

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



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



COURSE STRUCTURE

Courses	Course Code	Course Title	Instructional Hours per Week	Credits
SEMESTER I				
Language Course I	15UEN111.1	Listening and Speaking skills	5	4
Language Course II	15UML/HN/ FR111.1	Additional Language I	4	3
Foundation Course I	15UEN121	Writings on contemporary issues	4	2
Core Course I	15UZO141	Animal Diversity I	3	3
Complementary Course I	15UCH131.4	Theoretical Chemistry	4	2
Complementary Course II	15UBO131	Phycology, Mycology, Lichenology, Bryology, Pteridology, Gymnosperms & Plant Pathology	4	2
SEMESTER II				
Language Course III	15UEN211.1	Reading Skills	5	4
Language Course IV	15UEN212.1	Modern English Grammar & Usage	4	3
Language Course V	15UML/HN/ FR211.1	Additional Language II	4	3
Core Course II	15UZO241	Animal Diversity II	3	3
Complementary Course III	15UCH231.4	Inorganic & Bioinorganic Chemistry	4	2
Complementary Course IV	15UBO231	Histology, Reproductive Biology & Micro Techniques	4	2
SEMESTER III				
Language Course VI	15UEN311.1	Writing & Presentation Skills	5	4
Language Course VII	15UML/HN/ FR311.1	Additional Language III	5	4
Core Course III	15UZO341	Methodology and Perspectives of Zoology	3	2
Complementary Course V	15UCH331.4	Organic & Biophysical Chemistry	5	3
Complementary Course VI	15UBO331	Angiosperm Taxonomy, Economic Botany, Ethno Botany, Pharmacognosy & Plant Breeding	4	3

SEMESTER IV				
Language Course VIII	15UEN411.1	Reading in Literature	5	4
Language Course	15UML/HN/ FR411.1	Additional Language IV	5	4
Core Course IV	15UZO441	General Informatics & Bioinformatics	3	3
Core Course V	15UZO442	Practical I of 15UZO141, 15UZO241, 15UZO341 & 15UZO441		4
Complementary Course VII	15UCH431.4	Organic and Biophysical Chemistry	5	3
Complementary Course IX	15UCH432.4	Complementary course Practical of 15UCH131.4, 15UCH231.4, 15UCH331.4 & 15UCH431.4		4
Complementary Course VIII	15UBO431	Plant Physiology, Environmental Biology, Horticulture & Plant Bio- technology	4	3
Complementary Course X	15UBO432	Complementary Course Practical of 15UBO131, 15UBO231, 15UBO331 & 15UBO431		4
SEMESTER V				
Core Course VI	15UZO541	Cell and Molecular Biology	5	4
Core Course VII	15UZO542	Genetics and Biotechnology	4	4
Core Course VIII	15UZO543	Microbiology and Immunology	4	4
Core Course IX	15UZO544	Cell Biology, Molecular Biology, Genetics, Biotechnology, Microbiol- ogy & Immunology		4
Open Course		Open Course	3	2
SEMESTER VI				
Core Course X	15UZO641	Physiology and Biological Chemistry	5	4
Core Course XI	15UZO642	Developmental Biology and Experi- mental Embryology	4	4
Core Course XII	15UZO643	Ecology, Conservation Biology, Ethology, Evolution and Zoogeog- raphy	4	3
Core Course XIII	15UZO644	Physiology and Biological Chemistry		3
Core Course XIV	15UZO645	Developmental Biology, Ecology, Conservation Biology, Ethology, Evolution and Zoogeography		3
Elective Course	15UZO661.1 15UZO661.2 15UZO661.3	Ornamental Fish Culture Vermiculture and Apiculture Dairy farming and Broiler farming	3	2
Project	15UZO646	Zoology Project and Field Study		4

Open Courses				
Open Course	15UZ0551.1	Human Health and Sex Education	3	2
Open Course	15UZ0551.2	Public Health and Hygiene	3	2
Open Course	15UZ0551.3	Human diseases and their management	3	2

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 University 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 par-

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

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

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

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

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

Improvement of ESE

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

Mark Cum Grade Sheet

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

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

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

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

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

SEMESTER I

Language Course I

15UEN111.1: LISTENING AND SPEAKING SKILLS

No. of credits: 4

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

AIMS

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

OBJECTIVES

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

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

COURSE OUTLINE

Module 1

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

Module 2

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

Module 3

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

Module 4

Dialogue Practice

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

COURSE MATERIAL

Modules 1 - 3

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

Further reading:

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

Module 4:

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

The following One-act plays are prescribed:

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

Reference:

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

Language Course II (Additional Language I)

15UML111.1: മലയാള കവിത

No. of credits: 3

No. of instructional hours per week: 4

പുസ്തകം : കാവ്യപഥം

(കോളേജ് പ്രസിദ്ധീകരണം)

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

പാഠ്യപദ്ധതി :

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

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

മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)

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

മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

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

മൊഡ്യൂൾ നാല് (18 മണിക്കൂർ)

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

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

സഹായകഗ്രന്ഥങ്ങൾ

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

Language Course II (Additional Language I)

15UHN111.1: PROSE AND GRAMMAR

No. of credits: 3

No. of instructional hours per week: 4

Aim of the Course / Objectives

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

Module I

Prose (Prescribe a prose collection)

Module 2

Grammar

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

Prescribed Textbooks

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

Lessons to be studied

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

Topics to be studied

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

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

No. of credits: 3

No. of instructional hours per week: 4

AIMS:

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

Module I

Prose (Prescribe a prose collection)

Module 2

Grammar

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

Prescribed Textbooks

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

Lessons to be studied

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

Topics to be studied

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

Language Course II (Additional Language I)

15UFR111.1: Communication skills in French

No. of credits: 3

No. of instructional hours per week: 4

AIMS:

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

OBJECTIVES:

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

SYLLABUS:

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

Publisher : Didier

Module 1 : Parler de soi

Unit 1 : Bonjour !

Unit 2 : Rencontres

Unit 3 : 100% questions

Reference books :

Le Nouveau Sans Frontières Vol I by Philippe Dominique

Panorama Vol I by Jacky Girardet

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

Foundation Course I

15UEN121: WRITINGS ON CONTEMPORARY ISSUES

No. of credits: 2

No. of instructional hours per week: 4

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.

Core Course I

15UZO141: Animal Diversity I

No. of credits: 3

No. of instructional hours per week: 3

Aim of the course

To provide the students with an in-depth knowledge of the diversity in form, structure and habits of invertebrates.

Objectives of the course

- ★ To learn the basics of systematics and understand the hierarchy of different categories.
- ★ To learn the diagnostic characters of each phyla through brief studies of typical examples.
- ★ To obtain an overview of economically important invertebrate fauna

Module I

4 hrs

Introduction to Zoology: taxonomy- definition, history, new trends and importance, mention molecular taxonomy. Components of classification, Taxonomic hierarchy- taxon, category and rank. Linnaean hierarchy, nomenclature, principles of nomenclature. International Code of Zoological Nomenclature (ICZN), rules of nomenclature, requisites – uni, bi and trinomialism. Mention taxonomic keys.

Module II

6 hrs

Kingdom Protista: general characters, structure and zoological importance of *Actinophrys*, *Noctiluca* and *Opalina*. Parasitic protozoans: morphology, life history, pathogenicity and prophylaxis of *Trypanosoma gambiense* and *Plasmodium vivax*.

Module III

6 hrs

Kingdom Animalia: Outlines of classification – Sub kingdom Mesozoa, Sub kingdom Parazoa, Sub kingdom Eumetazoa. Levels of organization– cellular, tissue, organ. Divisions of Eumetazoa- Radiata, Bilateria, Acoelomata, Pseudocoelomata, Eucoelomata, Protostomia, Deuterostomia. Sub kingdom Mesozoa- general characters, eg. Rhopalura. Sub kingdom Parazoa- general characters and mention the classes of Porifera- Calcispongia- eg. *Sycon*, Hydrospongia, eg. *Euplectella*, Desmospongia - eg. *Spongilla*.

Module IV**4hrs**

Phylum Cnidaria: General characters (self study). Classes-Hydrozoa eg. *Obelia*, *Physalia*; Scyphozoa eg. *Aurelia*, *Rhizostoma* ; Anthozoa eg. *sea anemone*, *Madrepora*. General topic: corals and coral reefs.

Module V**8 hrs**

Phylum Platyhelminthes: General characters (self study). Classes- Turbellaria eg. *Planaria*;

Trematoda eg. *Fasciola*; Cestoda, eg. *Taenia solium*.

Phylum Nematoda: general characters (self study), Parasitic nematodes- Morphology, Life history, Pathogenicity and Prophylaxis of *Ascaris*, *Ancylostoma*, *Enterobius*, *Wuchereria*.

Phylum Annelida: General characters (self study). Classification: Polychaeta : eg. *Nereis* (Mention *Heteronereis*), *Arenicola* ; Oligochaeta eg. Earthworm, Hirudinea eg. Leech. General topic - Vermiculture (brief account)

ModuleVI**16hrs**

Phylum Arthropoda: General characters (self study), Type- Penaeus. Mention the classes.

eg. Cockroach, *Limulus*, *Eupagurus*, *Sacculina*, termite, honey bee, scorpion. Phylum Onychophora: general characters, eg. *Peripatus*. General topic: Apiculture, Sericulture.

Module VII**10hrs**

Phylum Mollusca: General characters (self study), Classes- Monoplacophora, eg. *Neopilina*; Amphineura, eg. Chiton; Aplacophora, eg. Neomenia, Gastropoda eg. Pila; Scaphopoda, eg. *Dentalium*; Pelicypoda eg. *Perna*; Cephalopoda, eg. *Sepia*. General topic- Economic importance of mollusca - emphasis on pearl culture. Phylum Echinodermata: General characters (self study) Classes- Asterozoa, eg. *Asterias*; Ophiurozoa, eg. *Ophiothrix*; Echinozoa, eg. *Echinus*; Holothurozoa, eg. Sea cucumber, Crinozoa, eg. Sea lily. General Topic :Larval forms

References

- 1 Barnes, R.D. (1987). Invertebrate Zoology. W. B. Saunders. New Delhi.
- 2 Barrington E.J.W. (1967). Invertebrate Structure and Function. ELBS and Nelson, London.

- 3 Bhamra, H.S and Kavita Juneja. (2000). An Introduction to Coelenterata. Anmol Publications. Pvt. Ltd. New Delhi.
- 4 Bhaskaran.K.K.,P.K.Sumodan & A.Biju kumar 2007.Nonchordate Zoology, Manjusha Publications,Calicut,Kerala,671.pp.
- 5 Brusca, R.C . and G. J. Brusca. (1940). Invertebrates. Sinauer Associates, Sunderland, M.A.
- 6 Darlington, P. I. (1957). Zoogeography, The geographical distribution of animals. Wiley, New York.
- 7 Dhami, P.S and Dhami, J. K. (1979). Invertebrate zoology. R. Chand & Co. New Delhi.
- 8 Ekambaranatha Ayyar M. (1990). A Manual of Zoology. Vol. 1.Invertebrata- Part 1 & Part11. S. Viswanathan Printers and Publishers.Pvt. Ltd.
- 9 Green. N.P.O. et al. (2000). Biological Science, Cambridge University Press.
- 10 Hickman, C.P and Roberts, L.S. (1994). Animal Diversity. Wm. C. Brown, Dubuque, IA.
- 11 Hyman, L. H. (1942). The invertebrate volumes. Mc Gew - Hill.
- 12 Jorden, E.L and Verma, P.S. (2000). Invertebrate Zoology. S. Chand and Co Ltd. New Delhi.
- 13 Kapoor, V.C. (1994).Theory and Practice of animal taxonomy. Oxford & IBH Publishing Co, New Delhi.
- 14 Kotpal, R.L, Agarwal, S.K. and R.P. Khetarpal. (2002). Modern text book of Zoology-Invertebrates.
- 15 Majpuria, T.C. Invertebrate Zoology. Pradeep publication, Jalandar.
- 16 Marshall, A. J. and Williams, W. D. (1972). Text book of zoology vol. 1 Invertibrates. ELBS & MacMillan, London.
- 17 Mayer, E. (1980). Principles of Systematic Zoology. Tata Mc Graw Hill Publishing Co, New Delhi.
- 18 Nair, K.K., Ananthkrishnan, T.N. David, B.V. (1976). General And Applied Entomology. T. M. H. New Delhi.
- 19 Nair, M.R.G.K. A monograph of crop pests of Kerala and their control. Kerala Agricultural University.
- 20 Nigam, S. (1978). Invertebrate Zoology. S. Nigam& Co.
- 21 Parker, T.J and Haswell, W. A. (1962). Text book of Zoology. Vol.I Invertebrate. LBS and MacMillan, London.

- 22 Pearse, V., Pearse, J., Buchsbaum, M. and Buchsbaum, R. (1987). Living Invertebrates. Blackwell Scientific Publications, California.
- 23 Ruppert, E.E., Fox, R. and Barnes, R.D., (2004). Invertebrate Zoology. Thomson Books/Cole, U.S.A.
- 24 The New Encyclopedia Britannica. Macropedia. 15th Ed. 1998. Encyclopedia Britannica Inc. Chicago.
- 25 Vijayakumaran Nair, K. Invertebrate Zoology. Academia.

Complementary Course I

15UCH131.4: Theoretical Chemistry

No. of credits: 2

No. of instructional hours per week: 4

Module I – Atomic Structure

(9 hrs)

Atomic spectrum of hydrogen - different series, Rydberg equation, Bohr theory – postulates – statement of Bohr energy equation – derivation of spectral frequency from Bohr equation. Schrodinger wave equation (mention only, no derivation), concept of orbitals, the four quantum numbers and their significances. Orbital wise electron configuration, energy sequence rule – Pauli's principle, Hund's rule, Stability of filled and half filled orbitals. Electronic configuration of lanthanides and actinides, Lanthanide contraction

Module II – Chemical Bonding (9 hrs)

Energetics of bond formation – Born-Haber cycle. Hybridisation and structure of molecules – sp , sp^2 , sp^3 , dsp^2 , dsp^3 , sp^3d^2 and sp^3d^3 hybridisation with examples. Explanation of bond angle in water and ammonia. VSEPR theory with regular and irregular geometry –. Hydrogen bond – inter and intra molecular – its consequences on boiling point – volatility and solubility. Partial covalent character of the ionic bond – Fajan's Rules. A brief review of molecular orbital approach – LCAO method – bond order, bond distance and stability of O_2 , O_2^{2+} , O_2^{2-} , NO , NO^+ , CO and HF .

Module III – Analytical Principles (9 hrs)

Principles of volumetric analysis – primary standard – standard solutions normality and molarity, theory of acid-base titrations, permanganometric and dichrometric titrations, iodometry and complexometric titrations. Theory of acid-base indicator – redox indicators. Principles of colorimetric titration.

Module IV – Organometallics (9 hrs)

Definition and classification, Organo metallic compounds of Mg, Sn, Li, Hg, Fe and their synthesis, applications. Biological and environmental aspects of organic compounds – Organometallic compounds in medicines – organomercury, organoboron, organosilicon and organo arsenic compounds – outline of preparation and uses. Antitumour drugs, silylated derivatives of bioactive organic compounds in agriculture and horticulture. Environmental aspects of Organometallic compounds.

Reference:

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan
5. Co-ordination Chemistry – Bosolo and Johns
6. Chemistry of Organometallics – Rochoco.

Complementary Course II
**15UBO131: PHYCOLOGY, MYCOLOGY, LICHENOL-
OGY, BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS
AND PLANT PATHOLOGY**

No. of credits: 2

No. of instructional hours per week: 4

MODULE-I Phycology

9 hrs

1. Salient features of the following major groups with reference to the structure, reproduction and life cycle of the types given below(Excluding the developmental details)-

- a) Cyanophyceae-*Nostoc*
- b) Chlorophyceae-*Chlorella, Volvox, Oedogonium and Chara*
- c) Phaeophyceae -*Sargassum*
- d) Rhodophyceae -*Polysiphonia*

Practical

9 hrs

- 1. Make micro preparations of vegetative and reproductive structures of the types mentioned in the syllabus.
- 2. Identify the algal specimens up to the generic level and make labeled sketches of the specimens observed.

MODULE -II Mycology 9 hrs

1. Salient features of the following major groups with reference to the structure, reproduction and life cycle of the types given below(Excluding the developmental details)-

- a) Zygomycotina-*Rhizopus*
 - b) Ascomycotina
 - i. Discomycetes -*Peziza*
 - c) Basidiomycotina
 - i. Teliomycetes-*Puccinia*
 - d) Deuteromycetes- *Cercospora*
2. Economic importance of Fungi

Lichenology

General account, structure, reproduction, life cycle and economic importance of *Usnea*

Practical

8 hrs

A detailed study of structure and reproductive structures of types given in the syllabus and submission of record.

Rhizhopus, Cercospora, Peziza, Puccinia and Usnea.

MODULE - III Bryology

6 hrs

1. Introduction, general characters and classification (Brief account only)
2. Study of the habit, thallus organization, vegetative and sexual reproduction and Life cycle of the following types (Developmental details are not required). *Riccia*, *Funaria*
3. Economic Importance of Bryophytes.

Practical

6 hrs

Riccia-Habit, Internal structure of thallus-V.S. of thallus through archegonia, anthredia and sporophyte.

Funaria-Habit, V.S. of archegonial cluster, V.S. of anthredial cluster, Sporophyte V.S.

MODULE -IV**Pteridology**

6 hrs

1. Introduction: General characters and classification. (Brief account only)
2. Study of the habitat, habit, internal structure, reproduction and life cycle of the following types (Developmental details not required). *Selaginella* and *Pteris*.

Practical

6hrs

Selaginella: Habit, stem and rhizophore, T.S and V.S. of strobilus, Megasporophyll and Microsporophyll.

Pteris-Habit, T.S of Rhizome, Petiole and Sporophyll.

MODULE -V Gymnosperms 3 hrs

1. Introduction, general characters and classification (Brief account only)
2. Study of the Habit, anatomy, reproduction and life cycle of *Cycas* (Developmental details are not required)

Practical

4 hrs

Cycas-T.S of rachis, leaflet and coralloid root, Microsporophyll and Megasporophyll.

Plant Pathology

3hrs

1. A brief account on the following plant diseases with reference to the symptoms, causative organism, spread of the disease and effective control measures.

- a) Brown spot disease of Paddy b) Powdery mildew of Rubber
C) Leaf Mosaic of Tapioca d) Quick Wilt of Pepper

2. Method of preparation and mode of action of the following fungicides-Bordeaux mixture, Tobacco decoction.

Practical

3hrs

Students are expected to observe the symptoms and causal organisms of all plant diseases mentioned above.

REFERENCES

1. Fritsch F.B.(1945)Structure and Reproduction of Algae Vol.I & II.Cambridge University Press.
2. Vasishta B.R.(1990)Botany for Degree students,Algae,S.Chand & Co.
3. Singh V.,Pandey P.C and Jain D.K(1998) A Text book of Botany for Undergraduate Students,Rastogi Publications.
4. Kanika Sharma (2009)Manual of Microbiology,Ane Books Pvt.Ltd.
5. Mamatha Rao (2009)Microbes and Non flowering plants,Impact and applications;Ane Books Pvt.Ltd.
6. Vashishta B.R.(1990)Botany for degree students,Fungi,S.Chand & Co.
7. Shing V,Pandey PC and Jam D.K(1998)A Text Book of Botany for Under Graduate Students,Rastogi Publications
8. Webster J (1970) Introduction to Fungi,Cambridge University Press.
9. Vasishta B.R., Singha A K and Kumar A 2008.Botany for Degree Students- Bryophyta-S.Chand and Co.New Delhi.
10. Gupta V.k.and Varshneya U.D(1967)-An Introduction to Gymnosperms-
Kedarnath,Ramnath-Meerut.
11. Vashishta B.R.(1993)-Pteridophyta-S.Chand and Co.New Delhi
- 12.Vashishta B.R.(1993)-Gymnosperms-S.Chand and Co.New Delhi

SEMESTER II

Language Course III

15UEN211.1: READING SKILLS

No. of credits: 4

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

AIMS

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

OBJECTIVES

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

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

COURSE OUTLINE

Module 1

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

Module 2

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

Drama (Loot, Macbeth, Happy Days)

Module 3

Introducing students to different text types - prose – fictional - (Alice in

Wonderland, Nineteen Eighty Four, Catch -22, Animal Farm, The Sacred and Profane Love Machine)

Nonfictional – (Civilized Man, Our Bodies Ourselves)

Module 4

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

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

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

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

COURSE MATERIAL

Modules 1 – 4

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

Further reading:

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

Reference:

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

Language Course IV

15UEN212.1: MODERN ENGLISH GRAMMAR AND USAGE

No. of credits: 3

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

AIMS:

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

OBJECTIVES:

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

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

COURSE CONTENTS

Module 1:

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

Module 2:

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

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

Module 3:

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

Module 4:

- Written Composition – précis writing – outline story – Comprehension

COURSE MATERIAL

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

Further Reading:

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

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

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

Language Course V (Additional Language II)

15UML211.1: ഗദ്യസാഹിത്യം

No. of credits: 3

No. of instructional hours per week: 4

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

നോവൽ

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

1. എം.മുകുന്ദൻ - ഒരു ദളിത് യുവതിയുടെ കദനകഥ

മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)

ചെറുകഥ

മലയാള ചെറുകഥയുടെ വികാസപരിണാമങ്ങളെപ്പറ്റിയുള്ള സാമാന്യജ്ഞാനം.

ആഖ്യാന തന്ത്രങ്ങളുടെ വൈചിത്ര്യം. പ്രമേയത്തിലും രൂപരീതിപ്പത്തിലും 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 | - അടുകളെകൾ തിരിച്ചു പിടിക്കുക |

റഫറൻസ് ഗ്രന്ഥങ്ങൾ

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

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

Language Course V (Additional Language II)

15UHN211.1: Fiction and Literary Analysis

No. of credits: 3

No. of instructional hours per week: 4

Aims of the Course / Objectives

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

Module 1

Short story (Prescribe a short story collection)

Module 2

Novel (Prescribe a novel of post eighties)

Module 3

Literary Analysis

The meaning and definitions of literature – Types of literature – Literature and film – Literature and Mass Communication Media – Print media – Electronic media etc.

Literary criticism

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

Prescribed Textbooks

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

Stories to be studied

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

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

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

No. of credits: 3

No. of instructional hours per week: 4

AIMS:

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

OBJECTIVES:

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

SYLLABUS:

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

Publisher : Didier

Module 2 : Echanger

Unit 4 : Enquête

Unit 5: Invitations

Unit 6: A table !

Reference books:

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

Core Course II

15UZ0241: Animal Diversity II

No. of credits: 3

No. of instructional hours per week: 3

Aim of the course

To provide the students with an in-depth knowledge of the diversity in form, structure and habits of vertebrates.

Objectives of the course

- To learn the general characteristics and classification of different classes of vertebrates.
- To understand the vertebrate evolutionary tree.
- To understand general aspects of applied interest.

Module I

5 hrs

Phylum Chordata: Chordate characters and their classification into three Sub phyla (self study). Sub phylum Urochordata- General characters, Class Larvacea eg. Oikopleura ; Class Ascidiacea eg. *Ascidia* (Mention -Ascidian tadpole larva, Retrogressive metamorphosis) Class Thaliacea eg. *Salpa*. Sub phylum Cephalochordata-general characters, eg. *Amphioxus* (Mention feeding behaviour).

Module II

10 hrs

Sub phylum Vertebrata: General characters, Division 1 Agnatha -General characters,

Class Cyclostomata eg. *Petromyzon*, Class Ostracodermi; Division 2 Gnathostomata –General characters, Classification into Super class Pisces and Tetrapoda.

Super class Pisces- General characters and classification, Class Placodermi, Class Chondrichthyes- Sub class Elasmobranchii eg. Shark, Sub class Holocephali eg. *Chimaera*;

Class Osteichthyes- Sub class Choanichthyes- Order1 Crossoptergii eg. *Latimeria*, Order 2 Dipnoi eg. *Protopterus*, Subclass Actinopterygii- Super order Chondrostei eg. *Acipenser*. Super order Holostei eg. *Lepidosteus*, Super order Teleostei eg. *Anabas*, *Clarius*, *Saccobranchnus*,

Ophiocephalus, *Echeneis*. General topic: Accessory respiratory organs in fishes, Dipnoians.

Module III

4 hrs

Super class Tetrapoda: Salient features, Class Amphibia - General characters (self study). Classification- Order Urodela eg. *Amblystoma*, Order Anura eg. *Hyla*, *Racophorous* Order Apoda eg. *Ichthyophis*. General topic: Parental care in *Amphibia*.

Module IV

11hrs

Class Reptilia - General characters (self study). Classification - Sub class Anapsida - Order Chelonia eg. *Chelone*; Subclass Parapsida eg *Ichthyosaurus*; Subclass Diapsida- Order Rhynchocephalia eg. *Sphenodon*, Order Squamata- Suborder Lacertilia eg. *Chamaeleon*, *Draco* *Hemidactylus*, Suborder Ophidia eg. *Naja naja*, *Vipera*, *Bungarus*, *Enhydrina*, *Ptyas*, *Lycodon*, *Tropidonotus*, *Dryophis*, *Typhlops* and *Eryx johni*, Suborder Crocodilia eg. *Crocodylus*, *Alligator*; Subclass Synapsida eg *Cynognathus*. General topic: Identification of poisonous and nonpoisonous Snakes, Poison apparatus, biting mechanism and snake venom.

Module V

5hrs

Class Aves- general characters (self study). Classification- Subclass Archeornithes eg. *Archeopteryx*; Subclass Neornithes- Super order Paleognathae eg. *Sruthio* and *Emu* Super order Neognathae eg. Pigeon (External features, Feathers). General topic: Migration in birds. Flightless birds, Flight adaptations in birds.

Module VI

14hrs

Class Mammalia –General characters and classification of Class Mammalia - Subclass Prototheria eg. *Tachyglossus*; Subclass Metatheria eg. *Macropus*; Subclass Eutheria - Order Insectivora eg. *Paraechinus*, Order Dermoptera eg. *Galeopithecus*, Order Chiroptera eg. *Pteropus*, Order Primates eg. *Loris*, Orangutan, Order Carnivora eg. *Panthera leo*, Order Cetacea eg. *Delphinus*, Order Perissodactyla eg. *Equus*, Order Artiodactyla eg. *Camelus*, [Hippopotamus], Order Proboscidea eg. *Elephas*. Order Sirenia eg. *Dugong*, Order Hyracoidea eg. *Procavia*, Order Rodentia eg. *Rattus*, Order Lagomorpha eg. *Oryctolagus*, Order Edentata eg. *Dasyopus novemcinctus* (Armadillo), Order Pholidota eg. *Manis*, Order Tubilidentata eg. *Orycteropus*. General topic: Dentition in mammals, Egg laying mammals, Aquatic adaptations in mammals.

Module VII

5 Hrs

Comparative account of Brain, Heart and Arterial system of Vertebrates.

References

- Bhaskaran, K. K. and Biju Kumar, A. (2003). Chordate Zoology. Manjusha Publications. Calicut.
- Ekambaranath Iyer. (2000). A Manual of Zoology. Vol. II S. Viswanathan and Co.
- Jordan E. L. and P. S. Verma. (2002). Chordate Zoology. S. Chand and Co. New Delhi
- Kotpal, R.L. (2000). Modern Textbook of Zoology: Vertebrates. Rastogi Publications, Meerut.
- Verma, P.S. (2002). A Manual of Practical Zoology-Chordates. S. Chand and Co. Ltd.
- William S. Beck, Karel, F., Liem and George Gaylord Simpson. (2000). Life: An introduction to biology. Harper Collins Publishers, New York.
- Young J.Z. (2006). The life of Vertebrates. Oxford University Press.

Complementary Course III 15UCH231.4: INORGANIC AND BIOINORGANIC CHEMISTRY

No. of credits: 2

No. of instructional hours per week: 4

Module I – Environmental Chemistry (9 hrs)

Nature of environmental threats and role of chemistry. 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, treatment of industrial waste water using activated charcoal, synthetic resins, reverse osmosis, electro dialysis.-Dissolved oxygen-BOD,COD

Module II - Coordination Chemistry (9 hrs)

Nomenclature, Coordination number and geometry of chelates – isomerism – structural and stereo isomerism valence bond theory of bonding in octahedral and tetrahedral complexes – drawbacks of valence bond theory – high and low spin complexes – magnetic properties. Application in qualitative and quantitative analysis.

Module III – Bio inorganic compounds (9 hrs)

Metalloporphyrins – cytochromes – chlorophyll photosynthesis and respiration – haemoglobin and myoglobin, mechanism of O_2 – CO_2 transportation, nitrogen fixation, carbon fixation and carbon cycle. Biochemistry of iron toxicity and nutrition, essential and trace elements in biological systems.

Module IV – Spectroscopy – I (9 hrs)

Regions of electromagnetic spectrum - interaction of radiation with matter – Different types of energy levels in molecules – rotation, vibration and electronic levels. Various types of molecular spectra – Microwave spectroscopy – spectra of diatomic molecules – Expression for rotational energy - selection rule – frequency separation., Infra red spectra – equation for frequency of vibration – expression for vibrational energy. Selection rule, calculation of force constant.

Reference:

1. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
2. Concise Inorganic Chemistry – J.D. Lee
3. Environmental Chemistry A. K. De
4. Modern Inorganic Chemistry A.D. Madan
5. Co-ordination Chemistry – Bosolo and Johns
6. Chemistry of Organometallics – Rochoco.

Complementary Course IV
15UBO231: HISTOLOGY, REPRODUCTIVE
BOTANY AND MICROTECHNIQUE

No. of credits: 2

No. of instructional hours per week: 4

MODULE-I

Histology

10 hrs

1. Objectives and scopes of Plant Anatomy
2. Tissues-Meristems, Definition and Classification based on origin, position, growth Patterns and functions.
3. Apical meristems & theories on apical organization -Apical cell theory, Histogen theory, Tunica -Corpus theory, organization of root apex in dicots & monocots.
4. Permanent tissues-Definition, Classification-simple, complex and secretory.
5. Tissue systems-Epidermal tissue systems, Ground tissue systems & Vascular tissue systems. Different types of vascular arrangements.

MODULE-II

10hrs

6. Primary structure-Root, Stem and leaf (Dicot & Monocot). Secondary growth of (stelar and extra stelar) Root and Stem, Cambium (structure and function) annular rings, heart wood and sap wood, tyloses, ring porous wood and diffuse porous wood, periderm formation, phellum, phellogen and phelloderm; lenticels.
7. Anomalous secondary growth-Boerhaavia.

Practical

32 hrs

1. Familiarize killing and fixing agents, stains
2. Simple permanent tissue -Parenchyma, Chlorenchyma, Arenchyma, C ollenchyma and Sclerenchyma
3. Primary structure-Dicot Stem: Hydrocotyle
4. Monocot stem: Grass
5. Dicot root: *Limnanthemum*
6. Monocot root: *Colocasia*

7. Secondary structure-Stem (Normal type)-*Vernonia* or any normal type
8. Secondary structure-Root (Normal type) -*Tinospora, Ficus, Carica* papaya, or any normal type.
9. Anomalous secondary thickening-*Boerhaavia*

MODULE -III

Reproductive Botany

10 hrs

1. Micro sporogenesis-structure and functions of wall layers.
2. Development of male gametophyte-Dehiscence of anther.
3. Megasporogenesis-Development of female gametophyte-Embryo sac-
Development and types-Monosporic-Polygonum type
4. Pollination-Fertilization-Double fertilization. Structure of Embryo-Dicot
(*Capsella*)

Practical

4 hrs

Students should be familiar with structure of anther and embryo.
(Permanent slides can be used)

MODULE-IV

Microtechnique

6 hrs

1. Killing and fixing agents-Carnoy's fluid, F.A.A
2. Stains and staining techniques double staining.
General account; Stains: saffranin, hematoxylin, acetocarmine.

REFERENCES

1. Prasad and Prasad (1972) Out lines of Botanical Micro technique, Emkay publishers, New Delhi.
2. Esau K. (1965)-Plant Anatomy -Wiley Eastern, New York.
3. Fahn A. (1985)-Plant Anatomy-Pergamon Press, Oxford.
4. Pandey, B.P. (1997)-Plant Anatomy-S. Chand and co. New Delhi Biology
-McGraw Hill Co, New York.
5. Vashista. P.C (1984)-Plant Anatomy-Pradeep Publications-Jalandhar.
6. P. Maheswari (1971)-Embryology of Angiosperms-Mc Graw Hill Book
Co. London

SEMESTER III

Language Course VI

15UEN311.1: WRITING AND PRESENTATION SKILLS

No. of credits: 4

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

AIMS

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

OBJECTIVES

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

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

COURSE OUTLINE

Module 1

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

Module 2

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

Module 3

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

Module 4

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

COURSE MATERIAL

Modules 1 – 4 Core reading:

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

Further reading:

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

Reference:

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

Language Course VII (Additional Language III)

15UML311.1: ദൃശ്യകലാസാഹിത്യം

No. of credits: 4

No. of instructional hours per week: 5

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

മൊഡ്യൂൾ ഒന്ന് (36 മണിക്കൂർ)

ആട്ടക്കഥ, തുള്ളൽ സാഹിത്യം

കഥകളിയുടെ ഉത്ഭവവികാസ പരിണാമങ്ങൾ, പ്രധാന ആട്ടക്കഥാകൃത്തുക്കൾ തുള്ളൽ പ്രസ്ഥാനം

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

മൊഡ്യൂൾ രണ്ട് (36 മണിക്കൂർ)

നാടക സാഹിത്യം

മലയാള നാടക പ്രസ്ഥാനം

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

മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

തിരക്കഥാപഠനം

ചലച്ചിത്രനിർമ്മിതിയിൽ തിരക്കഥയ്ക്കുള്ള പ്രാധാന്യത്തെക്കുറിച്ച് സാമാന്യജ്ഞാനം.

എം.ടി. വാസുദേവൻ നായർ - ഒരു വടക്കൻ വീരഗാഥ

റഫറൻസ് ഗ്രന്ഥങ്ങൾ

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

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

Reference books :

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

Core Course III

15UZO341: Methodology and Perspectives of Zoology

No. of credits: 2

No. of instructional hours per week: 3

Aim:

To introduce the methodology and perspectives of Science in general so as to enable the students to systematically pursue Zoology in relation to other disciplines that come under the fabric of Science.

Objectives:

- To learn the fundamental characteristics of science as a human enterprise
- To understand how science works
- To study the application of scientific methods independently

Module I Introduction to Science: (8 hrs)

Science- Definition, Major branches (Physical, Life and Earth science) Fields of science in biology, Scientific Methods (observation, prediction, experiment, hypothesis, Consistency, theory) Creativity in Science, Scientific theory, Scientific Law, Scientific Revolution, Scientific naming,

Scientific temper, Empirism, Hypothetic deductive and inductive models, Simulation and virtual testing, Evidences and Proofs of Impact of science in human life - Positive and negative aspects. Science for nation building, Types of knowledge: Practical, Theoretical and Scientific knowledge, Information.

Module II Life Sciences

(4 hrs)

Definition of life and its manifestations, Biology - The science of life, History of Biology in ancient times, Landmarks in the progress of Biology, Branches of Biology Nature and scope of Zoology, Opportunities for further studies in Zoology, Websites for Zoology studies (Specify few such as web of life, Encyclopaedia of life, Species 2000 etc.,)

Module III Experimentation in science:

(9hrs)

Design of experiments-observation, data collection, nature and types of data (typical examples), treatment of data, data interpretation, significance of statistical tools in data interpretation. Experimentation: Selection of controls, Observational requirements, Instrumental requirements. Types of experiments: Experiment to test a hypothesis, to measure a variable or to gather data by preliminary and explorative experiments.

Observations: Direct and indirect observations, Controlled and uncontrolled observations, Human and machine observations.

Sampling methods: Qualitative sample, Quantitative sample, Random sample, Non random samples. Bio ethics in science: (brief account only), publications and patents, Ethics in research, plagiarism

Module IV Data collection and presentation :

(16 Hrs)

Introduction to Biostatistics: Variable and attribute; Population vs. sample; Census vs. sample survey; Arrangement of data; Frequency distribution.

Graphical presentation of data: Line diagram; Bar diagram; Pie chart; Histogram.

Measures of central tendency: Arithmetic mean; Mode; Median.

Measures of dispersion: Variance; Standard deviation; Standard error of mean; Standard score.

Testing of hypothesis and goodness of fit: Null hypothesis, Level of significance, Probability,

Normal distribution, Error of inference, Student's t-test, Chi-square test.

Module V Tools and Techniques in Biology (9Hrs)

Scientific Drawing – Purpose and principles, Basic understanding on the principle and uses of the following: I) Microscopy a) Light microscopy ,b)Compound microscope ,c) Phase contract microscope, d) Dark field microscopy ,e) Fluorescence microscopy, f) Polarization microscopy ,g) Video microscopy ,h) Camera Lucida, II) Electron microscopy , a)Scanning (SEM), b) Transmission (TEM) , c)STEM ; Confocal microscope.

Instrumentation Techniques : PH meter, Separation Techniques (Centrifuges, Chromatography, Electrophoresis) Analytical Techniques (Colorimeter, Spectro photometer, X - ray Crystallography)

Module VI Nature and scope of Zoology: (8 Hrs)

Branches of Zoology, Research and career options in Zoology, Institutes of Zoological and Scientific importance in India- Location, major achievements and present activities (academic and scientific) [Zoological Survey of India, Wild life institute of India, Central Marine Fisheries Research Institute, Central Institute of Fisheries Technology, Rajiv Gandhi Centre for Biotechnology, ICAR & CSIR,NIO,NIST, Centre for Cellular and Molecular Biology, National, Bioinformatics Centre and Library, Indian Institute of Sciences, Kerala Forest Research Institute, Indian Institute of Technologies, National Centre for Biological Sciences (NCBS), Ashoka Trust for Research in Ecology and the Environment, Jawaharlal Nehru Centre for Advanced Scientific Research, Stem Cell Institute, Institute of Genomics and Integrative Biology, National Institute of Immunology, Centre for DNA Fingerprinting and Diagnostics, Central Drug Research Institute, JNTBGRI , NCBS.

References

- 1 Gieryn, T.F. (1999) Cultural Boundaries of Science. University of Chicago press.
- 2 Graeme. D. Ruxton and Nick Colegrave. (2006) Experimental design for the life science, 2nd edition. Oxford University press.
- 3 Bowler Peter, J. and Iwan Rhys Morus (2005) Making modern Science: A Historical Survey. University of Chicago Press, Chicago.
- 4 Ernest Mayr (1982) The growth of Biological Thought: Diversity, Evolution and Inheritance Published by Harvard University Press.
- 5 Aggarwal S.K. (2009) Foundation Course in Biology – Students Edition.

- 6 Killick H.J. (1971) Beginning Ecology- Ibadan University Press.
- 7 Debbie Holmes, Peter Moody and Diana Dine (2006) Research Methods for the Biosciences. International student Edition. Oxford University Press.
- 8 Marie M. (2005) Animal Bioethics Principles and Teaching Methods Wageningen Academic Publishers.

Complementary Course V
15UCH331.4: ORGANIC AND BIOPHYSICAL
CHEMISTRY I

No. of credits: 3

No. of instructional hours per week: 5

Module I – Mechanisms in organic substitution reactions (9 hrs)

Electron displacement in organic compounds – Inductive, electromeric and mesomeric effects, influence of inductive effect on acidic and basic properties of organic compounds, hyperconjugation and steric effect. Reaction mechanism - Bond fission, rate determining step, nucleophilic substitution of alkyl halides, SN_1 , SN_2 reactions. Effect of structure on reactivity as illustrated by methyl, ethyl, isopropyl and tertiary butyl groups. Electrophilic addition to ethene and propene – Markownikoff's rule, free radical addition, peroxide effect.

Module II – Stereochemistry (9 hrs)

Optical isomerism, chirality, racemisation and resolution, relative and absolute configuration, asymmetric synthesis, optical isomerism due to restricted rotation. Geometrical isomerism, E and Z nomenclature. Aldoximes and ketoximes. Rotational isomerism. Rotation about carbon – carbon single bond, conformation of ethane, propane, butane cyclohexane, axial and equatorial bonds.

Module III – Carbohydrates (9 Hrs)

Classification, configuration, glyceraldehyde, erythrose, threose, ribose, 2-deoxy ribose, arabinose, glucose, fructose and mannose. Pyranoside structures of glucose and fructose, furanoside structure of fructose

(structure elucidation not expected). Mutarotation and epimerization. Conversion of glucose into fructose and viceversa.

Module IV – Spectroscopy II (9 hrs)

Raman spectroscopy:- Stokes and antistokes lines. Quantum theory of Raman spectrum. Advantages and disadvantages of Raman spectrum. Rotational Raman Spectrum. Selection rule and frequency separation. Mutual exclusion principle. NMR spectroscopy. Principle of NMR spectroscopy nuclear spin – interaction with external magnetic field. Chemical shift. Spin – spin coupling. Applications.

Module V – Heterocyclics and alkaloids (9 hrs)

An outline study of the preparation and properties of furan, pyrrole, thiophene, pyridine. Hoffmann's exhaustive methylation. Alkaloids – General methods of isolation, general properties, physiological action of alkaloids, conine, morphine and nicotine (no structural elucidation expected)

Module VI – Vitamins & Hormones (9hrs)

Classification of vitamins, Source, Isolation, Physiological function and deficiency diseases caused by Vitamin A₁(retinol) A₂ (axerophthol) Vitamin B – B₁(thiamine) B₂(riboflavin and folic acid) B₅(niacin) B₆(pyridoxine) B₁₂(cyanocobalamine) Vitamin C(ascorbic acid) Vitamin D₂ (ergo calciferol) Vitamin E(Tochopherols) Vitamin H(biotin) and Vitamin K. Hormones – Steroids – Cholestrol, Bile acids, Artificial hormones (only elementary study)

Reference:

1. Organic Chemistry Vol I and II – I.L. Finar
2. Biophysical Chemistry – Principles and Techniques – A. Upadhyay. K.Upadhyay & N. Nath
3. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
4. Physical Chemistry – Rakshit
5. Essentials of Physical Chemistry – Bahl, Tuli & Arun Bahl
- 6.Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co

Complementary Course VI
15UBO331: ANGIOSPERM TAXONOMY, ECONOMIC
BOTANY, ETHNOBOTANY, PHARMACOGNOSY
AND PLANT BREEDING

No. of credits: 3

No. of instructional hours per week: 4

MODULE –I

6hrs

Angiosperm Taxonomy

1. Definition, Scope and significance of Taxonomy.
2. Systems of classification:
 - a. Artificial (Brief account)
 - b. Natural- Bentham and Hooker (detailed account)
 - c. Phylogenetic (Brief account)
3. Basic rules of binomial Nomenclature. Definition and importance of Herbarium

MODULE –II

9hrs

Floral Morphology: Parts of a flower, types of inflorescenc (Cymose , Raemose Special type-Cyathium-Breif account only)aestivation and placentation, Floral diagram and Floral formula.

MODULE –III

12hrs

A study of the following families with emphasis on the morphological peculiarities and economic importance of its members. (Based on Bentham and Hooker's System)

- | | | | |
|----------------|-------------------|-----------------|---------------|
| 1. Annonaceae | 2. Malvaceae | 3. Rutaceae | 4. Fabaceae |
| 5. Rubiaceae | 6. Asteraceae | 7. Apocyanaceae | 8. Solanaceae |
| 9. Verbenaceae | 10. Euphorbiaceae | 11. Liliaceae | 12. Poaceae |

Practical

32 hrs

1. Students must be able to identify the angiosperm members included in the syllabus. Draw labeled diagram of the habit ,floral parts, L.S of Flower, T.S. of ovary, Floral diagram, Floral formula and describe the salient features of the member in technical terms.
2. Students must submit the practical records at the time of practical examination.

MODULE-IV

Economic Botany

8 hrs

Study of the Botanical name, family, morphology of useful parts, and utility of the following;

1. Cereals and Millets - Paddy and Ragi
2. Legumes - Ground nut, Black gram
3. Sugar yielding plants - Sugarcane
4. Spices & condiments - Cumin, Clove, Cardamom and Pepper
5. Fibre - Cotton
6. Dyes - Henna
7. Resins - Asafoetida
8. Tuber crops - Tapioca, Colocasia
9. Tropical fruits - Banana, Jack fruit
10. Oil yielding Plants - Sesamum, Cocos
11. Medicinal plants - Ocimum, Adhathoda, Sida, Turmeric

Practical

4 hrs

Identify the economic products obtained from the plants mentioned under economic Botany.

MODULE - V

a) Ethnobotany 4 hrs

1. Introduction and relevance .
2. Ethnobotanically important plants.

b) Pharmacognosy

1. Definition & scope of pharmacognosy.
2. Sources of crude drugs-roots, rhizome, bulb, corm, leaves, stem, flowers, fruits & seeds.

MODULE –VI

11hrs

Plant Breeding

1. Introduction , Objectives in plant breeding.
2. Plant introduction, Agencies of plant introduction in India, Procedure of introduction-Acclimatization-Achievements.

3. Selection-mass selection,pure line selection and clonal selection.
4. Hybridization:Procedure of hybridization,inter generic,inter specific,inter varietal hybridization with examples.Composite and synthetic varieties.
5. Heterosis and its exploitation in plant breeding.
6. Polyploidy breeding.
7. Breeding for disease resistance.
8. Mutation breeding

REFERENCES

1. Pandey SN and Misra SP, 2008 Taxonomy of Angiosperms;Ane books Pvt.Ltd.
2. Davis,P.H.and Haywood,v.H.1963.Principles of Angiosperm Taxonomy.Oliver and Royd,London.
3. Jones,S.B.Jr.and Luchsinger,A.E.1986.Plant Systematics (2nd edition). Mc Graw-Hill Book Co.,NewYork
- 4 . Lawrence.G.H.M.1951.Taxonomy of vascular Plants.Macmillan,New york.
5. Naik,V.N.1984.Taxonomy of Angiosperms.Tata McGraw Hill,New York.
6. Radford.A.E.1986.Fundamentals of Plant Systematics Harper and Row, New York.
- 7 . Singh.G.1999.Plant Systematics:Theory and practice Oxford &IBH Pvt,Ltd.New Delhi.
8. Jefftey,C.A.1982.An Introduction to plant Taxonomy.Cambridge University Press,Cambridge London.
9. Verma V,2009 Text Book of Economic Botany;Ane Books Pvt.Ltd.
10. Kapoor LD,2001 Hand Book Of Ayurvedic Medicinal Plants,CRC Press New YORK,Ane Books Pvt.Ltd.
11. S.K.Jain,1987.Glimpses of Ethanobotany .Oxford and IBH publishing Company,New Delhi.
12. S.K.Jain,1987,A manual of Ethanobotany.Scientific Publishers,Jodhpur

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: വിനിയമം, 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 തെറ്റാകാതെ പ്രയോഗിക്കുന്നതിലൂടെ ഭാഷാശുദ്ധി നിലനിർത്തുക. വിവർത്തനത്തിൽ പ്രായോഗിക പരിശീലനം നൽകുക.

പാഠ്യപദ്ധതി

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

വിനിയമവും മാധ്യമങ്ങളും

വിനിയമം- നിർവ്വചനം - ആശയവിനിയമ പ്രക്രിയ - വ്യവസ്ഥാപനം, നിർവ്വയവസ്ഥാപനം, ആശയവിനിയമ പ്രക്രിയയുടെ ഘടകങ്ങൾ, ആശയ വിനിയമ മാതൃകകൾ - വിവിധതരം ആശയവിനിയമങ്ങൾ - 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 ആശയവിനിയമം - തത്ത്വവും പ്രയോഗവും
- 2. ആശയ വിനിയമം - 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 കോളനിഡ്ജ് - പ്രഥമഭാവനയും ദ്വിതീയ ഭാവനയും - ഫാന്റസിയും ഇമാജിനേഷനും തമ്മിലുള്ള വ്യത്യാസം - വേർഡ്സ്വർത്തിന്റെ കാവ്യനിർവചനം - സർഗ്ഗാത്മകരചനയിലേക്കു നയിക്കു സാഹചര്യങ്ങൾ - ജന്മവാസനയും അനുഭവവും - രചനയുടെ വിവിധ ഘട്ടങ്ങൾ.

പ്രായോഗിക പരിശീലനം

കവിത, കഥ, ലഘുനാടകം പ്രസ്തുതചിത്രങ്ങൾക്കുള്ള തിരക്കഥ, ഫീച്ചർ തുടങ്ങിയ വയുടെ 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
(ഇരുൾചിറകുകളുടെ ആമുഖം)
- 4. കാഥികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ
(ഒരു കഥ 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.മുട്ടുത്ത്,
ലിപി പബ്ലിക്കേഷൻസ്
- 5. മലയാളവും ഇന്റർനെറ്റും - സുനീത ടി.വി,
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
- 6. സൈബർ മലയാളം - (എഡി) സുനീത ടി.വി,

- 7. ഭാഷയും ഭരണഭാഷയും - കറന്റ് ബുക്സ്, തൃശൂർ
- ഡോ. എഴുമാറ്റൂർ രാജരാജവർമ്മ, ഇൻഫർമേഷൻ ആന്റ് പബ്ലിക്കേഷൻ വകുപ്പ്, കേരള സർക്കാർ
- 8. ഭരണ ശബ്ദാവലി - കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 9. വൃത്താന്തപത്രപ്രവർത്തനം - സ്വദേശാഭിമാനി രാമകൃഷ്ണപിള്ള, മാളുബെൻ പബ്ലിക്കേഷൻസ്
- 10. ലിനിക്കൽ ബാലഡ്സിന്റെ ആമുഖം - വില്യം വേർഡ്സ്വർത്ത്, വിവ: ഡോ.തോന്നയ്ക്കൽ വാസുദേവൻ, എം.എൻ.വിജയൻ സാസ്ക്കാരിക വേദി
- 11. സാഹിത്യവിദ്യ - കുട്ടികൃഷ്ണമാരാർ, 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.വാസുദേവദേവതിരി, കേരളഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 18. തെറ്റും ശരിയും - പ്രൊഫ.പന്ദന രാമചന്ദ്രൻ നായർ, കറന്റ് ബുക്സ്, കോട്ടയം
- 19. തെറ്റില്ലാത്ത മലയാളം - പ്രൊഫ.പന്ദന രാമചന്ദ്രൻ നായർ, കറന്റ് ബുക്സ്, കോട്ടയം
- 20. ഭാഷാശുദ്ധി സംശയപരിഹാരങ്ങൾ - പ്രൊഫ.പന്ദനരാമചന്ദ്രൻ നായർ
- 21. ഭാഷാശുദ്ധിയും ഭരണഭാഷയും - ഡോ.വിളക്കുടിരാജേന്ദ്രൻ, പ്രിയദർശിനി പബ്ലിക്കേഷൻസ്
- 22. മലയാളശൈലി - കുട്ടികൃഷ്ണമാരാർ, 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. തർജ്ജമയുടെ താക്കോൽ - സി.വി. വാസുദേവഭട്ടതിരി,
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
27. നല്ല മലയാളം - സി.വി.വാസുദേവഭട്ടതിരി,
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
28. http://en.wikipedia.org/wiki/media_influence
29. http://en.wikipedia.org/wiki/creative_writing
30. [http://www.du.ae.in/du/course creative-writing.pdf](http://www.du.ae.in/du/course%20creative-writing.pdf).

Language Course IX (Additional Language IV)

15UHN411.1: Poetry, Translation and Communicative Hindi

No. of credits: 4

No. of instructional hours per week: 5

Aim of the Course / Objectives

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

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

Module 1

Poetry – Prescribe a poetry collection (Ancient and Modern)

Module 2

Translation (Prescribe a text book)

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

Module 3

Communicative Hindi (Prescribe a textbook)

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

Prescribed Textbooks

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

Poems to be studied

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

Edited by Dr. M.S. Vinayachandran
Published by Lokbharathi Prakasan,
New Delhi

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

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

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

Language Course IX (Additional Language IV)

15UFR411.1: Culture and Civilization

No. of credits: 4

No. of instructional hours per week: 5

AIMS:

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

OBJECTIVES:

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

SYLLABUS:

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

Publisher : Didier

Module 4 : Se situer dans le temps

Unit 10 : Au jour le jour

Unit 11 : Roman

Unit 12 : Je te retrouverai

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

Reference books :

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

Core Course IV

15UZ0441: General Informatics & Bioinformatics

No. of credits: 3

No. of instructional hours per week: 3

Aim of the course

To expand basic informatics skill and attitudes relevant to the emerging society and also to equip the student to effectively utilize the digital knowledge resources for the study of Zoology

Objectives of the course

- ✦ To review the basic concepts and functional knowledge in the field of informatics
- ✦ To create awareness about nature of the emerging digital knowledge society
- ✦ To create awareness about social issues and concerns in the use of digital technology
- ✦ To learn the nature, application and scope of Bioinformatics

General Informatics

34 hrs

Module I

4hrs

Introduction- Information systems- software ,Hardware & Data, Information Technology in Industry, Medicine ,Education, Research and Training, Entertainment & Arts ,Science & Engineering –IT in Global Positioning System(GPS),GIS

Module II: Internet and Networking

12hrs

Introduction LAN &WAN- The World Wide Web(WWW)-Browsing the web search engine –data mining Website related to the field of biology, Retrieval of information, Multimedia in biology, Application of Net work-Email,browsing,Chating(demonstration),Internet (demonstration).Basic concepts of IPR, copyrights and patents, Bio piracy, plagiarism, introduction to use of IT in teaching and learning, case study of educational softwares. Academic services – INFLIBNET, NICNET, BRNET

Module III**12hrs**

Social Informatics : IT and society – Issues and Concerns – digital divide, IT and development, new opportunities and new threats, cyber ethics, cyber crime, security, privacy issues, cyber addictions, information overload; health issues – guide lines for proper usage of computers, internet and mobile phones, Digital , Traditional Knowledge library of India.

Module IV**8 Hrs**

IT @ Service of society, e-governance application and state level, overview of IT application in medicine, Healthcare, Business, Commerce, Industry, Defence, Law, Crime detection, Publishing, Communication, Resource management, Weather forecasting , Education, Film and media

Bioinformatics**16hrs****Module IV****9 hrs**

Definition, Nature & Scope of Bioinformatics - Contrast between Bioinformatics and Computational Biology; Key Bio-sequences in Molecular Biology - DNA, RNA and Amino acid sequences - Popular Databases in Bioinformatics - NCBI, DDJB, PDB, OMIM; BLAST & FASTA sequence file formats, Approach of Comparative Biology based on sequence comparison - The basic idea of sequence comparison (algorithms not required) - idea of scoring matrices

Module V**9hrs**

The Blast search engine - important features - Idea of Multiple sequence alignment – Proteomics: Basic ideas of Protein Structure prediction- Concept of Homology Modeling- Idea of Molecular Phylogenetics - advantages and computational procedure (only description of use of a package such as Phylip)- Basic concepts of computer Aided Drug Discovery- General description of drug discovery pipeline- concept of Personalized medicine;

Bioinformatics tools: (i)Molecular Visualization Software - Rasmol (Basic features only) - (ii) ORF finding (iii) gene finding, (iii) BLAST (iv) Hydrophobicity Prediction (v) Single Nucleotide Polymorphism (SNP) prediction using GENSNIIP

References

- 1 . Alan Evans, Leslie Lamport et.al. Informatics Technology in action. Pearson, Delhi, Chennai and Chandigarh.

- 2 Alan Evans, Kendal Martin et.al. Technology in Action, Pearson Prentice Hall
- 3 Alexis & Mathews Leon, Fundamentals of Information Technology, Leon Vikas, ISBN 08125907890
- 4 Arthur M. Lesk. Introduction to Bioinformatics. Oxford publishers.
- 5 Attwood, T.K., Parry, D. J. (2006) Introduction to Bioinformatics. SmithPearson Education Ltd. London.
- 6 Barbara Wilson, Information Technology: The Basics, Thomson Learning
- 7 Bryan Bergeron M.D. (2003). Bioinformatics Computing. Pearson Education Ltd. London
- 8 Claverie & Notredame. (2003). Bioinformatics - A Beginners Guide, Wiley-Dreamtech India Pvt Ltd.
- 9 Dan E. Krane and Michael L. Raymer, Fundamental Concepts of Bio-informatics, Pearson Education
- 10 George Beekman, Eugene Rathswohl, Computer Confluence, Pearson Education, ISBN 0-13-066185-6
- 11 Greg Perry, SAMS Teach Yourself Open Office. Org, SAMS , ISBN 0672326183
- 12 Jean M. Clavierie and Notredam. Bioinformatics, a beginners Guide.
- 13 John Ray, 10 Minute Guide to Linux, PHI,ISBN 81-203-1549-9,
- 14 Mani, K. and Vijayaraj, N. Bioinformatics, A practical Approach Aparna Publication Coimbatore.
- 15 Mount, D. Bioinformatics: sequence & Genome Analysis, Cold spring Harbor press,USA.
- 16 Ramesh Bangia, Learning Computer Fundamentals, Khanna book Publishers, ISBN 818752252b,
- 17 Rastogi et. al., Bioinformatics: Methods and Applications, Prentice Hall of India.
- 18 Xiong, J. (2007) Essential bioinformatics. 2nd edition. Cambridge University press.
- 19 Westhead, D.R., Parish, J.H. and Twyman, R.M. (2003) Bioinformatics. Viva Books Private Limited, NewDelh.

Core Course V

15UZO442: Practical - I

No. of credits: 4

No. of instructional hours per week:

Aim of the course

To provide a hands on training experience in anatomy through simple dissection and mountings

Objectives of the course

- ✦ To familiarize students with conventional organ system in common, easily available animals.
- ✦ To emphasize the adage that 'seeing is believing' typical examples and economically important specimen (preserved) to be studied.

Methodology and Perspectives of Zoology

1) Instrumentation

(giving emphasis on the principle; description and use of the equipment concerned)

- ★ Compound Microscope.
- ★ Micrometer. (Measurement of a given animal in slide mount)
- ★ Camera Lucida.
- ★ pH meter.(Measurement of a PH of a given sample)
- ★ Colorimeter/Spectrophotometer.
- ★ Electrophoresis apparatus.
- ★ Estimation of Mean, Median, Mode and SD of a given data.
- ★ Graphical representation of the data provided.

Animal Diversity I

Minor Practicals

1. Earthworm – body setae
2. Honey bee – mouth parts
3. Prawn – appendages

Major Practical – (Any Two)

1. Earthworm – nervous system
2. Cockroach – nervous system
3. Prawn – nervous system

Taxonomy

Identification , Classification up to class and brief note of the following specimens.

1. Protista – *Actinophrys*, *Noctiluca*, *Paramecium*, *Opalina* – any 2
2. Phylum Porifera – *Euplectella*, *Spongilla*- any 1
3. Phylum Cnidaria – *Hydra*, *Obelia*, *Physalia*, *Aurelia*, *Sea anemone*, *Madrepora* – any 3
4. Phylum Nematoda – *Ascaris* male and female (entire)
5. Phylum Platyhelminthes – *Bipalium*, *Fasciola*, *Taenia solium* – any 1
6. Phylum Annelida – Earthworm, *Nereis*, *Leech*, *Aphrodite*, *Arenicola* – any 1
7. Phylum Onychophora – *Peripatus*
8. Phylum Arthropoda – Cockroach, *Limulus*, *Eupagurus*, *Sacculina*, Honey bee, *Lepisma*, Scorpion – any 3
9. Phylum Mollusca – *Chiton*, *Pila*, *Xancus*, *Dentalium*, *Perna*, *Mytilus*, *Teredo*, *Sepia*, *Octopus*. – any 2
10. Phylum Echinodermata – *Starfish*, *Brittle star*, *Sea urchin*, *Sea cucumber*, *Sea lily* – any 2

Animal Diversity II

Minor practical

1. Fishes - placoid scales of *Scoliodon*, cycloid and ctenoid scales of *Anabas*
2. Fish - Brain

Major practical

1. Fish – Viscera-Flag label the parts and write notes.
2. Fish – Alimentary canal-Flag label the parts and write notes.

Osteology

Human limb bones, girdles, typical vertebra, atlas, axis, thoracic and lumbar vertebrae and lower jaw.

Turtle - carapace and plastron.

Taxonomy

Identification , classification up to order and brief note of the following specimens.

1. Prochordates –Amphioxus (entire)
2. Pisces - 2 cartilaginous fishes, 2 fishes with accessory respiratory organs, 2 edible fishes, 2 culturable fishes and 2 Cat fishes.
3. Amphibia - any 3 (representing the three orders).
4. Reptilia - 2 poisonous and 2 non -poisonous snakes, *Draco*, *Chameleon*
5. Aves - Different feathers, Pigeon.
6. Mammals – Bat

General Informatics & Bio Informatics

1. Download a specified sequence from NCBI and search with it in BLAST and report results with comments
2. Download a specified DNA sequence from NCBI and Identify ORF Genes, if any ,in it.

Complementary Course VII

15UCH431.4: ORGANIC AND BIOPHYSICAL CHEMISTRY II

No. of credits: 3

No. of instructional hours per week: 5

Module I – Amino acid and Proteins (9 hrs)

Classification and properties – synthesis of glycine, alanine and tryptophan – polypeptides and proteins, peptide linkage, peptide synthesis, polypeptides, primary, secondary, tertiary and quaternary structure of proteins, test for proteins, Enzymes – Characteristics, catalytic action, theory of enzyme catalysis – Michaelis – Menton theory – Co-enzymes.

Module II – Nucleic acids and Lipids (9 hrs)

RNA, DNA – their biological role, hydrolysis of nucleoproteins, elementary idea regarding the structure of nucleic acids.

Lipids – Classification oils, fats and waxes, iodine value and saponification value, properties of oils and fats – phospholipids

Module III – Polymers (9 hrs)

Classification with example – natural and synthetic polymers – condensation and addition polymerization. Elastic fibres, thermoplastics and thermosetting plastics. Terpenes – classification, isoprene rule, essential oils, elementary study of citral and geraniol (structure elucidation not required) . Rubber - structure – Vulcanisation of rubber – synthetic rubber – neoprene, butyl rubber, Buna S, Buna N

Module IV – Bio physical Analysis (9 hrs)

Osmosis – osmotic pressure, isotonic solutions, determination of molar mass by osmotic pressure measurement – reverse osmosis. Adsorption – Types of adsorption – applications. Factors influencing adsorption – Langmuir theory of adsorption

Module V – Colloids (9 hrs)

Properties of Colloids – Tyndal effect – Ultramicroscope – Brownian movements – electrophoresis – electro osmosis sedimentation and streaming potential – stability of colloids – zeta potential – Hardy Schultz rule. Protective Colloids – gold number – emulsions, Gels – application of Colloids – delta formation medicines – sewage disposal – emulsification and cleansing action of detergents and soaps.

Module VI – Chromatography (9 hrs)

Introduction to Chromatography, Classification, Adsorption, Column chromatography, Introduction, Principle, Experimental details, Theory of development, factors affecting column efficiency, Applications, Paper chromatography, Types of paper chromatography, Experimental details, Applications. TLC – Introduction, Features, Advantages and limitations, Detecting agents.

Reference:

1. Organic Chemistry Vol I and II – I.L. Finar
2. Biophysical Chemistry – Principles and Techniques – A. Upadhyay, K. Upadhyay & N. Nath
4. Reaction Mechanism in Organic Chemistry – Mukherjee and Singh – Macmillan
5. Physical Chemistry – Rakshit
6. Essentials of Physical Chemistry – Bahl, Tuli & Arun Bahl
7. Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co

Complementary Course VIX

15UCH432.4: Practical

No. of credits: 4

No. of instructional hours per week:

Qualitative Analysis

Systematic analysis with a view to identify the organic compound (aromatic –aliphatic, saturated – unsaturated, detection of elements and detection of functional groups) – polynuclear hydrocarbons, alcohols, phenols, halogen compounds, nitro compounds, amino compounds, aldehydes, ketones, carboxylic acids, amides, urea, thiourea and esters. Only monofunctional compounds are to be given.

Organic preparations

1. Acetanilide from aniline
2. Metadinitrobenzene from nitro benzene
3. Benzoic acid from benzyl chloride

A student has to analyse at least twelve organic compounds.

Volumetric Analysis

I .Acidimetry and alkalimetry

- a.Preparation and standardization of decinormal HCl using sodium carbonate as primary standard.
- b.Estimation of sodium hydroxide using (i) Std oxalic acid and (ii) Std HCl
- c. Determination of sodium hydroxide and sodium carbonate in a mixture (indicator method)

II.Permanganometry

- d. Standardization of KMnO_4 by oxalic acid/sodium oxalate and Mohr's salt
- e. Estimation of oxalic acid/sodium oxalate
- f. Estimation of Mohr's salt
- g. Estimation of calcium

III.Dichrometry

- h. Preparation of Std. $\text{K}_2\text{Cr}_2\text{O}_7$ and estimation of ferrous iron by external and internal indicators.
- i. Estimation of ferric iron by reduction with stannous chloride (internal indicator).

IV.Iodimetry and Iodometry

- j. Standardisation of sodium thiosulphate using std potassium dichromate
- k. Estimation of copper in a solution
- l. Estimation of iodine.

V.Complexometric titrations

- m. Standardisation of EDTA using std Mg^{2+} or Zn^{2+} ion solution.
 - n. Estimation of any one metallic ion from Ca^{2+} , Mg^{2+} , Zn^{2+} or Ni^{2+}
- A student has to carry out at least twelve experiments in this class.

Gravimetric Analysis

- 1.Estimation of water of hydration in barium chloride crystals
- 2.Estimation of barium in barium chloride solution.

This laboratory based course reinforces the qualitative and quantitative chemical analysis that the student has learned in the 1st ,2nd , 3rd and 4th semesters

Complementary Course VIII
15UBO431: PLANT PHYSIOLOGY, ENVIRONMENTAL
BIOLOGY, HORTICULTURE AND PLANT
BIOTECHNOLOGY

No. of credits: 3

No. of instructional hours per week: 4

MODULE -I

Plant Physiology

10 hrs

1. General introduction :Physiological processes,their significance and applications.
2. Water relations of plants:Importance of water to plant life.
 - a. Absorption of water-organs of absorption ,root and root hair.
Physical aspect of absorption -imbibition,diffusion and osmosis.Plant cell as an osmotic system;Water potential and osmotic potential. Plasmolysis and its significance,practical applications.Mechanism of water absorption-active and passive absorption ,root pressure. Pathway of water across root cells.
 - b.Ascent of sap-Vital and physical theories.
 - c.Loss of water from plants:transpiration-cuticular,lenticular and stomatal mechanism-theories-starch sugar hypothesis,potassium ion theory. Significance of transpiration-guttation,anti-transpirants,factors affecting transpiration.
3. Mineral nutrition: macro and micro elements,role of essential elements and their deficiency symptoms.Mechanism of mineral absorption (a) passive absorption-ion exchange and Donnan equilibrium (b) Active absorption-carrier concept.

MODULE-II

10 hrs

4. Photosynthesis:Introduction,significance and general equation.Photo-synthetic apparatus,structure and function of chloroplast,quintasomes-solar spectrum and its importance-Fluorescence and two pigment systems-raw material for photosynthesis-Mechanism of photosynthesis-Light reaction-cyclic and non cyclic photophosphorylation.Hill

reaction Dark reaction: Calvin cycle. Comparative study of C₃, C₄ and CAM plants. Photorespiration.

5. Factors affecting photosynthesis-Law of limiting factor.

MODULE-III

10hrs

6. Respiration: Introduction, definition, significance and general equation. Respiratory substances, types of respiration-aerobic and anaerobic. Aerobic respiration-glycolysis, Krebs's cycle, terminal oxidation. Anaerobic respiration- fermentation: alcoholic and lactic acid fermentation. Energy relation of respiration -R.Q and its significance-Factors affecting respiration.
7. Translocation of solutes: Path way of movement, phloem transport, mechanism of transport-Munch hypothesis, protoplasmic streaming theory-activated diffusion hypothesis, electro osmotic theory.
8. Growth: Phases of growth-vegetative and reproductive growth-growth curve-plant growth regulators-Auxins, Gibberellins, Cytokinins, Ethylene, Abscisic acid-Synthetic plant hormones-practical applications. Senescence and abscission. Photoperiodism.

Practical

14hrs

1. Water potential of onion peel/Rhoeo peel by plasmolytic method
2. Papaya petiole osmoscope.
3. Determination of water absorption and transpiration ratio.
4. Measurement of rate of transpiration using Ganong's potometer or Farmer's potometer.
5. Evolution of oxygen during photosynthesis.
6. Evolution of CO₂ during respiration.
7. Ganong's respirometer and measurement of R.Q
8. Simple respiroscope
9. Alcoholic fermentation using Kuhne's fermentation vessel
10. Geotropism using Clinostat.
11. Measurement of growth using Arc auxanometer.

MODULE -IV

Environmental Biology

8 hrs

1. Definition-Scope and relevance

2. Ecosystems-Concept of an ecosystems-Structure and function of an ecosystem
3. Biotic and abiotic components-Energy flow in an ecosystem.
4. Ecological succession-Definition & types (Hyrosere & Xerosere).
5. Food chains-Food web & ecological Pyramids.
6. Introduction-types, characteristic features, structure and functions of the following ecosystems.
 - a) 1. Forest ecosystem 2. Grassland ecosystem 3. Desert ecosystem 4. Aquatic ecosystems-Ponds, Estuaries.
 - b) Plant adaptations-Morphological, anatomical and physiological adaptations of-Hydrophytes, Xerophytes, Halophytes, Epiphytes, Parasites.

Practical

12 hrs

1. Study of ecological and anatomical modifications of Xerophytes, Hydrophytes, Halophytes, Epiphytes and Parasites.
2. Observation and study of different ecosystems mentioned in the syllabus.

MODULE -V Horticulture

6hrs

1. Introduction to horticulture
2. Garden tools and implements
3. Methods of vegetative propagation: Cutting, grafting, layering, special methods of propagation, propagation by seeds.
4. Media for propagation of plants-soil, sand, Cocopeat, Sphagnum moss, vermiculture, soil mixture, nursery beds
5. Manures-organic and inorganic

Practical

2 hrs

Methods of vegetative propagation: Cutting, grafting, layering, special methods of propagation-propagation by seeds.

MODULE -VI

10hrs

Plant Biotechnology

1. Introduction-History-Major achievements-Biotechnology in india
2. Plant Tissue culture-Culture media; composition, preparation and sterilization- Totipotency: definition and importance.

Dedifferentiation and redifferentiation-Callus and suspension culture,meristem culture-Somatic embryogenesis,Anther culture and production of haploids.

Practical

8 hrs

Preparation of media, sterilization, inoculation and callus induction (Demonstration only)

REFERENCES

1. Verma V 2007,Text book of Plant Physiology.Ane Books Pvt.Ltd
2. Devlin &Witham 1986-Plant Physiology (CBS publishers).
3. Kochhar P.L.& Krishnamoorthy H.N. 1995-Plant Physiology.(Atmaram & Sons- Delhi,Lucknow).
4. Malic C.P. & Srivastava A.K. 1982-Textbook of Plant Physiology(Kalyani Publishers- New Delhi).
5. Pandey S.N. & Sinha B.K. 1995-Plant Physiology (Vikas Publishing House,New Delhi.)
6. Salisbury F.B.& Ross C.W 1992.Plant Physiology.(Wadsworth publishing Company).
7. Sundara Rajan S. 2000-College Botany Vol.IV(Himalaya publishing house)
- 8.Misra SP and Pandey SN,2009,Essential Environmental studies,Ane Books Pvt.Ltd.
9. Ahluwalia VK &Sunitha Malhotra 2009,Environmental science,Ane Books Pvt.Ltd.
10. Sharma,P.D 1989-Elements of Ecology (Rastogi's Company Ltd.,Publications).
11. Kumar.N 1999.An intro.to Horticulture.Rajalekshmi public.Nagarcoil.
12. Bose.t.k,j.Kabir,P.das and pp.joy.2001.Tropical horticulture.Naya prakash public.Culcutta.
13. Desh Beer Singh &Poonam Wasir 2002-Bonsai-an art,scientific public.Jodhpur
14. Chaha,K.I 2001.Handbook of horticulture.Icar,Delhi.
15. Edwin Biles,2003.The complete book of gardening.Biotech.book. Delhi.
16. Bhattachargee.S.K 2006.Advaces in ornamental horticulture.Pointer

publications.Jaipur

17. Singh S.P.1999..Advances in horticulture and forestry.Scientific public.Jodhpur.
18. Sharma.V.K.2004.Advaces in horticultuire,strategies production,plant protection and value addition-Deep and Deep Public.Delhi.
- 19 .Gupta P.K 2014-Elements of Biotechnology(Rastogi Publications).
17. Ignacimuthu S.J. 1996-Applied Plant Biotechnology (Tata Mc Graw Hill)
18. Sobti RC and Suparna S Pachauri 2009,Essentials of Biotechnology, Ane Books Pvt.Ltd.
- 19.Victoriano Valpuesta 2004,Fruit and Vegetable Biotechnology,CRC Press.New York.Ane Books Pvt.Ltd
20. Kumar H.D. 2000-Molecular Biology & Biotechnology(Vikas publishing).
21. Misra S P (2009) Plant tissue culture , Ane Book Pvt. Ltd.

SEMESTER V

Core Course VI

15UZO541: Cell and Molecular Biology

No. of credits: 4

No. of instructional hours per week: 5

Aim

- ★ To educate the student on the basic structure and function of a cell and the principles of molecular biology and gene manipulation.

Objectives of the course

- ★ To study the ultra-structure of prokaryotic and eukaryotic cells.
- ★ To obtain a broad concept of gene expression and regulation.

Module I

(38 Hrs)

CELL and CELL ORGANELLES –Historical perspective, Ultra structural organization and functions of the following. Cell and its components: Basic types of cells- prokaryotic and eukaryotic, nature and comparison (self study) Ultra structural organization and functions: Plasma membrane- ultra structure- fluid mosaic model , functions of plasma membrane, trans-membrane transport. Cell communication- cell signaling and signal transduction, basic elements involved. Mitochondria- structure, functions, mention oxidative phosphorylation and electro transport chain. Endoplasmic reticulum - morphology, types, functions and formation. Golgi bodies - morphology, types, functions (role in secretion) and formation. Lysosomes- morphology, mention major groups of enzymes, classification, polymorphism and functions. Microbodies - morphology, major enzymes, peroxisomes and glyoxisomes functions. Ribosomes - different types, subunits, functions. Proteosomes - structure, ubiquitin - tagged protein degradation. Centrioles and basal bodies- structure and functions. Cytoskeleton- microtubules, microfilaments and intermediate filaments- examples and functions.interphase nucleus - gross structure and functions; nuclear envelope- pores and pore complexes;

nuclear lamina, formation of NE; nucleoplasm- nature and importance. Nucleolus - structure, nucleolar cycle, nucleolar organizer and functions. Chromatin - euchromatin and heterochromatin, nucleosomes, unit fibre, solenoid fibre, and higher order of organization, condensation and coiling. Chromosome - structure of a typical metaphase chromosome; giant chromosomes- polytene chromosomes, lamp brush chromosomes; endomitosis.

Module II **8hrs**

Cell Communications: Cell surface receptors, Cell signaling and signal transduction. Cell Division: cell cycle- G_1 , S, G_2 , and M phases (mention G_0 , and D_0 stages and their significances); amitosis (brief account only). Mitosis (self study). Meiosis: description of all stages, synaptonemal complex, significance

Module III **2hrs**

Biology of cancer: characteristics of cancer cells, dedifferentiation of cancer cells, theories of cancer, carcinogenesis, oncogenes and tumor suppressor genes

Module IV **2hrs**

Aging: cellular and other changes, apoptosis, causes of aging, mention free radicals and superoxide dismutase (SOD).

Molecular Biology **40 hrs**

Module VI **16hrs**

Introduction: history, development and scope.

Nature of genetic material: search for the genetic material, Griffith's experiment, transformation, contributions of Avery, MacLeod and McCarty, Conrat & Stern's experiment with TMV, Hershey & Chase's experiment, transduction. Composition and structure of nucleic acids - Watson - Crick model of DNA, clover leaf model of tRNA, different types of DNA and RNA; DNA replication in prokaryotes and eukaryotes - Semi-conservative method, Messelson & Stahl experiment, replication machinery and mechanism; modification and repair of DNA.

Module VII **15hrs**

Gene Expression: contributions of Garrod, one gene – one enzyme hypothesis, one gene one polypeptide hypothesis, central dogma of Molecular Biology, central dogma reverse, colinearity of genes and gene products. Genetic code - deciphering / cracking the GC, characteristics

of GC, codon assignment and wobble hypothesis. Mention contributions of Nirenberg and his associates, Khorana and his associates.

Transcription of RNAs - RNA polymerases, transcription factors, mechanism of transcription, post-transcriptional modifications of mRNA, rRNA and tRNA, reverse transcription, translation –machinery and mechanism; post translational modification of proteins; role of chaperones in protein normal folding and protection

Module VIII

5hrs

Gene regulation: in prokaryotes (inducible and repressive systems); operon concept – Lac operon and Trp operon

Module IX

4hrs

Bacterial Recombination: transformation, conjugation and transduction (general and specialized transduction)

REFERENCES

- ✧ Alberts B et al. Molecular Biology of the cell. Garland pubg .Inc; New York.
- ✧ Beker W M et al (2004). The World of cell. Pearson Edn ; Singapore.
- ✧ Bhaskaran K K & Biju kumar A. Cell Biology, Genetics & Molecular Biology. Manjusha.
- ✧ Darnell et al .Molecular Cell Biology. Scientific American Book.
- ✧ De Roberties ED etal. Cell and Molecular Biology TMH.
- ✧ Karp G (2005). Cell and Molecular Biology 4 th ed, John Wiley & Sons, Inc.
- ✧ Klein smith L J& Kish VM (1995). Principles of Cell and Molecular Biology. 2 Ed, Harper Collins College pubs..
- ✧ Varma P S & Agarwal VK . Cytology . S Chand &Co.
- ✧ Vijayakumaran Nair K& Jayaprakash M. Cell Biology, Genetics, Molecular Biology. Academica, TVM.
- ✧ Alberts, B. et al. Molecular Biology of the Cell. Garland Pubg. Inc., New York
- ✧ Beker, W. M. et. al. (2004) The World of Cell. Pearson Edn., Singapore
- ✧ Bhaskaran, K. K. & Biju Kumar, A. Cell Biology, Genetics & Molecular Biology. Manjusha

- ✧ Darnell, J. et al. Molecular Cell Biology. Scientific American Book
- ✧ De Robertis, E. D. P. et al. Cell and Molecular Biology TMH
- ✧ Freifelder, D. Molecular Biology. Narosa Publishing House, N. D.
- ✧ Karp G. (2005). Cell and Molecular Biology. 4 e, John Wiley & Sons, Inc.
- ✧ Kleinsmith, L. J. & Kish, V. M. (1995). Principles of Cell and Molecular Biology. 2e, Harper Collins College Pubs
- ✧ Micklos, D. A. & Freyer, G. A. (1990). DNA Science. Cold-Spring Harbour Lab Press.
- ✧ Primrose, S. B. et al. (2000). Principles of Gene Manipulation, 6e, Blackwell Science.
- ✧ Sadava, D. E. Cell Biology. Jones & Bartlett Publishers, London
- ✧ Sheeler, P. and Bianchi D. E. Cell Biology –Structure, Biochemistry and Functions.
- ✧ Snustad & Simons. (2003) Principles of Genetics. 3e, J W & S
- ✧ Strachan, I. & Read, A. P. (1999) Human Molecular Genetics. JW & S Veera Bala Rastogi. (2006). Fundamentals of Molecular Biology 1 e. Ane Books, India
- ✧ Verma, P. S. & Agarwal, V. K. Cytology. S. Chand & Co.
- ✧ Vijayakumaran Nair, K. & Jayaprakash, M. Cell Biology, Genetics, Molecular Biology. Academica, TVM.
- ✧ Vijn J. Aging of the Genome, Oxford University Press
- ✧ Watson, J.D. et al., Molecular Biology of the Gene, 4e, Benjamin Cummings

Core Course VII

15UZO542: Genetics and Biotechnology

No. of credits: 4

No. of instructional hours per week: 4

Aim of the course

To educate the students on the underlying genetic mechanism operating in man and state of the art bio-techniques

Objectives of the course

- ✦ To learn the mechanism of crossing over and inheritance patterns in man.
- ✦ To understand the principles and techniques involved in DNA technology and get an overview of modern techniques like PCR, Hybridoma technology, gene therapy and Human cloning

Genetics

37hrs

Module 1

[8hrs]

Introduction, Mendel and his experiments, Correlation between Mendel's theory and chromosome behaviour (self study); genetic terminology-gene, allele, genotype, phenotype, genome; wild type and mutant type , test cross, back cross and reciprocal cross. Interaction of genes: Allelic, incomplete dominance, lethal and co-dominance, non- allelic, complementary gene action (self study); Co-epistasis (comb pattern in fowl), dominant (feather coat) and recessive (coat colour), polygenic action (skin colour), pleiotropism (one example). Multiple alleles- ABO Blood group system, Rh group and its inheritance.

Module II

8hrs

Linkage and crossing over: Linked genes, linkage groups, chromosome, theory of linkage , theory of chromosomal crossing over, factors affecting crossing over and its significance. Chromosome mapping (brief account only).

Sex Linkage: Characteristics of sex linked inheritance, sex linked inheritance of man (colour blindness and haemophilia), incompletely sex linked genes , holandric genes, sex limited genes and sex influenced genes.

Module III

8hrs

Sex Determination: Environmental factors on sex determination, mention genic balance theory, chromosomal mechanism of sex determination, (XX-XY, XX-XO, ZZ-ZW), sex determination in man, role of Y chromosome, Barr bodies, dosage compensation and Lyon hypothesis. Chromosome mosaicism. Mention inter sex, gynandromorph and hermaphrodite.

Module IV

6hrs

Mutation: Types of mutations - somatic, germinal, spontaneous, induced, autosomal and allosomal, euploidy and aneuploidy. Chromosomal mutation, Gene mutation, molecular basis of mutation, Factors causing mutation.

Module V

3hrs

Cytoplasmic inheritance: Mitochondrial DNA, kappa particles in *paramecium*, maternal effects in *Drosophila*.

Module VI

4hrs

Human Genetics: Karyotyping, normal chromosome complement, pedigree analysis, chromosomal anomalies in man, autosomal (eg. Down syndrome, Edwards syndrome), allosomal (eg. Klinefelters syndrome, Turner's syndrome) Biochemical genetics: Human biochemical genetics, biochemical pathway of phenyl alanine, tyrosine metabolism in normal man. Disorders-Phenylketonuria, Alkaptonuria, Tyrosinosis and Albinism.

Biotechnology

35 hrs

Module VII

8hrs

Introduction-Scope of biotechnology, Branches of biotechnology.

Genetic engineering and recombinant DNA technology: History, Procedure of genetic engineering, (restriction endonucleases, ligases), major steps in cutting and joining of DNA, Vectors - plasmids, Cosmid, bacteriophage; probes, linkers, host cells, Method of recombinant DNA formation- transformation, transfection and non bacterial transformation.

Module VIII

5hrs

Genomic library, construction of genomic library and cDNA library, Polymerase Chain Reaction-basic steps and applications of PCR, DNA sequencing (Sanger method, Automated sequencing), patenting DNA sequences.

Module IX **5hrs**

Blotting Techniques: Southern, Northern and Western blotting, DNA fingerprinting.

Module X **5hrs**

Human Genome Project, hybridoma technology and monoclonal antibodies; gene transfer techniques (chemical treatment, electroporation, lipofection, microinjection, retro viral vector method, embryonic stem cell method and shot gun method); transgenic microbes, plants and animals.

Module XI **3hrs**

Gene therapy: somatic gene therapy and germ line gene therapy; gene doping and its implications; DNA vaccines; Human cloning –therapeutic and reproductive cloning.

Module x **9hrs**

Environmental biotechnology: Biotechnological methods of pollution detection, bioremediation, biotechnology and biodegradation, genetically engineered microbes in bio-treatment of waste, eco-friendly bioproducts for environmental health, bio-piracy, bio-pesticides and bio-fertilizers, organic farming and its merits. Green chemistry – designing a Green synthesis, basic principles of Green chemistry.

References

Genetics

- ▲ Benjamin Lewin. (2004). Genes VIII. Oxford University press, N.Y.
- ▲ Daniel J Fairbanks and W. Ralph Brooks. (1999) Genetics – principles and analysis. Jones and Bartlett Publishers, Massachusetts.
- ▲ Peter Snustad, D. and Michael, J. (2000). Principles of Genetics. John Wiley and Sons, Inc., N. Y
- ▲ Robert J. Brooker. (1999) Genetics-analysis and principles. Addison-Wesley, Menlo Park, California.
- ▲ Shukla. R.S and P.S.Chandel(2007) Cytogenetics, Evolution and Biosttistics. S.Chand & Company.
- ▲ Snustad and Simon (2003) Principles of genetics. 3e. John Wiley and Sons, New York.

- ⤴ Strachan, I. and Read. (1999) Human molecular genetics. John Wiley and Sons, New York.

Biotechnology

- ⤴ Bernard R. Glick and Jack J. Pasternak. (2003). Molecular biology. ASM Press, Washington DC
- ⤴ Brown, T. A. (1995). Gene cloning. Chapman and Hall, London
- ⤴ Daniel J. Fairbanks. (1999). Genetics. Ralph Brooks, Cole Publishing Company
- ⤴ George M Malasinski and David Freifelder (1988) Essentials of Molecular Biology. Jones and Bartlett Publishers, London.
- ⤴ Gerald Karp (1996). Cell and Molecular Biology - Concepts and Experiments. JohnWiley & sons, Inc. N.Y.
- ⤴ Kingsman, S. M. and A.J.Kingsman. (1988). Genetic Engineering. Blackwell Scientific Publications, London
- ⤴ MaxLevitan. (1988). Text Book of Human Genetics. Oxford university Press, N.Y.
- ⤴ Old, R. W. and Primrose, S.B. (1994). Principles of Gene Manipulation. Blackwell Scientific Publications London
- ⤴ Peter J Russell (1998) Genetics. The Benjamin cummines publishing co., Inc. Menlo Park, California.
- ⤴ Taylor. D. J., Green, N. P. O. and Stout, G. W. (2008). Biological science. 3rd edition. Cambridge University press.
- ⤴ William H Elliott and Daphne C Elliott. (1997). Biochemistry and Molecular Biology. Oxford University Press, N. Y.

Core Course VIII

15UZ0543: Microbiology and Immunology

No. of credits: 4

No. of instructional hours per week: 4

Aim of the course

To update the student on the scope and importance of clinical immunology and create an awareness about the inherent dangers of microbes

Objectives of the course

- ◆ To enable the student to understand the principles and mechanisms of immunology
- ◆ To learn the malfunctioning and disorders of the immune system
- ◆ To get a broad understanding of microbes and their economic importance with special reference to pathogenic forms.

Microbiology

35hrs

Module I

14hrs

Introduction: history, development and scope Importance of microbes in various ways- beneficial, harmful, ecological and others.

Classification of microbes/ particles: broad classification- viruses- different groups, examples; mention viroids and prions, Mycoplasmas, Rickettsiae and Chlamydiae; Bacteria: 1. Archaea – significance of extreme life forms(Methanoarchaea , extreme halophiles and thermophiles); Eubacteria (=Bacteria) Major groups of Eubacteria: Bergey's system of classification; modern methods of classification of Eubacteria (outline only with familiar examples)- Nonphotosynthetic proteobacteria:- (Fermentative Rods and Vibrios) ex. Vibrio, Pasteurella (oxidative rods and cocci) eg. Pseudomonas, Azotobacter, Rhizobium; Chemo-lithotrophic bacteria:- eg. nitrifying, sulphur and iron bacteria; Firmicutes (eg. Staphylococcus) and Actinobacteria (Coryneform bacteria); Phototrophic bacteria (Cyanobacteria); Algae-(details not expected) Protista- different groups- examples: Plasmodium, Giardia;

Module II **9hrs**

Applied microbiology: various fields: emphasis on environmental, agricultural, medical, biotechnological, industrial and strategic fields.

Module III **2 Hrs**

Techniques in Microbiology- Replica plating, Staining, Streaking, Agar diffusion test, Fermentation test – tube (aerobic & anaerobic).

Module IV **10hrs**

Symbiotic microbes: microbes with other microbes, microbes with plants microbes with animals; microbe – human host interactions, normal human microbiota of various organs- mention any 3 examples, pathogenic microbes – mention any 3 examples, microbial toxins – mention any 2 examples. Microbial diseases in man (of skin, respiratory system etc.)- viral – chicken pox, measles, cold, herpes, hepatitis, poliomyelitis; bacterial – diphtheria, pneumonia, leprosy, ornithosis; fungal – aspergillosis, candidiasis and others – malaria

Immunology **37hrs**

Module IV **2hrs**

Introduction, history, development and scope.

Module V **3hrs**

Immunity: definition, classification of immunity. Innate (non-specific)– species, racial and individual IM with examples, acquired (specific)– active IM (natural and artificial) with examples, passive IM (natural and artificial) examples.

ModuleVI **6hrs**

Immune system: organs and tissues of the immune system. Primary (central) - thymus, bone marrow, bursa of Fabricii; secondary (peripheral)- spleen, lymph nodes, MALT etc. Cells lymphocytes – T cells and B cells – formation, development and maturation; plasma cells and null cells – natural killer cells, killer cells, lymphokine - activated killer cells; phagocytes / macrophages; antigen presenting cells – macrophages, B-lymphocytes, dendrite cells, Langerhans cells; follicular dendrite cells, neutrophils, eosinophils, basophils, mast cells. Mitogens – mention only

Module VII

14hrs

Antigens (immunogens) (Ag): definition, complete antigens, haptens, antigenic determinants or epitopes; antibodies (Immoglobulins)- definition, general structure of Ig, Ig determinants, physico-chemical properties of Ig, classes of Ig- G, M, A, D, E; mention abnormal Igs; antigen – antibody reactions- mechanism (mention zone phenomenon), precipitation reactions, agglutination reactions, complement fixation, neutralization, opsonisation (brief accounts only) Complement system: definition, general features, major histocompatibility complex (MHC) (brief account only). Immune response- definition, types of immune responses- humoral immune response (antigen mediated immunity - AMI) and cellular immune response (cell mediated immunity - CMI) in detail .

Module VIII

12hrs

Hyper sensitivity / allergy: definitions, classification- types I, II and III (Brief accounts only); immuno deficiency diseases (ID)- definition, primary IDs, disorders of immune mechanism (humoral, cellular and combined IDs), disorders of complements, disorders of phagocytosis, mention one example each, secondary IDs - mention example, an account of Acquired Immune Deficiency Syndrome (AIDS); Auto immunity-definition, mechanism, mention AI diseases; transplantation immunity-definition, classification of transplants, graft versus host reactions;,graft rejection, mechanism of graft rejection, factors affecting graft survival; Immunisation and vaccination- definitions, vaccines; types of immunization- active immunization- killed and live attenuated vaccines, microbial extracts, vaccine conjugates, toxoids, recombinant vaccines, DNA vaccines; passive immunization- pooled normal human Igs, specific Igs (hyper antisera); combined immunization

References

- ★ Ananthanarayanan, R. & Panikar, J.: TB of Microbiology. Orient Longman
- ★ Chakraborty, P. A.: A TB of Microbiology. New Central Book Agency, Kolkotta
- ★ Chapel, H. et al.:Essentials of Clinical immunology. 5 e., '06. Ane Books, India.
- ★ Gandhi. Microbiology and Immunology notes and cases – Blackwell Publishing.

- ★ Goldsby et al.: Immunology. 5 e., 2003. W H Freeman
- ★ Heritage, J. et. al. Introductory Microbiology. Cambridge University Press.
- ★ Hyda, R. M.: NMS Immunology. B. I. Waverly
- ★ Johnson, T. R. & Case, C. L.: Lab. Expts. In Microbiology. 2003. Addison Wesley.
- ★ Joshi, K. R.: Immunology. Agro Bios
- ★ Krieg, N. R. & Holt, J. G. Bergey's Manual of Systematic Bacteriology. Vols 1 – 4. (1984-89). Williams & Wilkins, Baltimore
- ★ Kuby, J.: Immunology. W. H. Freeman
- ★ Lydyard, P. M. et al.: Instant Notes in Immunology. Viva Books
- ★ Nagoaba, B. S. & Vedpathak, D. V.: TB of Immunology. '03. Paras Pub., Hyderabad
- ★ Pelczar, M. J., Reid, R. D. and Chan, E. C. S.: Microbiology, TMH.
- ★ Perry, J. J., Stanley, J. T. & Lory, S.: Microbial Life. 2002. Sinaeur Associates.
- ★ Playfair, J.H. L. et al.: Medical Immunology for students. Churchill Livingstone, UK
- ★ Rajeshwar Reddy, K. TB of Immunology. 2007. AITBS Publishers, India
- ★ Rao, A. S. Introduction to Microbiology, Prentice Hall of India.
- ★ Roitt, I. M.: Essential Immunology. Blackwell Scientific
- ★ Schiegel, H. G. General Microbiology, Cambridge University Press.
- ★ Shetty & Nandini: Immunology. Wiley Eastern
- ★ Talwar, G. P.: A Handbook of Practical Immunology. Vikas, New Delhi
- ★ Todd. Lecture notes on Immunology. Iowa State Uty. Press. Ane Books India
- ★ Tortora, G. et. al.: Microbiology- An Introduction. 2003. Addison Wesley
- ★ Wise, D. J. & Carter, G. R. Immunology. Iowa State Uty. Press. Ane Books India

Core Course IX

15UZO544: Practical II

No. of credits: 3

No. of instructional hours per week:

Aim of the course

To expertise the student to carry out routine hematological and microbiological techniques

Objectives of the course

- 1) To prepare and observe chromosomal arrangements during cell division
- 2) To study chromosomal aberrations in man
- 3) To gain abroad knowledge of conventional biotechnological procedures
- 4) To perform routine blood analysis.

Cell Biology and Molecular Biology

1. Staining of prokaryotic cells: (a) *Lactobacillus* from curd (b) Nitrogen fixing bacteria (*Rhizobium*) from root nodules of legumes
2. Staining of eukaryotic cells: buccal epithelial cells (observe Barr body)
3. Study of muscle cells - Insect
4. Study of cell organelles using models/slides
5. Mitosis: stages in onion (*Allium cepa*) root meristem (squash preparation)
6. Calculation of mitotic index and metaphase index in root meristem of *Allium cepa*
7. Meiosis: stages in testis of grass hopper (demonstration only)
8. Giant chromosomes in Diptera: (*Drosophila Chironomus* larvae) salivary gland cells (demonstration only)
9. Study of Cancer cells using permanent slides.

Genetics

1. Study of monohybrid cross using coloured beads.
2. Study of normal chromosome complement and karyotype of man.
3. Study of genetic syndromes and abnormal karyotypes of man (Klinefelter's syndrome, Turner's syndrome, Down syndrome and Edward syndrome).
4. Study of Barr body and its significance (in stained buccal epithelial cells).
5. Construction of Pedigree chart.
6. Study of ABO Blood groups and Rh Factor in humans
7. Study of phenotypic characters of male and female *Drosophila*.

Biotechnology

1. Extraction of DNA by diphenylamine method.
2. Polymerase Chain Reaction
3. Southern blotting and Northern blotting
4. Electrophoretic separation of proteins
(Demonstration in the Department / Visit to research institute / CD display)

Microbiology & Immunology

1. Gram staining
2. Collection of blood, and study of the effect of anticoagulant.
3. Total and differential count of blood cells.
4. Microscopic observation and study of stained preparations of any two microbes

Open Course

15UZO551.1: Human Health and Sex Education

No. of credits: 2

No. of instructional hours per week: 3

Aim of the course

To redress problem associated with health and sex thereby promoting fitness and well being.

Objectives of the course

- ◆ To make the student understand the importance of good health.
- ◆ To educate the student on clean sexual habits thereby warding off sexually transmitted diseases.

Module I

14hrs

Introduction to health, health as a state of wellbeing, health awareness, Immunityimmunization and vaccination, factors affecting health- food, balanced diet, food supplements, pathogens, pollution, sleep, exercise and stress. Physical health, reproductive health, adolescence, senescence. Mental health- mental illness and disabilities, symptoms and prevention of mental illness; alcoholism, tobacco addiction, de-addiction, lifestyle diseases. Community health- health centres, role of health centres. Spiritual health, yoga and meditation.

Module II

8hrs

Human reproductive system: Male reproductive system- structural details of testis and accessory structures, functions of testis, semen, hormonal control. Female reproductive system- structure of ovary, accessory structures, puberty, reproductive cycles and hormonal control, menstrual cycle, gestation period, hysterectomy, menopause.

Module III

7hrs

Events of human reproduction: Gametogenesis- spermatogenesis and oogenesis, ovulation, fertilization, embryonic development, parturition

Module IV**12hrs**

Human intervention in reproduction: Contraception and birth control- barrier method, hormonal methods, natural methods, sterilization, termination of pregnancy. Infertility- male and female infertility, causes and treatment for infertility. Assisted Reproductive Techniques- IVF, GIFT, ZIFT, Donor Insemination (DI). Artificial Insemination by Donor (AID), Artificial Insemination by Husband or partner (AIH). Surrogacy, SUZI (sub-zonal insemination), MIST (micro insemination sperm transfer)

Module V**6hrs**

Sexually transmitted diseases: Syphilis, genital warts, chlamydia, chancroid, trichomoniasis, gonorrhea, genital herpes, AIDS

Module VI**7hrs**

Sex education: Adolescent sexual activity, teenage pregnancy, sexual harassment, sexual awareness and policies (legal aspects), lesbian and gay sex, bisexual, transgender youth, adolescent stress management

References

- ★ Common sexual problems and solutions by Dr. Prakash Kothari, UBS Publishers and Distributors Ltd.
- ★ Mac E. Hadley. Endocrinology. Pearson Education, Singapore.
- ★ Taylor, D.J., Green, N.P.O., Stout G. W. Biological Science. (Editor R. Soper) 3rd Edition, Cambridge University Press.
- ★ The Complete Manual of Fitness and Well-being. The Reader's Digest Association, Inc. Pleasantville, New York / Montreal.
- ★ Guyton & Hall. Textbook of Medical Physiology.

Open Course

15UZO551.2: Public Health and Hygiene

No. of credits: 2

No. of instructional hours per week: 3

Aim of the course

To make the student aware of the essentials of public health and sanitation thereby warding off diseases and uplifting the living standards of the community

Objectives of the course

- To learn the principles of nutrition and dietetics
- To understand the ill effects of modern lifestyle
- To study the advantages of being hygienic

Module I

6hrs

Introduction: Scope and importance of the study; balanced diet, diet control for diabetics, cholesterol etc., concept of energy, calories, daily food intake as per occupation, pregnancy and lactation. Dietary requirements of infants, pre-school ,children, school children, adults and geriatric care. Malnutrition and over nutrition – obesity and weight control; defects of modern food habits – fast food, soft drinks, ice-creams and broiler chicken.

Module II

4hrs

Adulteration of food: food hygiene – hygiene of milk, meat, fish, eggs, fruits and vegetables, common food adulterants – harmful effects and their detection, food additives, fortification of food; Food Adulteration Act and its stringent implementation

Module III

18hrs

Health Hazards: Health dynamicity – definition, factors influencing health, health as a medium of socio-economic development. Diseases – Common food borne and water borne diseases (gastroenteritis, jaundice, cholera, salmonellosis, travellers' diarrhoea and Escherichia coli infection, typhoid) – mode of transmission, causative agents, symptoms, preven-

tion and control. Sexually transmitted infections– AIDS, genital herpes, hepatitis B, syphilis, gonorrhoea – causative agents, symptoms, modes of transmission and prevention. Dengue, chikunguniya, rat fever (general methods of mosquito control and the need to prevent mosquito breeding in and around our homes). Lifestyle habits – excessive usage of T.V., computer, mobile phones, two wheelers, and their impacts on health. Lack of physical exercise and its deleterious effects on the body and mind

Module IV

6hrs

Health Education: Definition, objectives, principles and methods of health education, illeffects of smoking, alcoholism and drug abuse (emphasis should be given to pan masala, amphetamines, hashish, opium, brown sugar, pethedine). Population control and family welfare, use of contraceptives. Blood donation –basics of ABO, blood grouping including Rh factor. Genetic incompatibility and consanguineous marriages.

Module V

12hrs

Mental Health: Definition by WHO and necessity of mental well being, major depressive disorders, substance abuse, schizophrenia, obsessive compulsive disorders, domestic violence, causes for lost years of healthy life, strategies for prevention and possible interventions, childhood mental disorders and illnesses, gulf widow syndrome, stress reduction and management (importance of yoga)

Module VI

8hrs

Hygiene: Definition, personal hygiene- body odour, oral hygiene, grooming, feminine hygiene, sleep hygiene, hand washing, toiletry. Social hygiene – clean living movements, occupational hygiene, food and cooking hygiene, medical hygiene, excessive hygiene.

References

- ★ Jatin V. Modi and Renjith S. Chawan. Essentials of Public Health and Sanitation – Part I- IV
- ★ Murray, C. J. L. and A.D. Lopez. (1996). The Global Burden Of Disease. World Health Organization.
- ★ Park, J.E. and Park, K. Textbook of Community Health for Nurses.
- ★ Swaminathan S. Principles of Nutrition and Dietetics.

Open Course

15UZO551.3: Human diseases and their management

No. of credits: 2

No. of instructional hours per week: 3

Aim of the course

To instill in the students the need to manage communicable diseases thereby creating a healthy society

Objectives of the course

- To learn the various modes and agents of disease transmission
- To learn the causative factors of non communicable diseases

Module I

5 hrs

Introduction- Health – WHO definition, important of individual health.

Lifestyle choice for healthier life: Diet and health, exercise and health, alcohol, tobacco and drugs, sex and health, computers and health, mobile phone and health, psychological health

Module II

4 hrs

Communicable diseases: Classification of communicable diseases.
Defense mechanism – immunity (natural, acquired)

Module III

5 hrs

Viral Infections: Brief account of virus, chickenpox, poliomyelitis, rabies, yellow fever, dengue fever, mumps, influenza, measles, encephalitis, hepatitis ,HIV infection and AIDS – causes ,symptoms, prevention and cure.

Module IV

5hrs

Bacterial Infections: Brief account of bacteria, dysentery, cholera, tuberculosis, tetanus, diphtheria, septicemia, scarlet fever, typhoid, plague; STD and leprosy – causes, symptoms, prevention and cure.

Module V

5hrs

Protozoan Infections: Brief account of protozoans - amoebiasis, leishmaniasis, trichomoniasis, malaria - causes, symptoms, prevention and cure.

Module VI **5hrs**

Worm Infections: Brief account of platyhelminthes and nematods, cysticercosis, taeniasis, ascariasis, ancylostomiasis, encephalitis, enterobiasis and dracunculosis – causes, symptoms, prevention and cure.

Module VII **4hrs**

Vector borne diseases: Vector – identification of vectors – dengue, filaria, kala azar, Japanese encephalitis, chikungunya- causes, symptoms, prevention and cure.

Module VIII **5hrs**

Non-communicable diseases: Hereditary and congenital diseases – haemophilia, diabetes mellitus, hypertension, muscular dystrophia, some types of cancer. Immunological diseases – allergy, autoimmune diseases. Deficiency diseases – scurvy, pellagra, beriberi, xerophthalmia, rickets. Cardiovascular diseases-causes, symptoms, prevention and treatment.

Module IX **5hrs**

Mental health: Meaning, definition, history, characteristics of a mentally healthy person. Types of mental illness – causes, symptoms and prevention – major mental illness (schizophrenia, paranoia), minor mental illnesses (anxiety, phobia, obsessive compulsive neuroses)

Module X **9hrs**

Basic viewing techniques- endoscopy examination techniques: Blood-total count, differential count, ESR, immune function tests, blood clotting test, routine blood chemistry, blood cholesterol test, hormone tests; urine- routine urine chemistry; cell and tissue test- pap test, sputum test, biopsy, histopathology; genetic tests- amniocentesis, chorionic villi sampling; imaging techniques- X – ray, ultrasound scanning, CT scan, MRI scan, SPECT scanning, PET scanning;

Module XI **2hrs**

Role of yoga in management of common diseases.

Suggested topics for assignments/ seminars

Epidemiological study of the above diseases.

Questionnaire has to be prepared . Students has to be grouped in 10. Each student will have to visit 25 houses and record the observations. The data of 10 students (250 Houses) has to be tabulated, studied and

interpreted. Every year the study, if possible, has to carry out in the same houses or to the same locality. This follow up survey will be very useful

References

- ★ Abraham Verghese. (1996). Introduction to Psychiatry. BI Publication Pvt. Ltd.
- ★ Anderson, G. M. Communicable Disease Control,. Macmillan, New York.
- ★ Bajjee. (1995). Textbook of Preventive and Social Medicine. Jaypee Brothers Medical publishers, New Delhi.
- ★ Chauhan, S. S. Mental Hygiene – A Science of Adjustment, Allied Publishers.
- ★ Carol.D.Tamparo. Diseases of Human body
- ★ Deepak Kumar. (2001). Diseases and Medicines in India: A historical Overview.
- ★ Mangal, S., K. (2004). Introduction to Abnormal Psychology. Sterling Publishers.
- ★ Mary L M, Mark Zelman, Paul Holdway; Human Diseases – A Systematic Approach.
- ★ Park, K. (2005). Textbook of Prevention and Social Medicine, Jabalpur, Banarids.
- ★ Park, J., E., and Park, K. Textbook of Preventive and Social Medicine.
- ★ Swami Styananda Saraswathi, Swami Karam: Yogic Management of Common Diseases.

SEMESTER VI

Core Course X

15UZ0641: Physiology and Biological chemistry

No. of credits: 4

No. of instructional hours per week: 5

Aim of the course

To improve the student's perspective of health and biology through in-depth study of human physiology

Objectives of the course

- ◆ To study the different system and the inherent disorders/ deficiencies involved therein.
- ◆ To learn the structure and functions of bio-molecules and their role in metabolism

Physiology

60hrs

Module I

6hrs

Nutritional Physiology: Introduction, types of nutrition, mechanical and chemical changes of food in the alimentary canal, balanced diet, nutritional disorders – PEM, vitamin deficiency, deficiency of iron, iodine and calcium, lifestyle diseases, role of fibres, nervous and hormonal control of digestion

Module II

8hrs

Circulatory Physiology: Blood- Composition and functions of blood plasma and formed elements, blood groups, mechanism of blood clotting, intrinsic and extrinsic pathways, disorders of blood clotting, anticoagulants, heartbeat, conducting system and pace maker, pulse and blood pressure, clinical significance, control of cardiac activity, common cardiovascular diseases – arteriosclerosis, atherosclerosis, Myocardial infarction, electrocardiogram, angiogram, angioplasty. Lymph and lymphatic system (brief account)

Module III**8hrs**

Respiratory Physiology: Gas exchange, respiratory pigments- structure of haemoglobin, transport of O₂- Oxyhaemoglobin curve, Bohr effect, transport of CO₂ -carbonic acid, carbamino haemoglobin, bicarbonate and chloride shift, regulation of respiration – neural and chemical; respiratory disturbances – apnoea, dyspnoea, hypoxia, hypo and hyper capnia, asphyxia, carbon monoxide poisoning, bronchitis, asthma. Physiological effects of smoking.

Module IV**8hrs**

Renal Physiology: Nephron – Structure, Urine formation, Role of hormone in urine formation and concentration, Counter-current multiplier system, Role of kidney in osmoregulation, composition of urine, abnormal constituents of urine, regulation of kidney functions, renal disorders – nephritis, haematuria, renal calculi, acidosis and alkalosis – Dialysis and kidney transplantation.

Module V**8 hrs**

Muscle Physiology: Brief account of types of muscles, fast and slow twitch muscles, red and white muscles. Ultra structure of striated muscle fibre, muscle proteins, simple muscle twitch, summation, tetanus, tonus, All or None law, fatigue, oxygen debt, rigor mortis. Physiological and biochemical events in muscle contraction.

Module VI**6 hrs**

Nerve Physiology: Neurons – structure, types of neuron (self study). Synapse and types of synapse, nerve impulse propagation, synaptic transmission. Reflex action, refractory period, neuro transmitters, electro encephalo gram. Nerve disorders – epilepsy, Alzheimer's disease, Parkinson's disease.

Module VII**5 hrs**

Sensory Physiology: Structure of eye and ear (self study). Physiology of vision, visual elements and pigments, photo chemistry of vision. Eye defects – myopia, hyperopia, presbyopia, astigmatism, cataract. Structure of ear and mechanism of hearing, hearing impairments – deafness, labyrinthine disease. Olfactory, gustatory and tactile sense organs

Module VIII**3hrs**

Reproductive physiology: Male and female reproductive organs (self study). Reproductive Cycles(role of hormones), puberty, adolescence, pregnancy, parturition, lactation and birth control.

Module IX**8hrs**

Endocrinology: Endocrine glands in man, hormones and disorders, feedback mechanism, mechanism of hormonal activity.

Biological chemistry**30hrs****Module X****8hrs**

Biomolecules in relation to animals: micromolecules, macromolecules, water, buffer systems and importance; Carbohydrates-structure, classification- monosaccharides (trioses, tetroses, pentoses, hexoses, aldoses, ketoses), disaccharides and polysaccharides (homo and hetero polysaccharides); biological functions of carbohydrates. Lipids- classification- simple lipids, (neutral fats and waxes), conjugated lipids (phosphor lipids, sphingo lipids, glyco lipids, lecithins, cephalins, cerebrosides, gangliosides), derived lipids (fatty acids, steroids, prostaglandins), biological functions of lipids. Proteins - classification of proteins, amino acids- basic structure, structure of proteinprimary, secondary tertiary and quaternary structures, haemoglobin as atypical protein, biological functions of proteins.

Module XI**16hrs**

Metabolism in animals: Carbohydrate metabolism – glycogenesis, glycogenolysis, hexose monophosphate shunt, metabolic pathway of glucose- glycolysis, Kreb's cycle, electron transport series, chemi-osmotic theory, energetic; hormonal control of carbohydrate metabolism. Lipid metabolism – hydrolysis of lipid, beta oxidation, mention alpha and omega oxidation of fatty acids, hormonal control of lipid metabolism, hormonal control of lipid metabolism. Protein metabolism – deamination, transamination, formation of urea, hormonal control of protein metabolism.

Module XII**6hrs**

Enzymes: Chemical nature, mechanism of enzyme action, factors affecting enzyme activity, kinetics of enzyme action, Michaelis – Menten equation, iso enzymes, co-enzyme, co-factors, enzyme activation and inhibition.

References

Physiology

- ★ Best and Taylor. (1990). Physiological basis of Medical Practice. Wilkins Co.
- ★ Eckert, R. and D. Randell. (1987). Animal Physiology, CBS Publishers and Distributors N. Delhi.
- ★ Ganong, W.F. (2003), Review of Medical Physiology, McGraw Hill, New Delhi.
- ★ Guyton, A.C. (1981). Text book of Medical Physiology, W.B. Saunders Co.
- ★ Hoar, W.S.(1975). General and Comparative physiology, Prentice Hall.
- ★ Mac. Eleroy, W.D. (1971). Cell Physiology and Biochemistry. Prentice hall of India Ltd.
- ★ Nagabhushanan, R., Kaobarkar M.S. and Sarojini, R. (1983). A text book of animal physiology, Oxford IBH Publishing Co., New Delhi.
- ★ Prosser, C.L. (1978). Comparative animal physiology. W.B.Saunders Co.
- ★ Rama Rao, V., First aid in accidents, Srikrishnan Brothers, Thambuchetty Street, Madras.
- ★ Schmidt-Nielson K. (2002). Animal Physiology, Prentice Hall India Ltd.
- ★ Sebastian, M.M. Animal Physiology. Dona Publications, Changanacherry.
- ★ St. John ambulance associations text books (a) First aid to the injured (b) A preliminary course of first aid to the injured.
- ★ Subramanyan, S. and Madhavankutty, K. (1977). The text book of physiology, Orient Longman Ltd., New Delhi.
- ★ Vander, A.J., Sherman, J.H. and Luciano D.S. (1998), Human Physiology, MacGraw Hill Publishing Co., New Delhi.

- ★ Withers P.C . (1992). Comparative animal physiology. Saunders College Publishing Biological chemistry
- ★ Chattergi and Shinde, Text book of Medical Biochemistry.
- ★ Conn, E.E., Stumpf, P.K., Bruening, G & Doi R.H. (1999). Outlines of Biochemistry, John Wiley and Sons, New York.
- ★ Jain, J.L et.al. (2005). Fundamentals of Biochemistry. S. Chand & Co. Ltd., New Delhi.
- ★ Kaplan, L.A., Pesce, A.J. and Kazmierczak, S.E. (2003). Clinical Chemistry, Mosby London.
- ★ Keith Wilson and John Walker. (2000). Biochemistry and Molecular Biology 6th Edition, Cambridge University Press.
- ★ Mary K. Campbell .(2000). Biochemistry. Harcourt Brace College Publishers.
- ★ Murray, R.K., Granner, D.K., Mayers, P.A. and Rodwell. (2000) Harper's Biochemistry, Prentice Hall International, Inc.
- ★ Nelson, D.L. and Cox, M. (2000). Principles of Biochemistry, Macmillan Worth Publishers.
- ★ Talwar G.P., Srivastava L.M. (2003). Biochemistry and Human Biology, Prentice hall of India, New Delhi.
- ★ Thomas M. Devlin (2000). Biochemistry. John Wiley & Sons Inc. Publications
- ★ William, H. Elliott and Daphne C. Elliot. (1997). Biochemistry and Molecular Biology, Oxford University Press, N.Y.

Core Course XI
15UZO642: Developmental Biology
and Experimental Embryology

No. of credits: 4

No. of instructional hours per week: 4

Aim of the course

To familiarize the student with the principle of developmental biology and provide him a bird's eye view of sophisticated embryological techniques

Objectives of the course

- ♦To study the various stages involved in the developing embryo
- ♦To study the initial developmental procedures involved in Amphioxus, Frog and chick
- ♦To procure information on state- of- the art experimental procedures in embryology.

Developmental biology 57hrs

Module I 4 hrs

Introduction, historical perspective (brief account), theories- Preformation, Epigenesis, Recapitulation and Germplasm. Subdivisions of Developmental biology. Spermatogenesis and oogenesis, structure of Graafian follicle, typical egg and sperm. Polarity of egg, egg envelopes; classification of eggs based on different criteria.

Module II

8hrs

Fertilization: Agglutination, sperm penetration, activation of egg, amphimixis; physiological and biochemical changes during and after fertilization. Parthenogenesis- introduction, natural and artificial parthenogenesis, arrhenotoky and thelytoky, obligatory and facultative, significance of parthenogenesis.

Module III

9hrs

Cleavage: types of cleavage - holoblastic and meroblastic; patterns of cleavage – radial, bilateral, spiral, rotational; cell lineage in Planocera (brief account only). Morula formation in microlecithal, mesolecithal,

macrolecithal eggs; blastulation - introduction, different types of blastula – stereo blastula, coeloblastula, discoblastula, periblastula, blastocyst. Presumptive organ forming areas and fate maps, eg. amphioxus, frog, construction of fate maps.

Module IV

3hrs

Gastrulation: introduction, brief account of morphogenetic movements – epiboly and emboly (invagination, involution, infiltration, ingression, delamination, convergence, divergence) concept of germ layers, derivatives of germ layers.

Module V

5 hrs

Cell differentiation : totipotency, pluripotency and unipotency of embryonic cells. Determination and differentiation in embryonic development. Gene action, drosophila as a model organism (brief account only), Homeotic genes and Hox genes.

ModuleVI

25hrs

Development: Amphioxus - cleavage, blastulation, gastrulation, neurogenesis, notogenesis, mesoderm and coelom formation. Frog -cleavage, blastulation, gastrulation, organogeny – development of brain, eye, heart; metamorphosis - ecological, morphological and physiological changes and hormonal control. Chick - cleavage, blastulation, gastrulation, study of 24 hrs chick embryo; development of extra- embryonic membranes in chick. Man - implantation, pregnancy, parturition. Placentation in mammals – different types of placenta, functions.

Module VII

3hrs

Teratology: definition, causes, infections, drugs and chemicals, metabolic imbalance, ionizing radiation, malnutrition, autoimmunization.

Experimental embryology

Module VIII

15hrs

Spemann's constriction experiments, organizers and embryonic induction, transplantation experiments involving optic cup, nuclear transplantation experiments in amphibians. In vitro fertilization and embryo transfer experiments in farm animals, In vitro fertilization and embryo transfer experiments in man and test tube babies; cloning experiments in animalsmammals; prenatal diagnosis and sex determination methods –

amniocentesis chorionic villus sampling, ultra sound scanning. Embryonic and adult stem cell research and stem cell therapy.

References

- ★ P.C.Jain. (2007). Elements of Developmental Biology, 6th Edn. Rastogi Publications.
- ★ Agarwal, V.K. and Usha Gupta, S (1998). Chand's simplified course in zoology, chordate embryology and histology. S. Chand & Co Ltd.
- ★ Balinsky. B.I. (2004). An Introduction to Embryology. W.B. Saunders & Co.
- ★ Begley, D.J., Firth, J.A. and Houtt, J.R.S. (1980). Human Reproduction and developmental Biology, MacMillan Press Ltd.
- ★ Berry, A.K. (2008). An Introduction to Embryology. Emkay Publications.
- ★ Gibbs. (2006). Practical Guide to Developmental Biology. Oxford University Press.
- ★ Gilbert. S.F. (2000). Developmental Biology. Sinauer Associates, Inc. Publishers.
- ★ Goel, S.C. (1984). Principles of animal developmental biology. Himalaya Publ. House, Bombay.
- ★ Huettner, A.F. (1959). Comparative Vertebrate Embryology. MacMillan.
- ★ Mc Even. (1970). Vertebrate Embryology. Oxford-IBH
- ★ Nelson. (1960). Comparative Embryology of Vertebrates. MacMillan.
- ★ Rough. (1960). Frog- Reproduction and development. Oxford University Press.
- ★ Verma, P.S. and V.K. Agarwal (2007). Chordate Embryology. S. Chand & Co. Ltd.
- ★ Vijayakumaran Nair, K. and P.V. George (2002). A manual of Developmental Biology. Academica, Trivandrum.
- ★ Werner. A. Muller. (2008). Developmental Biology. Springer.
- ★ Wolpert, L. (1998). Principles of Development. Oxford University Press, N. Y.

Core Course XII
15UZ0643: Ecology, Conservation Biology,
Ethology, Evolution and Zoogeography

No. of credits: 3

No. of instructional hours per week: 4

Aim of the course

To enhance the student's concept of nature and her resources and appreciating the process and product of organic evolution

Objectives of the course

- ◆ To learn the principles, applications and management of environmental science.
- ◆ To study the inherent morphological and physiological bases of behavioural pattern exhibited by vertebrates
- ◆ To get an exhaustive knowledge of organic evolution with special reference to man.

Ecology 24 hrs

Module I

3 Hrs

Components of ecosystem: Environmental factors - abiotic factors, light, temperature, soil, water, air; biotic factors- autotrophs, phagotrophs and saprotrophs; ecosystem interaction and inter-relationship between biotic and abiotic factors.

Module II

6hrs

Biogeochemical cycles: Basic types of biogeochemical cycles - gaseous cycle-carbon and nitrogen cycles, mention sedimentary cycles (P and S), recycling pathways and recycle index. Limiting Factors- basic concepts- Leibig's law of minimum, Shelford's law of tolerance, combined concept of limiting factors, Light and temperature as limiting factors.

Module III

11 hrs

Habitat Ecology: Biosphere classification- lithosphere, hydrosphere and atmosphere –physical features, fauna and their adaptations of aquatic,

terrestrial and marine habitats (self study) Population ecology: Properties of population- density, natality, mortality, age distribution, biotic potential, environmental resistance and carrying capacity, population growth forms, J and S shaped curves, emigration, immigration and migration, population fluctuation. Community ecology: Definition and characters, species diversity; stratification; dominance; ecotone and edge effect; ecological indicators; community periodicity, succession (self study)

Module IV

4 hrs

Anthropogenic impact on ecosystem: Ionizing radiation and radioisotopes, ionizing radiation and human health, radiation accidents and other exposures, disposal of radioactive wastes, pesticides like DDT, endosulphan, furadan, insect repellants, e-wastes. Monitoring of pollutants – physical, chemical and biological. Sustainable development, Global environmental issues, GATT, Patents, Green house effects and climate changes, Acid rain, Global warming, Ozone depletion/thinning, Desertification and deforestation.

Conservation Biology

(10 Hrs)

Module V– Introduction

(2 Hrs)

Background - information for conservation initiatives. (Habitat loss, and fragmentation Poaching of wild life and trade, Man wild life conflicts, Invasive Alien Species) Endangered and Endemic species (IUCN red list)

Module VI–Conservation Strategies

(Exsitu and Insitu conservation)

(8Hrs)

Exsitu conservation

The strategy of exsitu conservation, Methods of exsitu conservation, Long time captive breeding, Short term propagation and release, Animal translocations, Animal reintroduction, Zoos and botanical gardens, Conservation of biodiversity in seed banks, Gene banks and germ plasm-reserves; On - farm conservation.

Insitu conservation:

Definition, Advantages and disadvantages, Strategies, National parks and sanctuaries, Biosphere reserves, Critical sites of protected areas and pollutions, Management of protected areas, Conservation beyond parks, sanctuaries and reserves

Ethology	10hrs
Module VII	10 hrs
History and scope of ethology: Motivation- models of motivation (Lorenz's psychohydraulic model and Deutsch's model); learning- types of learning (imprinting, habituation, conditioned reflex, unconditioned reflex, latent learning); neural mechanisms in behaviour role of hypothalamus and other brain centers, hormones and behavior; sociobiology- social groups –merits and demerits, properties of organized societies, social groups in mammals, social stress. Pheromones and chemical communications, human pheromones.	
Evolution	22 hrs
Module VIII	4 Hrs
Theories of organic evolution: Lamarck's theory, it's criticism (Weisman's germplasm theory) Darwin's theory of natural selection (mention the contributions of Wallace). Mutation theory (self study)	
Module IX	4hrs
Geological timescale, fossils, fossilization, paleontological evidences of evolution, fossil dating and significance of fossils.	
Module X	10 hrs
Modern concept of organic evolution: (Neo Darwinism) - genetic basis of evolution- gene pool, gene frequency, mutation, role of mutation in evolution, neutral mutation (Kimura), genetic drift, genetic equilibrium; factors affecting genetic equilibrium and Hardy –Weinberg law. Natural selection: types of selection (brief account of the observation in Biston betularia), isolation and isolating mechanisms; speciation- sympatric speciation and allopatric speciation. Hybridization- adaptive radiation with special reference to Darwin's finches.	
Module XI	6 hrs
Evolution of man: Organic and cultural, examples of trends in human evolution, fossil men brief accounts of Parapithecus, Propiopithecus, Dryopithecus, Ramapithecus, Australopithecus, Neanderthal, Cromagnon and Modern man.	

Zoogeography

8 hrs

Module XII

4hrs

Animal Distribution: Geographic distribution of animals-cosmopolitan distribution, discontinuous distribution, bipolar distribution and isolated distribution, factors affecting animal distribution, barriers to animal distribution- physical and biological barriers.

Module XIII

4 hrs

Zoogeographical Realms: (brief account of each realm mention the areas included, physical features and fauna) Palaearctic region, Australian region, Ethiopian region, Nearctic region, Oriental region and Neotropical region. Biogeographical classification of India- Western Ghats, Eastern Ghats and Himalayas. Insular Fauna: Brief account of oceanic islands and continental islands (with one example each)

References

- ◆ Ahluwalia, V. K. and Malhotra, S. (2006). Environmental science. Ane Books Pvt. Ltd.
- ◆ Allbrook D.B. (1975). The Evolution of Man. Part I and II. Gage Edl. Pub. and Deep Publications.
- ◆ Andrews M.I. and Joy K.P. (1989). Ecology Evolution and Zoogeography. RobersK, Kerieyer Pubo., New York.
- ◆ Aravind Kumar. (2004). Text Book of Environmental Science. APH Associates, Inc.Publishers. Massachusetts.
- ◆ Atchia. M. and Tropp.S. (1995). Environmental Management, John Wiley .
- ◆ Bhatia .A.I. Current trends in Global EnvironmentNew India publishing Agency,
- ◆ Bishop.P.L. (2000). Pollution Prevention: Fundamentals and Practice,
- ◆ Brace, C.L. (1967). The stages of Human Evolution, Prentice Hall International.CambridgeUniversity Press.33.
- ◆ Chapman J.L.and M.J.. (1999). Ecology – Principles and Applications.
- ◆ Chatterjee B. (2003). Environmental Laws: Imple mentation problems.

- ◆ Chatterji.A.K., Introduction to Environmental biotechnology, Prentice Hall of India
- ◆ Chauhan, K.P.S. (1998). International Treaties on Biological Resources: Co Down to Earth, Centre for Science and Environment. Co. , NewDelhi.
- ◆ Colbert E.H. (1980). Evolution of the Vertebrates, John Wiley & Sons. Corporation, NewYork
- ◆ Cutter S.L. (1999). Environmental Risks and Hazards. Prentice Hall of India Private Limited, New Delhi
- ◆ Dadson E.O. (1960). Evolution: Process and Product. Reinhold Pub.
- ◆ Darlington P.J.Jr. (1980). Zoogeography: The geographical Distribution of DehradunDelhi.
- ◆ Dobzhansky T. , Ayala G.L., Stebbins G.L. and Valentine J.W. 1976
- ◆ Dobzhansky T. (1964). Genetics and the origin of species Oxford and IBH Pub. New Delhi
- ◆ Edward j Kormandy. Concepts of Ecology, Prentice Hall of India Private Ltd. New Delhi.
- ◆ Ehrlrich P.R. & holm R.W. (1973). The Proces of Evolution, Mc. Graw-Hill Inc.
- ◆ Enger E.D. and Smith B.E. (2004). Environmental Science. Mc. Graw Hill,
- ◆ Eugene P Odum. (2002). Fundamentals of Ecology. Natraj Publishers,
- ◆ George W. (1962). Animal geography, Heinemann Edl. Books Ltd., London.
- ◆ Houghton, J. (1999) Global Warming, Cambridge University Press.
- ◆ John Alock. (2001). Animal Behavior, an evolutionary approach. Sinauer
- ◆ Kluge. H. Bittner, A and Hohnholz.J.H. (1995). Environment Mangement.Ltd., Ontario

- ◆ Lull R.S. (1947). Organic Evolution Macmillan Pub. Co. New York.
- ◆ Manning Aubrey. (1995). Introduction to Animal Behaviour.
- ◆ Edward Arnold Marvel and Hamilton. Mechanism of Behavior. McGraw-Hill NewDelhi.
- ◆ Moody P.A. (1978) Introduction to Evolution, Ind. Ed. Kalyani Pub., New Delhi
- ◆ Oparin A.I. (1957). The Origin of Life on Earth, Oliver & Boyd, London. Private limited, New Delhi Publishers Ltd.
- ◆ Rajagopalan R. (2006). Environmental studies. From crisis to cure. Oxford
- ◆ Savage J.M. (1969). Evolution, Hold, Rinchart and Winston Inc. New Delhi.
- ◆ Scragg. A. (1999). Environmental Biotechnology, ELBS.
- ◆ Seragelglin. (1999). Biotechnology and Biosafety. World Bank, Washington
- ◆ Sharma P.D. (2000). Environmental Biology. Rastogi Publications.
- ◆ Sharma, B.K. and Kaur, H, (1994). Environmental Pollution. GOEI Publishing
- ◆ Singh, B.P. et.al. (1988). Environment and Biotechnology. Today and Sons. St. Mary's Press and Book Depot., Changanassery.
- ◆ Stebbins G.L. (1977). Process of Organic Evolution, Prentic Hall Inc. Tomorrow printers, New Delhi.
- ◆ Trivedi R.K. Hand book of Environmental Laws, Rules,
- ◆ Trivedi, P.R. (2000). Global Biodiversity, Authors Press. University-Press.
- ◆ Varma P.S. and Agarwal V.K. (1993). Environmental Biology. S. Chand and Company
- ◆ Volpe E.P. (1985). Understanding Evolution. Ind. Repr. Universal Book Stall,

Core Course XIII

15UZO645: Practical III

No. of credits: 3

No. of instructional hours per week:

Aim of the course

To demonstrate basic principles in physiology

Objectives of the course

- ✦ To learn clinical procedures for blood & urine analysis
 - ✦ To make the student skillful in simple biochemical laboratory procedures. Physiology and Biological Chemistry Practicals: [Compulsory]
1. Measurement of oxygen consumption of cockroach using Fen's respirometer.[Experiment set up]
 2. Study of tonicity of blood cells
 3. Paper chromatographic separation of amino acids
 4. Estimation of haemoglobin of blood using Haemoglobinometer.
 5. Effect of temperature / pH on human salivary amylase activity
 6. Qualitative tests of sugars.
 7. Qualitative tests of proteins.
 8. Detection of abnormal constituents (glucose and albumin) in urine[two test each].
 9. Detection of excretory products – ammonia (Nessler's test), urea (Ammonia generation/ Biuret test) and uric acid (Phosphotungstic acid test)
 10. Preparation of blood smear and study of blood cells of man.
 11. Estimation of Cholesterol
 12. Digestion of starch and separation of maltose by dialysis.

Core Course XIV

15UZO646: Practical IV

No. of credits: 3

No. of instructional hours per week:

Developmental Biology and Experimental Embryology

1. Study of different types of eggs-Amphioxus, frog, chick, man- based on models/charts[Any three].
2. Study of blastula- Amphioxus, frog- slide / model [Any one]
3. Study of gastrula – Amphioxus/frog-yolk plug stage - slide / model. [Any one]
4. Mounting, sketch and label of 24hrs/48hrs chick blastoderm.[Any one]
5. Study of placenta(model/ specimen) – any two types.
6. Sperm motility in a fish /zebra fish
7. Embryonic development of the egg of zebra fish (demonstration only)

Ecology

1. Estimation of dissolved oxygen
2. Estimation of CO₂
3. Estimation of hardness of three different water samples.
4. Study of pond of an ecosystem.
5. Extraction of soil organisms- Berlese funnel, Baerman's funnel [Any one]
6. Construction of food web
7. Study of ecological adaptations – any three
8. Collection and observation of marine/Fresh water plankton .
9. Measurement of pH of different water samples using pH meter, pH paper and indicator solution.

Conservation Biology

10. Report on local biodiversity conservation and its efforts - Sacred groves/Medicinal gardens/Man groves (Report should be submitted by the students)

Ethology

11. Alarm pheromones in ants.

Evolution

12. Photo of Darwin and Lamark - Identify the scientist and mention the contribution .

Zoogeography

13. Study different zoogeographical realms with fauna.

Core Course XV

15UZO646: Project and Field study

No. of credits: 4

No. of instructional hours per week:

Aim of the course

To develop an aptitude for research in Zoology

Objective of the course

To inculcate proficiency to identify appropriate research topic and presentation Specifications

Topics of biological interest can be selected for the project.

Project is to be done by a group not exceeding 10 students.

Every student should submit typed (A4 paper, 12 Font, 1.5 Space), spirally bind project

report in duplicate to the department on the day of the examination of Practical II.

A copy duly attested by the supervising teacher and the Head of the Department must be

placed for ESE before a board of two Examiners.

The viva-voce based on the Project is conducted individually.

Project topic once chosen shall not be repeated by any later batches of students.

The project report may contain the following sections

1. Preliminary (Title page, declaration, Certificate of the supervising teacher, content etc.)
2. Introduction with relevant literature review and objective
3. Materials and Methods
4. Result
5. Discussion
6. Conclusion / Summary
7. References.

Field study

A total of eighteen hours (1hour/week) are allotted to field study in the fifth semester.

Field study of 4 days is compulsory. Students are directed to visit one research institute and one wild life sanctuary / ecosystem / museum / zoo, preferably with in the state of Kerala.

Scientifically prepared hand written study tour report must be submitted by each student for ESE on the day of the examination of Practical II.

Elective Course

15UZO661.1: Ornamental Fish culture (Elective)

No. of credits: 2

No. of instructional hours per week: 3

Aim of the course

To make the student aware of the vast potentials involved in ornamental fish farming and trading

Objectives of the course

- ◆ To know about the diversity of ornamental fishes and the scope of culture and trade
- ◆ To Learn setting up and maintenance of aquarium
- ◆ To learn the culture breeding and marketing techniques of common indigenous ornamental fishes

Module 1**7hrs**

History and importance of aquarium fish keeping. Design ,construction and maintenance of aquaria: aquarium fabrication- shape, size, volume, type of glass tanks, preparation of glass tank, strengthening and supporting of tank, fitting of tanks into room settings; aquarium floor setting – type and size of pebbles, gravels, granites used for bed setting and its advantages. Filters- biological, chemical and mechanical. Aquarium accessories like aerators, decoratives, lighting, heating and feeding trays,Public aquarium .

Module II**4 hrs**

Water quality management in aquarium systems – sources of water, containers,storage, temperature, pH, dissolved carbon dioxide, ammonia, hardness and turbidity ,Optimum water quality for tropical aquarium fish keeping.

Module III**6 hrs**

Aquarium plants: Uses of aquarium plants, different varieties of plants like Submergent plants (tubers, rooted plants,) and emergent plants , indoor plants and outdoor plants , selection of plants, planting techniques, propagation and maintenance of aquarium plants. Advantages of natural plants over artificial plants.

Module IV**11hrs**

Common ornamental fishes- indigenous and exotic species; Identification and biology of the common ornamental fishes. *Cyprinus carpio* (koi carp), *Molliensia sphenops* (black molly lyre tail), *Poecilia reticulata* (guppy), *Poecilia latipinna*, *Xiphophorous helleri* (red sword tail) *Xiphophorous maculates* (red platy) *Pterophyllum scalare altum* (angel fish) *Carassius auratus* (Gold fish) *Betta splendens* (Siamese fighting fish) *Trichogaster leeri* (pearl gourami). Live bearers and egg layers. Sexual dimorphism in ornamental fishes.

Module V**7hrs**

Breeding and rearing of common ornamental fishes. Conditions for breeding- pH, temperature and sex ratio. Brood stock management- selection of brooders, maintenance and management of brood stocks. Selective breeding and hybridization techniques. Induced breeding. Colour enhancement techniques.

Module VI**7hrs**

Food and feeding - live feed and formulated feed. Preparation and culture

of live feed (*Artemia*, *Infusoria*, *Spirulina*). Control of algal growth, snails and other predators. Common disease of ornamental aquarium fishes - their causative agents - virus, bacteria, fungi, protozoa and nematode; symptoms, treatment and prophylactic measures.

Module VII

12hrs

Indigenous ornamental fishes - Common indigenous ornamental fishes of western ghats- Identification and biology of the common ornamental fishes. Cyprinid: *Sahyadriadenisonii* (*Puntius denisonii* - red line torpedo fish), *Haludaria fasciatus* (*Puntius fasciatus* - melan barb), *Dawkinsia filamentosa* (*Puntius filamentosus* - Indian tiger barb), *Hypselobarbus kurali* (*Puntius curmuca*), *Danio malabaricus* (Malabar danio); Loaches (Nemacheilus triangularis (Zodiac loach), *Lepidocephalus thermalis* (Malabar loach); Cichlids: *Etroplus maculatus* (yellow and orange chromides), *E. suratensis* (pearl spot), Anabantids: *Anabas testudineus* (climbing perch) and Catfishes : *Horabagrus brachysoma* (Yellowish catfish), *H. nigricollaris* (White collared imperial catfish).

Assignment: Students are to visit ornamental fish Farm and submit a report with photos.

References

- ▲ Arumugam. N. (2008). Aqua culture, Saras publications, Tamil Nadu, India.
- ▲ Axelord, H.R. (1967). Breeding aquarium fishes, T F H Publications.
- ▲ Dick Mills (1981). Aquarium Fishes, Arco publishing.
- ▲ Dick Mills and Gwynne Vevers, (1982). The Practical encyclopedia of fresh water Tropical Aquarium fishes, Salamander Books limited, London.
- ▲ Gahlawat, S.K., et.al. (2007). Manual of experimental Ichthyology, Daya publishing House, Delhi.
- ▲ Gerhard Brunner, (1973). Aquarium plants, T F H Publications, Inc. Ltd., Hongkong.
- ▲ Gupta. S. K. & P. C. Gupta, (2006). General and applied Ichthyology, S. Chand & Co.Ltd., New Delhi.
- ▲ Harishankar J. A & A. Biju Kumar, (1997). Aquarium Fishes, B. R. publishing Corporation, Delhi.
- ▲ Jorgen Hansen, (1979). Making your own aquarium, Bell and Hyman Ltd., London.

- ▲ Ramachandran. A., (2002). Breeding, Farming and management of ornamental fishes. School of Industrial Fisheries, Cochin University of Science and Technology, Cochin-
- ▲ Saroj. K. Swain, (2003). Aquarium care and maintenance, Publ. CIFA, ICAR, Orissa, India.
- ▲ Stephen Spotte, (1970). Fish and invertebrate culture, Wiley Inter Science, John Wiley & Sons, Inc., New York.
- ▲ Tom Lovell (1998). Nutrition and feeding of fish second Ed. Kluwer Academic publishers.
- ▲ Talwar.P.K., and Jhingran.A.G.,(1991). Inland fishes Oxford and IBH Publishing Co. PVT LTD, New Delhi.
- ▲ Web site: [www. Ornamentalfish.org](http://www.Ornamentalfish.org)

Elective Course

15UZO661.2: Vermiculture and Apiculture (Elective)

No. of credits: 2

No. of instructional hours per week: 3

Aim of the course

To promote self employment and self reliance among educated youth

Objectives of the course

- To learn the basic procedure and methodology of vermiculture
- To learn the scope and methodology of apiculture.

Vermiculture

24hrs

Module I

6hrs

Introduction: definition and scope of vermiculture. Nature and species of earthworms: habit categories – epigeic, endogeic and anecic, indigenous and exotic species (*Eudrillus eugeniae/Eisenia foetidae/Perionyx excavatus/ Lampito mauritii*), identification of the above four species based on morphological characters.

Module II

10hrs

Methodology of vermicomposting: step by step methodology – containers for culturing, raw materials required, preparation of bed, environmental

pre-requisites, feeding, harvesting, and storage of vermicompost. Advantages of composting, precautions to be taken to prevent attack by pests and pathogens.

Module III

8hrs

Vermicompost profile and applied aspects: physical, chemical and biological parameters of vermicast, vermin enrichment, economic uses of vermiculture (biofertilizer, waste disposal, vermiwash, poultry feed, vermi-remediation etc.

Apiculture

30hrs

Module IV

8hrs

Introduction and Scope: Definition and significance of the study. Caste system and Social behavior; common species of honeybees used, organization of bee colony, social life and adaptations of honeybees.

Module V

12hrs

Bee keeping methods and equipments: indigenous methods, extraction appliances, extraction of honey from the comb and processing, management and maintenance of an apiary, bee pastures

Module VI

10hrs

Diseases and economics: diseases (bacterial, fungal, protozoan, acarine, brood diseases), preventive and curative measures. Use of honey, bees wax, bee venom, nutrient profile of honey, marketing strategies.

Suggested topics for assignments / seminars Vermiculture

1. Report of field visits to commercial/professional units
2. Feasibility of maintaining a vermicomposting plant in the College maybe worked out
3. Awareness programmes on waste management through vermicomposting may be conducted for the local residence associations

Apiculture

1. Report of field visits

References

1. Cherian & Ramachandran Bee keeping in South Indian Govt. Press, Madras.
2. Gupta, K.C. Romance of bee keeping. Khadi Paristhan, Calicut.
3. Mary Appelhof. Worms eat my Garbage.
4. Mishra R.C. Perspectives in Indian Apiculture
5. Sathe, T.V. Vermiculture and Organic farming.

Elective Course
15UZO661.3: Dairy farming and
Broiler farming (Elective)

No. of credits: 2

No. of instructional hours per week: 3

Aim of the course

To promote and encourage the students to take up animal husbandry instead of crawling for white collar jobs

Objectives of the course

- ◆ To aid white revolution by improving the breeds of cattle
- ◆ To learn the proper and scientific methodology behind poultry farming

Dairy farming

27hrs

Module I

7hrs

Breeds of livestock and dairy farm: Breeds of Taurus (exotic) dairy cattle, breeds of zebu (Indian) cattle, breeds of dairy buffaloes; present status of dairy farming; planning to establish dairy farm, location of farm, different housing systems, dairy buildings, space requirements, economically setting a small farm.

Module II

5hrs

Nutritive values of common feeds, commercial and mixed feeds: Feeding and providing feed - feeds rich in minerals , feeds rich in protein , live stock tonics - hormones , thyroprotein , stilbestrol , urea for dairy cattle, toxic feeds, food-poisoning - Balancing the dairy ration - general rule for feeding dairy herd.

Module III

4hrs

Mechanism of reproduction: Male reproductive organs, female reproductive organs, role of hormones in male reproduction, role of hormones in female reproduction; care and management of newborn animals.

Module IV

6hrs

Artificial insemination: Advantages of artificial insemination over natural breeding, limitation of A.I, problems under Indian conditions; collection of semen - electro ejaculation, dilution of semen and cryopreservation, insemination , cleaning and sterilization of apparatus. Common parasites

in India and cure methods - External parasites and pest, reproductive diseases, milk borne diseases.

Module V **5hrs**

Preparation and marketing of dairy products: Determining quality of milk, choosing market outlet, assembling dairy products from farms, co-operative action among creameries, hauling milk to city markets; Marketing fluid milk (i) Specific gravity of milk (ii) determination of specific gravity with a lactometer (iii) pasteurization of milk (iv) advantages of pasteurization; determining cost of distribution.

Broiler farming **27hrs**

Module VI **5hrs**

History, contribution to remove protein deficiency, role of broiler farm in urban and rural areas, employment potential, export potential. Poultry breeds, broiler strains available in India, day old chicks and their maintenance, hatchery potential; parental stocks and their maintenance

Module VII **5hrs**

Poultry house, site, space requirement, types of houses-cage and deep-litter system, equipment for feeding and watering, lighting for poultry houses, ventilation.

Module VIII **5hrs**

Nutrition of poultry birds, nutritional requirements according to age, starter feed, finisher feed, feed formulation. Availability of raw material for feed; use of antibiotics, aminoacids and minerals.

Module IX **5hrs**

Brooding and rearing baby chicks, types of brooders, vaccination, summer management and monsoon management.

Module X **7hrs**

Diseases and health management, common diseases caused by viruses, bacteria and worms, ranikhet, fowl pox, worms and other parasites, toxicosis and account of aspergillus, aflatoxin, Salmonella; deworming and insecticide treatment; machanised dressing methods; cold storage, avoiding aflatoxin.

Suggested topics for assignments / seminars

Dairy farming

1. Breeds of Taurus (exotic) dairy cattle, Breeds of zebu (Indian) cattle,

Breeds of dairy buffaloes.

2. Planning to establish dairy farm.
3. Setting a small farm.
4. Feeding and providing feed to dairy animals.
5. General rule for feeding dairy herd.
6. Role of hormones in male reproduction.
7. Role of hormones in female reproduction.
8. Care and management of newborn animals.
9. Advantages of Artificial insemination over natural breeding.
10. Common parasites in India and cure methods - External parasites and pest.
11. Reproductive diseases - Milk borne diseases.
12. Determining quality of milk.
13. Marketing fluid milk.

Broiler farming

1. Role of broiler farm to remove protein deficiency.
2. Role of broiler farm in employment potential and export potential.
3. Day old chicks and their maintenance.
4. Parental stocks and their maintenance.
5. Setting up of broiler farming.
6. Feed formulation. Availability of raw material for feed; Use of antibiotics, aminoacids and minerals.
7. Brooding and rearing baby chicks.
8. Summer management and monsoon management.
9. Diseases and health management.

References

Dairy farming

- ✦ Banerji, G.C. A text book of Animal husbandry, 1998. Oxford & IBH.
- ✦ ICAR. Handbook of Animal Husbandry, 1990/97, ICAR, PUSA.

Broiler farming

- ✦ Gnanamani. Profitable Poultry Farming.
- ✦ Banerji, G.C. Poultry. Oxford & IBH.

