and ESE will be carried out using Indirect Grading system on a 7-point scale.

Consolidation of Grades

The maximum mark for a Course (ESE theory) is 75. The duration of ESE is 3hours.

The marks of CE shall be consolidated by adding the marks of Attendance, Assignment/ Seminar and Test paper respectively for a particular Course.

| | | |
|---|--------------------|----------|
| a | Attendance | 5 marks |
| b | Assignment/Seminar | 5 marks |
| c | Test Paper | 15 marks |
| | Total | 25 |

Total marks for the ESE of Practical is 75. The components of ESE of Practical have to be set by the Chairmen, Boards of Studies, concerned.

The marks for the components of Practical for Continuous Evaluation shall be as shown below.

| | | |
|---|------------------------------------|----------|
| a | Attendance | 5 marks |
| b | Record | 5 marks |
| c | Test | 10 marks |
| d | Performance, Punctuality and Skill | 5 marks |
| | Total | 25 |

The marks of a Course are consolidated by combining the marks of ESE and CE (75+25).

A minimum of 40% marks (E Grade) is required for passing a Course with a separate minimum of 40% (E Grade) for Continuous Evaluation and End Semester Evaluation.

Consolidation of SCPA: SCPA is obtained by dividing the sum of Credit Points (CP) obtained in a semester by the sum of Credits (C) taken in that semester. After the successful completion of a semester, Semester Credit Point Average (SCPA) of a student in that semester shall be calculated.

Suppose the student has taken four Courses each of 4 Credits and two

Courses each of 2 Credits in a particular semester, after consolidating the Grade

for each Course. SCPA has to be calculated as shown in the example given below:

| Course Code | Title | Credit (C) | Marks (M) | Grades | Grade points ($G=M/10$) | Credit Point $CP=C*G$ |
|---|-------|------------|-----------|--------|------------------------------|--------------------------|
| 01 | | 4 | 82 | A | 8.2 | 32.8 |
| 02 | | 4 | 60 | C | 6.0 | 24.0 |
| 03 | | 4 | 50 | D | 5.0 | 20.0 |
| 04 | | 4 | 45 | E | 4.5 | 18.0 |
| 05 | | 2 | 75 | B | 7.5 | 15.0 |
| 06 | | 2 | 40 | E | 4.0 | 8.0 |
| Total | | 20 | | | | 119.8 |
| $SCPA = \text{Total Credit Points} / \text{Total Credits} = 119.8 / 20 = 5.99 = \text{D Grade}$ | | | | | | |

For the successful completion of a semester, a student has to score a minimum SCPA of 4.00 (E Grade). However, a student is permitted to move to the next semester irrespective of his /her SCPA.

Consolidation of CCPA: An overall letter Grade (Cumulative Grade) for the whole Programme shall be awarded to the student based on the value of CCPA using a 7-point scale, as given below. It is obtained by dividing the sum of the Credit Points in all the Courses taken by the student, for the entire Programme by the total number of Credits.

CONSOLIDATION OF CCPA

| Semester | SCPA Credit Point (CP) | SCPA Credit (C) |
|---|------------------------|-----------------|
| 1 | 119 | 20 |
| 2 | 120 | 20 |
| 3 | 110 | 20 |
| 4 | 105 | 20 |
| 5 | 100 | 20 |
| 6 | 120 | 20 |
| Total | 674 | 120 |
| CCPA=Total Credit Points of all semesters/Total Credits of all semesters=674/120=5.62=D Grade | | |

Overall Grade in a Programme

| Percentage of marks | CCPA | Letter Grade |
|---------------------|----------|----------------|
| 90 and above | > or = 9 | A+ outstanding |
| 80 to < 90 | 8 to < 9 | A Excellent |
| 70 to < 80 | 7 to < 8 | B Very Good |
| 60 to < 70 | 6 to < 7 | C Good |
| 50 to < 60 | 5 to < 6 | D Satisfactory |
| 40 to < 50 | 4 to < 5 | E Adequate |
| Below 40 | < 4 | F Failure |

The Marks of the Courses taken over and above the minimum prescribed Credits, shall not be counted for computing CCPA.

For the successful completion of a Programme and award of the Degree, a student must pass all Courses satisfying the minimum Credit requirement and must score a minimum CCPA of 4.00 or an overall grade of E

Pattern of Questions

| Question Type | Total Number of Questions | Number of Questions to be answered | Marks for each Questions | Total Marks |
|---|---------------------------|------------------------------------|--------------------------|-------------|
| Very short answer type (One word to Maximum of 2 sentences) | 10 | 10 | 1 | 10 |
| Short answer (Not to exceed one paragraph) | 11 | 7 | 2 | 14 |
| Short essay (Not to exceed 120 words) | 5 | 3 | 7 | 21 |
| Long essay | 4 | 2 | 15 | 30 |
| Total | 30 | 22 | | 75 |

Promotion to Higher Semesters: Students who complete the semester by securing the minimum required attendance and who register for the End Semester Evaluation conducted by the College of each semester alone shall be promoted to the next higher semester.

Re-appearance of Failed Students: “Students who fail shall have to reappear for the ESE of the same along with the next regular batch of students.” Candidates who fail to score ‘E’ grade in the ESE in any of the Course/Courses have to reappear for the ESE of the Course /Courses concerned with next regular batch of students. The number of chances or such appearances is limited to 5 and the same have to be done within a period of 12 continuous semesters including the semester in which they have first appeared.

However, students who fail to secure SCPA of 4.00 have to reappear for the ESE with the next regular batch of students for such courses for which they have secured the least Grade for improving the SCPA. Here also the number of appearance is limited to 5 and the same has to be done within a period of 12 continuous semesters including the semester in which they have first appeared.

In both cases (i.e. failure to obtain ‘E’ Grade for individual Course/Courses and ‘SCPA of 4.00) students shall not be allowed to repeat the semester, but the marks secured by them for the CE part shall be carried over and added to the marks obtained in the ESE they reappear. However, those who fail in the CE (i.e. those who fail to secure a minimum of ‘E’ grade) will have one chance to improve the same (except the marks for attendance) along with next regular batch of students.

Improvement of ESE

Candidates who have successfully completed the Semester, but wish to improve their marks for the End Semester Evaluation (ESE) shall have only one chance for the same along with the next immediate regular batch of students. In this case, the better marks obtained shall be considered for the calculation of SCPA.

Mark Cum Grade Sheet

The College under its seal shall issue to the students a Mark cum Grade Sheet on completion of each semester indicating the details of Courses, Credits Marks for CE and ESE, Grades, Grade Points, Credit Points and Semester Credit Point Average (SCPA) for each Course.

The Consolidated Mark cum Grade sheet issued at the end of the final semester on completion of the Programme shall contain the details of all Courses taken during the entire Programme including Additional Courses taken over and above the prescribed minimum Credits for obtaining the Degree. However, for the calculation of CCPA, only those Courses in which the student has performed the best with maximum Credit Points alone shall be taken subject to the minimum requirements of Credits for successful completion of a Programme. The Consolidated Mark cum Grade sheet shall indicate the CCPA and CCPA(S) and the overall letter grade for the whole Programme. The Consolidated Mark cum Grade sheet shall also indicate all the Audit Courses (Zero Credit) successfully completed by the student during the whole Programme.

No student shall be eligible for the award of the Degree unless he/she has successfully completed a Programme of not less than 6 semesters duration and secured at least 120 Credits (excluding Credits for Social Service/Extension Activities) as prescribed by the Regulations.

1. Course Structure for B.A/B.Sc. Degree Programmes

| Study Components | Number of Courses | Credits/ Course | Total Credits |
|------------------------|-------------------|-----------------|---------------|
| Language Courses | | | |
| a) English | 5 | 3-4 | 19 |
| b) Additional Language | 4 | 3-4 | 14 |
| Foundation Course | 2 | 2-3 | 5 |
| Core Course | 12-15 | 2-4 | 46-52 |
| Complementary Course | 8-10 | 2-3 | 22-28 |
| Project/Dissertation | 1 | 4 | 4 |
| Open Course | 1 | 2 | 2 |
| Elective Course | 1 | 2 | 2 |

SEMESTER I

Language Course I

15UEN111.1: LISTENING AND SPEAKING SKILLS

No. of credits: 4

No. of instructional hours per week: 5 (Total 90 hrs.)

AIMS

1. To familiarize students with English sounds and phonemic symbols.
2. To enhance their ability in listening and speaking.

OBJECTIVES

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

1. listen to lectures, public announcements and news on TV and radio.
2. engage in telephonic conversation.
3. communicate effectively and accurately in English.
4. use spoken language for various purposes.

COURSE OUTLINE

Module 1

Pronunciation-Phonemic symbols - consonants - vowels - syllables - word stress - strong and weak forms.

Module 2

Listening Skills - difference between listening and hearing - active listening - barriers to listening - academic listening - listening for details - listening and note-taking - listening to talks and descriptions - listening to announcements - listening to news programmes.

Module 3

Speaking Skills - interactive nature of communication - importance of context - formal and informal - set expressions in different situations - greeting - introducing - making requests - asking for / giving permission - giving instructions and directions - agreeing / disagreeing - seeking and giving advice - inviting and apologizing - telephonic skills - conversational manners.

Module 4

Dialogue Practice

(Students should be given ample practice in dialogue, using core and supplementary materials.)

COURSE MATERIAL

Modules 1 - 3

Core reading: Listening and Speaking, Cambridge University Press, India Pvt Ltd, 2010

Further reading:

1. Marks, Jonathan. English Pronunciation in Use. New Delhi: CUP, 2007.
2. Lynch, Tony. Study Listening. New Delhi:CUP, 2008.
3. Kenneth, Anderson, Tony Lynch, Joan MacLean. Study Speaking. New Delhi: CUP, 2008.

Module 4:

Core reading: Dramatic Moments: A Book of One Act Plays. Orient Black Swan, 2013.

The following One-act plays are prescribed:

1. Saki - The Death Trap
2. Philip Moeller - Helena's Husband
3. Serafin and Joaquin Alvarez Quinters - Sunny Morning: A Comedy of Madrid
4. Margaret Wood - Day of Atonement

Reference:

Jones, Daniel. English Pronouncing Dictionary 17th Edition. New Delhi: CUP, 2009.

Language Course II (Additional Language I)

15UML111.1: മലയാള കവിത

No. of credits: 3

No. of instructional hours per week: 4

പുസ്തകം : കാവ്യപഥം

(കോളേജ് പ്രസിദ്ധീകരണം)

പഠനോദ്ദേശ്യം : മലയാള കവിതയെ സംബന്ധിച്ച് സാമാന്യജ്ഞാനം നൽകുക. പഠിതാക്കളിൽ കാവ്യഭിരുചി വളർത്തുക. ആസ്വാദനത്തിനും വിശകലത്തിനും സജ്ജരാക്കുക.

പാഠ്യപദ്ധതി :

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

1. ചെറുശ്ശേരി - വേണുഗാനം
(രാഗങ്ങളോരോന്നേ ഗോകുലനായകൻ...
മുതൽ അവസാനം വരെ)
2. എഴുത്തച്ഛൻ - പാർത്ഥസാരഥീവർണ്ണന
3. വടക്കൻ പാട്ട് - ഉണ്ണിയാർച്ചയുടെ അപേക്ഷ
4. കുമാരനാശാൻ - കരുണ (ആദ്യത്തെ 100 വരി)

മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)

5. പി.കുഞ്ഞിരാമൻ നായർ - കൊടുത്തു മുടിഞ്ഞ മാവ്
6. ചങ്ങമ്പുഴ - രമണൻ (രംഗം - 5 മുഴുവൻ)
7. വൈലോപ്പിള്ളി - കൃഷ്ണാഷ്ടമി
8. ഇടശ്ശേരി - കറുത്ത ചെട്ടിച്ചികൾ

മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

9. വയലാർ - രാവണപുത്രി
10. ഒ.എൻ.വി - പാഥേയം
11. സുഗതകുമാരി - തുലാവർഷപ്പച്ച
12. അയ്യപ്പപ്പണിക്കർ - പകലുകൾ രാത്രികൾ

മൊഡ്യൂൾ നാല് (18 മണിക്കൂർ)

13. കടമ്മനിട്ട രാമകൃഷ്ണൻ - കടമ്മനിട്ട
14. ബാലചന്ദ്രൻ ചുള്ളിക്കാട് - ഗസൽ
15. പി.പി. രാമചന്ദ്രൻ - ലൈബ്രേറിയൻ മരിച്ചതിൽപ്പിന്നെ
16. റഫീക്ക് അഹമ്മദ് - തോരാമഴ

- 17. എസ്. ജോസഫ് - പെങ്ങളുടെ ബൈബിൾ
- 18. വി.എം. ഗിരിജ - ജീവജലം

സഹായകഗ്രന്ഥങ്ങൾ

- 1. ആധുനിക സാഹിത്യ ചരിത്രം
പ്രസ്ഥാനങ്ങളിലൂടെ - ഡോ.കെ.എം.ജോർജ്ജ് (എഡിറ്റർ)
- 2. കൈരളിയുടെ കഥ - എൻ. കൃഷ്ണപിള്ള
- 3. മലയാള കവിതാസാഹിത്യ ചരിത്രം - ഡോ.എം. ലീലാവതി
- 4. കവിയും കവിതയും രണ്ടാം വാല്യം - പി.നാരായണക്കുറുപ്പ്
- 5. കവിയരങ്ങ് - കെ.എസ്. നാരായണപിള്ള
- 6. കുമാരനാശാന്റെ കാവ്യപ്രപഞ്ചം - മലയാളവിഭാഗം,
കേരള സർവ്വകലാശാല
- 7. ഖണ്ഡകാവ്യ പ്രസ്ഥാനം - എം.വി. പണിക്കർ
- 8. ചങ്ങമ്പുഴ കൃഷ്ണപിള്ള - എൻ.മുകുന്ദൻ
- 9. ചങ്ങമ്പുഴ കൃഷ്ണപിള്ള
നക്ഷത്രങ്ങളുടെ സ്നേഹ ഭാജനം - എം.കെ.സാനു
- 10. കുമാരനാശാന്റെ രചനാശിൽപ്പം - എം.എം. ബഷീർ
- 11. കാല്പനികത - ഹൃദയകുമാരി
- 12. ആധുനിക മലയാളസാഹിത്യം - പി.കെ. പരമേശ്വരൻ നായർ
- 13. ഇടശ്ശേരിക്കവിത - മേലത്തു ചന്ദ്രശേഖരൻ
- 14. സിംബലിസം മലയാളകവിതയിൽ - ഡോ.കെ.എം. വേണുഗോപാൽ
- 15. ആധുനികത മലയാളകവിതയിൽ - ഡോ.എൻ.അജയകുമാർ
- 16. കേരളകവിതയിലെ കലിയും ചിരിയും - പ്രസരാജൻ
- 17. ഉത്തരാധുനികത - ബി.ഉണ്ണികൃഷ്ണൻ
- 18. മലയാളകവിതാപഠനങ്ങൾ - സച്ചിദാനന്ദൻ
- 19. മലയാളകവിതയിലെ
ഉയർന്നശിരസ്സുകൾ - ഡോ.എം.എൻ. രാജൻ
- 20. കടമ്മനിട്ടയിലെ കവി - ഡോ.കെ.എസ്.രവികുമാർ
- 21. ദലിത് പഠനം സ്വത്വം,സംസ്കാരം
സാഹിത്യം - ഡോ. പ്രദീപൻ പാമ്പിരിക്കുന്ന്
- 22. ആധുനിക മലയാള കവിതയിലെ
സ്ത്രീപക്ഷസമീപനങ്ങൾ - ഡോ.പി.ഗീത
- 23. പാഠങ്ങൾ പഠനങ്ങൾ - സച്ചിദാനന്ദൻ
- 24. കവിതവായനയും പ്രതികരണവും - എൻ.രാജൻ
- 25. കവിതയിലെ പുതുവഴികൾ - നെല്ലിക്കൽ മുരളീധരൻ

Language Course II (Additional Language I)

15UHN111.1: PROSE AND GRAMMAR

No. of credits: 3

No. of instructional hours per week: 4

Aim of the Course / Objectives

The aim of the course is to sensitize the students to the aesthetic and cultural aspects of literary appreciation and analysis. To introduce Modern Hindi prose to the students and to understand the cultural, social and moral values of modern Hindi prose. To understand the theory and practice of Hindi Grammar.

Module I

Prose (Prescribe a prose collection)

Module 2

Grammar

Parts of speech – varna – Noun – Lingavachan, karak – Pronoun – Adjective – Verb – Tense, voice Grammar Practice – Sentence Correction – Change of Tense – ‘Ne’ rule.

Prescribed Textbooks

1. Pose (Detailed) - Gadya Prabha Edited by
Dr. Alok Gupta
Published by Rajpal and sons
Kasmiri Gate, Delhi-6.

Lessons to be studied

1. Tyagamoorthy Nirala - Sivapoojan Sahay
2. Bharatheey Sanskriti - Rajendra Prasad
3. Holi aur Onam - Dr. N.E.V. Iyer
4. Ve Bahaduri se Bike - Harisankar Parsay
5. Sukh - Kaseenath Singh
6. Nadiya gahari naav purani - Amritlal Vegad
2. Grammar - Vyavaharik Hindi Vyakaran
By Dr. H. Parameswaran
Radhakrishna Prakasan, Delhi

Topics to be studied

Varna, Sangya - Ling-vachan-karak, Sarvanam, Visheshan, kriya – kaal – kaal ke prakar – ne prathyay and vachya only. Language

Course II (Additional Language I) **15UHN111.1: PROSE AND GRAMMAR**

No. of credits: 3

No. of instructional hours per week: 4

AIMS:

The aim of the course is to sensitize the students to the aesthetic and cultural aspects of literary appreciation and analysis. To introduce Modern Hindi prose to the students and to understand the cultural, social and moral values of modern Hindi prose. To understand the theory and practice of Hindi Grammar.

Module I

Prose (Prescribe a prose collection)

Module 2

Grammar

Parts of speech – varna – Noun – Lingavachan, karak – Pronoun – Adjective – Verb – Tense, voice Grammar Practice – Sentence Correction – Change of Tense – ‘Ne’ rule.

Prescribed Textbooks

1. Pose (Detailed) - Gadya Prabha Edited by Dr. Alok Gupt
Published by Rajpal and sons Kasmiri Gate, Delhi-6.

Lessons to be studied

1. Tyagamoorthy Nirala - Sivapoojan Sahay
2. Bharatheey Sanskriti - Rajendra Prasad
3. Holi aur Onam - Dr. N.E.V. Iyer
4. Ve Bahaduri se Bike - Harisankar Parsay
5. Sukh - Kaseenath Singh
6. Nadiya gahari naav purani - Amritlal Vegad

2. Grammar

- Vyavaharik Hindi Vyakaran

By Dr. H. Parameswaran

Radhakrishna Prakasan, Delhi

Topics to be studied

Varna, Sangya - Ling-vachan-karak, Sarvanam, Visheshan, kriya – kaal – kaal ke prakar – ne prathyay and vachya only.

**Language Course II (Additional Language I)
15UFR111.1: Communication skills in French**

No. of credits: 3

No. of instructional hours per week: 4

AIMS:

The aim of the course is to emphasis on conversational French and to develop the communication skills of the students.

OBJECTIVES:

- ★ To familiarise the students with a modern foreign language.
- ★ To familiarise the students with the sounds of French.
- ★ To encourage students to use French for basic communication in everyday situation.
- ★ To acquaint students with the basics of writing simple sentences and short compositions.

SYLLABUS:

NAME OF TEXT: CONNEXIONS – Niveau 1 By Régine Mérieux and Yves Loiseau

Publisher : Didier

Module 1 : Parler de soi

Unit 1 : Bonjour !

Unit 2 : Rencontres

Unit 3 : 100% questions

Reference books :

Le Nouveau Sans Frontières Vol I by Philippe Dominique

Panorama Vol I by Jacky Girardet

Cours de langue et de civilisation française Vol I (Mauger Bleu)

Core Course I
15UCH141: Inorganic Chemistry I

No. of credits: 4

No. of instructional hours per week: 4

Module I - Atomic Structure**6 hrs**

Introduction to the structure of atom - Dual nature of electron - de Broglie equation - matter waves and electromagnetic waves - experimental verification of de Broglie relation - Heisenberg's uncertainty principle - expression and significance. Wave mechanical concept of the atom - Schrodinger equation. Chemical atomism—background and thought of John Dalton. Atom models- Daltons, J.J. Thomson, Rutherford, Bohr model – Major contributions of Friedrich Wöhler, Dmitri Mendeleev, Michael Faraday and Marie Skodowska-Curie.

Module II - Electronic Configuration and Periodicity**6 hrs.**

Quantum numbers - Pauli's exclusion Principle - aufbau Principle – Hund's rule - Electronic configuration of atoms - classification of elements into s, p, d, f blocks -atomic radii, ionization enthalpy, electron gain enthalpy and electronegativity- Pauling's scale, Mulliken and Alred - Rochow scale- ionic character - periodicity - horizontal, vertical and diagonal relationships - anomalous behaviour of the first element of a group.

Module III - Analytical Principles - I**6hrs.**

Inorganic qualitative analysis - Common ion effect - solubility product – principle and procedure of elimination of interfering anions - precipitation of cations. Microscale analysis – Advantages Quantitative Analysis - Calibration and use of apparatus and weights for titration. Theory of

titration - acid-base, redox, precipitation and complexometric titrations. Theory of indicators - acid-base, redox, adsorption and metallochromic indicators. Two Burette Method of titration – Principle and advantages.

Module IV - Analytical Principles – II **6 hrs.**

Gravimetric Analysis - Mechanism of precipitate formation - Factors affecting solubility of precipitates – co-precipitation and post precipitation - Effect of digestion - washing, drying and ignition of precipitates. Chromatography - classification of methods - Elementary study of adsorption, paper, thin layer, ion exchange and gas chromatographic methods.

Module V Environmental Chemistry - Air Pollution **6 hrs.**

Environmental segments - Lithosphere, Hydrosphere, Biosphere, Atmosphere - Composition and structure of atmosphere - Troposphere, Stratosphere, Mesosphere, Thermosphere Air pollution - 3 types of classification, types of pollutants - CO, CO₂, NO, SO₂, H₂S, Cl₂, CFC, particulate matter, metals, fly ash, asbestos, hydrocarbons - their source and influence - ozone layer depletion, ozone hole, protection of ozone umbrella - acid rain, green house effect, smog - management of air pollution.

Module VI - Environmental Chemistry - Water and Soil Pollution

6 hrs.

Water pollution: Classification of pollutants - organic, inorganic, suspended solids and sediments, radioactive materials, Heat, industrial waste, sewage water, detergents, agricultural pollutants - treatment of industrial waste water - Quality of drinking water - Indian standard and WHO standard - Dissolved oxygen - BOD, COD. Soil pollution - Pesticides, Fertilizers, Industrial waste, plastics - Control of pollution

References

- 1) Manas Chanda, "Atomic structure and Chemical Bond including Molecular spectroscopy"
- 2) E.S. Gilreath "Fundamental concepts of Inorganic Chemistry"
- 3) Puri, Sharma and Kalia "Inorganic Chemistry"
- 4) Madan "Inorganic Chemistry".
- 5) Manku , "Theoretical principles of Inorganic Chemistry" -

- 6) M. C. Dey and J. Selbin "Theoretical Inorganic Chemistry".
- 7) F A Cotton and G. Wilkinson "Basic Inorganic Chemistry".
- 8) S. K. Banerji, "Environmental Chemistry".
- 9) A. I. Vogel, "Text book of Qualitative Analysis"
- 10) A. I. Vogel, "Text book of Quantitative Inorganic Analysis".
- 11) Day & Underwood "Quantitative analysis: laboratory manual"
- 12) A. K. De "Environmental Chemistry - An introduction"
- 13) A. K. Srivasthava and P. C. Jain, "Chemical Analysis"
- 14) B. K. Sharma "Air Pollution".
- 15) V. K. Ahluwalia "Environmental Chemistry"
- 16) G.W. vanLoon and S. J. Duffy "Environmental Chemistry: A global perspective"

Foundation Course I

15UEN121: WRITINGS ON CONTEMPORARY ISSUES

No. of credits: 2

No. of instructional hours per week: 4 (Total 72 hrs.)

AIMS

1. To sensitize students to the major issues in the society and the world.
2. To encourage them to read literary pieces critically.

OBJECTIVES

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

1. have an overall understanding of some of the major issues in the contemporary world.
2. respond empathetically to the issues of the society.
3. read literary texts critically.

COURSE OUTLINE

Module I: Globalization and its Consequences

Essays: (1) “The Globalized World” – AvinashJha.

(2) “Globalization and Education: Third World Experience” – AmitBhaduri.

Poem: “Unending Love” - Rabindranath Tagore

Module II: Environmental Issues

Essay: “Forests and Settlements” - RomilaThapar Poems:

(1) “God’s Grandeur” - G.M.Hopkins

(2) “The World is too Much with Us” – Wordsworth

Module III: Human Rights

Essay: “Thinking about Human Rights” - ManishaPriyam, Krishna Menon&Madhulika Banerjee

Poem: “London” - William Blake

Fiction: Untouchable [an extract] – Mulk Raj Anand

Module IV: The Gender Question

Essays: “Gender, Culture and History” – ManishaPriyam, Krishna Menon&Madhulika Banerjee

Fiction: “The Elder Sister” – M. T. Vasudevan Nair

COURSE MATERIAL

Modules 1 - 4

Core reading: Meeting the World: Writings on Contemporary Issues. Pearson, 2013.

Complementary Course I

15UMM131.2: Differentiation and Matrices

No. of credits: 3

No. of instructional hours per week: 4

Overview

The complementary course intended for Chemistry students lays emphasis on the application of mathematical methods to Chemistry. The two modules on Calculus links the topic to the real world and the student's own experience as the authors of the text put it. Doing as many of the indicated exercises from the text should prove valuable in understanding the applications of the theory. The third module covers matrix theory.

Module 1: Differentiation with applications to Chemistry-I

- ❖ Functions and graphs of functions with examples from Chemistry. Interpretations of slope. The graph showing direct and inverse proportional variation. Mathematical models (functions as models). Parametric equations. Cycloid and Brachistochrone problem. Exercise set 1.8; Questions 31 - 34.
- ❖ Instantaneous velocity and the slope of a curve. Limits. Infinite limits and vertical asymptotes. Limits at infinity and horizontal asymptotes. Some basic limits.
Exercise set 2.1; Questions 27 and 28.
- ❖ Continuity. Slopes and rates of change. Rates of change in applications. Derivative.
Exercise set 3.1; Questions 1, 2 and 16.
- ❖ Techniques of differentiation. Higher derivatives. Implicit differentiation. Related rates. Local linear approximation. Differentials.
Exercise set 3.8; Questions 53 - 55.
- ❖ Rectilinear motion. Speeding up and slowing down. Analysing the position versus time curve. Free fall motion.
Examples 1 - 7. Exercise set 4.4; Questions 8, 9, 30 - 32.
- ❖ Absolute maxima and minima. Applied maximum and minimum problems.
Exercise set 4.6; Questions 47 and 48.

- ❖ Statement of Rolle's Theorem and Mean Value Theorem. The velocity interpretation of Mean Value Theorem. Statement of theorems 4.1.2 and 4.83 (consequences of the Mean Value Theorem).
- ❖ Inverse functions. Continuity and differentiability of inverse functions. Graphing inverse functions. exponential and logarithmic functions. Derivatives of logarithmic functions and logarithmic differentiation. Derivatives of the exponential function. Graphs and applications involving logarithmic and exponential functions. Exercise set 7.4; Question 50.
- ❖ Definitions of hyperbolic functions. Graphs of hyperbolic functions. Hyperbolic identities. Why they are called hyperbolic functions. Derivatives of hyperbolic functions. Inverse hyperbolic functions. Logarithmic forms of inverse hyperbolic functions. Derivatives of inverse hyperbolic functions.

Module 2: Differentiation with applications to Chemistry-II

- ❖ Power series and their convergence. Results about the region of convergence of a power series (without proof). Radius of convergence. Functions defined by a power series. Results about term by term differentiation and integration of power series (without proof). Taylor's theorem with derivative form of remainder (without proof) and its use in approximating functions by polynomials. Taylor series and Maclaurin series and representation of functions by Taylor series. Taylor series of basic functions and the regions where these series converge to the respective functions. Binomial series as a Taylor series and its convergence. Obtaining Taylor series representation of other functions by differentiation, integration, substitution etc.
- ❖ Functions of several variables. Graphs of functions of two variables. Equations of surfaces such as sphere, cylinder, cone, paraboloid, ellipsoid, hyperboloid etc. Partial derivatives and differentials. The chain rule (various forms). Euler's theorem for homogeneous functions. Jacobians. Exercise set 14.3; Questions 47 and 48. Exercise set 14.4; Question 50. Exercise set 14.5; Question 42.
- ❖ Local maxima and minima of functions of two variables. Use of partial derivatives in locating local maxima and minima. Lagrange method for finding maximum/minimum values of functions subject to one

constraint.

Exercise set 14.9; Question 20.

Module 3 : Linear Algebra

- ❖ The rows and columns of a matrix as elements of \mathbb{R}^n for suitable n . Rank of a matrix as the maximum number of linearly independent rows/columns. Elementary row operations. Invariance of rank under elementary row operations. The echelon form and its uniqueness. Finding the rank of a matrix by reducing to echelon form.
- ❖ Homogeneous and non-homogeneous system of linear equations. Results about the existence and nature of solution of a system of equations in terms of the ranks of the matrices involved. The eigen value problem. Method of finding the eigen values and eigen vectors of a matrix. Basic properties of eigen values and eigen vectors. Eigen values and eigenvectors of a symmetric matrix. Diagonalisable matrices. Advantages of diagonalisable matrices in computing matrix powers and solving system of equations. The result (without proof) that a square matrix of order n is diagonalisable (i) if and only if it has n linearly independent eigen vectors (ii) if it has n distinct eigen values. Method of diagonalising a matrix. Diagonalisation of real symmetric matrices. Similar matrices.

Text for Module 1 and 2 : Howard Anton, et al, Calculus, Seventh Edition, John Wiley

Text for Module 3 : Peter V. O'Neil, Advanced Engineering Mathematics, Thompson Publications, 2007

Complementary Course II

15UPY131.2: ROTATIONAL DYNAMICS AND PROPERTIES OF MATTER

No. of credits: 2

No. of instructional hours per week: 4

Unit I (26 hours)

Dynamics of rigid bodies (7 hours)

Theorems of M.I with proof-Calculation of M.I of bodies of regular shapes

rectangular lamina, uniform bar of rectangular cross section, annular disc, circular disc, solid cylinder, solid sphere-K.E of a rotating body-spinning top.

Oscillations and waves (13 hours)

Examples of S.H oscillator-compound pendulum-determination of g-torsion pendulum oscillations of two particles connected by a spring-vibration state of a diatomic molecule Wave motion-general equation of wave motion-plane progressive harmonic wave energy density of a plane progressive wave-intensity of wave and spherical waves

Mechanics of solids (6 hours)

Bending of beams-bending moment-cantilever-beam supported at its ends-and loaded in the middle-uniform bending-experimental determination of Y using the above principles with pin and microscope-twisting couple on a cylinder-angle of twist and angle of shear-torsional rigidity.

Unit II (10 hours)

Surface Tension (5 hours)

Excess of pressure on a curved surface-force between two plates separated by a thin layer of liquid-experiment with theory to find surface tension and its temperature dependence by Jaeger' method-equilibrium of a liquid drop over solid and liquid surfaces.

Viscosity (5 hours)

Flow of liquid through a capillary tube-derivation of Poiseuille's formula-limitations-Ostwald's viscometer-variation of viscosity with temperature-Stokes formula determination of viscosity of a highly viscous liquid by Stokes method.

References

Mechanics: J.C.Upadhyaya, Ram Prasad & Sons

Oscillations & Waves: K.RamaReddy, S.Bbadami & V.Balasubramaniam (University Press)

SEMESTER II

Language Course III

15UEN211.1: READING SKILLS

No. of credits: 4

No. of instructional hours per week: 5 (Total 90 hrs)

AIMS

1. To make students competent in advanced reading skills like skimming, scanning and reading for meaning and pleasure.
2. To make them familiar with the concepts of extensive and intensive reading.
3. To help them increase their active and passive vocabulary.
4. To help them broaden their mental vision.

OBJECTIVES

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

1. Identify various text types and comprehend them.
2. Apply reading techniques like skimming and scanning to understand the main arguments and themes and distinguish supporting details.
3. Use and comprehend a reasonable vocabulary and reinforce their language proficiency.
4. Have a broader outlook resultant from the exposure to the study of fine specimens of reading.

COURSE OUTLINE

Module 1

Intensive reading - reading for information - application of scanning and skimming – silent and loud reading - various techniques - advantages and disadvantages. (Pull Out - Reading Tips)

Module 2

Introducing students to different text types – poetry (Henry IV, Nobody, I Am, Musee des Beaux Arts, Paradise Lost, Heaven, Kubla Khan, Message Clear)

Drama (Loot, Macbeth, Happy Days)

Module 3

Introducing students to different text types - prose – fictional - (Alice in Wonderland, Nineteen Eighty Four, Catch -22, Animal Farm, The Sacred and Profane Love Machine)

Nonfictional – (Civilized Man, Our Bodies Ourselves)

Module 4

Extensive reading – reading for pleasure and knowledge (Poem – Father and Son, The Poplar Field, Going Going, Anthem for Doomed Youth, A Refusal to Mourn, Ulysses, Andrea del Sarto)

Drama (Chicken Soup with Barley, A Night Out, The Importance of Being Earnest)

Prose –Fictional – (Sons and Lovers, Emma, Middlemarch, Down There on a Visit, Bleak House, The Picture of Dorian Gray)

Non –fictional – (Churchill’s Speech, Russell’s Autobiography)

COURSE MATERIAL

Modules 1 – 4

Core reading: Reading Between the Lines. Cambridge University Press, India Pvt Ltd, 2010

Further reading:

1. Brown, Katherine and Susan Hood. Academic Encounters: Life in a Society. New Delhi: CUP, 2006.
2. Longman Essential Activator. London: Pearson Longman, 2009.
3. Glendinning, Eric H and Beverly Holmstrom. Study Reading. South Asian Edition. CUP, 2008.
4. Oxford Dictionary of Collocations in English, Oxford University Press, 2009.
5. Wainwright, Gordon. How to Read Faster and Recall More. Macmillan India Ltd, 2008.
6. McCarthy, Michael et al. English Collocation in Use. CUP, 2007.

Reference:

Mayor, Michael, et al, Ed. Longman Dictionary of Contemporary English. 5th Edition. London: Pearson Longman Ltd, 2009.

Language Course IV

15UEN212.1: MODERN ENGLISH GRAMMAR AND USAGE

No. of credits: 3

No. of instructional hours per week: 4 (Total 72 hrs)

AIMS:

1. To help students have a good understanding of modern English grammar.
2. To enable them produce grammatically and idiomatically correct language.
3. To help them improve their verbal communication skills.
4. To help them minimise mother tongue influence.

OBJECTIVES:

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

1. Have an appreciable understanding of English grammar.
2. Produce grammatically and idiomatically correct spoken and written discourse.
3. Spot language errors and correct them.

COURSE CONTENTS

Module 1:

- Words - parts of speech – nouns – pronouns - adjectives - verbs - adverbs – prepositions – conjunctions - determinatives.
- Sentence as a self-contained unit – various types of sentence – simple – compound – complex – declaratives – interrogatives – imperatives – exclamatives.
- Basic sentence patterns in English - constituents of sentences – subject – verb - object - complement – adverbials.
- Phrases - various types of phrases - noun, verb, adjectival and prepositional phrases.

Module 2:

- Nouns - different types - count and uncount – collective - mass - case - number – gender.

- Pronoun - different types - personal, reflexive - infinite-emphatic – reciprocal
- Adjectives - predicative - attributive - pre- and post-modification of nouns.
- Verbs - tense-aspect - voice -mood - Concord - types of verbs – transitive - intransitive-finite - non-finite
- Helping verbs and modal auxiliaries - function and use.

Module 3:

- Adverbs - different types - various functions - modifying and connective.
- Prepositions - different types - syntactic occurrences - prepositional phrases - adverbial function.
- Conjunctions - subordinating and coordinating - Determinatives - articles - possessives - quantifiers
- Clauses - main and subordinate clauses - noun clauses - relative clauses - adverbial clauses - finite and non-finite clauses - analysis and conversion of sentences – Active to Passive and vice versa – Direct to Indirect and vice versa – Degrees of Comparison, one form to the other.

Module 4:

- Written Composition – précis writing – outline story – Comprehension

COURSE MATERIAL

Modules 1 - 4 Core Reading: Concise English Grammar by Prof. V. K. Moothathu. Oxford University Press, 2012.

Further Reading:

1. Leech, Geoffrey et al. English Grammar for Today: A New Introduction. 2nd Edition. Palgrave, 2008.
2. Carter, Ronald and Michael McCarthy. Cambridge Grammar of English. CUP, 2006.
3. Greenbaum, Sidney. Oxford English Grammar. Indian Edition. Oxford University Press, 2005.
4. Sinclair, John ed. Collins Cobuild English Grammar. Harper Collins Publishers, 2000.

5. Driscoll, Liz. Common Mistakes at Intermediate and How to Avoid Them.CUP, 2008.
6. Tayfor, Susanne. Common Mistakes at Upper-intermediate and How to Avoid Them.CUP, 2008.
7. Powell, Debra. Common Mistakes at Advanced Level and How to Avoid Them.CUP, 2008.
8. Burt, Angela. Quick Solutions to Common Errors in English. Macmillan India Limited,2008.
9. Turton. ABC of Common Grammatical Errors. Macmillan India Limited, 2008.
10. Leech, Geoffrey, Jan Svartvik. A Communicative Grammar of English. Third Edition. New Delhi: Pearson Education, 2009.

Direction to Teachers: The items in the modules should be taught at application level with only necessary details of concepts. The emphasis should be on how grammar works rather than on what it is. The aim is the correct usage based on Standard English and not conceptual excellence.

Language Course V (Additional Language II)

15UML211.1: ഗദ്യസാഹിത്യം

No. of credits: 3

No. of instructional hours per week: 4

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

നോവൽ

മലയാള നോവൽ പ്രസ്ഥാനത്തിന്റെ ഉത്ഭവം- വികാസപരിണാമങ്ങളെപ്പറ്റി സാമാന്യമായി മനസ്സിലാക്കുക. ഒരുനോവൽ വിശദമായി പഠിക്കുക

1. എം.മുകുന്ദൻ - ഒരു ദളിത് യുവതിയുടെ കദനകഥ

മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)

ചെറുകഥ

മലയാള ചെറുകഥയുടെ വികാസപരിണാമങ്ങളെപ്പറ്റിയുള്ള സാമാന്യജ്ഞാനം.

ആഖ്യാന തന്ത്രങ്ങളുടെ വൈചിത്ര്യം. പ്രമേയത്തിലും രൂപശിൽപ്പത്തിലും സംഭവിച്ച

മാറ്റങ്ങൾ

- | | |
|-------------------------|--|
| 1. സി.വി. കുഞ്ഞിരാമൻ | - ആത്മഹത്യ ചെയ്യാൻ എനിക്ക് മതിയായ കാരണമില്ലയോ? |
| 2. കാരൂർ | - പൊതിച്ചോറ് |
| 3. ലളിതാംബിക അന്തർജ്ജനം | - മനുഷ്യപുത്രി |
| 4. കെ.സരസ്വതിയമ്മ | - രമണി |
| 5. എം.ടി | - ബന്ധനം |
| 6. സക്കറിയ | - പത്രം |
| 7. ടി.പത്മനാഭൻ | - ദാസൻ |
| 8. അഷ്ടമൂർത്തി | - വീഡിയോ ചിത്രങ്ങൾ |
| 9. സിതാര | - അഗ്നി |
| 10. ബി.മുരളി | - ഐ.സി.യു |

മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

ഉപന്യാസം, പഠനം, അനുഭവം

സാഹിത്യവും സാഹിത്യേതരവുമായ 4 രചനകൾ പഠിക്കണം

- | | |
|----------------------|----------------------------------|
| 1. എം.എൻ. വിജയൻ | - മാമ്പഴം |
| 2. സുകുമാർ അഴീക്കോട് | - പ്രഭാഷണകല |
| 3. കെ.പി.അപ്പൻ | - മധുരം നിന്റെ ജീവിതം (ആദ്യഭാഗം) |
| 4. സാനാജോസഫ് | - അടുകളെകൾ തിരിച്ചു പിടിക്കുക |

റഫറൻസ് ഗ്രന്ഥങ്ങൾ

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|--|---------------------------------|
| 1. സമ്പൂർണ്ണ മലയാള സാഹിത്യ ചരിത്രം | - എഡിറ്റർ പന്ഥന രാമചന്ദ്രൻ നായർ |
| 2. കൈരളിയുടെ കഥ | - എൻ. കൃഷ്ണപിള്ള |
| 3. ആധുനിക സാഹിത്യ ചരിത്രം പ്രസ്ഥാനങ്ങളിലൂടെ | - ഡോ.കെ.എം. ജോർജ്ജ് |
| 4. മലയാളനോവൽ സാഹിത്യ ചരിത്രം | - ഡോ.കെ.എം. തരകൻ |
| 5. മലയാള ചെറുകഥാ സാഹിത്യചരിത്രം | - ഡോ.എം.എം.ബഷീർ |
| 6. നോവൽ സാഹിത്യം | - കെ.സുരേന്ദ്രൻ |
| 7. നോവൽ സ്വരൂപം | - കെ.സുരേന്ദ്രൻ |
| 8. നോവൽ സിദ്ധിയും സാധനയും | - പി.കെ.ബാലകൃഷ്ണൻ |
| 9. നോവൽ സാഹിത്യപഠനങ്ങൾ | - ഡോ. ഡി.ബഞ്ചമിൻ |
| 10. ആധുനിക നോവൽ ദർശനങ്ങൾ | - കെ.എം. തരകൻ |
| 11. ചെറുകഥാ പ്രസ്ഥാനം | - എം.പി. പോൾ |
| 12. ചെറുകഥ ഇന്നലെ, ഇന്ന് | - എം. അച്യുതൻ |
| 13. ചെറുകഥ - വാക്കുംവഴിയും | - കെ.എസ്.രവീകുമാർ |

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| 14. നോവൽ പഠനങ്ങൾ | - ഡോ.പന്മന രാമചന്ദ്രൻ നായർ |
| 15. ചെറുകഥാ പഠനങ്ങൾ | - ഡോ.പന്മന രാമചന്ദ്രൻ നായർ |
| 16. കഥയും ഫാൻസിയും | - ഡോ.വത്സലൻ വാതുശ്ശേരി |
| 17. കഥയിലെ ആത്മീയസഞ്ചാരങ്ങൾ | - ഡോ.ഇ. രമാഭായി |
| 18. കഥ അനുഭവവും ആഖ്യാനവും | - ഡോ.കെ.പി.അപ്പൻ |
| 19. കഥയും ദാവുകത്വപരിണാമവും | - ഡോ.കെ.എസ് രവികുമാർ |
| 20. ഏകാന്തനഗരങ്ങൾ | - ഡോ.പി.കെ രാജശേഖരൻ |
| 21. ദാരതപര്യടനം | - കുട്ടികൃഷ്ണമാരാർ |
| 22. മധുരം നിന്റെ ജീവിതം | - കെ.പി.അപ്പൻ |
| 23. ശീർഷാസനം | - എം.എൻ.വിജയൻ |
| 24. കവിതയും മനഃശാസ്ത്രവും | - എം.എൻ.വിജയൻ |
| 25. അടുകളുകൾ തിരിച്ചു പിടിക്കുക | - സാനാ ജോസഫ് |

Language Course V (Additional Language II)

15UHN211.1: Fiction and Literary Analysis

No. of credits: 3

No. of instructional hours per week: 4

Aims of the Course / Objectives

The aim of the course is to guide the students to the world of Hindi Fiction (Novel & Short Story). To develop enthusiasm in Literary and aesthetic approaches. To understand various aspects and dimensions of literature.

Module 1

Short story (Prescribe a short story collection)

Module 2

Novel (Prescribe a novel of post eighties)

Module 3

Literary Analysis

The meaning and definitions of literature – Types of literature – Literature

and film – Literature and Mass Communication Media – Print media – Electronic media etc.

Literary criticism

Models of Literary Criticism – Short story – Poetry – Novel – Drama – Film etc.

Prescribed Textbooks

- | | |
|---|---|
| 1. Short story collection (Non-Detailed) | Kahani Sankalan Edited by Dr. Sushama Dubey & Dr. Rajkumar Published by Vani Prakashan 21 – A, Dariagang, New Delhi-2 |
|---|---|

Stories to be studied

- | | |
|----------------------------|--|
| 1. Gunda | - Jayasankar Prasad |
| 2. Kafan | - Premchand |
| 3. Raja Nirbansiya | - Kamaleswar |
| 4. Sikka Badal Gaya | - Krishna Sobti |
| 2. Novel (Non Detailed) | - ABCD by Ravindra Kaliya Published by Vani Prakasan New Delhi-2 |
| 3. Literary Analysis | - Sahithya Vivechan by Jayanthi Prasad Nautiyal published by Kitab Ghar Prakasan Dariya Ganj, Delhi |

(Chapters 3, 4, 5, 6 and 9 should be omitted)

Language Course V (Additional Language II)
15UFR211.1: Translation and communication in French

No. of credits: 3

No. of instructional hours per week: 4

AIMS:

The aim of the course is to facilitate the use of translation for more communication.

OBJECTIVES:

1. To ameliorate the level of language proficiency
2. To analyse the translated texts.
3. To enhance the ability to translate to the target language.

SYLLABUS:

NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and
Yves Loiseau

Publisher : Didier

Module 2 : Echanger

Unit 4 : Enquête

Unit 5: Invitations

Unit 6: A table !

Reference books:

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)

Foundation Course II
15UCH221: Methodology and Perspectives
of Sciences and General Informatics

No. of credits: 3

No. of instructional hours per week: 4

Module – 1

6 hrs

Methods and Tools of Science & Experimentation in Science

Laws of science – Basis for scientific laws and factual truths – revolutions in science – science and technology - hypothesis – observations and proofs. Revision of scientific theories and laws. Importance of models, simulations and virtual testing Design of an experiment – experimentation - observation – data collection – Documentation of experiments – Nature and types of data – typical example. interpretation and deduction – necessity of units and dimensions – repeatability and replication. Documentation of experiments – record keeping – connection between measurements and underlying theory. Types of experiments –. Choice and selection of instruments. Types of instrumentation. Accuracy and precision.

Module II

6hrs

Science, Society and Various approaches of Science

Better understanding of Science-Science and culture, citizenship, social cohesion, work, employment, development and research- Multicultural society and Science strategies to meet challenges in twenty first century, Globalisation- Population Knowledge transfer process- Knowledge dissemination and utilization- Process and product of Science- Acquisition of various basic process skills of Science- Problem solving method – enquiry vs discovery approach- Development of Scientific creativity - induction-deduction methods –Integration of various methods.

Module III

6hrs

Evolution of Chemistry as a discipline of science

Evolution of Chemistry - ancient speculations on the nature of matter, early form of chemistry-alchemy, Robert Boyle and the origins of modern chemistry in the latter 1600s - origin of modern chemistry - Antoine

Lavoisier and the revolution in chemistry - Structure of chemical science: scope of chemical science, branches of chemistry. Role of Chemistry as a central science connecting Physics, Biology and other branches of science. Basic ideas of interdisciplinary areas involving Chemistry. Chemistry in action – explosives - characteristics of explosives: TNT, TNG, RDX, EDNA, HMX, toxic chemical weapons. Chemicals in small scale industries – safety matches, agarbatties, wax candles, shoe polish, plaster of paris, silicon carbide crucibles .

Module IV

6 hrs

Overview of Information Technology

Features of the modern personal computer and peripherals – computer network and internet – overview of operating system and major application of softwares. Data information and knowledge – knowledge management – internet as a knowledge repository – academic search techniques – creating your cyber presence – open access initiation – open active publishing models – Basic concepts of IPR, copy right and patents – plagiarism – Introduction to use of IT in teaching and learning – educational softwares – INFLIBNET, NICNET, BRNET, NPTEL, VIRTUAL LABS OF MHRD – academic services.

Module V

6 hrs

Research in Chemistry

Selecting a topic – hypothesis- design of experiment: variables, correlation and causality, sampling, use of controls, experimental bias, analysis, results, discussion of results, models., statistical analysis of experimental data using computers, mean, mode, deviation, standard deviation, plotting graph using spread sheet, preparation of seminar papers, project etc. using computers. Background Reading - Selected Internet Resources in chemistry –Major Publishers in Chemical science, Author, Citation, Computer

Searching, Reviews, Keywords

Module VI

6 hrs

Introduction to Cheminformatics

Basics of cheminformatics, applications of cheminformatics, storage & retrieval, file formats – MOL, SDF, CML, PDB formats, SYBYL Line Notation, SMILES of simple molecules like methane, ethyl alcohol, benzene

cyclohexane etc. Structure drawing, spread sheet and chemistry related softwares. Molecular visualization tools. Chemical Databases, Chemical Safety - Toxicology Information - material safety data sheets

Reference

1. T.F.Gieryn, Cultural boundaries of science Univ. Chicago Press 1999.
2. The Golem : What everyone should know about science. H.Collins and T.Pinch.Cambridge Univ Press 1993
3. Alexis Leon & Mathews Leon, Computers Today, Leon Vikas
4. Soti Sivendra Chanthra Contemporary Science Teaching,
5. Alexis & Mathews Leon, Fundamentals and Information Technology. LeonVikas ISBN 08125907890.
6. Ramesh Bangia, 'Learning Computer Fundamentals, Khanna Book Publishers, ISBN 818752252b
7. Barbara Wilson, Information Technology, The Basics, Thomas Learning.
8. Calvin W Tayler and Frank Barron Scientific Creativity : Its Recognition and Development,
9. Louise Cohen, Lawrence Manion & Keith Morrison A Guide to Teaching Practice,
10. Encyclopaedia of Modern Methods of Teaching and Learning, Edited V K Rao
11. Haseen Taj Current Challenges in Education,
12. Radha Mohan Research Methods in Education,
13. R T Mishra Teaching of information Technology,
14. M Ravikumar Information Technology for Higher Education,
15. Kolasani Sunil Kumar, K Ramakrishna and Digumarti Bhaskara Rao Methods of Teaching Chemistry,
16. V. Rajaram, Introduction to Information Technology , Prentice Hall.
17. Newton R G The Truth of Science : New Delhi 2nd edition.

18. Andrew R. Leach and V.J. Gillet An Introduction to Chemoinformatics
19. N.C. Datta The Story of Chemistry , University Press.
20. <http://www.vlab.co.in>
21. <http://nptel.iitm.ac.in/>
22. B.K.Sharma, Industrial Chemistry

Complementary Course III

15UMM231.2: Integration, Differential Equations and Analytic Geometry

No. of credits: 3

No. of instructional hours per week: 4

Overview

The complementary course in the second semester continues the trend indicated in the first, namely, laying emphasis on applications of integral calculus and vectors to problems in Chemistry. Module 1 consists of various applications of integration techniques. It also covers multiple integrals. Modules 2 deals with differential equations while Module 3 covers analytic geometry

Module 1: Applications of integration

Integral curves, integration from the view point of differential equations, direction fields Exercise set 5.2; Questions 43 and 44.

- ❖ Rectilinear motion: finding position and velocity by integration. Uniformly accelerated motion. The free-fall model. Integrating rates of change. Displacement in rectilinear motion. Distance travelled in rectilinear motion. Analysing the velocity versus time curve. Average value of a continuous function. Average velocity revisited. Exercise set 5.7; Questions 3, 4, 5, 6, 29 and 55.
- ❖ Use of definite integrals in finding area under curves, area between two curves, volume of revolution, arc length and surface area of a solid of revolution.

- ❖ The idea of approximating the volume under a bounded surface in 3-space by volumes of boxes, leading to the definition of double integrals of functions of two variables over bounded regions. Evaluation of double integrals by iterated integrals. Evaluation by changing to polar co-ordinates and by suitably changing order of integration in the iterated integral. Applications to finding the volume of solids under bounded surfaces.
- ❖ Triple integrals over bounded regions in three space. Evaluation by iterated integrals. Cylindrical coordinates and spherical coordinates and their relation to Cartesian coordinates. Use of cylindrical and spherical co-ordinates in evaluating triple integrals. Applications of triple integrals to finding volumes of solid objects.

Module 2: Differential equations

- ❖ Review of basic concepts about differential equations and their solutions. Method of solving special types of first order ODEs such as variable separable, exact, homogeneous, and linear. Finding the family of curves orthogonal to a given family.
- ❖ Second order linear differential equations. Nature of the general solution of homogeneous and non-homogeneous linear ODEs. Extension to higher order ODE.
- ❖ Second order linear homogeneous ODEs with constant coefficients. The characteristic equation and its use in finding the general solution. Extension of the results to higher order ODEs.
- ❖ Second order linear non-homogeneous ODEs with constant coefficients. General solution as the sum of complementary function and particular integral. Second order linear differential operator and its properties. The inverse operator and its properties. Operator method for finding the particular integral of simple functions. Extension of the results to higher order equations. Cauchy and Legendre equations and their solutions by reducing to equations with constant coefficients by suitable change of variable.

Module 3: Analytic Geometry

- ❖ Geometric definition of a conic-the focus, directrix and eccentricity of a conic. Classification of conics into ellipse, parabola and hyperbola based on the value of eccentricity. Sketch of the graphs of conics. Reflection properties of conic sections.
Exercise set 11.4; Questions 39 - 43.

- ❖ Equations of the conics in standard positions. Equations of the conics which are translated from standard positions vertically or horizontally. Parametric representation of conics in standard form. Condition for a given straight line to be a tangent to a conic. Equation of the tangent and normal to a conic at a point.
- ❖ Asymptotes of a hyperbola. Equation of the asymptotes.
- ❖ Conic sections in polar coordinates. Eccentricity of an ellipse as a measure of flatness. Polar equations of conics. Sketching conics in polar coordinates. Kepler's Laws.
Example 4 of section 11.6.
Text for Module 1 and 3 : Howard Anton, et al, Calculus, Seventh Edition, John Wiley
Text for Module 2 :Kreuzig, Advanced Engineering Mathematics, 8th edition, John Wiley.

Complementary Course IV

15UPY231.2: THERMAL PHYSICS

No. of credits: 2

No. of instructional hours per week: 4

Unit I – Diffusion (4 hours)

Graham's law of diffusion in liquids-Fick's law-analogy between liquid diffusion and heat conduction-methods of estimating concentrations-determination of coefficient of diffusivity.

Unit II – Transmission of Heat (16hours)

Thermal conductivity and thermometric conductivity-Lee's disc experiment-Radial flow of heat - cylindrical flow of heat-thermal conductivity of rubber-Weidmann and Franz law (statement only)-Radiation of heat-black body radiation-Kirchoff's laws of heat radiation absorptive power-emissive power-Stefan's law (no derivation) –energy distribution in the spectrum of black body and results-Wien's displacement law-Rayleigh-Jeans law-their failure and Planck's hypothesis-Planck's law-comparison solar constant-temperature of sun.

Unit III – Thermodynamics (8 hours)

Isothermal and adiabatic processes-work done-isothermal and adiabatic elasticity. Heat engines-carnot's cycle-derivation of efficiency-petrol and diesel engine cycles efficiency in these two cases-second law of thermodynamics-Kelvin and Clausius statements. Phase transition-first order and second order-liquid helium-super fluidity.

Unit IV – Entropy (8 hours)

Concept of entropy-change of entropy in reversible and irreversible cycles-principle of increase of entropy-entropy and disorder-entropy and available energy-T-S diagram for Carnot's cycle-second law in terms of entropy-calculation of entropy when ice is converted into steam.

References

1. The general Properties of matter: F.H.Newman & V.H.L.Searle
2. Heat & Thermodynamics: N.Subramaniam & Brijlal, S.Chand & Co
3. Heat & Thermodynamics: W.Zemansky, McGraw Hill
4. Heat & Thermodynamics: C.L.Arora.

SEMESTER III

Language Course VI

15UEN311.1: WRITING AND PRESENTATION SKILLS

No. of credits: 4

No. of instructional hours per week: 5 (Total 90 hrs)

AIMS

1. To familiarize students with different modes of general and academic writing.
2. To help them master writing techniques to meet academic and professional needs.
3. To introduce them to the basics of academic presentation
4. To sharpen their accuracy in writing.

OBJECTIVES

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

1. understand the mechanism of general and academic writing.
2. recognize the different modes of writing.
3. improve their reference skills, take notes, refer and document data and materials.
4. prepare and present seminar papers and project reports effectively.

COURSE OUTLINE

Module 1

Writing as a skill – its importance – mechanism of writing – words and sentences - paragraph as a unit of structuring a whole text – combining different sources – functional use of writing – personal, academic and business writing – creative use of writing.

Module 2

Writing process - planning a text – finding materials - drafting – revising – editing - finalizing the draft .

Module 3

Writing models – essay - expansion of ideas/proverbs – dialogue - letter writing – personal letters - formal letters - CV – surveys – questionnaire - e-mail – job application - report writing. Academic writing - writing examinations - evaluating a text - note-making- paraphrasing – summary writing - planning a text – organizing paragraphs – introduction – body – conclusion – rereading and rewriting - accuracy.

Module 4

Presentation as a skill - elements of presentation strategies – audience – objectives – medium – key ideas - structuring the material - organizing content - audio-visual aids – handouts - use of power point - clarity of presentation - non-verbal communication - seminar paper presentation and discussion.

COURSE MATERIAL

Modules 1 – 4 Core reading:

Write Rightly. Cambridge University Press, India Pvt Ltd, 2012

Further reading:

1. Robert, Barraas. Students Must Write. London: Routledge, 2006.
2. Bailey, Stephen. Academic Writing. Routledge, 2006.
3. Hamp-Lyons, Liz, Ben Heasley. Study Writing. 2nd Edition. Cambridge University Press, 2008.
4. Ilona, Leki. Academic Writing. CUP, 1998.
5. McCarter, Sam, Norman Whitby. Writing Skills. Macmillan India, 2009.
6. Jay. Effective Presentation. New Delhi: Pearson, 2009.

Reference:

Mayor, Michael, et al, Ed. Longman Dictionary of Contemporary English. 5th Edition. London: Pearson Longman Ltd, 2009.

Language Course VII (Additional Language III)

15UML311.1: ദൃശ്യകലാസാഹിത്യം

No. of credits: 4

No. of instructional hours per week: 5

പഠനോദ്ദേശ്യം : ദൃശ്യകലാ സംസ്കാരത്തിന്റെ സമ്പന്നതയെക്കുറിച്ചുള്ള അറിവ് വിദ്യാർത്ഥികൾ നേടേണ്ടതുണ്ട്. കഥകളി, തുള്ളൽ, നാടകം, സിനിമ എന്നീ ദൃശ്യകലകളെയും അവയ്ക്ക് ആധാരമായ സാഹിത്യപഠനങ്ങളെയും വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുകയാണ് ലക്ഷ്യം.

മൊഡ്യൂൾ ഒന്ന് (36 മണിക്കൂർ)

ആട്ടക്കഥ, തുള്ളൽ സാഹിത്യം

കഥകളിയുടെ ഉത്ഭവവികാസ പരിണാമങ്ങൾ, പ്രധാന ആട്ടക്കഥാകൃത്തുക്കൾ തുള്ളൽ പ്രസ്ഥാനം

- സാമാന്യ പരിചയം
- 1. ഉണ്ണായിവാദ്യർ - നളചരിതം ആത്മക്കഥ (നാലാംദിവസം) (രണ്ടാം സ്വയം വരത്തിനെത്തിയ നളനെ ദമയന്തി കാണുന്നഭാഗം വരെ)
- 2. കുഞ്ചൻ നമ്പ്യാർ - കല്യാണസൗഗന്ധികം തുള്ളൽ (ഹനുമാൻ - ഭീമ സംവാദം)

മൊഡ്യൂൾ രണ്ട് (36 മണിക്കൂർ)

നാടക സാഹിത്യം

മലയാള നാടക പ്രസ്ഥാനം

- സാമാന്യവലോകനം
- 1. മലയാള ശാകുന്തളം - എ.ആർ.രാജരാജവർമ്മ (നാലാം അങ്കം)
- 2. തോപ്പിൽ ഭാസി - അളിയൻ വന്നത് നന്നായി

മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

തിരക്കഥാപഠനം

ചലച്ചിത്രനിർമ്മിതിയിൽ തിരക്കഥയ്ക്കുള്ള പ്രാധാന്യത്തെക്കുറിച്ച് സാമാന്യജ്ഞാനം.

എം.ടി. വാസുദേവൻ നായർ - ഒരു വടക്കൻ വീരഗാഥ

റഫറൻസ് ഗ്രന്ഥങ്ങൾ

- 1. കേരള സാഹിത്യ ചരിത്രം - ഉള്ളൂർ
- 2. സാഹിത്യ ചരിത്രം പ്രസ്ഥാനങ്ങളിലൂടെ - ഡോ.കെ.എം.ജോർജ്ജ്

3. കൈരളിയുടെ കഥ - എൻ.കൃഷ്ണപിള്ള
4. കുഞ്ചൻ നമ്പ്യാർ വാക്കും സമൂഹവും - കെ.എൻ.ഗണേഷ്
5. നാട്യശാസ്ത്രം - ഭരതമുനി
6. കഥകളി - ജി.കൃഷ്ണപിള്ള
7. കഥകളിരംഗം - കെ.പി.എസ്. മേനോൻ
8. കഥകളിയും സാഹിത്യവും - മാടശ്ശേരി
9. കഥകളി വിജ്ഞാന കോശം - അയ്മനം കൃഷ്ണകൈമൾ
10. നളചരിതം വ്യാഖ്യാനം - എം.എച്ച്. ശാസ്ത്രികൾ
11. കഥകളി മഞ്ജരി - ഡോ.എസ്.കെ നായർ
12. ആത്മകഥ - പി.കൃഷ്ണൻ നായർ
13. ദി ആർട്ട് ഓഫ് ലിറ്ററേച്ചർ ഓഫ് കഥകളി - ഡോ.എസ്.കെ. നായർ
14. സിനിമയുടെ ലോകം - അടൂർ ഗോപാലകൃഷ്ണൻ
15. ആധുനിക മലയാള സിനിമ - കെ.പി. രാമൻ കുട്ടി
16. സിനിമയുടെ വഴിയിൽ - ഐ.ഷമുഖദാസ്
17. സഞ്ചാരിയുടെ വീട് - ഐ.ഷമുഖദാസ്
18. കഥയും തിരക്കഥയും - എ.ജി. രാജ്കുമാർ
19. സിനിമയും മലയാളസാഹിത്യവും - മധു ഇറവകര
20. മലയാള സിനിമ - സിനിക്
21. ചലച്ചിത്രത്തിന്റെ പൊരുൾ - വിജയകൃഷ്ണൻ
22. ചലച്ചിത്ര സമീക്ഷ - വിജയകൃഷ്ണൻ
23. സിനിമയുടെ രാഷ്ട്രീയം - രവീന്ദ്രൻ
24. കാഴ്ചയുടെ അശാന്തി - രവീന്ദ്രൻ
25. സിനിമയെ കണ്ടെത്തൽ - എം.എഫ്.തോമസ്
26. മലയാള സിനിമ അരനൂറ്റാണ്ട് - (എഡി) കെ.ജയകുമാർ
27. എം.ടി. കല, കാലം, വ്യക്തി - (എഡി) കെ.ജയകുമാർ
28. എം.ടി. കഥയും പൊരുളും - (എഡി) എം.എം. ബഷീർ
29. എം.ടി.യുടെ സർഗ്ഗപ്രപഞ്ചം - കേരളദാഷാഇൻസ്റ്റിറ്റ്യൂട്ട്
30. നാടകദർപ്പണം - എൻ.എൻ. പിള്ള
31. നാടകം ഒരു പഠനം - സി.ജെ.തോമസ്
32. ഉയരൂ യവനിക - സി.ജെ.തോമസ്
33. നാടക പഠനങ്ങൾ - എഡിറ്റർ പന്മന രാമചന്ദ്രൻ നായർ
34. എം.ടി.കല,കാലം,സ്വത്വം - ഡോ.എ.എസ്. പ്രതീഷ്

Language Course VII (Additional Language III)

15UHN311.1: Drama, One Act Plays and Technical Terminology

No. of credits: 4

No. of instructional hours per week: 5

Aim of the Course / Objectives

The aim of the course is to appreciate the literary and stylistic elements of Hindi Drama and One Act plays. To understand the distinct features of Hindi Drama. To understand Hindi as the National and official language of India. To overcome multilingual problems and its implications. To familiarize the technical terms used in offices.

Module 1

Drama – Prescribe a Drama (Post Sixties)

Module 2

One Act plays (Prescribe a collection of one act play)

Module 3

Technical Terminology (Prescribe a text book)

Translation of Technical terms – official terms
(English to Hindi and Hindi to English)

Prescribed Textbooks

1. Drama (Detailed)
 - Ek aur Dronacharya
By Shankar Shesh
Published by Parameswari Prakashan,
Preeth Vihar, Delhi
2. One Act Plays
(Detailed)
 - Panch Rang
Edited by Dr. Jagathpal Sharma
Published by Navodaya Sales,
New Delhi

Lessons to be studied

1. Lekshmi ka Swagath - Upendranath Ashk
2. Reed ki Haddi - Jagadeesh Chandra Mathur
3. Bahut Bada Saval - Mohan Rakesh

4. Technical Terminology - 'Paribhashik Sabdavali'
Edited by Dr. Satheesh kumar G.
Chairman (BOS)

Language Course VII (Additional Language III) 15UFR311.1: Literature in French

No. of credits: 4

No. of instructional hours per week: 5

AIMS:

The aim of the course is to acquaint students with French literature with consistent emphasis on grammar and vocabulary.

OBJECTIVES:

1. To enhance literary sensibility
2. To introduce students to the world of French literature.

SYLLABUS:

NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and Yves Loiseau

Publisher : Didier

Module 3 : Agir dans l'espace

Unit 7 : Rallye

Unit 8 : chez moi

Unit 9 : Les vacances

The following poems to be studied:

1. Le Pont Mirabeau - Guillaume Apollinaire
2. Déjeuner du Matin - Jacques Prévert
3. Le Pélican - Robert Desnos
4. Noel - Théophile Gautier
5. Chanson d'Automne - Paul Verlaine
6. Pour faire le portrait d'un oiseau – Jacques Prévert

Reference books :

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)
4. A bouquet of French poems (Polyglot house) by Prof. T.P Thamby

Core Course II

15UCH341: Inorganic Chemistry- II

No. of credits: 3

No. of instructional hours per week: 5

Module-1 Chemical Bonding –I

9hrs

Covalent bond-valence bond theory and its limitations- hybridization -hybridization in methane, ethylene, benzene, acetylene - VSEPR theory and its applications- structure of XeF_2 , XeF_4 , XeF_6 , ClF_3 , IF_5 , IF_7 , NH_3 , H_3O^+ , SF_4 & H_2O MO theory, LCAO of H_2^+ ion, homonuclear diatomic molecules- C_2 , B_2 , N_2 , O_2 and ions like O_2^+ - heteronuclear diatomic molecules (HF, NO, and CO) – Bond order -comparison of VB and MO theories.

Module II : Chemical Bonding –II

9hrs

Ionic bond-ionic lattice energy of ionic compounds- Bond-Lande equation, Born-Haber cycle, solvation energy and solubility of ionic solids-covalent character of ionic bond, Fajan's rules Polarity of Covalent bond- dipole moment- percentage ionic character- dipole moment and molecular structure Metallic bonding- free energy theory, VB theory and band

theory(Qualitative treatment only)- weak electrical forces – hydrogen bond, inter and intramolecular hydrogen bond, intermolecular interaction – induction forces and dispersion forces such as van der Waals forces, ion –dipole, dipole-dipole, ion-induced dipole, dipole-induced dipole, induced dipole-induced dipole interactions.

Module III : Nuclear Chemistry

9hrs

Natural radioactivity, modes of decay, Geiger –Nuttall rule, artificial transmutation and artificial radioactivity- nuclear stability, n/p ratio, mass defect and binding energy, nuclear fission and nuclear fusion, elementary idea of subatomic particles like neutrino, anti neutrino etc-applications of radioactivity- ^{14}C dating, rock dating, neutron activation analysis and isotope as tracers.

Module IV : Non Aqueous Solvents

9hrs

General properties- classification- self ionization and leveling effect- reaction in non-aqueous solvents- protic and aprotic non aqueous solvents- examples- solutions of metals in liquid ammonia- self ionization of liquid ammonia- liquid SO_2 , liquid HF, alkali metals in liquid ammonia.

Module V: Instrumental Methods of Analysis

9hrs

Atomic absorption spectroscopy- flame emission spectroscopy- applications –colorimetry- spectrophotometry- laws of spectrophotometry- Beer-Lambert's law applications of spectrophotometry- thermal methods- introduction to TG, DTA and DSC instrumentations and applications. Tools for measuring nanostructures (Elementary idea only): XRD, Atomic Force Microscopy (AFM), Scanning Tunneling Microscopy (STM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM).

Module VI : Chemistry of Nanomaterials

9hrs

Evolution of Nanoscience – Historical aspects- Preparations containing nano gold in traditional medicine. Lycopodium cup- Faraday's divided metal etc. Nanosystems in nature. Preparation of nanoparticles: Top-down approaches and Bottom to top approach Sol-gel synthesis, Colloidal precipitation, Co-precipitation, Combustion technique, Sonochemistry, Hydrothermal technique, High energy ball milling etc. Carbon nanotubes and fullerenes. Properties of nanoparticles: optical, magnetic, mechanical, thermal and catalytic properties with examples.

Reference:

1. "Basic Inorganic Chemistry" ; F. A. Cotton, G. Wilkinson and P. L. Gaus, Willey
2. "Concise Inorganic Chemistry" : J. D. Lee, ELBS
3. "Theoretical Inorganic Chemistry" : M. C. Day and Selbin
4. "Inorganic Chemistry- Principles and Structure and Reactivity" : J. E. Huheey
5. "Essentials of Nuclear Chemistry" : H. S. Arniker
6. "Non-aqueous Solvents" : Sisler
7. "Fundamentals of Inorganic Chemistry" : E. S. Gilreath
8. "Instrumental Methods of Analysis" : Willard, Merrit
9. "Inorganic Chemistry" : Shriver and Atkins
10. "Coordination Chemistry" : Bosolo and Johnson
11. "Coordination Chemistry" : S. F. A. Kettle
12. "Inorganic Chemistry" : J. E. Hueey
13. "Nano, The Essentials", T. Pradeep, Mc Graw- Hill Education

Complementary Course V

15UMM331.2: Vector Analysis and Theory of Equations

No. of credits: 4

No. of instructional hours per week: 5

Module 1: Vector Differentiation

- ❖ Vector function of a single variable and representation in terms of standard basis. Limit of a vector function and evaluation of limit in Cartesian representation. Continuous vector functions and the idea that such functions represent oriented space curves. Examples.
- ❖ Derivative of a vector function and its geometric significance. Derivative in terms of Cartesian components. Tangent vector to a curve, smooth and piecewise smooth curves. Applications to finding the

length and curvature of space curves, velocity and acceleration of motion along a curve etc.

- ❖ Scalar field and level surfaces. The gradient vector of a scalar field (Cartesian form) at a point and its geometric significance. Gradient as an operator and its properties. Directional derivative of a scalar field and its significance. Use of gradient vector in computing directional derivative.
- ❖ Vector fields and their Cartesian representation. Sketching of simple vector fields in the plane. The curl and divergence of a vector field (Cartesian form) and their physical significance. The curl and divergence as operators, their properties. Irrotational and solenoidal vector fields. Various combinations of gradient, curl and divergence operators.

Module 2: Vector Integration

- ❖ The method of computing the work done by a force field in moving a particle along a curve leading to the definition of line integral of a vector field along a smooth curve. Scalar representation of line integral. Evaluation as a definite integral. Properties. Line integral over piecewise smooth curves. Green's theorem in the plane (without proof) for a region bounded by a simple closed piecewise smooth curve.
- ❖ Oriented surfaces. The idea of flux of a vector field over a surface in 3-space. The surface integral of a vector field over a bounded oriented surface. Evaluation by reducing to a double integral. Use of cylindrical and spherical co-ordinates in computing surface integral over cylindrical and spherical surfaces.
- ❖ Stokes' theorem (without proof) for an open surface with boundary a piecewise smooth closed curve. Gauss' divergence theorem (without proof). Verification of the theorems in simple cases and their use in computing line integrals or surface integrals which are difficult to evaluate directly. Physical interpretation of divergence and curl in terms of the velocity field of a fluid flow.
- ❖ Conservative fields and potential functions. Relation of conservative vector fields to their irrotational nature and the path-independence of line integrals in the field (without proof). Significance of these results in the case of conservative force fields such as gravitational,

magnetic and electric fields. Method of finding the potential function of a conservative field.

Module 3: Theory of Equations

- ❖ Fundamental theorem of Algebra (without proof), relations between roots and coefficients of a polynomial, finding nature of roots of polynomials without solving-Des Cartes rule of signs, finding approximate roots via bisection method, Newton-Raphson method

Text for Module 1 and 2 : Howard Anton, et al, Calculus, Seventh Edition, John Wiley

Text for Module 3 :Barnard and Child, Higher Algebra, Macmillan
K A Stroud, Advanced Engineering Mathematics, 4th edition, Palgrave, 2003.

Complementary Course VI

15UPY331.2: OPTICS, MAGNETISM AND ELECTRICITY

No. of credits: 3

No. of instructional hours per week: 5

Unit I (34 hours)

Interference (10 hours)

Analytical treatment of interference-theory of interference fringes and bandwidth. Interference in thin films-reflected system-colour of thin films-fringes of equal inclination and equal thickness. Newton's rings-reflected system-measurement of wavelength.

Diffraction (10 hours)

Phenomenon of diffraction-classification-Fresnel and Fraunhofer. Fresnel's theory of approximate rectilinear propagation of light-Fresnel diffraction at a straight edge Fraunhofer diffraction at a single slit, two slits and N slits. Plane transmission grating determination of wavelength-Resolving power of grating.

Polarisation (8 hours)

Experiments showing the transverse nature of light-plane polarized

light-polarization by reflection-Brewster's law-double refraction-Nicol prism-propagation of light in uni-axial crystals-positive and negative crystals-principal refractive indices-half wave plate and quarter wave plate-elliptically and circularly polarized light-optical activity-Fresnel's theory and applications-polarimeters-determination of specific rotation.

Laser and Fibre Optics (6 hours)

Principle of operation of laser-population inversion-optical pumping-ruby laser applications of lasers. Light propagation in optical fibres-step index fibre-graded index fibre-applications.

Unit II (20 hours)

Magnetism (10 hours)

Magnetic properties of matter-definition and relation between magnetic vectors B, H and M.Magnetic susceptibility and permeability. Magnetic properties-diamagnetism paramagnetism-ferromagnetism-antiferromagnetism. Electron theory of magnetism explanation of ferromagnetism.

Electricity (10 hours)

EMF induced in a coil rotating in a magnetic field-peak, mean, rms and effective values of A.C. Ac circuits-AC through RC, LC, LR and LCR series circuits resonance-sharpness of resonance-power factor and choke coil-transformers.

References

1. A text book of optics – Brijlal & Subramaniam
2. Electricity and Magnetism – R.Murugesan, S.Chand & Co Ltd.
3. A text book of B.Sc subsidiary Physics – P.Vivekanandan.

SEMESTER IV

Language Course VIII

15UEN411.1: READINGS IN LITERATURE

No. of credits: 4

No. of instructional hours per week: 5 (Total 90 hrs)

AIMS

1. To sensitize students to the aesthetic, cultural and social aspects of literature.
2. To help them analyze and appreciate literary texts.

OBJECTIVES

On completion of the course, the students should be able to:

1. Understand and appreciate literary discourse.
2. Look at the best pieces of literary writing critically.
3. Analyze literature as a cultural and interactive phenomenon.

Module 1

What is literature – literature and context – genres – literature and human values – creative use of language – inculcation of aesthetic sense. Poetry – what is poetry – different types of poetry – poetic diction – figurative language – themes – stanza – rhyme.

Module 2

Drama. Scope and definition – different types – one act plays - structure – dialogue – characters – action.

Module 3

Prose What is prose – different types – personal – impersonal – technical.

Module 4: Fiction.

What is fiction – different types – plot – characters – setting – point of view – short story – its characteristics.

COURSE MATERIAL

Module 1

Core reading: Readings in Literature. Department of Publications, University of Kerala. Poems prescribed:

1. William Shakespeare: To Be or Not to Be (Hamlet, Act III, Scene 1)
2. William Blake: The Tiger
3. William Wordsworth: Lucy Gray
4. Alfred Lord Tennyson: Tithonus
5. Milton: On His Blindness
6. Rabindranath Tagore: Leave This Chanting (Poem 11 from Gitanjali)
7. John Keats: Ode to Autumn
8. Ted Hughes: Full Moon and Little Frieda.

Module 2

Core reading: Vincent Godefroy - Fail not our Feast [from Dramatic Moments: A Book of One Act Plays. Orient Black Swan, 2013]

Module 3

Core reading: Readings in Literature. Department of Publications, University of Kerala.

Essays prescribed:

1. Robert Lynd: The Pleasures of Ignorance
2. Martin Luther King: I Have a Dream
3. Stephen Leacock: The Man in Asbestos
4. Isaac Asimov: The Machine That Won the War.
5. E.R. Braithwaite: To Sir, with Love [extract]

Module 4

Core reading: Stories for Life, Indian Open University.

Stories prescribed:

- (i) Catherine Mansfield: A Cup of Tea.
- (ii) O Henry: The Last Leaf.
- (iii) Rabindranth Tagore: The Postmaster.
- (iv) Oscar Wilde: The Happy Prince.

(v) Ernest Hemingway: A Day's Wait

(vi) Further reading

1. A Concise Companion to Literary Forms. Emerald, 2013.
2. Abrams, M. H. A Glossary of Literary Terms.
3. Klarer, Mario. An Introduction to Literary Studies. Second edition. Routledge, 2009.

Direction to Teachers

The introduction to various genres is intended for providing basic information and no conceptual analysis is intended.

Language Course IX (Additional Language IV)

15UML411.1: വിനിമയം, സർഗ്ഗാത്മക രചന, ഭാഷാവബോധം

No. of credits: 4

No. of instructional hours per week: 5

പഠനോദ്ദേശ്യം : (i) ആശയവിനിമയത്തിന്റെ വിവിധ ഘടകങ്ങളും പ്രക്രിയകളും വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുക. ആശയവിനിമയ സിദ്ധാന്തങ്ങളെക്കുറിച്ചും ആശയവിനിമയ മാതൃകകളെക്കുറിച്ചും അവബോധമുണ്ടാക്കുക.

(ii) ഭരണകാര്യങ്ങൾ മാതൃഭാഷയിലൂടെ നിർവഹിക്കപ്പെടണം എന്ന കാര്യം ഇന്ന് പൊതുവേ അംഗീകരിക്കപ്പെട്ടിട്ടുണ്ട്. മലയാളം ഭരണഭാഷയാകുമ്പോൾ ഉണ്ടാകുന്ന പ്രശ്നങ്ങളെക്കുറിച്ച് വിദ്യാർത്ഥികളെ ബോധവൽക്കരിക്കുക.

(iii) എഴുത്തുകാരുടെ രചനാനുഭവങ്ങൾ വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുക. സർഗ്ഗാത്മകരചനയ്ക്ക് വിദ്യാർത്ഥികളെ പ്രാപ്തരാക്കുക.

(iv) പദം, വാക്യം, ചിഹ്നം എന്നിവ തെറ്റുകൂടാതെ പ്രയോഗിക്കുന്നതിലൂടെ ഭാഷാശുദ്ധി നിലനിർത്തുക. വിവർത്തനത്തിൽ പ്രായോഗിക പരിശീലനം നൽകുക.

പാഠ്യപദ്ധതി

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

വിനിമയവും മാധ്യമങ്ങളും

വിനിമയം- നിർവ്വചനം - ആശയവിനിമയ പ്രക്രിയ - വ്യവസ്ഥാപനം, നിർവ്വയവസ്ഥാപനം, ആശയവിനിമയ പ്രക്രിയയുടെ ഘടകങ്ങൾ, ആശയ വിനിമയ മാതൃകകൾ -

വിവിധതരം ആശയവിനിമയങ്ങൾ - വിവിധതരം മാധ്യമങ്ങൾ - അച്ചടി, റേഡിയോ, ടെലിവിഷൻ, സിനിമ, ഇന്റർനെറ്റ് തുടങ്ങിയ നവമാധ്യമങ്ങൾ - ഇവയുടെ സവിശേഷതകൾ - മാധ്യമങ്ങളും സമൂഹവും

വിശദപഠനത്തിന്

മാദ്ധ്യമം : മൗലികതയും നിരാകരണവും - ഡോ.എ.ശ്രീധരൻ, നാഷണൽ ബുക്ക് സ്റ്റാൾ (താഴെപ്പറയുന്ന രണ്ടു ലേഖനങ്ങൾ മാത്രം)

- 1. മാനവ ആശയവിനിമയം - തത്ത്വവും പ്രയോഗവും
- 2. ആശയ വിനിമയം - സിദ്ധാന്തവും പ്രയോഗവും

മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)

ഭരണഭാഷ മലയാളം

ഭരണഭാഷ - നിർവ്വചനം - ഭരണനിർവ്വഹണം മാതൃഭാഷയിലൂടെ ആകേണ്ടതിന്റെ ആവശ്യകത - മലയാളം ഭരണഭാഷയാകുമ്പോൾ സ്വീകരിക്കേണ്ട മുന്നൊരുക്കങ്ങൾ ഭരണഭാഷയ്ക്കുണ്ടായിരിക്കേണ്ട ഗുണങ്ങൾ - നിയതാർഥ ബോധകം, ആർജ്ജവം, സുതാര്യത സരളം, ലഘുവാക്യങ്ങൾ, ആശയത്തെക്കുറിച്ചുള്ള അസന്ദിഗ്ദ്ധത മുതലായവ - വിവിധ സർക്കാർ വകുപ്പുകളുടെ സാങ്കേതിക പദാവലികൾ.

പഠനപ്രവർത്തനം

ഇംഗ്ലീഷിലുള്ള സർക്കാർ ഉത്തരവുകളും നടപടിക്രമങ്ങളും മലയാളത്തിലേക്കു മാറ്റാനുള്ള പരിശീലനം.

മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

സർഗ്ഗാത്മകരചന

സർഗ്ഗാത്മകത - നിർവചനം - സർഗാത്മകതയുടെ ഉറവിടം - വിവിധ കാഴ്ചപ്പാടുകൾ - കാവ്യപ്രചോദനത്തെക്കുറിച്ചുള്ള ഭാരതീയ സങ്കല്പം - പ്രതിഭയെക്കുറിച്ചുള്ള രാജശേഖരന്റെ അഭിപ്രായം - ഭാവയിത്രി, കാരയിത്രി - ഭാവനയെപ്പറ്റി കോളറിഡ്ജ് - പ്രഥമഭാവനയും ദ്വിതീയ ഭാവനയും - ഫാന്റസിയും ഇമാജിനേഷനും തമ്മിലുള്ള വ്യത്യാസം - വേർഡ്സ്പർത്തിന്റെ കാവ്യനിർവചനം - സർഗ്ഗാത്മകരചനയിലേക്കു നയിക്കു സാഹചര്യങ്ങൾ - ജന്മവാസനയും അനുഭവവും - രചനയുടെ വിവിധ ഘട്ടങ്ങൾ.

പ്രായോഗിക പരിശീലനം

കവിത, കഥ, ലഘുനാടകം പ്രസ്തുചിത്രങ്ങൾക്കുള്ള തിരക്കഥ, ഫീച്ചർ തുടങ്ങിയവയുടെ രചനാപരിശീലനം വിദ്യാർത്ഥികൾക്ക് നൽകേണ്ടതാണ്. ആവശ്യമെങ്കിൽ വിദ്യാർത്ഥികളെ ഗ്രൂപ്പുകളായി തിരിക്കാവുന്നതാണ്.

വിശദപഠനത്തിന്

- 1. സർഗ്ഗാത്മകത - ഡോ.കെ.എം. കോശി

- 2. വാക്കുകളുടെ ശില്പം - എം.കെ. സാനു
(സാഹിത്യവിജ്ഞാന പ്രവേശിക)
(കാവ്യതത്ത്വപ്രവേശിക)
- 3. എന്റെ കവിതയെപ്പറ്റി - സുഗതകുമാരി
(ഇരുൾചിറകുകളുടെ ആമുഖം)
- 4. കാഥികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ
(രക്തമുഖം എന്ന അനുഭവക്കുറിപ്പ് മാത്രം)

മൊഡ്യൂൾ നാല് (18 മണിക്കൂർ)

ഭാഷാവബോധം

തെറ്റായ രൂപത്തിൽ എഴുതപ്പെടുന്ന വാക്കുകളും അവയുടെ ശരിയായ രൂപങ്ങളും - വാക്യരചനയിൽ സാധാരണ വരുന്ന പിഴവുകളും അവ തിരുത്തുന്നതിനുള്ള മാർഗ്ഗനിർദ്ദേശങ്ങളും - പ്രധാനപ്പെട്ട ചിഹ്നങ്ങളും അവയുടെ പ്രയോഗ സാഹചര്യങ്ങളും.

പ്രായോഗിക പരിശീലനം

ഇംഗ്ലീഷിൽ നിന്ന് മലയാളത്തിലേക്കും മലയാളത്തിൽ നിന്ന് ഇംഗ്ലീഷിലേക്കുമുള്ള വിവർത്തനം - ഗദ്യം, പദ്യം, ശൈലികൾ, പഴഞ്ചൊല്ലുകൾ, സാങ്കേതിക പദങ്ങൾ മുതലായവയുടെ വിവർത്തനം.

സഹായകഗ്രന്ഥങ്ങൾ

- 1. മാധ്യമം : മൗലികതയും നിരാകരണവും - ഡോ.എം.എൻ. ശ്രീധരൻ,
നാഷണൽ ബുക്ക് സ്റ്റാൾ
- 2. മാധ്യമങ്ങളും മലയാളസാഹിത്യവും - എം.വി.തോമസ്,
കേരള സാംസ്കാരിക പ്രസിദ്ധീകരണ വകുപ്പ്
- 3. മാധ്യമങ്ങളും മലയാളസാഹിത്യവും - പലർ, കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 4. മാധ്യമവിചിന്തനം - ഡോ.കെ.വി.തോമസ്,
ഡോ.മാത്യു ജെ.മുട്ടുത്ത്,
ലിപി പബ്ലിക്കേഷൻസ്
- 5. മലയാളവും ഇന്റർനെറ്റും - സുനീത ടി.വി,
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
- 6. സൈബർ മലയാളം - (എഡി) സുനീത ടി.വി,
കറന്റ് ബുക്സ്, തൃശൂർ
- 7. ഭാഷയും ഭരണഭാഷയും - ഡോ. എഴുമാറ്റൂർ രാജരാജവർമ്മ,
ഇൻഫർമേഷൻ ആന്റ്
പബ്ലിക്കേഷൻ വകുപ്പ്,
കേരള സർക്കാർ
- 8. ഭരണ ശബ്ദാവലി - കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്

- 9. വൃത്താന്തപത്രപ്രവർത്തനം - സ്വദേശാഭിമാനി രാമകൃഷ്ണപിള്ള, മാളുബെൻ പബ്ലിക്കേഷൻസ്
- 10. ലിറിക്കൽ ബാലഡ്സിന്റെ ആമുഖം - വില്യം വേർഡ്സ്വർത്ത്, വിവ: ഡോ.തോന്നയ്ക്കൽ വാസുദേവൻ, എം.എൻ.വിജയൻ സാസ്ക്കാരിക വേദി
- 11. സാഹിത്യവിദ്യ - കുട്ടികൃഷ്ണമാരാർ, മാരാർ സാഹിത്യ പ്രകാശം, കോഴിക്കോട്.
- 12. കാമികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ, ഡി.സി.ബുക്സ്
- 13. ഉയരു യവനിക - സി.ജെ.തോമസ്, മാളുബൻ പബ്ലിക്കേഷൻസ്, തിരുവനന്തപുരം
- 14. കാവ്യസ്വരൂപം - എസ്.ഗുപ്തൻനായർ, ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
- 15. കഥയുടെ ന്യൂക്ലിയസ്സ് - ഡോ.വത്സലൻ വാതുശ്ശേരി, ഒലിവ് പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
- 16. ഇരുൾചിറകുകൾ - സുഗതകുമാരി
- 17. ഗദ്യശില്പം - സി.വി.വാസുദേവഭട്ടതിരി, കേരളഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 18. തെറ്റും ശരിയും - പ്രൊഫ.പന്മന രാമചന്ദ്രൻ നായർ, കറന്റ് ബുക്സ്, കോട്ടയം
- 19. തെറ്റില്ലാത്ത മലയാളം - പ്രൊഫ.പന്മന രാമചന്ദ്രൻ നായർ, കറന്റ് ബുക്സ്, കോട്ടയം
- 20. ഭാഷാശുദ്ധി സംശയപരിഹാരങ്ങൾ - പ്രൊഫ.പന്മനരാമചന്ദ്രൻ നായർ
- 21. ഭാഷാശുദ്ധിയും ഭരണഭാഷയും - ഡോ.വിളക്കുടിരാജേന്ദ്രൻ, പ്രിയദർശിനി പബ്ലിക്കേഷൻസ്
- 22. മലയാളശൈലി - കുട്ടികൃഷ്ണമാരാർ, മാരാർ സാഹിത്യ പ്രകാശം, കോഴിക്കോട്
- 23. തായ്മൊഴി - എം.എൻ.കാശ്ശേരി
- 24. ഭരണഭാഷാപ്രശ്നങ്ങൾ - എം.വി.തോമസ്, കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 25. വിവർത്തനവിചാരം - ഡോ.എൻ.ഇ.വിദ്യാനാഥയ്യർ,

- കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
26. തർജ്ജമയുടെ താക്കോൽ - സി.വി. വാസുദേവഭട്ടതിരി,
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
27. നല്ല മലയാളം - സി.വി.വാസുദേവഭട്ടതിരി,
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
28. http://en.wikipedia.org/wiki/media_influence
29. http://en.wikipedia.org/wiki/creative_writing
30. http://www.du.ae.in/du/course_creative-writing.pdf.

Language Course IX (Additional Language IV)

15UHN411.1: Poetry, Translation and Communicative Hindi

No. of credits: 4

No. of instructional hours per week: 5

Aim of the Course / Objectives

The aim of the course is to introduce the student to the world of Hindi Poetry Ancient and Modern. To sensitize the student to the aesthetic aspects of literary appreciation and analysis.

Systematic study of the theory, description and application of translation. To develop students skill in communicative Hindi.

Module 1

Poetry – Prescribe a poetry collection (Ancient and Modern)

Module 2

Translation (Prescribe a text book)

Translation definition – Importance of Translation – Field of Translation – Types of Translation – Literary, Non Literary Translation – Translation of English passage to Hindi.

Module 3

Communicative Hindi (Prescribe a textbook)

Procedure for the development of communicative skills of students.

Use of Hindi language in different situations – in Home, in College, in Banks, in Hospitals, in Railway Stations in Book Shops etc. Names of Animals, Birds, Trees, Plants, diseases, vegetables, professions, kitchen utensils, etc.

Prescribed Textbooks

1. Poetry Collection - Hindi Kavya Sopan
(Detailed) Edited by Sathyaprakash Misra
Published by Lokbharathi, New Delhi

Poems to be studied

1. Kabeer – Sakhi – 1 to 8
2. Soordas – Pad – 1 to 3
3. Bihari – Doha – 1 to 4
4. Nadi ke Dweep – Agyey
5. Desh Gaan – Sarveswar Dayal Saksena
6. Proud Shiksha – Dhoomil

2. Translation (Detailed) - Anuvad
Edited by Dr. M.S. Vinayachandran
Published by Lokbharathi Prakasan,
New Delhi

(Chapter 2, 3 and 6 should be omitted. From chapter 4 Anuvad ke Prakar, Portions upto karyalayeen anuvad should be studied, Chapter -7 Translation. First 5 passages should be studied)

3. Communicative Hindi - Bolchaal ki Hindi
By Dr. Suseela Gupt,
Lokbharati Prakashan, Elahabad-1

(Conversations in Home, College, Bank, Hospital, Railway Station and Book shop should be studied. Names of Animals, Birds, Trees, Plants, Diseases, Professions, Vegetables, Kitchen utensils, Spices and Eatables should be studied.

Language Course IX (Additional Language IV)

15UFR411.1: Culture and Civilization

No. of credits: 4

No. of instructional hours per week: 5

AIMS:

This course is intended to familiarize the students with French culture and civilization with specific reference to Kerala culture.

OBJECTIVES:

1. To acquaint the students with French culture and civilization.
2. To comprehend, compare and understand better the civilization of one's native place.

SYLLABUS:

NAME OF TEXT: **CONNEXIONS** – Niveau 1 By Régine Mérieux and Yves Loiseau

Publisher : Didier

Module 4 : Se situer dans le temps

Unit 10 : Au jour le jour

Unit 11 : Roman

Unit 12 : Je te retrouverai

Articles on Kerala culture with special emphasis on festivals, tourist centres and cuisine.

Reference books :

1. Le Nouveau Sans Frontières Vol I by Philippe Dominique
2. Panorama Vol I by Jacky Girardet
3. Cours de langue et de civilisation française Vol I (Mauger Bleu)

Core Course III

15UCH441: Organic Chemistry – I

No. of credits: 3

No. of instructional hours per week: 3

Module I: Introduction to Organic Reaction Mechanism I 9 hrs

Introduction to reaction mechanism, Drawing electron movements with arrows- curved arrow notation. Half headed and double headed arrows. Nature of bond fission –Homolytic and Heterolytic. Types of reagents – Electrophiles and Nucleophiles. Types and sub types of following organic reactions with definition and at least one example of each- Substitution, Addition, Elimination and Rearrangement. Reactive intermediates with examples Electron displacement effects – inductive effect, electromeric effect, hyperconjugation, resonance, steric effect., energy considerations. Reaction intermediates – carbocations, carbanions, free radicals, carbenes, benzyne. Methods of determination of reaction mechanism – product analysis, intermediates, isotope effect, kinetic and stereochemical studies.

Module II: Reaction mechanism II 9 hrs

Aliphatic nucleophilic substitutions, mechanism of SN^1 , SN^2 and SN^i reactions – effects of structure-substrate, solvent, nucleophile and leaving groups - Stereochemistry- Walden inversion, Elimination Reactions:- Hoffmann and Saytzeff rules- cis and trans eliminations –mechanisms of $E1$ and $E2$ reactions. Elimination versus substitution. Addition reactions- mechanisms of addition of Bromine and hydrogen halides to double bonds-Markownikoff's rule and peroxide effect Study of reactions of hydroboration, epoxidation, ozonolysis, hydration, cis-hydroxyaltion.

Module III: Arenes & Aromaticity 9 hrs

Nomenclature of benzene derivatives, Aromaticity, Huckel's rule, Non-benzenoid aromatic compounds – 5 membered and 7 membered ring compounds structure of benzene. Mechanism of aromatic electrophilic substitution in benzene– halogenation, nitration, sulphonation, Friedel-Crafts alkylation, acylation. Energy profile diagram. Orienting effect of substituents like $-OH$, $-NH_2$, $-NO_2$, $-CH_3$ and halogens. Nucleophilic aromatic substitution. Elimination-addition mechanism, reactivity and

orientation. aromatic electrophilic substitution in naphthalene- Friedel-Crafts alkylation and acylation - nitration.

Module IV. Carbohydrates

9 hrs

Classification and Nomenclature of monosaccharides. Configuration of monosaccharides. Preparation, properties and structural elucidation of glucose, fructose and sucrose. Anomers, epimers and mutarotation. Mechanisms of Epimerization and Mutarotation. Ascent and descent series in aldoses and ketoses. Conversion of aldoses to ketoses and ketoses to aldoses. Conversion of glucose to mannose. Polysaccharides: - Starch and Cellulose - Preparation, properties and structure of starch and cellulose (structural elucidation not expected).

Module V: Stereochemistry-I

9 hrs

Stereoisomerism - definition - classification into optical and geometrical isomerism Projection formulae - Fischer, flying wedge, sawhorse and Newman projection formulae- notation of optical isomers -D-L notation- Cahn-Ingold-Prelog rules - R-S notations for optical isomers with one and two asymmetric carbon atoms - erythro and threo representations. Optical isomerism - optical activity - optical and specific rotations -conditions for optical activity - asymmetric centre -- chirality - achiral molecules -meaning of (+) and (-) Elements of symmetry - Racemisation - methods of racemisation- Resolution - methods of resolution (chemical- conversion to diastereo isomers, biochemical and chiral chromatography) - Asymmetric synthesis –asymmetric catalysis-BINAP for the synthesis of naproxen. Stereoisomerism in the real world-pthalidomide, chiral drugs.

Module VI: Stereochemistry-II

9 hrs

Optical activity in compounds not containing asymmetric carbon atoms- Biphenyls, allenes Geometrical isomerism - cis-trans, syn-anti and E-Z notations – geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes - methods of distinguishing geometrical isomers using melting point, dipole moment, dehydration and cyclisation Conformational analysis - introduction of terms - conformers, configuration, dihedral angle, torsional strain - Conformational analysis of ethane and n-butane

including energy diagrams - conformers of cyclohexane (chair, boat and skew boat forms) - axial and equatorial, Bonds-ring flipping showing axial equatorial interconversions, conformation of methyl cyclohexane.

References

1. I L Finar, "Organic Chemistry - Vol. I", Longman
2. M K Jain, "Principles of Organic Chemistry",
3. Morrison & Boyd, "Organic Chemistry", Prentice Hall
4. Peter Sykes, "A Guide book to Mechanisms in Organic Chemistry", Longman
5. Jerry March, "Advanced Organic Chemistry", Wiley
6. Bahl&Bahl, "Advanced Organic Chemistry"
7. Tewari&Mahotra, "A text book of Organic Chemistry"
8. P L Soni, "Organic Chemistry"
9. Rein hard Bruckner, "Advanced Organic Chemistry Reaction Mechanisms"
10. Arun Parikh, Hansa Parikh, Khyati Parikh, "Name Reactions in Organic Synthesis".
11. Ernest L. Eliel, Samuel H. Wilen "Stereochemistry of Organic Compounds"

Core Course V

15UCH442: SEMSTER I, III & IV Course Code 15UCH141, 15UCH341 & 15UCH441

No. of credits: 2

No. of instructional hours per week: 2

I. Qualitative Analysis (Micro /Semimicro Analysis)

a. Studies of the reactions of the following radicals with a view to their identification and confirmation:

Pb²⁺, Cu²⁺, Bi²⁺, Cd²⁺, Sn²⁺, Sb²⁺, Fe²⁺, Fe³⁺, Al³⁺, Cr³⁺, Zn²⁺, Mn²⁺, Co²⁺, Ni²⁺, Ca²⁺, Sr²⁺, Ba²⁺, Mg²⁺, K⁺, NH₄⁺, CO₃²⁻, S²⁻, NO₂⁻, NO₃⁻, F⁻, Cl⁻, Br⁻, I⁻, BO₃⁻, acetate, oxalate, CrO₄²⁻, PO₄³⁻ and SO₄²⁻.

b. Systematic qualitative analysis by microscale methods of a mixture containing two acidic and two basic radicals from the above list (not more than one interfering radical).

II. Inorganic Preparations

The following preparations are to be done:-

a. Potash alum

- b. Hexamine cobalt
- c. Chloride
- d. Tetramine copper
- e. Sulphate
- f. Mohr's salt
- g. Microcosmic salt
- h. Sodium cobalti nitrate
- i. Sodium nitro pruside
- j. Manganese phthalocyanin
- k. Potassium trioxalatochromate and
- l. Potassium trioxalatoferrate

Complementary Course VII

15UMM431.2: Abstract Algebra and Linear Transformations

No. of credits: 4

No. of instructional hours per week: 5

MODULE 1: Abstract Algebra

- ❖ Groups-definition and examples, elementary properties, finite groups and subgroups, cyclic groups, elementary properties, groups of permutations
- ❖ Rings and Fields - definition and examples

[Sections 2, 4, 5, 6, 8 (excluding the subsection on Cayley's theorem) and 18 (excluding the subsection on homomorphism and isomorphism) of text. Proofs of theorems are excluded. However ideas contained in theorems and definitions should be explained with illustrative examples and problems.]

(See also J A Gallian, Contemporary Abstract Algebra, Narosa Publications for examples of symmetry groups)]

Module 2: Linear Transformations

- ❖ Linear independence of vectors. Linear independence of Matrix columns.
- ❖ Linear transformations from \mathbb{R}^n into \mathbb{R}^m . Matrix transformations. Linear transformation.
- ❖ The matrix of a Linear transformation. Matrix representation of simple transformations such as rotation, reflection, projection etc. on the plane.

[Sections 1.7, 1.8, and 1.9 of text]

Text for Module 1: J B Fraleigh, A First Course in Abstract Algebra, Narosa Publications

Text for Module 2: David C. Lay, Linear Algebra and its applications, Third Edition Pearson

References

1. Thomas and Finney, Calculus and Analytic Geometry, Ninth Edition, Addison-Wesley.
2. Michael D. Greenberg, Advanced Engineering Mathematics, Pearson Education, 2002.
3. James Stewart, Essential Calculus, Thompson Publications, 2007.
4. David C. Lay, Linear Algebra, Thompson Publications, 2007.
5. George F Simmons, Differential equations with applications and historical notes, Tata McGraw Hill, 2003
6. T. Gamelin, Complex Analysis, Springer-verlag, 2006
7. J A Gallian, Contemporary Abstract Algebra, Narosa Publications
8. Brown and Churchill, Complex Variables and Applications, McGraw-Hill Higher Education; 8 edition, 2008
9. S L Loney, The elements of coordinate geometry
10. SAGE Math official website <http://www.sagemath.org/>
11. Gnuplot official website containing documentation and lot of examples <http://www.gnuplot.info/>
12. More help and examples on gnuplot <http://people.duke.edu/hpgavin/gnuplot.html>
13. Maxima documentations <http://maxima.sourceforge.net/documentation.html>

Complementary Course VIII
15UEC431: INDIAN PLANNING AND
15UPY431.2: ATOMIC PHYSICS, QUANTUM ME-
CHANICS AND ELECTRONICS

No. of credits: 3

No. of instructional hours per week: 3

Unit I Atomic physics (12 hours)

Basic features of Bohr atom model-Bohr's correspondence principle-vector atom model various quantum numbers-magnetic moment of orbital electrons-electron spin-Spin-Orbit coupling-Pauli's exclusion principle-periodic table.

Unit II Superconductivity (8 hours)

Properties of superconductors-zero electrical resistance-Meissner effect-critical magnetic field-Type I and Type II superconductors-isotope effect-high temperature ceramic superconductors-applications of superconductors.

Unit III Quantum mechanics (12 hours)

Inadequacies of classical physics-experimental evidences-evidences for quantum theory-Planck's hypothesis-foundation of quantum mechanics-wave function and probability density-Schrodinger equation-time dependent and time independent particle in a potentialbox.

Unit IV Spectroscopic Techniques (7 hours)

EM spectrum-UV, Visible, IR, Radio and microwave regions-principle of various spectrometers used in specific regions of EM spectrum-absorption spectroscopy emission spectroscopy-mass spectroscopy-qualitative ideas of ESR & NMR spectrometer.

Unit V Electronics (15 hours)

Current-voltage characteristics of a diode-forward and reverse bias-breakdown mechanism of p-n junction diode-zener diode and its characteristics-half wave and full wave rectifiers bridge rectifier-ripple factor, efficiency. Construction and operation of a bipolar junction transistor-

transistor configurations current components-transistor characteristics-DC load line-Q point-AC load line transistor biasing-need for biasing-bias stabilization-biasing circuits-fixed bias, emitter feedback bias, voltage divider bias (qualitative study only). Transistor amplifier-basic features of an amplifier-gain, input and output resistances frequency response and band width-small signal CE amplifier-circuit and its operation.

References

1. Modern Physics – R.Murugesan, S.Chand & Co. Ltd.
2. A text book of B.Sc subsidiary Physics – P.Vivekanandan.
3. Principles of Electronics – V.K.Mehta.

Complementary Course IX 15UPY432: PRACTICALS

No. of credits: 4

No. of instructional hours per week: 2

1. Torsion Pendulum- n by torsional oscillations
2. Torsion Pendulum- n and I using equal masses
3. Fly Wheel
4. Cantilever- Y by pin and microscope method
5. Uniform bending- Y by pin and microscope
6. Symmetric bar pendulum- g and radius of gyration
7. Surface tension- capillary rise method
8. Coefficient of viscosity- capillary flow method
9. Specific heat-method of mixtures applying Barton's correction
10. Lee's disc- Thermal conductivity of cardboard
11. Melde's string- frequency of tuning fork
12. Method of parallax- optical constants of convex lens using i) mirror and mercury ii) mirror and water
13. Method of parallax- refractive index of liquid.
14. Spectrometer- A , D and n

15. Spectrometer- dispersive power of a prism
16. Spectrometer- Grating-normal incidence
17. Deflection and vibration magnetometer- M and Bh
18. Circular coil- magnetization of a magnet
19. Carey Foster's bridge- Resistivity
20. Potentiometer- Resistivity
21. Potentiometer- Calibration of ammeter
22. Mirror galvanometer- Current and Voltage sensitivity
23. Diode Characteristics (for Ge and Si diodes)
24. Half wave rectifier-Measurement of ripple factor with and without filter capacitor
25. Full wave rectifier- Measurement of ripple factor with and without filter capacitor

SEMESTER V

Core Course V

15UCH541: Physical Chemistry – I

No. of credits: 4

No. of instructional hours per week: 4

Module I – Gaseous state

9 hrs

Ideal gas equation, Behaviour of real gases, Deviation from ideal behaviour, Compressibility factor, Boyle temperature - van der Waal's equation of state – derivation and importance, Virial equation of state, Collision frequency, Collision number, Collision diameter and mean free path Types of molecular velocities and their inter relations, Maxwell Boltzmann distribution of molecular velocities, Statement of equation and explanation (No derivation), Effect of temperature on most probable velocity, Derivation of root mean square, most probable and average velocities from the equation. Critical phenomena: Isotherms of CO₂, continuity of states, Critical constants and their experimental determination, relation between critical constants and van der Waals constants.

Module II – Solid state

9 hrs

Isotropy and anisotropy, Space lattice and unit cell, Elements of symmetry of crystals, Bravais lattices, Crystal systems, Laws of crystallography, Miller indices, Representation of lattice planes of cubic crystals, Determination of Avogadro number from crystallographic data, X-ray diffraction studies of crystals, Bragg's equation – derivation and applications, Rotating crystal and powder method, Structure of NaCl and KCl Rutile, Zinc blend, Wurtzite, radius ratio effect and coordination number, limitations of Radius ratio rule-Imperfections in crystals, point defects – Schottky and Frenkel defects,
Non-stoichiometric defects.

Module III – Liquid state and Dilute solutions

9 hrs

Properties of liquids: Surface tension and its measurement by capillary rise and stalagmometer method, factors affecting Surface tension,

Viscosity, Poiseuille's equation, Determination of viscosity by Ostwald's viscometer, Refractive index and its determination by Abbe refractometer.

Dilute solutions: Molarity, Molality, Normality and Mole fraction. Colligative properties, Thermodynamic derivation of $\Delta T_b = K_b \times m$ and $\Delta T_f = K_f \times m$, Osmotic pressure, van't Hoff equation and molecular mass, Isotonic solutions, Determination of molecular mass of solutes by Beckmann's method, Rast's method and cooling curve method. Abnormal molecular mass, van't Hoff factor, Determination of degree of dissociation and association.

Module IV – Thermodynamics I

9 hrs

Basic concepts- system, surroundings, types of systems. Extensive and intensive properties, macroscopic properties. State functions and path functions. Types of Processes, Zeroth law of thermodynamics

Definition of internal energy and enthalpy. Heat capacities at constant volume (C_v) and at constant pressure (C_p), relationship between C_p and C_v . Mathematical statement of first law. Reversible process and maximum work. Calculation of work, heat, internal energy change and enthalpy change for the expansion of an ideal gas under reversible isothermal and adiabatic condition. The Joule-Thomson effect – derivation of the expression for Joule-Thomson coefficient. Sign and magnitude of Joule-Thomson coefficient, inversion temperature.

Thermochemistry – standard states. Enthalpies of formation, combustion and neutralization. Integral and differential enthalpies of solution. Hess's law and its applications. Kirchoff's equation.

Module V – Spectroscopy – I

9 hrs

Regions of electromagnetic spectrum. Different units of energy (erg, joule, calorie, cm^{-1} , Hz, Å^0 and eV) and their inter conversions. Interaction of radiations with matter. Born-Oppenheimer approximation. Rotational spectroscopy: microwave spectra of diatomic molecules, energy expression, selection rule, rotational energy levels.

Vibrational spectroscopy: Harmonic oscillator. IR spectra of diatomic molecules.

Energy expression. Selection rules, frequency of separation, calculation of force constant, anharmonic oscillators. Morse equation. Fundamental and overtone transitions, degree of freedom of polyatomic molecules.

Raman spectroscopy: Stoke's and antistoke's lines and their intensity difference, rotational Raman spectrum. Selection rule. Frequency of separation, vibrational Raman spectrum, Mutual exclusion principle.

Module VI – Group theory & Liquid crystals

9 hrs

Group theory: Elements of symmetry – Proper and improper axis of symmetry, plane of symmetry, centre of symmetry and identity element. Combination of symmetry elements, Point groups, C_{2v} , C_{3v} and D_{3h} , Group multiplication table of C_{2v} , Determination of point groups of simple molecules like H_2O , NH_3 and BF_3 . Liquid crystals: Types of liquid crystals – smectic, nematic and cholesteric, Swarm theory of liquid crystals, uses of liquid crystals.

(At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.)

References

1. P W Atkins, "Physical Chemistry", Oxford University Press
2. R J Silby and R A Alberty, "Physical Chemistry", John Wiley & Sons
3. G W Castellan, "Physical Chemistry", Narosa Publishing House
4. F Daniels and R A Alberty, "Physical Chemistry", Wiley Eastern
5. E A Moelwyn Hughes, "Physical Chemistry", Pergamon Press
6. Puri, Sharma and Pathania, "Principles of Physical Chemistry", Millennium Edition, Vishal Publishing Co
7. R. Stephen Berry, Stuart A. Rice, John Ross, "Physical Chemistry, 2nd edition, Oxford".
8. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publishing House
9. S Glasstone, "Thermodynamics for Chemists", Affiliated East West Publishers
10. L V Azaroff, "Introduction to Solids", McGraw Hill
11. N B Hannay, "Solid State Chemistry", Prentice Hall
12. Anthony R West, "Solid State Chemistry and its Applications", Wiley Eastern
13. V Ramakrishnan and M S Gopinathan, "Group Theory in Chemistry", Vishal Publishing Co.
14. A. Salahuddin Kunju and G. Krishnan "Group Theory and its Applications in Chemistry"

Core Course VI

15UCH542: Inorganic Chemistry – III

No. of credits: 4

No. of instructional hours per week: 4

Module I Transition and inner transition elements **18hrs**

(a) Transition elements : Electronic configuration and general characteristics - Comparison of 3d, 4d and 5d transition series – Colour, catalytic activities and spectral properties with reference to d1 to d10 systems. Preparation, properties and uses of $K_2Cr_2O_7$, $KMnO_4$ and $TiCl_4$.
(b) Lanthanides and actinides : Lanthanides - electronic configuration and general properties – Occurrence and isolation of lanthanides from monazite – Lanthanide contraction – Magnetic properties and complexation behaviour.

Actinides – Oxidation states, ionic radii, colour, complex formation in comparison with lanthanides.

Module II Coordination Chemistry **18hrs**

Nomenclature – EAN rule – Chelates – Stability of complexes – Factors affecting stability of complexes – Isomerism – Structural and stereoisomerism – Geometrical and optical isomerism – Bonding in complexes – V.B. Theory, CFT applied to Oh and Td complexes, Effect of crystal field splitting – factors affecting crystal field - CFSE – Spectrochemical series - M.O.Theory – Magnetic properties and colour of metal complexes – Application of coordination compounds in quantitative and qualitative analysis.

Module III Organometallic Compounds and

Bioinorganic Chemistry **18 hrs**

Organometallic Compounds : Definition – Nomenclature and classification – sigma complex – Pi complex – those containing both sigma and Pi bonds – 18 electron rule – Metal carbonyls – mononuclear and polynuclear (give examples of carbonyls of Fe, Co, Ni) – preparation and properties of carbonyls of iron and nickel – Bonding in organometallic compounds like ferrocene, dibenzene chromium, Ziese's salt – Dinitrogen complexes – Application of organometallic compounds.

Bioinorganic Chemistry : Role of metal ions in biological systems – Biochemistry of iron, haemoglobin and myoglobin (elementary idea of the structure and mechanisms of their actions) – Photosynthesis – Sodium-Potassium pump - Biochemistry of magnesium and calcium (brief study only)

Module IV Compounds of non-transition elements **18hrs**

Manufacture and uses of the following Glass – different types of glasses, Silicates, Zeolites and Silicones .Inorganic Polymers : Phosphorus, boron and silicon based polymers – Structure and industrial applications. Borax - boron hydrides, boron nitrides, borazole and carboranes. Oxides and oxyacids of phosphorus. Oxides and oxyacids of halogens (structure only) – Inter halogen compounds and pseudo halogens – Compounds of noble gases – Uses of noble gases. Refractory carbides, nitrides, salt-like carbides, borides, and silicides

References

1. Advanced Inorganic Chemistry : Cotton and Wilkinson
2. Inorganic Chemistry : J.E. Huheey
3. Inorganic Chemistry : Shriver and Atkins
4. Concise inorganic Chemistry : J.D.Lee
5. Coordination Chemistry : Bosolo and Johnson
6. Coordination Chemistry : S. F. A. Kettle
7. Bio inorganic Chemistry : M.N. Hughes

Core Course VII

15UCH543: Physical Chemistry – II

No. of credits: 4

No. of instructional hours per week: 4

Module I – Phase Equilibria **12hrs**

Phase Equilibria:-Terminology, the phase rule, thermodynamic derivation of phase rule and its application to (a) water system (b) sulphur system (c) solid-liquid equilibria involving simple eutectic system such

as Pb-Ag system, KI-water system, freezing mixtures, thermal analysis and desilverisation of lead (d) solid-liquid equilibria involving compound formation with congruent and incongruent melting points:- $\text{FeCl}_3 - \text{H}_2\text{O}$ system and $\text{Na}_2\text{SO}_4 - \text{H}_2\text{O}$ system (e) solid-gas system- decomposition of CaCO_3 , dehydration of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, deliquescence and efflorescence.

Module II – Colloids and Adsorption

12hrs

Colloidal state: Types of solutions – true, colloid and suspensions, Purification of colloids – ultra filtration and electro dialysis, Kinetic, optical and electrical properties of colloids. Ultra microscope, Electrical double layer and zeta potential. Coagulation of colloids, Hardy-Schulz rule. Gels: Elastic and non-elastic gels, Imbibition and syneresis, Micelles and critical micelle concentration, sedimentation and streaming potential, Application of colloids – Cottrell precipitator, purification of water and delta formation.

Adsorption: Physical and chemical adsorption, Freundlich adsorption isotherm, Derivation of Langmuir adsorption isotherm, Statement and explanation of BET and Gibbs isotherms, determination of surface area of adsorbents by Langmuir equation. Applications of adsorption.

Module III – Binary liquid systems & catalysis

12hrs

Liquid-Liquid system:- Completely miscible, ideal and non-ideal mixtures, Raoult's law, vapour pressure- composition and temperature-composition curves, fractional distillation, deviation from Raoult's law, Azeotropic mixtures, partially miscible liquid system, critical solution temperature, Conjugate layers, example for upper, lower and upper cum lower CST, Theory of steam distillation, distribution law, its thermodynamic derivation, limitations of distribution law, application of distribution law to the study of association and dissociation of molecules, solvent extraction.

Catalysis:- Theories of catalysis, Intermediate compound formation theory, steady state method, Enzyme catalysis, Michaelis-Menten law.

Module IV – Thermodynamics II

12 hrs

Need for IInd law. Different statements of IInd law, Thermodynamic scale of temperature. Carnot cycle and its efficiency, carnot theorem. Concept of entropy- Definition and physical significance. Entropy as a function of volume and temperature, Entropy as a function of pressure and temperature. Entropy as a criteria of spontaneity and equilibrium. Gibbs and Helmholtz free energies and their significances- criteria of equilibrium and spontaneity. Gibbs-Helmholtz equation, dependence of Gibbs free energy

change on temperature, volume and pressure. Maxwell's relations. Partial molar quantities-Chemical potential-Gibbs-Duhem equation. Concept of fugacity, determination of fugacity by graphical method.

Nernst heat theorem, proof and its consequences. Statement of third law –Plank's statement, Lewis Randall statement. Exceptions to third law with reference to examples –CO, NO, N₂O and H₂O.

Module VI – Non-spectroscopic methods

12 hrs

Non-spectroscopic methods: Dipole moment, Debye equation and Clausius-Mosotti equation, measurement of dipole moment by temperature method, Dipole moment and molecular structure, Diamagnetism and paramagnetism, Magnetic susceptibility and unpaired electrons, measurement of magnetic susceptibility, Molar refraction and molecular structure, Atomic refraction, Optical exaltation, Parachor and atomic equivalent of parachor. At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.

References

1. P W Atkins, "Physical Chemistry", Oxford University Press
2. R J Silby and R A Alberty, "Physical Chemistry", John Wiley & Sons
3. G W Castellan, "Physical Chemistry", Narosa Publishing House
4. Puri, Sharma and Pathania, "Principles of Physical Chemistry", Millennium Edition, Vishal Publishing Co.
5. Gurdeep Raj, "Advanced Physical Chemistry", Goel Publishing House.
6. S Glasstone, "Thermodynamics for Chemists", Affiliated East West Publishers
7. M C Gupta, "Elements of Statistical Thermodynamics", New Age International (P) Ltd.
8. L K Nash, "Elements of Statistical Thermodynamics", Addison Wesley
9. A W Adamson, "The Physics and Chemistry of Surfaces", Interscience
10. N K Adam, "The Physics and Chemistry of Surfaces", Oxford University Press
11. Manas Chanda, "Atomic structure and Chemical bonding in Molecular Spectroscopy", Tata McGraw Hill
12. Physical Chemistry, R. Stephen Berry, Stuart A Rice & John Rose 2nd Edn Oxford

Core Course VIII

15UCH544: Inorganic Volumetric analysis

No. of credits: 3

No. of instructional hours per week: 5

Inorganic Volumetric analysis (Double Burette titration)

(a) Acidimetry and alkalimetry

Preparation of carbonate free sodium hydroxide. Use of constant boiling hydrochloric acid Titrations using (1) Strong acid – strong base (2) Strong base – weak acid (3) Strong acid – weak base, determination of Na_2CO_3 and NaHCO_3 in a mixture by indicator method and NH_3 in an ammonium salt by direct and indirect methods.

(b) Permanganometry

The following determinations are to be done using standard permanganate solution (1) Ferrous iron (2) Oxalic acid (3) Hydrogen peroxide (4) Calcium (5) Nitric and (6) MnO_2 in pyrolusite.

(c) Dichrometry

Determination of Ferrous iron using internal indicator and Ferric iron after reduction with SnCl_2 .

(d) Cerimetry

Standardisation of ceric ammonium sulphate with Mohr's salt. Determination of oxalic acid using ceric ammonium sulphate.

(e) Iodometry

Standardisation of thiosulphate using KIO_3 , electrolytic copper and potassium dichromate. Determination of a copper salt.

(f) Precipitation titration

Determination of chloride in neutral medium.

(g) Complexometry (using EDTA)

Standardisation of EDTA solution with ZnSO_4 – determination of Zn, Mg, Ni and Ca – determination of permanent and temporary hardness of water.

Core Course IX

15UCH545: Physical Chemistry Experiments

No. of credits: 2

No. of instructional hours per week: 4

I. Physical Chemistry Practicals

The following experiments are to be done :

Determination of

1. Partition coefficient of iodine between CCl_4 and H_2O or Partition coefficient of ammonia between CHCl_3 and H_2O
2. Transition temperature of a salt hydrate. Molar mass of a solute using transition point depression of a salt hydrate.
3. Depression in freezing point of a solid solvent by cooling curve method. Molar mass of a solute.
4. Critical solution temperature of phenol – water system.
5. Viscosity of binary mixtures and then concentration of an unknown mixture.
6. Surface tension of binary mixtures and then concentration of an unknown mixture.
7. Refractive indices of KCl solutions of different concentrations and then concentration of an unknown KCl solution.
8. Conductometric titration of NaOH Vs HCl.
9. Potentiometric titration of Fe^{2+} vs $\text{K}_2\text{Cr}_2\text{O}_7$
10. Potentiometric titration of KMnO_4 Vs KI
11. Determination of water equivalent of a calorimeter and heat of neutralisation of strong acid – strong base.
12. Kinetics of hydrolysis of an ester
13. Influence of KCl impurity on miscibility temperature of phenol – water system and then the determination of concentration of a given KCl solution.

Open Course

15UCH551.1: Essentials of Chemistry

No. of credits: 2

No. of instructional hours per week: 3

Module 1: Atomic structure and Periodic Classification of Elements 9hrs

Structure of atom- Fundamental particles, atomic mass, atomic number, isotopes. Bohr theory of atom. Orbitals- Quantum numbers, aufbau principle, Hund's rule; Pauli's exclusion principle. Electronic configuration of atoms- half and completely filled orbitals. Modern periodic table: Periods, Groups, Periodicity- valency, atomic radius, electronegativity, Ionisation potential, Electron affinity.

Module 2 :Nuclear Chemistry, Green chemistry and Nano chemistry 9hrs

Nuclear fission and Nuclear fusion. Rock dating- Radio carbon dating. (elementary idea only)

Green chemistry- Role of chemical industries in polluting the environment, polymer recycling , biodegradable polymers, introduction to the principles of green chemistry

Nano chemistry - Basic concepts , fullerene, carbon nanotube, quantum dot. Applications of nanotechnology (Brief idea only)

Module 3 :Polymer Chemistry 9hrs

Classification of polymer: Origin, structure, synthesis, Molecular forces. Commercially important polymers: Application of polyethylene, polystyrene, polyhaloolefines, Nylon-6, Nylon-66, Melamine, Terylene, Bakelite, Natural and synthetic rubber, vulcanization, inorganic polymer: (Examples Only).

Module 4 :Chemistry in Biological Process 9hrs

Vitamins: Vitamin-A, Vitamin-B2, Vitamin-C, Vitamin-D, Vitamin-E and Vitamin-K- Name, Source, Function and deficiency diseases. Enzymes- Classifications, characteristics, role, examples. Hormones- Sex hormones- Androgens, oestrogens, progesterone, Example, function. Cortical hormones- A few examples with function. Nucleic acid- RNA, DNA: Introduction- role in life process (No structure or chemical reactions needed).

Module 5 : Chemistry in action**9hrs**

Dyes: classification based on constitution, application, examples, uses. Drugs: Antipyretic, analgesic, antiseptic, disinfectants, tranquilisers, antibiotics structure, name and uses only. Soaps and detergents: Hard and soft soaps, anionic, cationic and non-ionic detergents, cleansing action of soaps, Explosives: TNT, TNG, RDX, Gun cotton: name, structure and action. (No structure or chemical reactions needed)

Module 6 :Environmental Chemistry**9hrs**

Air Pollution: Types of pollutant in air- carbon monoxide, carbon dioxide, Nitrogen oxides, Sulphur dioxides, hydrogen sulphide, Cl_2 , CFC, particulate matter, metals, fly ash, asbestos, hydrocarbons- source and influence. Acid rain, Green house effect, ozone layer and its depletion. Water Pollution: Various factors affecting purity of water, sewage water, industrial waste, agricultural pollution such as pesticides, fertilizers, detergents. Hard and soft water, Removal of hardness, disadvantage of hard water. Soil pollution : Due to pesticides, herbicide, fungicide, long term use of fertilizers, plastic waste

References

1. M. C. Day and J. Selbin, "Theoretical Inorganic Chemistry".
2. H. S. Arniker, "Essentials of Nuclear Chemistry".
3. B.K. Sharma "Environmental Pollution".
4. Solomons- John- Wiley, "Fundamentals of Organic Chemistry".
5. F.A. Carey, Mc. Graw Hill, "Organic Chemistry" Inc. 226
6. I.L Finar, "Organic Chemistry", Vol. 1 Longman
7. Tewari, Mehrotra- Vikas & Vishnoi, "A Text book for Organic Chemistry".
8. M.K. JainJain, "Principles of Organic Chemistry".
9. A.K. Dey, "Environmental Chemistry".

SEMESTER VI

Core Course X 15UCH641: Organic Chemistry II

No. of credits: 4

No. of instructional hours per week: 3

Module I Alcohols , Ethers and Phenols **9 hrs**

Preparation and properties, Zeisels method, Brief study of crown ethers and epoxides Monohydric alcohols: Classification, physical properties–hydrogen bonding–distinction between primary ,secondary and tertiary alcohols- Ascent and decent in alcohol series Dihydric alcohols: Oxidative cleavage – Lead tetra acetate, Periodic acid- Pinacol - Pinacolone rearrangement –mechanism, Phenols – Acidity of phenols- effects of substituents – comparison of acidity with alcohols, Preparation and uses of nitrophenols, picric acid, catechol, resorcinol and quinol Mechanisms of Reimer –Tiemann reaction, Fries rearrangement.

Module.II Aldehydes and Ketones **9 hrs**

Structure and reactivity of the carbonyl group - acidity of alpha hydrogen. Comparative studies of -aldehydes and ketones,Reimer-Tiemann(mechanism) – aliphatic and aromatic aldehydes - formaldehyde and acetaldehyde-Mechanism of nucleophilic additions to carbonyl groups with mechanism on Claisen , Benzoin, Aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction(mechanism). Mannich reaction.-Addition of Grignard reagents. Oxidation and reduction of aldehydes and ketones - Baeyer-Villiger oxidation-Cannizzaro's reaction(mechanism), Meerwein-Ponendorf Verley reduction, Clemmensen, Wolff- Kishner, LiAlH_4 and NaBH_4 reductions (mechanisms expected) .Use of acetal as protecting group, Beckmann rearrangement(mechanism)

Module.III Ethers, Carboxylic acids and their derivatives **9 hrs**

Carboxylic acids and their derivatives: - Preparation and properties of aliphatic and aromatic carboxylic acids. Ascent and descent series in aliphatic carboxylic acids. Effect of substituents on acidity of aliphatic and

aromatic carboxylic acids. Preparation, properties and uses of anthranilic acid, cinnamic acid, lactic acid, salicylic acid, adipic acid, acid anhydrides, amides, esters, coumarin, malic acid, tartaric acid and citric acid.

Module IV Organic reagents and organometallic compounds 9Hrs

Acetoacetic ester-synthesis and tautomerism-synthetic application of Acetoacetic ester, Synthesis and synthetic application of Diethylmalonate. Grignard reagents, organic zinc reagents, Reformatsky reaction.

Module V Amino acids, Proteins and Nucleic acids 9 hrs

Amino acids: - Classification, structure and stereochemistry of amino acids, essential and non essential amino acids, zwitter ion, isoelectric point, General methods of preparation and reactions of α -amino acids. Peptides: structure and synthesis (Carbobenzoxy method, Sheehan method only, Solid Phase Peptide Synthesis). Proteins: - Structure of proteins, denaturation and colour reactions. Nucleic acids: - Classification and structure of DNA and RNA. Replication of DNA, Genetic Codes

Module VI Oils, Fats, Detergents, Alkaloids, Vitamins and Terpenes 9hrs

Oils and Fats: - Occurrence and extraction. Common fatty acids, soap, saponification value, iodine value, acid value, Alkaloids: - Extraction and structural elucidation of conine, nicotine and importance of quinine, morphine and codeine. Terpenes: - Essential oils, isolation of citral and geraniol (No structural elucidation) Isoprene and special isoprene rule. Vitamins: - Classification and structure (structures of vitamin A, B1 and C but no structural elucidation). Chemistry of vision

References

- 1 Morrison & Boyd, "Organic Chemistry".
- 2 F. Carey, McGrawHill, "Organic Chemistry".
- 3 I.L. Finar, "Organic Chemistry", Vol I & II Longmann.
- 4 L.G. Wade, "Organic Chemistry".
- 5 P.Y. Bruice, "Organic Chemistry".
- 6 Stanley, H. Pine, McGrawHill, "Organic Chemistry".
- 7 Jerry March, "Advanced Organic Chemistry".
- 8 S.M. Mukherji and S.P. Singh, "Reaction Mechanism in Organic Chemistry" MacMillan.

9. Rein hard Bruckner ,“Advanced Organic Chemistry Reaction Mechanism”.
- 10 Bahl&Bahl,“ Advanced Organic Chemistry”.
- 11 Tewari, Mehrotra,“ A text book of Organic Chemistry”.
- 12 M.K. Jain ,“Principles of Organic Chemistry”.
- 13 Fieser&Fieser,“ Advanced Organic Chemistry”.
- 14 D. Nasipuri, “Stereo Chemistry of Organic compounds” Wiley Eastern.
- 15 Arun Parikh, Hansa Parikh, Khyati Parikh ,“Name Reactions in Organic Synthesis”.

Core Course XI

15UCH642: Organic Chemistry- III

No. of credits: 4

No. of instructional hours per week: 4

Module –I Polymers

18hrs

Polymers- Types of polymerization- addition, condensation and coordination polymerization. Ziegler –Natta catalyst. Synthesis and applications of urea – formaldehyde resins, Bakelite, polythene, PVC, PMMA, Nylon-6,6. Natural and synthetic resins. Buna-N , Buna-S, Neoprene, Polystyrene. Biodegradable polymers- two examples- starch and cellulose. Number average molecular weight and weight average molecular weight of polymers. Composites(refer any two) Dyes- Theory of colour and constitution, classification of dyes, synthesis of methyl orange, congo red, malachite green, crystal violet, phenolphthalein, fluorescein, alizarin and indigo

Module –II Organic Sulphur and Nitrogen compounds

18 Hrs

Aromatic sulfur compounds –Preparation and applications of benzene sulphonic acids, toluene sulphonic acid, benzene sulphonyl chloride, sulphanic acid , sulphanilamide and sulphadiazine, sulphathiazole, sulphathiazole, sulphadiazine, sulphaguanidine and sulphacetamide. synthetic detergents and detergent action, alkyl and aryl sulphonates. Organic Nitrogen Compounds Nitro compounds- preparation of nitroalkanes and nitroarenes, tautomerism, reduction of nitrobenzene in acid ,

base and neutral medium. General methods of preparation and reactions of aliphatic and aromatic amines, sandmeyer's reaction classification of amines, separation of mixture of amines, methods to distinguish primary, secondary and tertiary amines, basicity of amines, effect of substituents, quaternary ammonium compounds- Hofmann elimination. Diazonium and diazocompounds preparation, structure and their synthetic importance. Benzidine rearrangement

Module III- Heterocyclic compounds and Drugs- 18 Hrs

Introduction, classification of heterocyclic compounds, nomenclature, aromaticity, preparation and properties of furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline, pyrimidine, purine and indole. Structural elucidation of pyrrole, pyridine and indole. Mechanism of electrophilic substitution in indole, quinoline and isoquinoline. Importance of heterocyclic compounds in medicine and biochemistry. Classification of Drugs. Classification of various types of drugs with examples. Rational drug design and synthesis, salicylic acid and its derivatives, Ibuprofen. Principles of green chemistry.

Module IV – Organic Spectroscopy 18 Hrs

UV-Visible Spectroscopy- absorption, types of electronic transitions, effect of conjugation, concept of chromophore, auxochrome, bathochrome, hypochromic shifts, hyperchromic and hypochromic effects. UV-Visible spectra of enes. Calculation of λ_{max} .

IR Spectroscopy- molecular vibrations, factors influencing vibrational frequencies, inductive effect and hydrogen bonding. Finger print region and interpretation of IR spectra of simple organic molecules such as phenol, acetone, acetanilide, benzaldehyde.

NMR spectroscopy- Proton NMR- shielding and deshielding effect, chemical shift, factors influencing chemical shift, spin-spin splitting, coupling constant, interpretation of PMR spectrum of simple molecules like ethylbromide, pure ethanol and impure ethanol (acidic impurities), acetaldehyde and toluene.

Basic knowledge of ^{13}C NMR. Theory of Mass spectrometry- mass spectrum, base peak and molecular ion peak, types of fragmentation, McLafferty rearrangement, isotopic effect. Applications- determination of molecular mass.

References :

1. Bahl & Bahl ,“Advanced Organic Chemistry”.
2. Tewari & Mehrotra ,“Advanced Organic Chemistry”.
3. M K Jain,“Principles of Organic Chemistry”.
4. Fieser & Fieser “Advanced Organic Chemistry”.
5. Jerry March,“Advanced Organic Chemistry”.
6. Morrison & Boyd ,“Organic Chemistry”.
7. I L Finar ,“Organic Chemistry” Vol I & II.
8. L G Wade,“ Organic Chemistry”.
9. S M Mukherji & S P Singh ,“Reactions , Mechanisms of Organic Chemistry”.
10. Peter Sykes ,“Organic Chemistry”.
11. William Kemp “Organic spectroscopy”
12. P S Kalsi “Spectroscopy of Organic Compounds”
13. Fred W. Billmeyer “Textbook of polymer chemistry”
14. V R Gowariker, N V Viswanathan, Jayadev Sreedhar “Polymer Science”
15. Jones, Norton & Norton “Organic Chemistry”

Core Course XII **15UCH643: PHYSICAL CHEMISTRY- III**

No. of credits: 4

No. of instructional hours per week: 4

Unit I: Chemical Kinetics

12 hrs

Order of reaction, Derivation of integrated rate equation of zero, first, second and third order reactions, nth order reaction, determination of order of reactions:- Graphical and analytical methods using integrated rate equations, Fractional life- method, Differential rate equation method, Isolation method. Kinetics of complex reactions:- Derivation of rate equation of (a) opposing reactions when both forward and backward reactions are of first order (b) first order consecutive reactions (c) parallel reactions forming two products with first order rate process, Qualitative idea of

chain reactions. Influence of temperature on rate of reaction: Arrhenius equation, Determination of Arrhenius parameter, Energy of activation and its significance. Collision theory, Derivation of the rate equation for a second order reaction based on collision theory, collision theory of unimolecular reactions, Lindemann mechanism, steady state approximation, Theory of absolute reaction rate.

Unit II: Chemical and Ionic equilibria

12 hrs

Equilibrium constant and free energy, Thermodynamic derivation of law of mass action, relation between K_p , K_c and K_x , Reaction isotherm, Temperature dependence of equilibrium constant, Pressure dependence of equilibrium constant, Clausius-clapeyron equations and its applications.

Ionic equilibrium : Ionic product of water, Effects of solvents on ionic strength, levelling effect, P_{ka} and P_{kb} values, solubility product and common ion effect and their applications, pH and its determination by indicator methods, buffer action, Henderson's equation, hydrolysis of salts of all types, degree of hydrolysis and hydrolytic constant, determination of degree of hydrolysis, relation between hydrolytic constant and ionic product of water

Unit III: Quantum mechanics

12 hrs

Radiation phenomena- blackbody radiation, photoelectric effect, Compton effect and atomic spectra. Plank's quantum theory and explanation of the radiation phenomena. Schrodinger wave equation – significance of, well behaved functions, Concept of operators and some operators of interest (properties of operators not required), Postulates of quantum mechanics Application of quantum mechanics to simple systems- particle in 1 D box, normalization of wave function, Particle in 3 D box. Concept of degeneracy. Application to hydrogen atom (no derivation) Schrodinger wave equation in Cartesian and spherical polar co-ordinates, Quantum numbers

Unit IV: Thermodynamics III & Statistical thermodynamics

12 hrs

Nernst heat theorem, proof and its consequences. Statement of IIIrd law-Plank's statement, Lewis Randall statement. Concept of perfect crystal, evaluation of absolute entropies of solid, liquid and gas. Exception to IIIrd law with reference to examples- CO, NO, N_2O and H_2O Phase space, system, assembly and ensemble-types of ensembles and uses.

Thermodynamic probability, Boltzmann distribution law (no derivation). Partition function, entropy and probability. Thermodynamic functions in terms of partition functions - internal energy, enthalpy, pressure, work function and free energy function.

Unit V: Electromotive force

12 hrs

Electrochemical cells(brief explanation) Reference electrodes-standard hydrogen electrode, calomel electrode, Types of electrodes-Metallic electrodes, anion reversible electrodes and redox electrodes, Electrode reactions and cell reactions, Derivation of Nernst equation for electrode potential and cell potential, Gibb's Helmholtz equation and EMF of a cell, calculation of ΔG , ΔH and ΔS from EMF data.

Concentration cells with and without transference, electrode and electrolyte concentration cells, derivation of equation for the EMF of concentration cells with and without transference, Liquid Junction Potential, Fuel cells :- Hydrogen-Oxygen fuel cell, Hydrocarbon – Oxygen fuel cell. Redox electrodes and redox systems, formal redox potential, principle of redox indicators, over voltage and polarization.

Applications of potential measurement:- Determination of ionic product of water, hydrolysis constant and solubility product, pH value using quinhydrone and glass electrode, potentiometric titrations of acid-base and redox reaction.

Unit VI: Spectroscopy – II

12 hrs

Electronic spectroscopy: Frank-Condon principle. Singlet and triplet states dissociation and pre-dissociation. Electronic spectra and diatomic molecules. Dissociation energy, electronic spectra of polyatomic molecules (qualitative idea only). NMR spectroscopy: Principle of NMR, nuclear spin. Interaction of nuclear spin with external magnet. Precession. Relaxation, Chemical shift. Low resolution spectra. Delta and tau scales. Spin-spin coupling and high resolution spectra. Electron spin resonance spectroscopy: principle. Types of substances with unpaired electrons, interaction of electron magnet with external magnet. Energy level splitting. Lande splitting factor, presentation of ESR spectrum. The normal and derivative spectra. Hyperfine splitting. Simple examples like methyl and benzene radicals.

At least 100 problems are to be worked out from all units together. 30% of the questions for Examination shall contain problems.

References:

1. Advanced Physical Chemistry , Gurdeep Raj, Goel publishing house
2. Elements of Physical Chemistry , Glasstone and Lewis, Macmillan
3. Physical Chemistry , P.C. Rakhit, Sarat Book House, Calcutta
4. A Text book of Physical Chemistry , K.L.K. Kapoor, Vol 1,3 & 4, Macmillan
5. Physical Chemistry, R. Stephen Berry, Stuart A. Rice & John Ross 2nd Edn, Oxford
6. Physical Chemistry , Levin, 5th edn , TMH
7. Physical Chemistry , G.M .Barrow, 6th edn, The McGRAW-HILL Companies , INC
8. Principles of Physical Chemistry, Puri, Sharma & Pathania, Vishal Publishing Co
9. R J Silby and R A Albery, "Physical Chemistry", John Wiley & Sons
10. G W Castellan, "Physical Chemistry", Narosa Publishing House
11. S Glasstone, "Thermodynamics for Chemists", Affiliated East West Publishers
12. M W Hanna, "Quantum Mechanics in Chemistry", Benjamin
13. I N Levine, "Quantum Chemistry", Prentice Hall
14. C N Banwell, "Fundamentals of Molecular Spectroscopy", Tata McGraw Hill

Core Course XIII

15UCH644: Organic Chemistry Experiments.

No. of credits: 3

No. of instructional hours per week: 5

I. Organic Chemistry Practicals (micro / semimicro scale)

1. Tests for elements : Nitrogen, halogens and sulphur
2. Determination of physical constants

3. Studies of the reactions of common functional groups using known organic compounds.
4. Qualitative analysis with a view to characterization of the functional groups. The following compounds may be given for the analysis : chlorobenzene, benzyl chloride, phenol, o – m – p – cresols, naphthols, resorcinol, benzaldehyde, acetophenone, benzophenone, benzoic, phthalic, cinnamic and salicylic acids, ethyl benzoate, methyl salicylate, benzamide, urea, aniline, o – m, p – toluidines, dimethylaniline, nitrobenzene, o – nitro toluene p – nitro toluene, m – dinitrobenzene, naphthalene, anthracene, glucose and sucrose.

Organic preparations involving halogenation, nitration, oxidation, reduction, acetylation benzoylation, hydrolysis and diazotisation. Isolation of an organic compound from a natural source eg. Hippuric acid from cow's urine.

5. Chromatography

- a. Paper chromatographic separation of mixture of nitroanilines, amino acids and sugars.
- b. Separation of a mixture of dyes by column chromatography.

6. Organic estimation

- a. Molar mass determination of an acid and base by titration method
- b. Determination of the phenol/aniline by bromate – bromide method
- c. Determination of the equivalent of an ester

Core Course XIV 15UCH645: Gravimetry

No. of credits: 2

No. of instructional hours per week: 3

I. Gravimetry

The following determinations are to be done using silica crucible

(1) Ba as BaSO_4

- (2) Sulphate as BaSO_4
- (3) Iron as Fe_2O_3
- (4) Calcium as CaCO_3
- (5) Aluminium as Al_2O_3 and Magnesium as $\text{Mg}_2\text{P}_2\text{O}_7$

The following determinations are to be done using sintered crucible

- (1) Magnesium as oxinate
- (2) Nickel using dimethyl glyoxime
- (3) Copper as copper thiocyanate and
- (4) Silver as silver chloride .

II. Colorimetry (Using photo electric colorimeter)

Determination of Iron using thiocyanate and ammonia using Nessler's reagent.

REFERENCE

1. A.I.Vogel, "A text book of Qualitative Analysis including semi micro methods" Longmans.
2. V.V.Ramanujam, "Semi micro Qualitative Analysis"
3. E.S.Gilreath "Qualitative Analysis using semi micro method" Mc Graw Hill
4. A.I.Vogel, "A text book of Qualitative Inorganic Analysis" Longmass
5. A.I.Vogel, "Elementary Practical Organic Chemistry" Longmass
6. Day and Raman, "Laboratory Mannual of Organic Chemistry". Viswanathan
7. Mann and Saunders, "Practical Chemistry"
8. A.Findlay, "Practical Physical Chemistry"
9. R.C.Das and E.Behara, "Experimental Physical Chemistry", Tata Mc Graw Hill
10. N.K.,Vishnu, "Advanced practical organic chemistry" Vikas publishing house, New Delhi

***Examination for 15UCH544 Lab course II and 15UCH545 lab course III may be conducted on the same day for 6 hrs at a stretch.**

Examination for 15UCH644 Lab course IV and 15UCH645 lab course V may be conducted on the same day for 6 hrs at a stretch.

Elective Course

15UCH661.2: BIOCHEMISTRY (Elective)

Module - I Blood 9hrs

Constituents of blood cells and plasma, plasma proteins, albumin and globular - lipoproteins, functions (Details not expected), Coagulation - 'Coagulation factors, Hemoglobin - functions, Structure of hemoglobin, abnormal hemoglobin

Module II Respiration 9hrs

Chemical and physiological events, affecting diffusion of O₂ and CO₂ during respiration, Transport of Oxygen in Blood O₂ dissociation curve, Interrelationship between O₂ and CO₂ transport

Module III Kidney Function 9hrs

Body water balance, buffers in blood, Formation of Urine, Kidney function, Renal Threshold, Constituents of Urine, diseases associated with Kidney function.

Module IV Nutrition 9hrs

Measurement of Energy Value of food , Calorific value, caloric requirement, Kilocalorie. Basal metabolic rate (BMR):- Significance, Condition, factors , measurement.

Module V Digestion And Absorption Of Food 9hrs

Outline study of digestion and absorption of Carbohydrates, proteins, fats and enzymes involved , composition and functions of bile - Bile pigments, Bile acids, Bile salts.

Module – VI Biochemical Techniques 9hrs

Chromatography - Ion exchange, adsorption paper, TLC, GLC, affinity, Gel filtration Electrophoresis - paper, gel, ultracentrifugation.

REFERENCES

1. Gyton, "Text Book of Medical Physiology".
2. Ganog, "Text Book of Medical Physiology".
3. David Randall, "Physiology".
4. Dr. A.C. Deb, "Fundamentals of Biochemistry".
5. Swaminathan, "Advanced Text Book on Food & Nutrition".
6. B. Srilakshmi, "Nutrition Science".