FATIMA MATA NATIONAL COLLEGE
(AUTONOMOUS)
KOLLAM

SCHEME & SYLLABUS OF

B.Sc. Polymer Chemistry

2015 Admission Onwards

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	=	18
Semester VI	=	24

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		Credits	Duration of ESE Exam	Evaluation		Total Credits
		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%	
15UEN121	Foundation course I	4		2	3 hrs	25%	75%	
15UPO141	Core course I	2		4	3 hrs	25%	75%	
15UPY131.2	Complementary course I	2	2	2	3 hrs	25%	75%	
15UMM131.2	Complementary course II	4	2	3	3 hrs	25%	75%	

Semester II								
Course Code	Course Title	Instructional Hours per Week		Credits	Duration of ESE Exam	Evaluation		Total Credits
		T	P			CE	ESE	
15UEN211.1	Language Course III	5		4	3 hrs	25%	75%	18
15UEN212.1	Language Course IV	4		3	3 hrs	25%	75%	
15UML/HN/FR211.1	Language Course V	4		3	3 hrs	25%	75%	
15UPO221	Foundation course II	2	2	3	3 hrs	25%	75%	
15UPY231.2	Complementary course III	2		2	3 hrs	25%	75%	
15UMM231.2	Complementary course IV	4		3	3 hrs	25%	75%	

Semester III								
Course Code	Course Title	Instructional Hours per Week		Credits	Duration of ESE Exam	Evaluation		Total Credits
		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%	
15UPO341	Core course II	3	2	3	3 hrs	25%	75%	
15UPY331.2	Complementary course V	3	2	3	3 hrs	25%	75%	
15UMM331.2	Complementary Course VI	5		4	3 hrs	25%	75%	

Semester IV								
Course Code	Course Title	Instructional Hours per Week		Credits	Duration of ESE Exam	Evaluation		Total Credits
		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%	
15UPO441	Core Course III	3		3	3 hrs	25%	75%	
15UPO442	Core course IV (Lab of 15UPO141, 15UPO341 & 15UPO441)		2	2	3 hrs	25%	75%	
15UPY431.2	Complementary Course VII	3		3	3 hrs	25%	75%	
15UPY432.2	Complementary Course VIII (Lab of 15UPY131.2, 15UPY231.2, 15UPY231.2 & 15UPY431.2)		7	4	3 hrs	25%	75%	
15UMM431.2	Complementary course IX	5		4	3 hrs	25%	75%	

Semester V								
Course Code	Course Title	Instructional Hours per Week		Credits	Duration of ESE Exam	Evaluation		Total Credits
		T	P			CE	ESE	
15UPO541	Core course V	3		3	3 hrs	25%	75%	18
15UPO542	Core course VI	4		4	3 hrs	25%	75%	
15UPO543	Core course VII	4		4	3 hrs	25%	75%	
15UPO544	Core Course VIII		6	3	3 hrs	25%	75%	
15UPO545	Core Course IX		3	2	3 hrs	25%	75%	
15UPO551	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	
15UPO641	Core course X	3		3	3 hrs	25%	75%	18
15UPO642	Core course XI	4		4	3 hrs	25%	75%	
15UPO643	Core course XII	4		4	3 hrs	25%	75%	
15UPO644	Core Course XIII		2	3	3 hrs	25%	75%	
15UPO645	Core Course XIV		6	4	3 hrs	25%	75%	
15UPO661.1	Elective Course	3		2	3 hrs	25%	75%	
15UPO646	Project and Factory Visit		3	4	viva		100%	

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=Total Credit Points/Total Credits=119.8/20=5.99=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 Question 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
Pronounciation-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 വാലും - പി.നാരായണക്കുറുപ്പ്
5. കവിയരങ്ങ് - കെ.എസ്. നാരായണപിള്ള
6. കുമാരാനാശാന്റെ 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 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.

Course II (Additional Language I)
15UFR111.1: COMMUNICATION SKILLS IN FRENCHNO. OF CREDITS: 3

No. of credits: 4

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
15UPO141: Inorganic Chemistry I

No. of credits: 4

No. of instructional hours per week: 4

Module I (Modern theory of atomic structure) 6 hours

Introduction to wave mechanics: Dual nature of electron, Heisenberg's uncertainity principle and its significance, Schrodinger wave equation for a particle in one dimensional box and its solution (no derivation), Radial and angular function, significance of and, orbital concept, Pauli's exclusion principle, Aufbau principle, extra stability of filled and half-filled orbitals, shape of orbitals, classification of elements into s, p, d and f blocks.

Module II (Periodic properties, occurrence and isolation of elements) 6 hours

Size of atoms & ions, ionization energies, electron affinity, Fajan's rule. electronegativity - Pauling, Mulliken, Allred & Rochow scale, horizontal vertical and diagonal relationship in the periodic table. Occurrence & isolation of elements (brief idea)-mechanical separation of elements that exist in the native form, thermal decomposition methods, displacement of one element by another, high temperature chemical reduction method, electrolytic reduction, factors influencing the choice of extraction process.

Module III (Chemical bonding I) 6 hours

Types of bonds, transition between the main types of bonding, General properties, ionically & covalently bonded compounds, lattice energy, Born - Haber cycle. Fajans rule, partial covalent character of ionic bond. Secondary bond forces - Van der Waal's forces, ion--dipole, dipole-dipole, ion-induced dipole and dipole - induced dipole interactions, Hydrogen bonds and their consequences, dipole moment and its application.

Module IV (Chemical bonding II) 6 hours

Covalent bond - Lewis theory, Sidgwick - Powell theory, VSEPR theory, V.B. theory (qualitative idea taking hydrogen as example), Hybridisation (explanation of structures of molecules such as SF_4, ClF_3, IF_7, XeF_4 &

XeF_6). Sigma & pi bonds, the extent of d orbital participation in molecular bonding, M. O. Method – s-p, p-p, p-d, d-d, and non- bonding combinations of orbitals, rules of LCAO, M.O. configuration of H_2^+, He_2+,Li_2+, C_2, N_2, O_2, O_{2-}, F_2, NO and CO, bond order, M.O. treatment involving delocalized pi bonding-resonance. Metallic bonding - general properties, qualitative idea of theories of bonding in metals – free electron theory, V.B. theory, and band theory.

Module V (Nuclear chemistry) 6 hours

Structure of nucleus - liquid drop model, shell model, forces in the nucleus, stability, ratio of neutrons to protons, modes of decay,gamma radiation, half-life period, binding energy & nuclear stability -alpha decay, radioactive decay series, induced nuclear reactions -nuclear fission &nuclear fusion, atomic bomb, moderators. Types of reactor (general idea) HTR,water cooled thermal reactor, fast breeder reactors, application of radioactive isotopes-radio carbon dating, rock dating, neutron activation analysis, solubility of sparingly soluble salt.

Module VI (Analytical principles) 6 hours

Qualitative analysis - Principles of elimination of interfering anions,principles involved in the precipitation of compounds of cation. Volumetric analysis, acid-base, redox,precipitation& complexometric titrations. Indicators- acid -base, redox & adsorption indicators. Gravimetric analysis - factors affecting the solubility of precipitates - co-precipitation & error due to coprecipitation. Colorimetric methods - theory & application.

References

1. J. D. Lee .Concise inorganic chemistry, Blackwell science limited
2. Sathya Prakash , G. D. Tuli, Basu S. K. &Madan R. D. ,Advanced Inorganic Chemistry, (Vol. I) ,5. Chand &COI71.LId .New Delhi.
3. F.A. Cotton.P. L .Gaus& G. Wilkinson, Basic inorganic Chemistry, John Wtlev & Sons.
4. B. R. Puri, L. R. Sharma & K .C .Kalia Principles of Inorganic Chemistry .Vallabh Publications .New Delhi
5 . D. F. Shriver, P .W. Atkins &C.H .Langford, Inorganic Chemistry, Oxford Univ. Press
6. M.C. Day &Selbin ,Theoretical Inorganic Chemistry
7. R .D .Madan .Modern Inorganic Chemistry, S. Chand &Company Ltd Jv ‘w Delhi.

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 applica-

tions. 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. Re-sults 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 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 diagonalisabe (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. Tayfoor, 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 ഉത്ഭവ - 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. സാറാജോസഫ് - അടുക്കളകൾ തിരിച്ച് പിടിക്കുക

റഫറൻസ് ഗ്രന്ഥങ്ങൾ

1. സമ്പൂർണ്ണ മലയാള സാഹിത്യ ചരിത്രം - എഡിറ്റർ പന്മന 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.രവികുമാർ

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

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

Foundation Course II

15UPO221: METHODOLOGY & INFORMATICS

No. of credits: 3

No. of instructional hours per week: 4

Module – 1 (Science and its Methods) **12 hrs**

Theories and laws of science. Basis for scientific laws and factual truths. Science and technology.Scientific temper, empiricism and the vocabulary of science. Hypothesis, observations and proofs. Formulation of hypothesis, its verification (proving), corroboration and falsification (disproving), Revision of scientific theories and laws.Importance of models, simulations and virtual testing.

Module II **12 hrs**

(Experimentation and Data Handling in Science)

Design of an experiment. observation, data collection, interpretation and deduction, repeatability and replication. Documentation of experiments. Planning of experiments-Design, selection of controls, choice and selection of instruments. Data interpretation, significance of statistical tools in data interpretation, errors and inaccuracies. Data presentation. Graphics, tables, histograms and pi diagrams, Accuracy and precision.

Module III **12hrs**

(Evolution of chemistry as a discipline of science)

Ancient speculations on the nature of matter, alchemy- early form of chemistry, Robert Boyle and the origins of modern chemistry, Antoine Lavoisier and the revolution in chemistry, Chemical atomism- John Dalton, Atom model- J.J. Thomson, Ruther Ford and Bohr.Major contributions of Friedrich Wohler, Dmitri Mendeleev, Michael Faraday and Marie Sklodowska- Curie. Structure of chemical science: scope of chemical science, branches of chemistry. Evolution of nanoscience and Its basic aspects. Carbon nanotubes and fullerenes.Applications-in electronics, robotics, sensors, medicine. Introduction to green chemistry - basic aspects of atom economy calculations (simple reactions) .

Module IV **12 hrs**

Over view of information technology)

Personal computer and its peripherals, computer networks & internet, Wireless technology, introduction to mobile phone technology overview of operating systems & major application software. Data, information and knowledge, knowledge management, Internet access methods, internet as a knowledge repository, academic search techniques, internet-based information mining in chemistry and chemistry related websites. Basic concepts of IPR, copyrights and patents, plagiarism, IT in teaching and learning, educational software, academic services-INFLIBNET, NICNET, BRNET, Virtual labs.

Module V **12 hrs**

Introduction to Computer Applications in Polymer Chemistry

Structure drawing, spread sheet and chemistry related soft wares, collection of chemistry soft wares by RISC, 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. Back ground reading- Selected internet resources in chemistry, Majo publishers in chemical sciences, Author, Citation, Reviews, Key words

Module VI **12 hrs**

Introduction to Cheminformatics

Basics of cheminformatics, applications of cheminformatics, storage & retrieval, lie formats- MOL, SDF, CML, PDB formats, SYBYL Line Notation, SMILES of simple molecules like rrethane, ethyl alcohol, benzene, cyclohexane etc., Molecular visualization tools, Chemical Data baSIS, Chemical safety, Toxicology information- material safety data sheets.

Reference

1. Newton RG. The Truth of Science: New Delhi, 2nd edition
2. The Golem: What everyone should know about science. Collins and Pinch. Cambridge Univ 1993
3. Contemporary Science Teaching, DrSotiSivendra Chandra
4. The Story of Chemistry, N.C. Datta, Universrtv Press
5. Alexis Leon & Mathews Leon, Computers Today, Leon vikas

6. Alexis & Mathews Leon, Fundamentals and Information Technology. Leon Vikas ISBN 08125907890.
7. Ramesh Bangia, 'Learning Computer Fundamentals, Khanna Book Publishers, ISBN 818752252b
8. Barbara Wilson, Information Technology, the Basics, Thomas Learning.
9. Teaching of information Technology, RT Mishra
10. Methods of Teaching Chemistry, Kolasani Sunil Kumar, K Ramakrishna and D.B. Rao
11. Introduction to Information Technology, Prentice Hall,V. Rajaraman
12. Introduction to Cheminformatics, Andrew. R.Leach&V.J.Giliet
13. Principles of Nano science and nanotechnology, M A Shah, Tokeer Ahmed, Narosa Publishing House
14. T. Pradeep, "NANO: The Essentials", 'McGraw-Hili Education'
15. Anastas. P.T;Warner, J.C, "Green Chemistry; Theory and Practice", Oxford University Press; Oxford, U.K., 1998.
16. Green Chemistry; An introductory text, Lancaster.M, Royal society of chemistry,Cambridge, UK, 2003.

PART B. LABORATORY

COMPUTER LABORATORY [No ESA for this component]

ComputerLab based instruction on the use of IT in learning. Use of educational-softwares, information

mining from internet and using INFLIBNET/NICNET.Word processing and document preparation. Data

handling and presentation. Introduction to Scilab\Matlab.

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 :Kreyzig, Advanced Engineering Mathematics, 8thedition,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 Uty 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 സാഹിത്യപാഠങ്ങളെയും വിദ്യാർത്ഥികൾക്ക് പരിചയപ്പെടുത്തുകയാണ് ലക്ഷ്യം.

മൊഡ്യൂൾ ഒന്ന് (36 മണിക്കൂർ)

ആട്ടക്കഥ, തുള്ളൽ സാഹിത്യം

കഥകളിയുടെ ഉത്ഭവവികാസ പരിണാമങ്ങൾ, പ്രധാന ആട്ടക്കഥാകൃത്തുക്കൾ

തുള്ളൽ പ്രസ്ഥാനം - സാമാന്യ പരിചയം

1. ഉണ്ണായിവാര്യർ - 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 (നാലാം അങ്കം) - എ.ആർ.രാജരാജവർമ്മ
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.കൃഷ്ണപിളള
4. കുഞ്ചൻ നമ്പ്യാർ വാക്കും സമൂഹവും - കെ.എൻ.ഗണേഷ്
5. നാട്യശാസ്ത്രം - ഭരതമുനി
6. കഥകളി - ജി.കൃഷ്ണപിളള
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 & 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 ഇറവങ്കര
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 - കേരളഭാഷാഇൻസ്റ്റിറ്റ്യൂട്ട്
30. നാടകദർപ്പണം - എൻ.എൻ. പിളള
31. നാടകം ഒരു പഠനം - സി.ജെ.തോമസ്
32. ഉയരു 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)

A bouquet of French poems (Polyglot house) by Prof. T.P Thamby

Core Course II
15UPO341: PHYSICAL CHEMISTRY-I

No. of credits: 3

No. of instructional hours per week: 5

Module 1 First Law of Thermodynamics **9hrs**

Terminology of thermodynamics: 'System, surroundings, types of systems. Extensive and intensive properties.State and path functions. Types of processes- Zeroth law of thermodynamics. First law of thermodynamics: Definition of Internal energy and Enthalpy. Statement of first law. Heat capacities at constant volume (C_v) and at constant pressure (C_p). Thermodynamic derivation of the relation between C_p and C_v. Reversible process and maximum work. Calculation of work, heat, internal energy change and enthalpy change for the expansion of ideal gases under reversible, isothermal and adiabatic conditions.The Joule-Thomson effect. Derivation of the expression for Joule-Thomson coefficient.Sign and magnitude of Joule-Thomson coefficient, inversion temperature. Thermo chemistry: Heat of reaction at constant pressure (Q_p), at constant volume (Q_v) and their relationship. Enthalpies of formation, combustion

and neutralisation.Integral and differential enthalpies of solution. Hess's law and its application. Kirchoff s equation.

Module II :Gaseous State **9hrs**

Types of molecular velocities and their inter relations.-Maxwell Boltzmann distribution. Statement and explanation (No derivation).Effect of temperature.Derivation of R.M.S, average and most probable velocities from M B equation. Collision frequency, collision number, collision diameter and mean free path.Ideal gas equation. Behaviour of real gases.Deviation of real gases from ideal behaviour.Compressibility factor, Boyle temperature- Van der Waals' equation of state- derivation and importance.Virial equation of state.Determination of molar mass by limiting density method.

Critical phenomena-Isotherms of CO_2.Continuity of state.Critical constants and their experimental determination.Relation between critical constants and Van der Waals constants.Reduced equation of state. Liquefaction of gases-Linde's and Claude's process.

Module III : Colloids and Adsorption **9hrs**

Colloidal state: Purification of colloidal solutions -dialysis and ultra-filtration. Kinetic, electrical and optical properties of colloidal systems-Ultra microscope, Electrical double layer and zeta potential.

Coagulation of colloids, Hardy-Schulz rule and gold number. Gels: elastic and non-elastic gels, imbibition, synergesis. Surfactants -micelles, critical micelle concentration, sedimentation and streaming potential. Application of colloids-Cottrell precipitator-sewage disposal-formation of deltas. 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 IV : Chemical and Ionic Equilibria **9hrs**

Thermodynamic derivation of law of mass action. Relation between Kp, Kc and Kx. Vant Hoff reaction isotherm. Variation of equilibrium constant (Kp&Kc) with temperature - The Vant Hoff equation.

Ionic equilibrium: Ionic product of water. Effect of solvents on ionic strength.Levelling effect, Ionization of weak acids and bases.pK_a and pK_b values.Solubility product and common ion effect and their applications, pH and its determination by indicator methods.Buffers and calculation of their pH - Henderson'sequation.Hydrolysis of salts of all types.Degree of

hydrolysis and hydrolysis constant.Relationbetween hydrolysis constant and ionic product of water.

Module V: Chemical kinetics **9hrs**

Order and molecularity of reaction.Derivation of integrated rate equation of zero, first, second, third and n^{th} order reactions and examples. 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 equations 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 the rate of reactions. Arrhenius equation. Determination of Arrhenius parameter.Energy of activation and its significance.Collision theory.Derivation of rate equation for a second order reaction based on collision theory.Collision theory of unimolecular reactions.Lindeman mechanism.Steady state approximation.Theory of absolute reaction rate.

Module VI : Electrical Conductance **9hrs**

Conductance: Arrhenius^theory .Variation of conductance with dilution of strong and weak electrolyte. Debye- Huckeltheory of inter ionic attraction. Debye-Huckel-Onsagar equation (only qualitative treatment).Activity and activity coefficient of electrolytes.Kohlrausch's law and its application. Wien effect.Debye-Falkenhageneffect.Walden's rule.

Ionic mobilities: Transference number and its determination by Hittorff's and moving boundary methods. Abnormal transference number. Applications of conductivity measurements: Determination of degree of dissociation of weak electrolytes, degree of hydrolysis, solubility of sparingly soluble salts, conductometric titrations involving strong acid - strong base, strong acid weak base, weak acid - strong base, weak acid - weak base and precipitation

Reference:

1. Glasstone& Lewis, "Elementary Physical Chemistry", Longman.
2. Kundu& Jain, "Physical Chemistry", Chand.

3. Kapoor, “Elements of Physical Chemistry”, Macmillan
4. Barrow, “Physical Chemistry”.6th edn. The McGraw -Hill.
5. Alberty&Silbey, “Physical Chemistry”, John Wiley & Sons.
6. Castellan, “Physical chemistry”, Narosa Publishing House. New Delhi
7. Atkins, “Physical Chemistry”, Longman.
8. Glasstone, “Thermodynamics for Chemists”.
9. Rastogi&Misra, “An Introduction to Chemical thermodynamics”, Vikas.
10. Puri, Sharma &Pathania, “Principles of Physical Chemistry”, Vishal.
11. Gurdeep Raj, “Advanced Physical Chemistry’”, Goel.

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 piecwise 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 intrepretation 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.Murugeshan, 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 പ്രക്രീയ - വ്യവസ്ഥാപനം, നിർവ്യവസ്ഥാ

പനം, ആശയവിനിമയ പ്രക്രീയയുടെ 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 - വേർഡ്സ്വർത്തിന്റെ കാവ്യനിർവചനം - സർഗ്ഗാത്മകരചനയിലേക്കു നയിക്കു സാഹചര്യങ്ങൾ - ജന്മവാസനയും അനുഭവവും - രചനയുടെ വിവിധ ഘട്ടങ്ങൾ.

പ്രായോഗിക പരിശീലനം

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

വിദേശപഠനത്തിന്

1. സർഗ്ഗാത്മകത - ഡോ.കെ.എം. കോശി
(സാഹിത്യവിജ്ഞാന പ്രവേശിക)
2. വാക്കുകളുടെ ശില്പം - എം.കെ. സാനു
(കാവ്യതത്ത്വപ്രവേശിക)
3. എന്റെ കവിതയെപ്പറ്റി - സുഗതകുമാരി
(ഇരുൾച്ചിറകുകളുടെ ആമുഖം)
4. കാഥികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ
(ഒരുകഥ ജനിക്കുന്നു 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.മുട്ടത്ത്,
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. വ്യത്താന്തപത്രപ്രവർത്തനം - സ്വദേശാഭിമാനി രാമകൃഷ്ണപിള്ള, മാളുബെൻ പബ്ലിക്കേഷൻസ്

10. ലിറിക്കൽ ബാലഡ്സിന്റെ ആമുഖം - വില്യം വേർഡ്സ്വർത്ത്, വിവ: ഡോ.തോന്നയ്ക്കൽ വാസുദേവൻ, എം.എൻ.വിജയൻ സാസ്ക്കാരിക വേദി

11. സാഹിത്യവിദ്യ - കുട്ടികൃഷ്ണമാരാര്, മാരാർ സാഹിത്യ പ്രകാശം, കോഴിക്കോട്.

12. കാഥികന്റെ 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, കറന്റ ബുക്സ്, കോട്ടയം

20. ഭാഷാശുദ്ധി സംശയപരിഹാരങ്ങൾ - പ്രൊഫ.പന്മനരാമചന്ദ്രൻ നായർ

21. ഭാഷാശുദ്ധിയും ഭരണഭാഷയും - ഡോ.വിളക്കുടിരാജേന്ദ്രൻ, പ്രിയദർശിനി പബ്ലിക്കേഷൻസ്

22. മലയാളശൈലി - കുട്ടികൃഷ്ണമാരാര്, മാരാർ സാഹിത്യ പ്രകാശം, കോഴിക്കോട്

23. തായ്മൊഴി - എം.എൻ.കാരശ്ശേരി

24. ഭരണഭാഷാപ്രശ്നങ്ങൾ - എം.വി.തോമസ്,

കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്

25. വിവർത്തനവിചാരം - ഡോ.എൻ.ഇ.വിശ്വനാഥഅയ്യർ, കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്

26. തർജുമയുടെ 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 (Detailed) - Hindi Kavya Sopan
   Edited by Sathyaprakash Misra
   Published by Lokbharathi, New Delhi

Poems to be studied

1. Kabeer – Sakhi – 1 to 8
2. Soordas – Pad – 1to 3
3. Bihari – Doha – 1to 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

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

Core Course III

15UPO441: Organic Chemistry – I

No. of credits: 3

No. of instructional hours per week: 3

Module I: **9 hrs**

Introduction to Reaction Mechanisms and Hydrocarbons

Electron displacement effect - inductive, electromeric, resonance, hyper conjugation and steric effects.Homolytic and heterolytic fission of bonds. Reactive intermediates - carbocations, carbanions, free radicals,carbenes, nitrenes and benzyne.

Arenes: Aromaticity. HuckePs rule; Non-benzenoid aromatic compounds. Polynuclear hydrocarbons -preparation of Naphthalene, anthracene and phenanthrene, its resonance structures - aromatic electrophilicsubstitution.Directive influence of substituent such as -OH. $-NH_2$, $-NO_2$, Alkyl groups and halogens.

Module II: Organic Reaction Mechanisms **9 hrs**

Types of organic reaction - substitutions (in aliphatic and aromatic) SN1, SN^2 and SN^1 reactions andmechanisms. Addition reactions (electrophilic and nucleophilic) and Mechanism of addition of hydrogen, hydrogen halide to alkenes and alkynes - free radical addition, Markownikoff's rule and Kharasch effect.Elimination reactions - E^1 & E^2.Stereochemistry of the above reactions. Saytzeff's and Hofmann's rules.Competition between elimination and substitution.

Module III: Cycloalkanes and Conformations **9 hrs**

Cycloalkanes: Nomenclature, methods of formation (from halides, Simmons-Smith reaction) and reactions.Baeyer's strain theory and its limitations, ring strain in cyclopropane and cyclobutane. Theory of strainless rings, banana bonds in cyclopropane.Ring, angular and torsional strain, relative stabilities.

Conforrnations:Conforrnational analysis of ethane, n-butane, cyclohexane and mono substituted cyclohexanes. Fischer Newman, Saw-horse and wedge projections. Introduction to polycyclic alkanes: decalin, cubane, prismane andadamantane.

Module IV. Stereochemistry of organic compounds **9 hrs**

Elements of symmetry, chiralily, stereogenic centre, enantiomers, chiral and achiral molecules with two stereogenic centres, diastereoisomers, meso compounds, resolution, inversion and racemization.Absolute and relative configuration, D-E, R-S systems of nomenclature, Priority and sequence rules. Asymmetric synthesis.Geometrical isomerism: E-Z systems of nomenclature. Geometric isomerism of maleic and fumaric acid and butadiene.

Module V: **9 hrs**

Halogen Compounds, Alcohols, Phenols and Ethers

Halogen compounds: methods of preparation (from alcohol and alkene) and properties, synthetic uses of vinylchloride, chloroform, carbon tetrachloride, chloroprene, Freon-12, DOT, BHC. Alcohols, phenols and ethers: Methods of preparation (hydroboration & hydration of alkene) Special emphasis to oxy-mercuration, demercuration, hydroboration, oxidation and anti-hydroboration, crown ethers. Pinacol-pinacolone rearrangement. Mechanisms - Reimer-Tiemann reaction, Kolbe reaction. Fries and Claisen rearrangernents and their mechanisms.Phthalein reaction.

Module VI: Stereochemistry-II **9 hrs**

Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: - General methods of preparation: Grignard reaction; oxidation reaction. General chemical reactions.Reduction using $LiAlH_4$, Sodium borohydride and Aluminumisopropoxide - comparative study. Mechanism of Wolff-Kishner reduction, Clemmenson reduction, Aidol condensation and Benzoincondensation.Preparation and properties of aliphatic and aromatic carboxylic acids. Ascent and descent series in aliphatic carboxylic acids. Mechanism of Cannizarro reaction and Beckmann rearrangement.

References

1. K. S. Tewari, S.N. Mehrotra and N.K. Vishnoi, “A Text Book of Organic Chemistry”, Vikas
2. I. L. Finar, “Organic Chemistry” Vol 1 &2, Longman.
3. R. T. Morrison and R. T. Boyd, “Organic Chemistry”, Prentice-Hall.
4. F. Carey, “Organic Chemistry”. McGraw Hill

5. P. Y. Bruice “Organic Chemistry”
6. P. Sykes, “Guide Book to Mechanism in Organic Chemistry”, Orient Longman.
7. S. M. Mukherji and S. P. Singh, “Reaction Mechanisms of Organic Chemistry”, Macmillan.
8. M. K. Jain, “A Text Book of Organic Chemistry”.
9. Bahl and Bahl, “Advanced Organic Chemistry”.
10. P. S. Kalsi, “Stereochemistry and Mechanism through Solved Problems”, New Age.
11. P. S Kalsi, “Organic Reactions and Their Mechanisms”, New Age.
12. S. M. Mukherji and S. P. Singh, Reaction Mechanism in Organic Chemistry, McMillan

Core Course IV

15UPO442: Inorganic Qualitative and Volumetric Analysis

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:

Pb^{2+}, Cu^{2+}, Bi^{2+}, Cd^{2+}, Sn^{2+}, Sb^{2+}, Fe^{2+}, Fe^{3+},Al^{3+}, Cr^{3+}, Zn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+},Mg^{2+}, K+, NH_4^+, CO_3^{2-}, S^{2-}, NO_2^- , NO_3^-, F^-, Cl^-, Br^-, I^-, BO_3^- , acetate, oxalate, $CrO4^{2-}$, $PO4^{3-}$and $SO4^{2-}$.

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

III. 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 Na2CO3 and NaHCO3 in a mixture by indicator method and NH3 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) MnO2 in pyrolusite

(c) Dichrometry

Determination of Ferrous iron using internal indicator and Ferric iron after reduction with SnCl2.

(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 KIO3, 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 ZnSO4 – determination of Zn, Mg, Ni and Ca – determination of permanent and temporary hardness of water

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 R^n into 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 Churchil, 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 gnuplothttp://people.duke.edu/hpgavin/gnuplot.html
13. Maxima documentations http://maxima.sourceforge.net/documentation.html

Complementary Course VIII

15UPY431.2: ATOMIC PHYSICS, QUANTUM MECHANICS 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.Murugeshan, 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
15UPO541: ORGANIC CHEMISTRY-II

No. of credits: 3

No. of instructional hours per week: 3

Module I –Nitrogen and Sulphur Compounds **9 hrs**

Methods of preparation of aliphatic (reaction of alkyl halide or alcohol with ammonia) and aromatic(reduction, Hoffmann degradation) amines. Methods of separation of amine mixtures

Hoffmann and Hinsbergmethods.Hoffman exhaustive methylation.Preparation and uses of benzene diazonium salts. Benzidinere arrangement and its mechanism. Preparation, structure and properties of urea.Methods of preparation of mercaptans, sulphoxides, sulphones, sulphonic acid, sulphanilic acid and sulphanilamide.

Module II – Carbohydrates **9 hrs**

Classification and nomenclature of monosaccharides, configuration of monosaccharides Epimerization,mutarotation and anomers. Elucidation of structures of glucose and fructose. Chair conformation of D-glucopyranose.Occurrence and chemical properties of disaccharides. Elucidation of structure of sucrose. Starch and cellulose (brief study). Industrial application of cellulose,

Module III – **9 hrs**

Heterocyclic and Organometallic Compounds

Heterocyclic compounds: Introduction, classification and nomenclature. Aromaticity in heterocyclic compounds. General methods of preparation and properties of furan, thiophene, pyrrole, indole, pyridine,quinoline and isoquinoline. Importance of heterocyclic compounds. Organometallic compounds: Preparation, reactions and synthetic uses of Grignard reagent, organo zinc and organo lithium compounds. Reformatsky reaction. Synthetic reagents: Ethyl acetoacetate - synthesis, structure, tautomerism and synthetic applications. Diethyl malonate -synthesis and

synthetic application.

Module IV – Alkaloids, Terpenes, Dyes **9 hrs**

Alkaloids: Introduction, extraction and general properties. Elucidation of structures of coniine and nicotine.Importance of alkaloids.Terpenoids: Introduction - Isoprene and special isoprene rules. Isolation of terpenoids.Structure of citral and geraniol (structure elucidation not required). Importance of menthol, alphapinene and camphor. Dyes: Classification. Witt's theory. Synthesis of the following dyes: Methyl orange,congo red, Bismarck brown, malachite green, rosaniline, indigotin and alizarin.

Module V – Steroids, Vitamins and Drugs **9 hrs**

Steroids: Introduction. Diel's hydrocarbon.General nature of steroids. General idea of structure of cholesterol (elucidation not required). Sex hormones - examples and functions (Structure not expected).Importance of androgen, estrogen and cortisone. Vitamins: Introduction, classification and general features.Physiological functions and deficiency symptoms of vitamin A, thiamin, riboflavin, nicotinic acid, vitamin B_{12},C, D, E and K. Drugs: Classification of various types of drugs with examples. Sulphonamides, antimalarials and chemotherapy.

Module VI – Group theory & Liquid crystals **9 hrs**

Bioorganic Chemistry -Amino acids, Proteins and Nucleic Acids.

Amino acids: - Classification, structure and stereochemistry of amino acids -two methods of preparation,reactions of a-amino acids - essential and non-essential amino acids, zwitter ion, isoelectric point. Peptides:structure and synthesis (Carbobenzoxy method, Sheehan method only). Proteins: Structure of proteins, denaturation and colour reactions. Enzymes: General nature and classification, specificity of enzymes. Nucleicacids: Classification and structure of DNA and RNA. Replication of DNA, Genetic Codes.

Oils and Fats: -Occurrence and extraction. Common fatty acids, soap, saponification value, iodine value, acid value, synthetic detergents and detergent action, alkyl and aryl sulphonates.

References

1. K. S. Tewari, S.N. Mehrotra and N.K. Vishnoi, "A Text Book of Organic Chemistry", Vikas

2. I. L. Finar, “Organic Chemistry” Vol 1 &2, Longman.
3. R. T. Morrison and R.T. Boyd, “Organic Chemistry”, Prentice-Hall.
4. T. W. Graham Solomons, “Organic Chemistry”. John Wiley&Sons.
5. S. H. Pine, “Organic Chemistry”, Prentice Hall.
6. M. K. Jain, “A Text Book of Organic Chemistry”.
7. Bahl and Bahl, “Advanced Organic Chemistry”.

Core Course VI
15UPO542: PHYSICAL CHEMISTRY-II

No. of credits: 4

No. of instructional hours per week: 4

Module I Second Law of Thermodynamics **12 hrs**

Second law of thermodynamics: Need for II law. Different statements of second law-.The Carnot cycle and its efficiency.Carnot’s theorem and its proof.

Concept of entropy: Definition and physical significance. Entropy change for reversible and irreversible processes and in phase changes.Dependence of entropy on T, P and V. Gibb’s and Helmholtz free energies and their significances. Criteria of equilibrium and spontaneity. Gibb’s-Helmholtz equation. Dependence of Gibb’s free energy change on temperature, volume and pressure. Clausius - Clapeyron equation and its applications.

Maxwell’s relations. Partial molar quantities: Chemical potential. Gibb’s-Duhem equation. Concept of fugacity. Determination of fugacity of a gas by graphical method.

Module II Liquid state and Dilute solutions **12hrs**

Properties of liquids: Surface tension- measurement by capillary rise method and stalagmometer method,factors affecting surface tension. Viscosity-Poisuelle equation, Determination of viscosity by Ostwald’s viscometer. Refractive index and its determination by Abbe’s refractometer.

Dilute solutions: Molality, molarity, normality and mole fraction. Colliga-

tive properties. Thermodynamic derivation of $\Delta T_b = K_b \times m$ and $\Delta T_f = K_f \times m$. Osmotic pressure: Laws of osmotic pressure.-Van't Hoff equation. Determination of molecular mass of solute by Beckmann 'method, Rast method and cooling curve method.Abnormal molecular mass-Van't Hoff factor. Determination of degree of dissociation and association

Module III Solid state **12 hrs**

Isotropy and anisotropy, space lattice and Unit cell.Elements of symmetry of crystal.Crystal systems, Bravais lattices.Laws of crystallography, Miller indices, Representation of lattice planes of cubic crystals. Diffraction of X-rays by crystals: Braggs' equation-derivation and application, identification of type of cubic crystal. Rotating crystal and powder method.Structure of NaCl, KCland CsCl. Defects in crystals - Schottky and Frenkel defects.

Liquid crystals: Types of liquid crystals- smectic, nematic and cholesteric. Molecular arrangements in various states of liquid crystals, uses of liquid crystals.

Module IV Microwave & Infrared Spectroscopy **12hrs**

Regions of electromagnetic spectrum.Different units of energy (erg, Joule, calorie, cm"', Hz, A° and eV) and their interconversions. Interaction of radiations with matter.Various types of molecular spectra. Born-Oppenheimer approximation.

Rotational spectroscopy: Microwave spectra of rigid diatomic molecules. Moment of inertia. Derivation of energy expression and rotational energy levels.Selection rule. Determination of bond length.Effect of isotopic substitution.

Vibrational spectroscopy: Harmonic oscillator. IR spectra of diatomic molecules. Energy expression. Selectionrules. Frequency of separation. Calculation of force constant. Anharmonic oscillators.

Morse equation.Fundamental and overtone transitions.Combination bands and hot bands.Degree of freedom of polyatomic molecules.Group frequencies and application of IR spectra.

Module V Phase Equilibria **12 hrs**

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, Thermal analysis and desilverisation of lead . KI-water system

and Freezing mixtures.(d) Solid-liquid equilibria involving compound formation with congruent and incongruent melting point- $FeCl_3$-H_2O system and Na_2SO_4-H_2O system.(e) Solid Gas system - decomposition of $CaCO_3$ and dehydration of $CuSO_4$-$5H_2O$. Efflorescence and Deliquescence

Module VI Catalysis and Photochemistry 12hrs

Catalysis: Theories of catalysis, Intermediate formation theory, steady state method, Enzyme Catalysis-mechanism. Effect of temperature on enzyme catalysis.Michaelis-Menten equation.

Beer-Lambert Law, Grotthus -Draper law and Stark- Einstein Law of Photochemical Equivalence. Quantum Yield, Reason for very low and very high quantum yields. Kinetics of decomposition of HI.Qualitative treatment of H_2-Cl_2 reaction.Fluorescence and phosphorescence.Photosensitisation and chemiluminescence.Explanation and examples.

References

1. S. Glasstone& Lewis, “Elementary Physical Chemistry”, Longman.
2. N. Kundu and S. K. Jain, “Physical Chemistry”, S Chand.
3. K. L. Kapoor, “Elements of Physical Chemistry”, Macmillan
4. G. M. Barrow, “Physical Chemistry”, 6thedn, McGraw-Hill.
5. R. A. Alberty& R. J. Silbey, “Physical Chemistry”, John Wiley.
6. G. W. Castellan, “Physical chemistry”, Narosa.
7. P. W. Atkins, “Physical Chemistry”, Longman.
8. Puri, Sharma & Pathania, “Principles of Physical Chemistry”
9. Glasstone, Physical Chemistry, Macmillan
10. C. N. Banwell, “Fundamentals of Molecular Spectroscopy”, Tata McGraw Hill.
11. M. C. Gupta, “Atomic and Molecular Spectroscopy”, New Age.
12. P. S. Sindhu, “Fundamentals of Molecular Spectroscopy”, New Age International

Core Course VII
15UPO543: POLYMER CHEMISTRY-I

No. of credits: 4

No. of instructional hours per week: 4

Module I – Basic principles of polymer chemistry 12hrs

Historical development of polymer chemistry.Monomers, polymers, repeating units, functionality.Nomenclature of polymers.Importance and applications of polymers -acrylic, vinyl, cellulose, fluorinated, poly ethylene, & SAN copolymer.Classification of polymers. Ladder and spiral polymers.Cis- trans configuration. DL isomers and tacticity. Inorganic polymers-importance, advantages and applications- structure, preparation and properties of silicones and polyphosphazenes. Comparison with organic polymers.

Module II – Free radical addition polymerization 12hrs

Chain growth polymerization.Mechanism of chain growth polymerization. Initiation, propagation and termination.Types of free radical initiators (peroxo, azo and redox initiators).Initiator efficiency.Inhibitors and retarders - functions and examples.Chain transfer reactions.Kinetics of chain growth polymerization.Kinetic chain length.Auto acceleration, thermal & electrochemical polymerization.

Module III – Ionic & stereoregular polymerization 12hrs

Ionic polymerization - anionic and cationic catalysts, Solvent effects in ionic polymerizations.Mechanism and kinetics of anionic and cationic polymerizations. Counter ions. Termination modes.Living polymers. Coordination polymerization: stereo regularity, Ziegler-Natta catalysts. Metallocene catalysts.Bimetallic and monometallic mechanisms.

Module IV – Condensation or step growth polymerization 12 hrs

Step growth polymerization,-Average functionality, basic characteristics, extent of reaction, degree of polymerization, Carother's equation. Gel and gel point. Mechanism of self-catalysed and non- catalysed esterification. Ring-opening & interfacial polymerization, Copolymerization: random, alternate, block and graft. Copolymerization involving two monomers(free

radical mechanism). Reactivity ratio, its determination.Q-e scheme. Polymerisation techniques (bulk,solution,suspension and emulsion). Melt, solution and interfacial condensation.

Module VI – Molecular mass and size of polymers 12 hrs

Degree of polymerization and molecular weight.Practical significance of molecular weight.Threshold molecular weight.Concept of average molecular mass and molecular mass distribution. Number average, weight average and z average molecular mass and their calculation. Viscosity average molecular mass. Molecular mass distribution curve.Polydispersity and polydispersity index of polymers. Examples of monodispersed and polydispersedpolymers. Molecular mass & mechanical properties. Size of polymer molecules.

Module VII – 12 hrs

Determination of molecular mass of polymers

Absolute and relative methods of molecular mass determination.Determination of No. average molecular mass - end group analysis, cryoscopy & vapour phase osmometry, Weight average molecular mass- ultracentrifugation (principle only), Light scattering method (No experimental details expected), viscosity average molecular mass, Gel permeation chromatography

References

1. Malcon P. Steves, Polymer chemistry-An introduction, 3rd edition, Oxford University Press.
2. F. W. Billmayer, Text book of Polymer Science, 3rd edition, John Wiley &Sons V. R. Gowariker, N. V. Viswanathan&J. Sreedhar, Polymer Science, New Age International Publishers.
3. P. Bahadur&N. V. Sastry, Principles of Polymer Science, Narrora Publishing House, 2nd Edition, New Delhi.
4. PremamoyGhosh, Polymer Science & Technology, 3r edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
5. G. Odian, Principles of polymerization, 3" edition, John Wiley &Sons. G. S. Misra, Introductory? Polymer Chemistry New age International Publishers & Distributors, New Delhi

6. V. K. Ahluwalia& A. Misra, Poly mer Science- A Text Book, Ane Books, India, New Delhi.
7. J. R. Fried, Polymer Science & Technology. Prentice Hall of India Pvt. Ltd, New Delhi.

Core Course VIII
15UPO544: Physical Chemistry Experiments

No. of credits: 3

No. of instructional hours per week: 6

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+} V_s $K_2Cr_2O_7$

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.

Core Course IX
15UPO545: Polymer Chemistry Experiments

No. of credits: 2

No. of instructional hours per week: 3

Module 1

Determination of: 1. ammonia content 2. total solid content 3. dry rubber content 4. KOH number. 5. acid value 6. iodine value 7. estimation of hydroxyl groups 8. estimation of nitrogen in polymeric andrelated samples.

Module II

Determination of 1: ash content; 2. volatile matter and 3. Metal (Cu, Fe and Th) content of dryrubber.

Module III

Qualitative analysis of plastics and rubbers

Module IV

Synthesis of different polymers involving various polymerization processes and techniques.

References

Handbook for analysis of synthetic polymer and plastics, J. Urbanski, W. Czerwinski, K. Janicka et al., EllisHarwood Ltd.

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Open Course
15UPO551.1: CHEMISTRY IN EVERY DAY LIFE

No. of credits: 2

No. of instructional hours per week: 3

Module 1: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.

Module 2 : Basic Concepts of Chemistry **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 3 : 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 4 :Frontiers in 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, i ntroduction to the

principles of green chemistry

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

Module 5 : Industrial Polymers **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 6 : Fundamentals of Biochemistry **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)

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
15UPO641: Inorganic Chemistry II

No. of credits: 3

No. of instructional hours per week: 3

Module I Transition & Inner Transition elements 9 hrs

Transition elements -Electronic configuration & general characteristics, abundance, difference between the 1st row and the other two rows, Lanthanides - Electronic configuration general properties, occurrence, separation – chemical & ion exchange methods, lanthanide contraction & its consequences, magnetic properties & complex formation behaviour. Actinides - Electronic configuration position in periodic table oxidation state, occurrence, Trans actinides - Names & symbol.

Module.II Coordination Chemistry -I 9 hrs

Double salts & coordination compounds, nomenclature, Werner's theory, EAN rule, shapes of d orbitals, bonding in transition metal complexes, V. B. Theory, Crystal field theory - explanation of magnetic properties, geometry, colour, electronic spectra of d^1 & d^9 systems, spectrochemical series, effects of crystal field splitting, Jahn - Teller distortion, M. O. theory, chelates – application

Module.III Coordination chemistry II& Group theory 9 hrs

Isomerism & stability of complexes, factors affecting stability, geometry of different coordination numbers, application of complexes in qualitative & quantitative analysis. Group theory - elements of symmetry, proper & improper axis of symm, plane of symm, centre of symm.& identity element. Combination of symm, elements, point groups (C_{2V} & C_{3V}). Schoenflies symbol of simple molecules like H_2O, NH_3 & BF_3

Module IV Organometallic Compounds 9Hrs

Definition, nomenclature & classification, 18 electron rule, metal carbonyls (mono nuclear & poly nuclear - examples of carbonyls of Fe, Co, & Ni), preparation & properties of carbonyls of Fe & Ni, structure & nature of metal -carbonyl bonding in mononuclear Ni carbonyls , bonding in

ferrocene, structure & application of Ziese s salt , Wilkinson's catalyst. Application of organo metallic compounds.

Module V **9 hrs**

Compounds of non-transition elements & non -aqueous solvents

Preparation., properties & structural aspects of following: boron nitrides,borazole, boron hydrides. Preparation & properties of hypo-halous acids, per halic acid & pseudo halogens, chemistry of cement, glass, ceramics & Xenon compounds.

Non - aqueous solvents - Classification of solvents, characteristics of common solvents, protic & aprotic solvents, liquid ammonia solutions of alkali metals, reactions in liquid SO_2 & liquid HF

Module VI Bioinorganic chemistry **9 hrs**

Role of alkali & alkaline earth metal ions in biological systems, biological functions, excess & deficiency diseases of Cr, Mn, Cu, Fe, Ni &Co. Toxicity of metal ions(Pd, As, Cd, Mg),oxygen carriers, haemoglobin & myoglobin - structure & mechanism of action, cooperative effect in Hb, biochemistry of iron, biological role of Mg&Ca ions, elementary idea of cytochromes, ferretin & ferredoxines, Metallo enzymes -carbonic anhydrase & peroxidase, photosynthesis, principle & mechanism.

References

1. J. D. Lee, Concise inorganic chemistry, Blackwell science limited
2. SathyaPrakash, G. D. Tuli, S. K.Basu& R. D.Madan, Advanced Inorganic Chemistry, (Vol. 1) ,S .Chand &Com .Ltd .,New Delhi.
3. F.A .Cotton,?. L .Gaus& G. Wilkinson, Basic Inorganic Chemistry, John Wiley & Sons.
4. B. R. Puri, L. R. Sharma & K. .C .Kalia, Principles of Inorganic Chemistry, Vallabh Publications, New Delhi
5. D . F. Shriver, P .W. Atkins &C .H .Langford, Inorganic Chemistry, Oxford Univ. Press
6. M .C. Day &J .Selbin, Theoretical Inorganic Chemistry, East west press pvt.Ltd.
7. R .D .Madan, ModernInorganic Chemistry, S. Chand &Company Ltd .New Delhi

8. SathyaPrakash, G. D. Tuli, Basu S. K. &Madan R. D. , Advanced Inorganic Chemistry, (Vol.11), S .Chand &Com .Ltd, New Delhi
9. W .U .Malik, G. D. Tuli& R. D. Madan, Selected Topics in inorganic chemistry, S.Chand&Co .Ltd, New Delhi
10. M .N. Hughes,The Inorganic chemistry of biological processes,John Wiley.

Core Course XII
15UPO642: Physical Chemistry III

No. of credits: 4

No. of instructional hours per week: 4

Module I Development of Quantum Mechanics **12 hrs**

Radiation phenomena: Black body radiation. Planck's quantum theory, Photoelectric effect, Compton effect and atomic spectra. Concept of operators: Linear, Laplacian, Hamiltonian and Hermitian operators. Postulates of quantum mechanics.Derivation of Schrodinger wave equation and its significance. Eigen functions and eigen values.

Application of quantum mechanics to simple systems: Particle in 3D box and its complete solution. Concept of degeneracy.Schrodinger equation for H atom - Separation into three equations (without derivation). Simple harmonic oscillator: Classical treatment - Derivation of total energy of the oscillator. Quantum mechanical treatment - Schrodinger equation of the particle executing simple harmonic motion and energy expression (No derivation)

Module II Binary Liquid Systems **12 hrs**

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 systems: Critical solution temperature. Conjugate layers. Examples for upper, lower and upper cum lower CST. Immiscible liquid pairs.Theory of steamdistillation.Distribution law - Its thermodynamic derivation.Limitations of distribution law. Applications of distribution law to the study of association and dissociation of

molecules. Solvent extraction.Equilibrium constant of KI + I_2 → KI_3

Module III Raman, UV-VIS and NMR Spectroscopy 12 hrs

Raman spectroscopy: Stokes and antistoke's lines. Quantum and classical theory of Raman effect. Rotational Raman spectrum.Selectionrule. Frequency of separation.Vibrational Raman spectrum. Mutual exclusion-principle. Advantages of Raman Spectroscopy.

Electronic spectroscopy: Electronic spectra of diatomic molecules. Franck-Condon principle.Singlet and triplet states.Dissociation and predissociation.Dissociation energy.Selection rules.Electronic spectra of polyatomic molecules (qualitative idea only).

NMR spectroscopy: Principle of NMR, Nuclear spin. Interaction of nuclear magnet with external magnet.Precession.Relaxation.Shielding and deshielding effect. Chemical shift. Delta and tau scales. Spin - spin coupling. Low and high.resolution spectra.Interpretation of PMR spectra of simple molecules such as ethyl bromide, ethanol, acetaldehyde, ethyl acetate, toluene and acetone

Module IV ESR, EIMS and Non Spectral methods 12 hrs

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 ESRspectrum.The normal and derivative spectra.Hyperfine splitting. Simple examples like hydrogen atom, methyl and benzene radicals.

Mass spectrometry: Theory of mass spectrum. Production of ions.Base peak and molecular ion peak.Common types of dissociation.Mass spectra of simple molecules.Application of mass spectrometer in the determination of molar mass.

Non-spectral 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 refractions.Optical exaltation. Parachor and atomic equivalent of parachor..

Module V Electromotive Force 12 hrs

Electrochemical cells (brief explanation). Types of electrodes - Metallic

electrodes, gas electrodes, anion reversible electrodes and redox electrodes.Reference electrodes- standard hydrogen and calomel electrodes. Electrode reactions and cell reactions.Derivation of Nernst equation for electrode potential and cell potential.Gibbs-Helmholtz equation and EMF of a cell.Calculation of ΔG, ΔH & ΔS and equilibrium constant from EMFdata. Concentration cells with and without transference: Electrode and electrolyte concentration cell.Derivation of equation for the EMF of concentration cell with and without transference.Liquid junction potential.

Fuel cells: Principle, H_2-O_2 and hydrocarbon-O_2 fuel cells. Over voltage. Applications of potential measurements: Determination of ionic product of water, hydrolysis constant and solubility product. pH value using quinhydrone and glass electrodes. Potentiometric titrations of acid - base and redox reactions.

Module VI **12 hrs**

Thermodynamics-III and Statistical Thermodynamics

Nernst heat theorem, proof and its consequences.Statement of third law-Planck's statement, Lewis Randall statement.Concept of perfect crystal. Determination of absolute entropies of solid, liquid and gas. Exception to third law with reference to examples- CO, NO, N_2O and H_2O. Statistical Thermodynamics: Phase space, system, assembly and ensemble. Types of ensembles.Thermodynamic probability. Boltzmann distribution law (no derivation): Entropy and probability. Partition function and its physical significance. Partition functions and thermodynamic properties - Internal energy, enthalpy, heat capacity, pressure, work function, Gibb's free energy and chemical potential.

About 150 problems to be worked out.

References:

1. S. Glasstone& Lewis, "Elementary Physical Chemistry", Longman.
2. Kundu and S. K. Jain, "Physical Chemistry", S Chand.
3. K. L. Kapoor, "Elements of Physical Chemistry", Macmillan
4. G. M. Barrow, "Physical Chemistry", 6thedn, McGraw-Hill.
5. R. A. Alberty & R. J. Silbey, "Physical Chemistry", John Wiley.
6. G. W. Castellan, "Physical chemistry", Nafosa.
7. P. W. Atkins, "Physical Chemistry", Longman.

8. M. Chanda, “Atomic Structure & Chemical Bond Including Molecular Spectroscopy”, Tata McGraw Hill.
9. R. K. Prasad, “Quantum Chemistry”, New Age International.
10. Puri, Sharma & Pathania, “Principles of Physical”.

Core Course XIII
15UPO643: Polymer Chemistry II

No. of credits: 4

No. of instructional hours per week: 4

Module –I Molecular forces and bonding in polymers 12hrs

Primary structure - polarity of monomers.Secondary structure - conformation and configuration.Tertiary structure - crystalline and amorphous polymers.Polar and non-polar interactions.Segmental mobility and total mobility of polymer chains.Solid, liquid, glassy and rubbery states. Amorphous and crystalline behaviours.Tg and Tm. Viscoelastic deformation. Determination of Tg. Factors influencing Tg(molecular geometry, molecular mass, plasticisers, copolymerization) relationship between Tg and Tm. Importance of Tg. Factors influencing crystalline state, polymer single crystals, spherulites.

Module –II Polymer reactions-I 12 Hrs

Reactions involving hydroxyl, aldehydic, ketonic, carboxylic and amino groups.Hydrolysis, acidolysis, oxidation, hydrogenation, addition and substitution reactions.Cyclisation reactions of PVA and PAN.Prepolymers and curatives.Illustrations of curing of unsaturated polyesters with styrene, thiols with PbO_2 or epoxide or diamine. Cyclisation of natural rubber in acid medium, cross linking- photo chemical, through labile intermediate, vulcanization using peroxide, sulphur, sulphur compounds, mechanism of sulphur vulcanization

Module III- Polymer reactions-II 12 Hrs

Preparation of block and graft copolymers. Preparation, properties and applications of ion exchange resins. Structure and applications of: con-

ducting polymers, photoconducting polymers, Polymer drugs. Polymer supported reactions, advantages. Merrifield's solid phase peptide synthesis, dendritic polymers (brief idea).

Module IV – Polymer solution **12 Hrs**

Difference of polymer solution from that of low molecular mass solutes. Swelling and formation of ellipsoid.Viscosity changes.Gel-sol systems. Good and poor solvents. Fractionation of polymers: fractional precipitations, gradient illusion and gel permeation chromatography. Cohesive dispersion forces.Cohesive energy density (CED).Solubility parameter. Thermo-dynamics of polymer dissolution.Nature, size and shape of macromolecules in solution. End to end distance and radius of gyration. Perturbed and unperturbed dimensions. θ -Solvent and θ -temperature.

Module V – Polymer degradation **12 Hrs**

Process of degradation.Random and chain end degradation. Methods of degradation: thermal degradation - factors affecting thermal stability; mechanical degradation - milling and mastication; photodegradation - photostabilisers; oxidative degradation - oxidants and antioxidants; hydrolytic degradation; degradation by high energy radiation, chemical degradation .Polymer waste management.

Module VI – Biopolymers and biodegradable polymers **12 Hrs**

DNA and RNA - structure and functions. Structure of proteins, Preparation, properties and applications of cellulose 'derivatives: cotton and rayon: cellulose plastics: cellulose acetate, cellulose nitrate & regenerated cellulose. Structure and applications of starch, shellac, chitin and chitosan.Commercial applications of natural polymers-lignin, kerogen, amber, asphaltenes.Biodegradable polymers, examples.Biomedical applications of polymers.

References :

1. Malcon P. Sieves, Polymer chemistry-An introduction, 3d edition, Oxford University Press.
2. F. W. Billmayer, Text book of Polymer Science, 3rd edition, John Wiley &Sons
3. V. R, Gowariker, N. V. Viswanathan&J. Sreedhar, Polymer Science, New Age International Publishers.

4. P. Bahadur& N. V. Sastry. Principles of Polymer Science, Narrora Publishing House, 2 Edition, New Delhi.
5. PremamoyGhosh, Polymer Science & Technology, 3rd edition, Tata McGraw Hill Education Pvt. Ltd., New Delhi
6. G. Odian, Principles of polymerization, 3' edition, John Wiley &Sons.
7. G. S. Misra, Introductory- Polymer Chemistry New age International Publishers & Distributors, New Delhi
8. V. K. Ahluwalia& A. Misra, Polymer Science-/. Text Book, AneBooks , India, New Delhi.
9. 7. R. Fried, Polymer Science & Technology, Prentice Hall of India Pvt. Ltd, New Delhi

Core Course XIII
15UPO644: Gravimetric Analysis

No. of credits: 3

No. of instructional hours per week: 2

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 $Mg_2P_2O_7$

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

Core Course XIV
15UPO645: Organic Chemistry Experiments

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

***Examination for 15UPO544 Lab course III and 15UPO545 lab course IV may be conducted on the same day for 6 hrs at a stretch.**

 # Examination for 15UPO644 Lab course V and 15UPO645 lab course VI may be conducted on the same day for 6 hrs at a stretch.

Elective Course

15UPO661.1: ADVANCED POLYMER CHEMISTRY (Elective)

No. of credits: 2

No. of instructional hours per week: 3

Module –I Characterizarion of polymers – I 9 hrs

Preliminary analysis: solubility, flame test, Lassaigne's test, heating test and melting point test (LDPE and HOPE). Analysis of polystyrene (dye test). Molecular weight (mention any two methods only). Physical properties: stress-strain behavior in tension, fatigue, impact strength, tear resistance, optical properties - transmittance, reflectance; electrical properties - dielectric strength (no experimental details and method of

determination).

Module II - Characterizatiop. of polymers - II **9 hrs**

Applications of IR, NMR (proton and C-13) and X-ray diffraction in characterization.Thermal analysis; differential thermal analysis, thermogravimetric analyisis and differential scanning calorimetry

Module III - Plastics and engineering plastics **9 hrs**

Preparation, structure and properties of polyolefins (LDPE, HOPE, LLDPE and PP); vinyl polymers (PVC, Poly vinyl acetals and PMMA); Teflon and polyurethanes; Phenol formaldehyde and urea formaldehyde resins; nylons and polyesters (Terylene and Dacron). Engineering plastics, ABS, polyamides, polycarbonates, PPO, PPS, polysulphones, polyimides, polyesters, flouropolymers, ionomers. and liquidcrystalline polymers.

Module IV - Elastomers and fibres **9 hrs**

Natural rubber, composition, preservation & coagulation of latex, Structure, properties and preparation of synthetic rubbers (PB, SBR, NBR, polychloroprene, polyisobutylene, IIR, EPDM, buna-N, thiacol). Reclaimed rubbers.Thermoplastic elastomers- advantages, polyurethdnes.Fibies:natural (structure and properties); synthetic (structure and properties of nylon, polyester and acrylics)

MODULE V- Polymer processing **9 hrs**

Peculiarities in the- properties of elastomeric, fibreforming(tenacity, spirality and crimp) and plastic materials: structure, property, relationship. Compounding: additives and functions. Vulcanizers, hard rubber, ebonite, accelerators, activators, extenders, fillers, antioxidants, antiozonants, UV stabilizers, lubricants, plasticizers, flame retardants and colourants, typical examples.Blending methods: milling and internal mixing.

MODULE VI- - Technology of polymer processing **9 hrs**

Moulding processes: Compression moulding- transfer moulding, injection moulding, blow moulding. Forming techniques- extrusion, spinning, calendaring, and casting. Other techniques-Lamination & reinforcement, foaming, coating, finishing, micro encapsulation.

References:

1. Malcon P. Sieves, Polymer chemistry-Art introduction, 3" edition, Oxford University Press.
2. F. W. Bilimayer, Text book of Polymer Science, 3" edition, John Wiley &Sons
3. V, R. Gowariker, N. V. Viswanathan&J. Sreedhar, Polymer Science, New Age International Publishers.
4. PremamoyGhosh, Polymer Science & Technology, 3" edition, Tata McGraw Hill Education Pvl, Ltd., New Delhi
5. Siddaramaiah, Practicals in Polymer Science, CBS Publishers & Distributors, New Delhi
6. P. Bahadur& N. V. Sastry, Principles of Polymer Science, Narrora Publishing House, 2"' Edition, New Delhi.
7. G. Odian, Principles of polymerization, 3"J edition, John Wiley &Sons.
8. G. S. Misra, Introductory Polymer Chemistry New age International Publishers & Distributors, New Delhi
9. V, K. Ahluvi'aj.ia& A. Misra, Polymer Science-A Text Book, AneBooks, India, Ne u "Delhi.
10. R. Fried, Polymer Science & Technology, Prentice Hall of India Pvt. Ltd. ,Vcw Delhi