

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

**B.SC BOTANY**

**2015 ADMISSION ONWARDS**



## OBJECTIVES OF THE PROGRAMME

The programme is designed in such a way that ensures proper understanding of Science and especially botanical science. The curriculum and content are arranged systematically in order to provide a thorough understanding of various disciplines of botanical science, giving special emphasis on their traditional, fundamental, historical and social relevance.

The syllabi described hereafter are nicely planned to cater the needs of students at undergraduate level, and hope the contents will encourage the students to pursue their endeavors in botanical science and its applications. Sequencing of components in this syllabus will develop the scientific attitude among the students. Various course components may help the students to make a proper scientific vocabulary.

The curriculum has given more emphasis on the special theme 'Environment and Botanists', which itself is introduced in order to develop an environmental concern among the students, the real need of the hour. It has also given importance to knowledge on natural phenomena, manipulation of nature for the benefit of human beings and his desired species.

The course offers Biotechnology as an open subject. It is introduced for familiarizing the students the basic, fundamental and applied aspects of the subject that in turn will make revolutionary changes in the field of agriculture, biodiversity conservation and characterization, medicine, industry, and environment management. The basic facts of Bioinformatics are included for making the students aware of the role of Information Technology on Biology.

The practical works mentioned in the syllabi are designed to develop skill in performing scientific experimentation, and also provide him a detailed awareness on the laboratory environment, laboratory materials and laboratory ethics. This will also provide the student a preliminary experience in collection and interpretation of scientific data.

Field works are prescribed in the curriculum wherever necessary for getting the live experience to the students on various botanical matters. A research work is also suggested to perform, which will equip the students to take up serious assignments in Botanical Science in future. The curriculum offers language courses and complementary courses like Chemistry and Zoology, in addition to the core courses on Botany. This is simply for the all round development of the students in communication and understanding Science in a holistic perspective.

**Table 1. General Structure of the  
First Degree Programme in Botany**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Dura- tion (Hrs.)	Evaluation		Total Cred- its
			T	P			Inter- mal	ESE	
1	15UEN111.1	Language Course I	5	-	4	3	25%	75%	16
	15UML/HN/FR111.1	Language Course II	4	-	3	3			
	15UEN121	Foundation Course I	4	-	2	3			
	15UBO141	Core Course I	2	2	3	3			
	15UCH131.2	Comple. Course I Chemistry	2	2	2	3			
15UZO131.2	Comple. Course II Zoology	2	2	2	3				
2	15UEN211.1	Language Course III	5	-	4	3	25%	75%	17
	15UEN212.1	Language Course IV	4	-	3	3			
	15UML/HN/FR211.1	Language Course V	4	-	3	3			
	15UBO221	Foundation Course II	2	2	3	3			
	15UCH231.2	Comple. Course III Chemistry	2	2	2	3			
15UZO231.2	Comple. Course IV Zoology	2	2	2	3				
3	15UEN311.1	Language Course VI	5	-	4	3	25%	75%	17
	15UML/HN/FR311.1	Language Course VII	5	-	4	3			
	15UBO341	Core Course II	3	2	3	3			
	15UCH331.2	Comple. Course V Chemistry	3	2	3	3			
	15UZO331.2	Comple. Course VI Zoology	3	2	3	3			
4	15UEN411.1	Language Course VIII	5	-	4	3	25%	75%	25
	15UML/HN/FR411.1	Language Course IX	5	-	4	3			
	15UBO441	Core Course III	3	2	3	3			
	15UCH431.2	Comple. Course VII Chemistry	3	2	3	3			
	15UZO431.2	Comple. Course VIII Zoology	3	2	3	3			
	15UCH432.2	Comple IX Practical Chemistry	-	(8)*	4	3			
	15UZO432.2	Comple X Practical Zoology	-	(8)*	4	3			

5	15UBO541	Core Course IV	4	3	4	3	25%	75%	20
	15UBO542	Core Course V	5	2	4	3			
	15UBO543	Core Course VI	4	2	3	3			
	15UBO544	Core Practical-1 VII	-	(4)*	3	3			
	15UBO545	Core Practical-2 VIII	-	(4)*	4	3			
	15UBO551	Open Course	3	-	2	3			
6	15UBO641	Core Course IX	5	2	4	3	25%	75%	25
	15UBO642	Core Course X	4	2	4	3			
	15UBO643	Core Course XI	4	2	4	3			
	15UBO644	Core Practical-3 XII	-	(5)*	3	3			
	15UBO645	Core Practical-4 XIII	-	(8)*	4	3			
	15UBO651	Elective Course	3	-	2	3			
	15UBO646	Project	-	3	4	3			
Total Credit								120	

L= Lecture; P= Practical; (\*) Practical hour already distributed in the semester concerned; ESE= End Semester Examination

**Table 2. SEMESTER I**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Dura- tion (Hrs.)	Evaluation		Total Cred- its
			T	P			Inter- nal	ESE	
1	15UEN111.1	Listening and Speak- ing Skills	5	-	4	3	25%	75%	16
	15UML/HN/ FR111.1	Additional Language I	4	-	3	3			
	15UEN121	Foundation Course I - Writing on Contem- porary Issues	4	-	2	3			
	15UBO141	Core Course I - An- giosperm Anatomy, Reproductive Botany & Palynology	2	2	3	3			
	15UCH131.2	Comple. Course I – Theoretical Chem- istry	2	2	2	3			
	15UZO131.2	Comple. Course II Zoology-Animal Diversity I	2	2	2	3			

**Table 3. SEMESTER II**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Dura-tion (Hrs.)	Evaluation		Total Cred-its
			T	P			Inte- rnal	ESE	
2	15UEN211.1	Reading skills	5	-	4	3	25%	75%	17
	15UEN212.1	Modern English Grammar & usage	4	-	3	3			
	15UML/HN/ FR 211.1	Additional Language II	4	-	3	3			
	15UBO221	Foundation Course II - Methodology and Perspectives in Plant Science	2	2	3	3			
	15UCH231.2	Inorganic and bioinorganic Chem-istry	2	2	2	3			
	15UZO231.2	Animal diversity II	2	2	2	3			

**Table 4. SEMESTER III**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Dura-tion (Hrs.)	Evaluation		Total Cred-its
			T	P			Inte- rnal	ESE	
3	15UEN311.1	Writing and presen-tation skills	5	-	4	3	25%	75%	17
	15UML/HN/ FR 311.1	Additional Language III	5	-	4	3			
	15UBO341	Core Course II - Microbiology, Phycology, Mycology, Lichenology & Plant Pathology	3	2	3	3			
	15UCH331.2	Physical and inor-ganic chemistry	3	2	3	3			
	15UZO331.2	Functional Zoology	3	2	3	3			

**Table 5. SEMESTER IV**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Duration (Hrs.)	Evaluation		Total Cred-its
			T	P			Inte- rnal	ESE	
4	15UEN411.1	Reading in Literature	5	-	4	3	25%	75%	25
	15UML/HN/ FR 411.1	Additional Language IV	5	-	4	3			
	15UBO441	Core Course III - Bryology, Pteridol- ogy, Gymnosperms & Paleobotany	3	2	3	3			
	15UCH431.2	Organic Chemistry	3	2	3	3			
	15UZO431.2	Applied Zoology	3	2	3	3			
	15UCH432.2	15UCH131.2, 15UCH231.2, 15UCH331.2 & 15UCH431.2	-	(8)*	4	3			
15UZO432.2	15UZO131.2, 15UZO231.2, 15UZO331.2 & 15UZO431.2	-	(8)*	4	3				

**Table 6. SEMESTER V**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Duration (Hrs.)	Evaluation		Total Cred-its
			T	P			Inte- rnal	ESE	
5	15UBO541	Core Course IV - Angiosperm Morphology, Systematic Botany, Economic Botany, Ethnobotany & Pharmacognosy	4	3	4	3	25%	75%	20
	15UBO542	Core Course V - Environmental Studies & Phytogeography	5	2	4	3			
	15UBO542	Core Course VI - Cell Biology, Genetics & Evolutionary Biology	4	2	3	3			
	15UBO544	Core Practical - 1 (15UBO541& 15UBO221)	-	(4)*	3	3			
	15UBO545	Core Practical - 2 (15UBO341 & 15UBO441)	-	(4)*	4	3			
	15UBO551.1	Open Course - Horticulture	3	-	2	3			



**Table 7. SEMESTER VI**

Sem No	Course Code	Course Title	Instru-ctional Hours/Week		Cre dits	ESE Dura- tion (Hrs.)	Evaluation		Total Cred- its
			T	P			Inte- rnal	ESE	
6	15UBO641	Core Course IX - Plant Physiology & Biochemistry	5	2	4	3	25%	75%	25
	15UBO642	Core Course X - Molecular Biology, General Informatics & Bioinformatics	4	2	4	3			
	15UBO643	Core Course XI - Plant Breeding, Horticulture & Research Methodology	4	2	4	3			
	15UBO644	Core Practical - 3 (15UBO541 & 15UBO542)	-	(5)*	3	3			
	15UBO645	Core Practical - 4 (15UBO 543, 15UBO 641, 15UBO 642 & 15UBO 643)	-	(8)*	4	3			
	15UBO661.1	Elective Course - Biotechnology & Nanobiotechnology	3	-	2	3			
	15UBO646	Project	-	3	4	3			

**Table 8. Distribution of Contact Hours and Credits  
(CORE, FOUNDATION & OPEN COURSES, PROJECT/  
DISSERTATION)**

Course Code	Course Title	Semester I			Semester II			Semester III			Semester IV			Semester V			Semester VI			Total	
		Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours		Credits	Contact Hours	Credits
		T	P		T	P		T	P		T	P		T	P		T	P			
15UBO 141	Angiosperm Anatomy, Reproductive Botany & Palynology	2	2	3															4	3	
15UBO 221	Methodology & Perspectives in Plant Science				2	2	3												4	3	
15UBO 341	Microbiology, Phycology, Mycology, Lichenology & Plant Pathology							3	2	3									5	3	
15UBO 441	Bryology, Pteridology, Gymnosperms & Paleobotany									3	2	3							5	3	
15UBO 541	Angiosperm Morphology, Systematic Botany, Economic Botany, Ethnobotany & Pharmacognosy											4	3	4					7	4	
15UBO 542	Environmental Studies & Phytogeography											5	2	4					7	4	
15UBO 543	Cell Biology, Genetics & Evolutionary Biology											4	2	3					6	3	
15UBO 544	Practical-I (15UBO141, 15UBO 221)		2*			2*													4	3	
15UBO 545	Practical-II (15UBO 341, 15UBO 441)							2*		2*									4	4	
15UBO 551	Horticulture											3	2						3	2	

15UBO 641	Plant Physiology & Biochemistry																	5	2	4	7	4	
15UBO 642	Molecular Biol- ogy, General Informatics & Bioinformatics																		4	2	4	6	4
15UBO 643	Plant Breeding, Horticulture & Research Methodology																		4	2	4	6	4
15UBO 644	Practical-III (15UBO 541, 15UBO 542)																	5*				5	3
15UBO 645	Practical-IV (15UBO 543, 15UBO 641, 15UBO 642, 15UBO 643)																			8		8	4
15UBO 661	Biotechnology & Nanobiotech- nology																		3			3	2
15UBO 646	Project Report, Tour Diary, Viva-Voce																	2		3		5	4

L = Lecture; P = Practical; \*Practical hour already distributed in the semester concerned

**Table 9. Scheme of Evaluation of Foundation Course II,  
Core Courses, Open Courses & Project**

Sem	Course Code	Course Title	Marks		Duration of ESE
			CE	ESE	
I	15UBO141	Angiosperm Anatomy, Reproductive Botany & Palynology	25	75	3 hrs
II	15UBO221	Methodology & Perspectives in Plant Science	25	75	3 hrs
III	15UBO341	Microbiology, Phycology, Mycology, Lichenology & Plant Pathology	25	75	3 hrs
IV	15UBO441	Bryology, Pteridology, Gymnosperms & Paleobotany	25	75	3 hrs
V	15UBO541	Angiosperm Morphology, Systematic Botany, Economic Botany, Ethnobotany & Pharmacognosy	25	75	3 hrs
	15UBO542	Environmental Studies & Phytogeography	25	75	3 hrs
	15UBO543	Cell Biology, Genetics & Evolutionary Biology	25	75	3 hrs
	15UBO544	Practical-I (15UBO141, 15UBO221)	25	75	3 hrs
	15UBO545	Practical-II (15UBO341, 15UBO441)	25	75	3 hrs
	15UBO551	Horticulture	25	75	3 hrs
VI	15UBO641	Plant Physiology & Biochemistry	25	75	3 hrs
	15UBO642	Molecular Biology, General Informatics & Bioinformatics	25	75	3 hrs
	15UBO643	Plant Breeding, Horticulture & Research Methodology	25	75	3 hrs
	15UBO644	Practical-III (15UBO541, 15UBO542)	25	75	3 hrs
	15UBO645	Practical-IV (15UBO543, 15UBO641, 15UBO642, 15UBO643)	25	75	3 hrs
	15UBO661	Biotechnology & Nanobiotechnology	25	75	3 hrs
	15UBO646	Project Report, Tour Diary, Viva-Voce	25t	75	3 hrs

## **END SEMESTER ASSESSMENT (ESA)**

The college shall conduct the external examinations for all semesters. There will not be any supplementary exams. The practical examinations for Core courses shall be conducted after 4th, 5th and 6th semesters and Complementary courses at the end of 4th semester according to the common calendar and questions set up by the college. The Board of Examiners constituted by the college will have the right to make necessary changes in the pattern of practical examination as and when needed.

## **ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION**

Submission of the following

- Certified and bonafide practical record
- Certified herbarium sheets
- Certified field work
- Certified tour report
- Project report/Dissertation (certified and bonafide)

## **PROJECT**

Project work/Dissertation is compulsory. It can be carried out either individually or by a group not exceeding 15 students. The topics shall either be allotted by the supervising teacher or be selected by the student in consultation with the supervising teacher. The project report/dissertation duly attested by the Supervising teacher and Certified by the Head of the Department, has to be submitted on the day of examination of Practical - III (Core). The project shall be evaluated by an external examiner. The project report/ Dissertation (not less than 40 pages) shall be prepared as per the format given below.

1. Title page /Front page (Certified by the HOD)
2. Declaration by the candidate
3. Certificate attested by the Supervising teacher
4. Acknowledgement, if any
5. Table of contents
6. Abbreviation, if any
7. Introduction & Review of Literature
8. Material and Methods
9. Results and Discussion (Not less than 10 pages)
10. Summary and Conclusion
11. References

Tables, Graphs, Photographs etc. can be used to present the data. Topics selected once should not be repeated.

## STUDY TOUR

- Field trip to a place of plant diversity within or outside Kerala with a minimum duration of 3 days is compulsory. (Field trips are to be conducted for three days either as continuous or one day trips).
- A brief report of the trip has to be submitted.

## CORE COURSES

Sem	Course Code	Course Title	Marks		Duration of ESE
			CE	ESE	
I	15UBO141	Angiosperm Anatomy, Reproductive Botany & Palynology	25	75	3 hrs
II	15UBO221	Methodology & Perspectives in Plant Science	25	75	3 hrs
III	15UBO341	Microbiology, Phycology, Mycology, Lichenology & Plant Pathology	25	75	3 hrs
IV	15UBO441	Bryology, Pteridology, Gymnosperms & Paleobotany	25	75	3 hrs
V	15UBO541	Angiosperm Morphology, Systematic Botany, Economic Botany, Ethnobotany & Pharmacognosy	25	75	3 hrs
	15UBO542	Environmental Studies & Phytogeography	25	75	3 hrs
	15UBO543	Cell Biology, Genetics & Evolutionary Biology	25	75	3 hrs
	15UBO544	Practical-I (15UBO141, 15UBO221)	25	75	3 hrs
	15UBO545	Practical-II (15UBO341, 15UBO441)	25	75	3 hrs
	15UBO551	Horticulture	25	75	3 hrs

VI	15UBO641	Plant Physiology & Biochemistry	25	75	3 hrs
	15UBO642	Molecular Biology, General Informatics & Bioinformatics	25	75	3 hrs
	15UBO643	Plant Breeding, Horticulture & Research Methodology	25	75	3 hrs
	15UBO644	Practical-III (15UBO541, 15UBO542)	25	75	3 hrs
	15UBO645	Practical-IV (15UBO543, 15UBO641, 15UBO642, 15UBO643)	25	75	3 hrs
	15UBO661	Biotechnology & Nanobiotechnology	25	75	3 hrs
	15UBO646	Project Report, Tour Diary, Viva-Voce	20	75	3 hrs

**No Course shall carry more than 4 Credits.**

### **ATTENDANCE (Maximum 5 Marks)**

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 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. However, Viva-Voce based on the Project/Dissertation work shall be conducted individually.

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

**GRADING SYSTEM**

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



## **CONSOLIDATION OF GRADES**

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

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

### **Distribution of marks in Continuous Assessment**

Test	15
Assignments/ Seminars	5
Attendance	5
TOTAL	25

Total marks for the ESE of Practical is 80. 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.

### **Distribution of marks in Continuous Assessment**

Test	10
Assignments/ Seminars	5
Attendance	5
Performance, punctuality and skill	5
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.

## **Overall Grade in a Programme**

<b>Percentage of marks</b>	<b>CCPA</b>	<b>Letter Grade</b>
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 EndSemester 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. 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.

**The minimum pass requirement UG degree courses from the academic year 2015-16 onwards shall be -**

- A minimum of 40% marks (E grade) is required for passing a course with a separate minimum of 40% (10 out of 25) for CE and 40% (30 out of 75) for ESE.
- 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.
- 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.

# 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  
ഉയർന്നശിഷ്ടകൾ - 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**

### **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 :**

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

# Foundation Course I

## 15UEN121: WRITINGS ON CONTEMPORARY ISSUES

**No. of credits: 2**

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

### **AIMS**

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

### **OBJECTIVES**

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

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

### **COURSE OUTLINE**

#### **Module I: Globalization and its Consequences**

Essays: (1) "The Globalized World" – Avinash Jha.

(2) "Globalization and Education: Third World Experience" –  
Amit Bhaduri.

Poem: "Unending Love" - Rabindranath Tagore

#### **Module II: Environmental Issues**

Essay: "Forests and Settlements" - Romila Thapar

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" - Manisha Priyam, 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" – Manisha Priyam, 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**

## **15UBO141: ANGIOSPERM ANATOMY, REPRODUCTIVE BOTANY AND PALYNOLOGY**

**No. of credits: 3**

**No. of instructional hours per week: 4**

### **ANGIOSPERM ANATOMY**

**22 hrs**

1. Objective and scope of plant anatomy
2. Cell wall organization - Gross structure - Primary and secondary wall pits – plasmodesmata-microscopic and sub microscopic structures – Extra cell wall material. Non living inclusions of the cell – Reserve food - secretory products, by products.
3. Tissues – Meristems, Definition, Classification based on origin, position, growth patterns, functions.
4. Apical meristems & theories on apical organization - Apical cell theory, Histogen theory, Tunica -Corpus theory. Organization of root apex in dicots & monocots.
5. Permanent tissues – Definition, classification - simple, complex and secretory.
6. Tissue systems – Epidermal tissue systems-stomata, structure and functions, Ground tissue systems & vascular tissue systems. Different types of vascular arrangements

7. Primary structure – Root, stem and leaf [Dicot & Monocot].
8. Secondary growth - Root and stem- cambium (structure and function) annual rings, heart wood and sap wood, tyloses, ring porous wood and diffuse porous wood, periderm formation, phellum, phellogen and phelloderm ; lenticels
9. Anomalous secondary growth – *Boerhaavia*, *Bignonia*, *Dracaena*.

### **Practical**

**27hrs**

1. Non living inclusions - Cystolith, Raphide, Sphaero-raphide, Aleurone grains.
2. Starch grains (Eccentric, concentric, compound)
3. Simple permanent tissue – Parenchyma, Chlorenchyma, Aerenchyma, Collenchyma and Sclerenchyma
4. Primary structure – Dicot stem: *Hydrocotyle*, *Eupatorium*.
5. Monocot stem: Grass and Asparagus.
6. Dicot root: Pea and *Limnanthemum*
7. Monocot root: Colocasia or any monocot root.
8. Secondary structure - Stem [Normal type]- *Vernonia*
9. Secondary structure - Root [Normal type]- *Tinospora*, *Ficus*, *Carica papaya*, or any normal type
10. Epidermal structures –Stomata.
11. Anomalous secondary thickening – *Boerhaavia*, *Dracaena*, *Bignonia*

### **REPRODUCTIVE BOTANY & PALYNOLOGY**

**14hrs**

1. Introduction to angiosperm embryology with special reference to Indian embryologists.
2. Micro sporogenesis - structure and functions of wall layers.
3. Development of male gametophyte - Dehiscence of anther.
4. Megasporogenesis - Development of female gametophyte - Embryo sac - Development and types - Monosporic – Polygonum type, Bisporic - Allium type, Tetrasporic – Adoxa type.
5. Pollination - Fertilization - Barriers of fertilization - Germination of pollen grains – Double fertilization.

6. Structure of Embryo- Dicot [Capsella], Monocot [Sagittaria] & Endosperm types.
7. Palynology: Pollen structure, pollen morphology, pollen allergy, Economic and Taxonomic importance

### **Practical**

**09hrs**

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

### **REFERENCES**

1. Bhojwani, S. S. and Bhatnagar S.P. 2000. The Embryology of Angiosperms (4th Ed.). Vikas Publishing House, Delhi.
2. Coutler E.G. 1969. Plant Anatomy – Part I Cells and Tissues. Edward Arnold, London.
3. Esau K. 1965. Plant Anatomy. Wiley Eastern, NewYork.
4. Fahn A. 1985. Plant Anatomy. Pergamon Press, Oxford.
5. Pandey, B.P. 1997. Plant Anatomy. S.Chand and co. New Delhi
6. Vashista .P.C.1984. Plant Anatomy. Pradeep Publications, Jalandhar
7. Maheswari, P. 1971. An Introduction to Embryology of Angiosperms. McGraw Hill Book Co., London.
8. Nair P.K.K. 1970. Pollen Morphology of Angiosperms, A Historical and Phylogenic Study. Scholar Publishing House, Lucknow, Vikas Publishing House, Delhi.

## **Complementary Course I** **15UCH131.2: 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. Orbitalwise 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**

### **15UZO131.2: Animal Diversity I**

**No. of credits: 2**

**No. of instructional hours per week: 4**

#### **Aim of the Course**

To inculcate in the student a love and understanding of the fascinating world of invertebrates

#### **Objectives of the course**

- Impart to the student a concrete idea of the evolution, hierarchy and classification of invertebrate phyla
- Understanding the basics of systematics by learning the diagnostic and general characters of various groups
- Getting an overview of typical examples in each phyla
- To study the economic importance of invertebrates with the special reference to insect pests

#### **Module I**

**5 hrs**

Introduction: Classification of organisms- two kingdom system, three kingdom system, four kingdom system, five kingdom system. Kingdom Protista- general features and classification: Phylum Dinoflagellataeg. Noctiluca, Phylum Parabasaliaeg. Trichonympha, Phylum Ciliophoraeg. Paramecium. Phylum Rhizopodaeg. Entamoeba – life history

#### **Module II**

**5hrs**

Kingdom Animalia : Salient features, levels of organization- cellular, tissue, organ and organ system. Branches- Mesozoa, Parazoa and Eumetazoa-radiata and bilateria- Protostomia and Deuterostomia; acoelomata, pseudo coelomata and eucoelomata- schizocoela and enterocoela; body segmentation- metamerism and pseudometamerism.

Phylum Porifera: general characters (self study), classification up to classes- Class Calcarea

eg. Sycon, Class Hexactinellidaeg. Euplectella, Class. Desmospongiaeeg. Spongilla.

Phylum Cnidaria: general Characters (self study), classification up to classes, Class Hydrozoaeg. Obelia, Physalia, Class Scyphozoaeg. Aurelia (mention larval stage), class Anthozoaeg. Sea anemone

### **Module III**

**10 hrs**

**Phylum Platyhelminthes:** general characters (self study), classification up to classes- Class Turbellariaeg. Bipalium, Class Cestodaeg. Taenia Solium, Class Trematoda e.g. Fasciola.

**Phylum Nematoda:** general characters (self study), classification up to classes- Class Secernentea (Phasmida) eg. Ascaris, Class Adenophorea (Aphasmida) eg. Trichinella. Human nematode parasites.

**Phylum Annelida :** general characters (self study), classification up to classes- Class Polychaetaeg. Neries (mention parapodium, heteronereis),- Class Oligochaetaeg. earthworm (mention vermiculture), Class Hirudineaeg. Hirudinaria.

**Phylum Mollusca:** General characters (self study), classification up to classes- Class Aplousobranchia eg. Neomenia, Class Monoplacophora e.g. Neopilina, Class Bivalviaeg. Pearl oyster, Class Gastropodaeg. Pila, Class Cephalopodaeg. Sepia, class Scaphopodaeg. Dentalium. Economic importance of molluscs.

**Phylum Onychophora :** General characters, eg. Peripatus-evolutionary significance.

### **Module IV**

**13 hrs**

**Phylum Arthropoda:** General characters (self study), classification up to classes- Subphylum Trilobitomorpha- Class Merostomataeg. Limulus, Class Arachnidaeg. scorpion, Class Pycnogonidaeg. Nymphon; Subphylum Mandibulata- Class Crustaceaeg. prawn (detailed study), Sacculina, Class Chilopodaeg. Scolopendra, Class Symphylaeg. Scutigera, Class Diplopodaeg. Spirostreptus, Class Pauropodaeg. Pauropus, Class Insectaeg. Cockroach (self study- external characters mouth parts, digestive system), mosquitoes- Anopheles, Culex and Aedes- pathogenicity of



mosquitoes. Pest of paddy - Leptocorisa and Spodoptera, Coconut palm Oryctes rhinoceros and Eriophid mite, stored food grains - Sitophilus oryzae and Tribolium.

## **Module V**

**3hrs**

Phylum Echinodermata: General characters (self study), classification - Class Asterozoa: sea star, Class Ophiurozoa: brittle star, Class Echinozoa: sea urchin, Class Holothurozoa: Sea cucumber, Class Crinozoa: sea lily (mention larval stages)

## **References**

- Brusca R.C. and Brusca G.J. (1990) Invertebrates. Sinauer Associates, Sunderland, MA
- Chandler, A.C. and Read. Parasitology.
- Hickman C.P. and Roberts L.S. (1994) Animal Diversity. Wm. C. Brown, Dubuque, IA
- Pearse V and Pearse J, Buchsbaum M and Buchsbaum R. (1987) Living Invertebrates Blackwell scientific Publications, California.
- Ruppert E.E., Fox R and Barnes R.D. (2004) Invertebrate Zoology. Thomson Books. Cole. USA >

# 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 ഉത്ഭവ- വികാസപരിണാമങ്ങളെപ്പറ്റി സാമാന്യമായി മനസ്സിലാക്കുക. ഒരുനോവൽ വിശദമായി പഠിക്കുക

1. എം.മുകുന്ദൻ - ഒരു ദളിത് യുവതിയുടെ കദനകഥ

**മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)**

**ചെറുകഥ**

മലയാള ചെറുകഥയുടെ വികാസപരിണാമങ്ങളെപ്പറ്റിയുള്ള സാമാന്യജ്ഞാനം.

ആഖ്യാന തന്ത്രങ്ങളുടെ വൈചിത്ര്യം. പ്രമേയത്തിലും രൂപശിൽപ്പത്തിലും സംഭവിച്ച മാറ്റങ്ങൾ

1. സി.വി. കുഞ്ഞിരാമൻ - ആത്മഹത്യ ചെയ്യാൻ എനിക്ക് മതിയായ കാരണമില്ലയോ?

- 2. കാരൂർ - പൊതിച്ചോറ്
- 3. ലളിതാംബിക അന്തർജ്ജനം - മനുഷ്യപുത്രി
- 4. കെ.സരസ്വതിയമ്മ - രമണി
- 5. എം.ടി - ബന്ധനം
- 6. സക്കരിയ - പുത്രം
- 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 - മാനുഷം
- 2. സുകുമാർ അഴീക്കോട് - പ്രഭാഷണകല
- 3. കെ.പി.അപ്പൻ - മധുരം നിന്റെ ജീവിതം (ആദ്യഭാഗം)
- 4. സാനാജോസഫ് - അടുകളകൾ തിരിച്ച് പിടിക്കുക

**റഫറൻസ് ഗ്രന്ഥങ്ങൾ**

- 1. സമ്പൂർണ്ണ മലയാള സാഹിത്യ ചരിത്രം - എഡിറ്റർ പന്മന രാമചന്ദ്രൻ നായർ
- 2. കൈരളിയുടെ കഥ - എൻ. കൃഷ്ണപിള്ള
- 3. ആധുനിക സാഹിത്യ ചരിത്രം  
പ്രസ്ഥാനങ്ങളിലൂടെ - ഡോ.കെ.എം. ജോർജ്ജ്
- 4. മലയാളനോവൽ സാഹിത്യ ചരിത്രം - ഡോ.കെ.എം.തരകൻ
- 5. മലയാള ചെറുകഥാ സാഹിത്യചരിത്രം - ഡോ.എം.എം.ബഷീർ
- 6. നോവൽ സാഹിത്യം - കെ.സുരേന്ദ്രൻ
- 7. നോവൽ സ്വരൂപം - കെ.സുരേന്ദ്രൻ
- 8. നോവൽ സിദ്ധിയും സാധനയും - പി.കെ.ബാലകൃഷ്ണൻ
- 9. നോവൽ സാഹിത്യപഠനങ്ങൾ - ഡോ. ഡി.ബഞ്ചമിൻ
- 10. ആധുനിക നോവൽ ദർശനങ്ങൾ - കെ.എം. തരകൻ
- 11. ചെറുകഥാ പ്രസ്ഥാനം - എം.പി. പോൾ
- 12. ചെറുകഥ ഇന്നലെ, ഇന്ന് - എം. അച്യുതൻ
- 13. ചെറുകഥ - വാക്കുംവഴിയും - കെ.എസ്.രവീകുമാർ
- 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 ഭാവുകത്വപരിണാമവും     | - ഡോ.കെ.എസ് രവികുമാർ   |
| 20. ഏകാന്തനഗരങ്ങൾ               | - ഡോ.പി.കെ രാജശേഖരൻ    |
| 21. ഭാരതപര്യടനം                 | - കുട്ടികൃഷ്ണമാരാർ     |
| 22. മധുരം നിന്റെ ജീവിതം         | - കെ.പി.അപ്പൻ          |
| 23. ശീർഷാസനം                    | - എം.എൻ.വിജയൻ          |
| 24. കവിതയും മനഃശാസ്ത്രവും       | - എം.എൻ.വിജയൻ          |
| 25. അടുകളുകൾ തിരിച്ചു പിടിക്കുക | - സാനാ ജോസഫ്           |

## Language Course V (Additional Language II)

### 15UHN211.1: Fiction and Literary Analysis

**No. of credits: 3**

**No. of instructional hours per week: 4**

#### **Aims of the Course / Objectives**

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

#### **Module 1**

Short story (Prescribe a short story collection)

#### **Module 2**

Novel (Prescribe a novel of post eighties)

#### **Module 3**

#### **Literary Analysis**

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



## Literary criticism

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

### Prescribed Textbooks

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

### Stories to be studied

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

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

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

**No. of credits: 3**

**No. of instructional hours per week: 4**

**AIMS:**

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

**OBJECTIVES:**

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

**SYLLABUS:**

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

Publisher : Didier

Module 2 : Echanger

Unit 4 : Enquête

Unit 5: Invitations

Unit 6: A table !

**Reference books:**

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

## Foundation Course II

### 15UBO221: METHODOLOGY AND PERSPECTIVES OF SCIENCE

**No. of credits: 3**

**No. of instructional hours per week: 4**

#### **SCIENTIFIC STUDIES**

**08 hrs**

1. Types of knowledge: practical, theoretical and scientific knowledge
2. Information: What is science; what is not science; laws of science; basis of scientific laws and factual truths.
3. Science as a human activity; scientific temper and empiricism, Science disciplines
4. Revolution in Science and Technology
5. Ethics in Science: Scientific information; depositories of scientific information, Primary, secondary and digital sources; sharing of knowledge; transparency and Honesty; danger of pre conceived ideas
6. Methods and tools in science: Steps in scientific method. Null hypothesis and alternative hypothesis. Inductive and deductive reasoning.

#### **DATA HANDLING IN SCIENCE**

**12 hrs**

1. Nature and types of data-typical examples, Data collection, Data presentation- Classification and tabulation, diagrammatic (bar, pie diagrams) and graphic presentation.
2. Samples and sampling techniques.
3. Statistical treatment of data: Statistical terms and symbols. Measures of central tendencies (mean, median, mode), Measures of dispersion (range, mean deviation, variance, standard deviation, coefficient of variation), Significance tests (chi-square test).
4. Data analysis – Normal frequency distribution and binomial distribution.

#### **Practical**

**16 hrs**

1. Workout problems on frequency distribution, measures of central tendencies (Mean, Median, Mode)
2. Workout problems on measures of dispersion. (range, mean deviation, variance, standard deviation, coefficient of variation)
3. Workout problems on chi-square test.

## **MICROTECHNIQUE**

**06 hrs**

1. Sectioning - hand and microtome– rotary and sledge
2. Killing and fixation agents – Carnoy's formula, Farmers formula, F .A. A
3. Dehydration - reagents
4. Stains and staining techniques - double staining. General account; Stains: safranin, haematoxylin, acetocarmine and acetoorcein
5. Mounting media - D. P. X and Canada balsam
6. Whole mounts - cytological methods: maceration, smear and squash preparation.

### **Practical**

**08 hrs**

1. Familiarize stains, fixatives and mounting media
2. General awareness of Micro technique - maceration, smears & squash
3. Demonstration of microtome sectioning and hand sectioning
4. Measurement of specimens using micrometer (Demonstration only).
5. Photomicrography and Camera lucida drawings (Demonstration only).

## **BIOPHYSICS**

**10 hrs**

1. Introduction - microscopy - simple and compound – phase contrast; dark field illumination and electron microscopes (SEM and TEM).
2. Micrometry, Camera lucida
3. Principles and applications of Colorimeter, Spectrophotometer and Centrifuge.
4. Basic knowledge of the separation methods: - Chromatography, Electrophoresis.
5. Buffers -their functions in biological systems -Uses of buffers in biological research, pH meter.
6. Cryobiology – cryopreservation and its applications.

### **Practical**

**02 hrs**

1. Preparation of buffer
2. Measurement of pH
3. Separation of plant pigments by paper chromatography/TLC.
4. Construct the absorption spectrum of any sample.

## REFERENCES

1. Gieryn T.F. 1999. Cultural Boundaries of Science. University of Chicago Press, Chicago.
2. Jeffrey A. Lee 2010. The Scientific Endeavor. Pearson, Delhi
3. Collins H. and Punch T. 1993. The Golem. What everyone should know about Science. Cambridge University Press
4. Hewitt, Paul G., Lyons, S., John A., Suchocki and Yeh, J. 2007. Conceptual Integrated Science. Addison-Wesley
5. Bass, Joel, E. et al. 2009. Methods for teaching Science as Inquiry, Allyn & Bacon
6. Veer Bala Rastogi 2008. Fundamentals of Biostatistics. Ane Books Pvt. Ltd
7. Stephen W. Looney 2009. Biostatistical Methods, Humana Press, Springer International Edn.
8. Casey E. J. 1962. Biophysics – Concepts and Mechanics. Van Nostr and Reinhold Company
9. Elizabeth Allman 2004. Mathematical Methods in Biology. Cambridge University Press India Pvt. Ltd
10. Richard Grey 1964. Hand book of microtechnique. Mac Graw Hill Book company
11. Donald A. Johansen 1940. Plant Microtechnique. Mac Graw Hill Book Company.
12. Prasad and Prasad 1972. Outlines of Botanical Micro technique. Emkay publishers, New Delhi

## **Complementary Course III**

### **15UCH231.2: 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<sub>2</sub> – CO<sub>2</sub> 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:**

4. Atomic structure and chemical bonding with introduction to molecular spectroscopy – Manas Chanda
5. Concise Inorganic Chemistry – J.D. Lee
6. 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**

### **15UZO231.2: Animal Diversity II**

**No. of credits: 2**

**No. of instructional hours per week: 4**

**Aim of the course**

To inculcate in the student a fascination for nature and learn the bionomics of vertebrates .

**Objectives of the course**

- Learn the evolution, hierarchy and classification of different classes of chordates
- To get an overview of the morphology and physiology of typical examples.
- To study the adaptations and economic importance of specific vertebrates.

**Module I****10hrs**

Phylum Chordate: Salient features of the phylum Chordata (self study), classification up to classes- Subphylum Urochordataeg. Ascidia- general characters, external features and retrogressive metamorphosis; Subphylum Cephalochordate- general characters, eg. Amphioxus.

**Module II****10hrs**

Subphylum Vertebrata: General characters(self study), classification- Super class Agnatha eg. Petromyzon; Super class Pisces eg. Scoliodon, Narcine, Anguilla, Echeineis, Hippocampus, Etroplus, mackerel, sardine, pomfret; Super class Tetrapoda- Class Amphibia-general charactersand eg. Ichthyophis, Rhacophorus, Amblystoma-axolotllarva.

**Module III****9hrs**

Class Reptilia: General characters (self study), eg. Calotes, Draco, Chameleon, Chelone, snakes- general features, non poisonous snakes eg. Lycodon, Ptyas(external features and peculiarities of examples), poisonous snakes eg. Naja, viper, Bungarus,Enhydrina(characteristic features), identification of poisonous and non poisonoussnakes,different types of venom, mode of action.

**Module IV****7hrs**

Class Aves: General characters (self study), flightless birds- eg.ostrich and kiwi, flying birds eg. pigeon- mention different types of feathers and pea fowl. Flight adaptations of birds. Class Mammalia- general characters(self study), eg. echidna, kangaroo, bat, loris, tiger and whale.

**References**

- Dhama, P.S. and Dhama, J.K. Vertebrate Zoology. R. Chand and Co.
- EkambaranathaAyyar, M. and Ananthakrishnan, T.N. A Manual of Zoology.Vol II
- Green N.P.O., et al (2000) Biological Science. Cambridge University Press.
- Jordan, E.L and Verma, P.S. Vertebrate Zoology.S. Chand and Co.
- Kotpal, R.L. (2002) Modern Text Book of Zoology: Vertebrates. Ras-togi Publishers
- Mayer E. (1980) Principles of Systematic Zoology. TatMcGraw Hill Publishing Co.New Delhi.
- The New Encyclopedia Britannica, Macropedia, (1998). Encyclopedia Britannica



# 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:**

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# Language Course VII (Additional Language III)

## 15UML311.1: ദൃശ്യകലാസാഹിത്യം

**No. of credits: 4**

**No. of instructional hours per week: 5**

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

### മൊഡ്യൂൾ ഒന്ന് (36 മണിക്കൂർ)

#### ആട്ടക്കഥ, തുള്ളൽ സാഹിത്യം

കഥകളിയുടെ ഉത്ഭവവികാസ പരിണാമങ്ങൾ, പ്രധാന ആട്ടക്കഥാകൃത്തുക്കൾ തുള്ളൽ പ്രസ്ഥാനം

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

### മൊഡ്യൂൾ രണ്ട് (36 മണിക്കൂർ)

#### നാടക സാഹിത്യം

മലയാള നാടക പ്രസ്ഥാനം

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

### മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)

#### തിരക്കഥാപഠനം

ചലച്ചിത്രനിർമ്മിതിയിൽ തിരക്കഥയ്ക്കുള്ള പ്രാധാന്യത്തെക്കുറിച്ച് സാമാന്യജ്ഞാനം.

എം.ടി. വാസുദേവൻ നായർ - ഒരു വടക്കൻ വീരഗാഥ

#### റഫറൻസ് ഗ്രന്ഥങ്ങൾ

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

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

# Language Course VII (Additional Language III)

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

**No. of credits: 4**

**No. of instructional hours per week: 5**

### **Aim of the Course / Objectives**

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

### **Module 1**

Drama – Prescribe a Drama (Post Sixties)

### **Module 2**

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

### **Module 3**

Technical Terminology (Prescribe a text book)

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

### **Prescribed Textbooks**

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

### **Lessons to be studied**

1. Lekshmi ka Swagath - Upendranath Ashk
2. Reed ki Haddi - Jagadeesh Chandra Mathur
3. Bahut Bada Saval - Mohan Rakesh
  
4. Technical Terminology - 'Paribhashik Sabdavali'  
Edited by Dr. Satheesh kumar G.  
Chairman (BOS)

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

**No. of credits: 4**

**No. of instructional hours per week: 5**

### **AIMS:**

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

### **OBJECTIVES:**

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

### **SYLLABUS:**

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

Publisher : Didier

### **Module 3 : Agir dans l'espace**

Unit 7 : Rallye

Unit 8 : chez moi

Unit 9 : Les vacances

The following poems to be studied:

1. Le Pont Mirabeau - Guillaume Apollinaire
2. Déjeuner du Matin - Jacques Prévert

3. Le Pélican - Robert Desnos
4. Noel - Théophile Gautier
5. Chanson d'Automne - Paul Verlaine
6. Pour faire le portrait d'un oiseau – Jacques Prévert

**Reference books :**

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

## **Core Course II**

### **15UBO341: MICROBIOLOGY, PHYCOLOGY, MYCOLOGY, LICHENOLOGY AND PLANT PATHOLOGY**

**No. of credits: 3**

**No. of instructional hours per week: 5**

#### **MICROBIOLOGY**

**08 hrs**

1. History & scope of microbiology.
2. Bacteria: Structure, Reproduction and Classification (based on staining and morphology)
3. Mycoplasma & Actinomycetes –General account.
4. Virus- General characteristics, nomenclature, classification, structure, chemical composition, properties and reproduction of bacteriophages and T. M. V. Significance of Viruses.
5. Soil microbiology – Soil microorganisms, the rhizosphere
6. Aquatic microbiology - Microbiology of sewage or waste water. Methods of waste water treatment (Brief account only)
7. Food microbiology - Food spoilage and preservation methods. [General account].
8. Agricultural microbiology - Role of microbes in soil fertility, Nitrogen fixation, Biofertilizers

9. Medical Microbiology
10. Industrial Microbiology
11. Medical Microbiology

### **Practical**

**07hrs**

1. Gram staining of bacteria.
2. Test for the Coli form bacteria in contaminated water.
3. Isolation of Rhizobium from root nodules of leguminous plants. (Demonstration)
4. Examination of different forms of bacteria.(Demonstration)

### **PHYCOLOGY**

**20 hrs**

1. Introduction – Range of thallus structure – Phylogenic trends – Pigments – Reproduction
2. Life cycle – Classification proposed by F .E Fritsch
3. 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*, *Oscillatoria*
  - b) Chlorophyceae - *Chlorella*, *Volvox*, *Oedogonium* and *Chara*
  - c) Xanthophyceae – *Vaucheria*
  - d) Bacillariophyceae – *Pinnularia*
  - e) Phaeophyceae – *Sargassum*
  - f) Rhodophyceae – *Polysiphonia*
4. Economic importance of algae
  - a) Commercial products of algae – Agar, Alginates, Carrageenin, Diatomaceous earth
  - b) Algae - medicinal aspects, algal blooms and red tides

### **Practical**

**15 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.

## MYCOLOGY

20 hrs

1. Introduction, structure, reproduction, life cycle, evolutionary trends, Classification based on Ainsworth.
2. Distinguishing characters of different classes of fungi representing the following genera (Excluding Developmental details)
  - a. Myxomycotina –Slime moulds
  - b. Zygomycotina - *Rhizopus*
  - c. Ascomycotina
    - Hemiascomycetes - *Saccharomyces*
    - Plectomycetes - *Penicillium*
    - Pyrenomycetes - *Xylaria*
    - Discomycetes – *Peziza*
  - d. Basidiomycotina
    - Teliomycetes - *Puccinia*
    - Hymenomycetes - *Agaricus*
  - e. Deuteromycotina - *Cercospora*.
3. Economic importance of Fungi

**Lichenology:** General account and economic importance; the structure, reproduction and life cycle of *Parmelia*

## Practicals

10 hrs

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

*Rhizopus, Saccharomyces, Penicillium, Xylaria, Peziza, Puccinia, Agaricus, Cercospora and Parmelia.*

## PLANT PATHOLOGY

06 hrs

1. Classification of plant diseases on the basis of causative organisms and symptoms – Host parasite interaction, phytoalexins.
2. Study of the following diseases with emphasis on symptoms, disease cycle and control measures - Leaf mosaic of Tapioca, Citrus Canker, Blast disease of Paddy, Root wilt of Coconut

3. Brief account of the following fungicides- Bordeaux mixture, Lime sulphur, Tobacco decoction, Neem cake & oil.

### **Practical**

**04hrs**

1. Identify the Diseases mentioned with respect to causal organism and symptoms- Leaf mosaic of Tapioca, Citrus Canker, Blast disease of Paddy.
2. Students should be trained to prepare the fungicide Bordeaux mixture & Tobacco decoction.

### **REFERENCES**

1. Kanika Sharma 2009. Manual of Microbiology. Ane Books Pvt. Ltd.
2. Alain Durieux 2009. Applied Microbiology. Springer International Edition
3. Schlegel 2008. General Microbiology. Cambridge University Press India Pvt Ltd.
4. Heritage L. 2007. Introductory Microbiology. Cambridge University Press India Pvt Ltd
5. Mamatha Rao 2009. Microbes and Non flowering plants, Impact and applications. Ane Books Pvt. Ltd.
6. Dubey R.C. and Maheswari D.K. 2006. A text Book of Microbiology. Chand & Co.
7. Alexopoulos C.J. and Mims C.V. 1988. Introductory Mycology. John Wiley & Sons.
8. Jim Deacon 2007. Fungal Biology. Blackwell Publishing, Ane Books Pvt. Ltd.
9. Smith G.M. 1955. Cryptogamic Botany, Vol.I. Mc Graw Hill.
10. Vashishta B.R. 1990. Botany for Degree Students, Fungi. S.Chand & Co.
11. Singh V., Pandey P.C. and Jam D.K. 1998. A Text Book of Botany for Under Graduate Students. Rastogi Publications.
12. Fritsch F.B. 1945. Structure and Reproduction of Algae Vol.I & II. Cambridge University Press.
13. Smith G.M. 1955. Cryptogamic Botany Vol. I. Mc Graw Hill
14. Vasishta B.R. 1990. Botany for Degree Students, Algae. S.Chand & Co.

15. Singh V., Pandey P.C. and Jain D.K. 1998. A Text book of Botany for Undergraduate Students. Rastogi Publications.
16. Webster J. 1970. Introduction to Fungi. Cambridge University Press.

## **Complementary Course V**

### **15UCH331.2: Physical & Inorganic Chemistry**

**No. of credits: 3**

**No. of instructional hours per week: 5**

#### **Module I. Chemical kinetics (9 Hrs)**

Chemical kinetics, catalysis, rate of reactions, various factors influencing rate, order, molecularity, zero, first, second, third order reactions (derivation of first order only) fractional life time, units of rate constants, influence of temperature on reaction rates, Arrhenius equation, Calculation of Arrhenius parameters, Collision theory, catalysis, different types of catalysis, intermediate compound formation theory and adsorption theory.

#### **Module II. Ionic equilibrium (9 Hrs)**

Arrhenius, Lowry- Bronstead concept of acids and bases,  $K_w$  and pH, pH of strong and weak acids,  $K_a$  and  $K_b$ , mechanism of buffer action, pH of buffer, Hydrolysis of salt, Degree of hydrolysis and hydrolysis constant .

#### **Module III. Solutions (9 Hrs)**

Completely miscible liquid pairs, composition curve, boiling point- composition curve- ideal and non ideal solutions, fractional distillations, azeotropes, CST, phenol- water, nicotine-water system, Effect of impurities on miscibility and CST, immiscible liquid pairs, steam distillation- Distribution law and its limitations, applications of solvent extractions.

#### **Module IV. Chromatography (9 Hrs)**

Outline study of adsorption and partition chromatography, paper, thin layer, ion exchange, gas chromatography and HPLC,  $R_f$  and  $R_t$  value, separation of amino acids and dyes.

### **Module V - Radioactivity and Nuclear Chemistry (9Hrs)**

Radio active equilibrium, Detection of radioactivity by Wilson's cloud Chamber and Geiger Muller counter, Units of radioactivity - Curie and Rutherford. Applications in agriculture and Medicine. A brief study of the biological effects of radiation such as pathological and genetic damage. Nuclear Chemistry - Stability of nucleus, n/p ratio, artificial transmutation and radioactivity. Mass defect, binding energy, neutron activation analysis.

### **Module VI. UV spectroscopy (9 Hrs)**

Basic characteristics of electromagnetic radiations- absorption of light by molecules electronic, vibrational and rotational energies- Beer Lambert's law-colorimetry, Colorimetric estimation of glucose and iron, UV spectroscopy-principle- $\lambda_{max}$  – auxochrome and chromophore, red shift and blue shift, simple applications of UV spectroscopy, conjugation, functional group and geometrical isomerism.

### **Module VI. NMR spectroscopy (9 Hrs)**

Principle of NMR, nuclear spin, chemical shift, spin-spin coupling,  $\tau$  and  $\delta$ , PMR of simple organic molecules, principle of MRI .

### **REFERENCES FOR SEMESTER III**

1. Organic Chemistry of Natural Products, Chatwal, Gurdeep, R, Himalaya Publications
2. Principles of physical chemistry, Puri Shrama Pathania, Vishal
3. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
4. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
5. Principles of Physical Chemistry, B.R.Puri, R.L.Sharma & Pathania, Vishal Publishing
6. Essentials of Physical Chemistry, B.S. Bahl., G.D. Tuli & Arun Bahl , S.Chand & Co., New Delhi.
7. Simplified Course in Physical Chemistry, R.L. Madan, G.D. Tuli , S.Chand & Co.
8. Chromatography, . B.K .Sharma, GOEL Publishing house, Meerut
9. Text Book of Pharmaceutical Chemistry, .Atherden L.M, Bentley and Driver, Oxford. University Press

# Complementary Course VI

## 15UZO331.2: Functional Zoology

**No. of credits: 3**

**No. of instructional hours per week: 5**

### **Aim of the course**

To familiarize students on the physiology of their own body and urge them to take precautionary measures to safeguard their health.

### **Objectives of the course**

- To study the structure and function of each system in the human body.
- To study the etiology of common physiological disorders, syndromes and diseases.

### **Module I**

**4hrs**

Nutrition: Types of nutrition – autotrophy and heterotrophy. Outline classification of food components. Brief mention of malnutrition disorders. Vitamins - physiological role and disorders (deficiency diseases).

### **Module II**

**6hrs**

Respiration: Respiratory pigments and their functions with special emphasis on haemoglobin, transport of oxygen and carbon dioxide. Neural and hormonal control of respiration in man. Respiratory disturbances – brief mention of Apnoea, Dyspnoea, Hypoxia, Hypo and Hypercapnia, Asphyxia and Carbon monoxide poisoning. Physiological effects of smoking.

### **Module III**

**8hrs**

Circulation : Blood-composition and functions, blood groups, mechanism of blood clotting (intrinsic and extrinsic pathways), anticoagulants, disorders of blood clotting – haemophilia and thrombosis. Heart - neurogenic and myogenic, peculiarities of cardiac muscle. Heart beat, pace maker. Blood pressure, ECG, cardiovascular disorders- arteriosclerosis, myocardial infarction, and hypertension; angiogram and angioplasty.

### **Module IV**

**6hrs**

Excretion and osmoregulation: Classification of animals based on excretory wastes. Human nephron - structure and urine formation - ul-

trafiltration, selective reabsorption, tubular secretion and countercurrent mechanism; hormonal control of renal function; composition of urine. Kidney diseases - proteinuria, uremia, acidosis and alkalosis; dialysis.

### **Module V**

**6hrs**

Neurophysiology: Neurone-structure, nerve impulse -resting potential, action potential and latent period; synapse and synaptic transmission-All or none law, refractory period, neurotransmitters. Saltatory transmission and EEG.

### **Module VI**

**8hrs**

Muscle Physiology: Ultra-structure of a striated muscle fibre, mechanism of muscle contraction, brief mention of muscle twitch, summation, tetanus and tonus, all or none law, fatigue, oxygen debt and rigor mortis.

### **Module VII**

**8hrs**

Endocrinology: List the various endocrine glands and their corresponding hormones, brief description of hormonal influence, action and hormonal disorders- goitre, cretinism, exophthalmic goitre, diabetes mellitus, diabetes insipidus, dwarfism, gigantism and acromegaly. Role of Hormones in reproductive cycle.

### **Module VIII**

**8hrs**

Immunology: Types of immunity-innate, acquired, active, passive, humoral and cell mediated. Cells, tissues and organs of immune system-lymphocytes, lymphoid tissue and organs (Lymph nodes, spleen, bone marrow, thymus and mucosa associated lymphoid tissue). Antigens. Antibodies- structure and function of immunoglobulin, classes of immunoglobulins. Hypersensitivity and allergy; immunization-passive and active; vaccination. AIDS and its etiology.

### **References**

- Eckert R and Randall D (1987) Animal physiology, CBS Publishers and Distributors,
- Ganong, W.F. (2002) Lange Review of Medical Physiology. Mc G H.
- Ganong, W.F. (2003) Review of medical physiology, McGraw-Hill, New Delhi.
- Goyal, K.A. & Sastry, K.V. :Animal Physiology. 6e 2002, Rastogi Publishers.

- Guyton A.C. (1998) Text book of Medical Physiology. W.B. Sanders Co.
- Hoar W.S. (1975) General and Comparative Physiology. Prentice Hall.
- Joshi, K.R. (2003) Immunology. Agro.
- Kuby, J. (1994) Immunology. W.H. Freeman & Co.
- Nagabhushanan R, Kobardar M.S. and Sarojini R (1983) A textbook of animal physiology. Oxford IBH publishing Co. New Delhi.
- Roitt J (2000) Immunology. W. Freeman, Oxford.
- Schimdt-Nielson K (2002) Animal Physiology. Prentice Hall India Ltd.
- Sebastian M.M. (1990).Animal Physiology.Madona Books, Kottayam.
- Withers P.X. (1992) Comparative animal physiology. Saunders College Publishing, New Delhi.

# 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 തെറ്റുകൂടാതെ പ്രയോഗിക്കുന്നതിലൂടെ ഭാഷാശുദ്ധി നിലനിർത്തുക. വിവർത്തനത്തിൽ പ്രായോഗിക പരിശീലനം നൽകുക.

പാഠ്യപദ്ധതി

മൊഡ്യൂൾ ഒന്ന് (18 മണിക്കൂർ)

വിനിയമവും മാധ്യമങ്ങളും

വിനിയമം- നിർവ്വചനം - ആശയവിനിമയ പ്രക്രിയ - വ്യവസ്ഥാപനം, നിർവ്വയസ്ഥാ

പനം, ആശയവിനിമയ പ്രക്രിയയുടെ ഘടകങ്ങൾ, ആശയ വിനിമയ മാതൃകകൾ - വിവിധതരം ആശയവിനിമയങ്ങൾ - വിവിധതരം മാധ്യമങ്ങൾ - അച്ചടി, റേഡിയോ, ടെലിവിഷൻ, സിനിമ, ഇന്റർനെറ്റ് തുടങ്ങിയ നവമാധ്യമങ്ങൾ - ഇവയുടെ സവിശേഷതകൾ - മാധ്യമങ്ങളും സമൂഹവും

**വിശദപഠനത്തിന്**

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

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

**മൊഡ്യൂൾ രണ്ട് (18 മണിക്കൂർ)**

**ഭരണഭാഷ മലയാളം**

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

**പഠനപ്രവർത്തനം**

ഇംഗ്ലീഷിലുള്ള സർക്കാർ ഉത്തരവുകളും നടപടിക്രമങ്ങളും മലയാളത്തിലേക്കു മാറ്റാനുള്ള പരിശീലനം.

**മൊഡ്യൂൾ മൂന്ന് (18 മണിക്കൂർ)**

**സർഗ്ഗാത്മകരചന**

സർഗ്ഗാത്മകത - നിർവ്വചനം - സർഗ്ഗാത്മകതയുടെ ഉറവിടം - വിവിധ കാഴ്ചപ്പാടുകൾ - കാവ്യപ്രചോദനത്തെക്കുറിച്ചുള്ള ദാർശ്വീക സങ്കല്പം - പ്രതിഭയെക്കുറിച്ചുള്ള രാജശേഖരന്റെ അഭിപ്രായം - ഭാവയിത്രി, കാരയിത്രി - ഭാവനയെപ്പറ്റി കോളറിഡ്ജ് - പ്രഥമഭാവനയും ദ്വിതീയ ഭാവനയും - ഫാന്റസിയും ഇമാജിനേഷനും തമ്മിലുള്ള വ്യത്യാസം - വേർഡ്സ്‌വർത്തിന്റെ കാവ്യനിർവ്വചനം - സർഗ്ഗാത്മകരചനയിലേക്കു നയിക്കു സാഹചര്യങ്ങൾ - ജന്മവാസനയും അനുഭവവും - രചനയുടെ വിവിധ ഘട്ടങ്ങൾ.

**പ്രായോഗിക പരിശീലനം**

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

**വിഭേദപഠനത്തിന്**

- 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  
(ഒരുക്വമ 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,  
കറന്റ് ബുക്സ്, തൃശൂർ
- 7. ഭാഷയും ഭരണഭാഷയും - ഡോ. എഴുമാറ്റൂർ രാജരാജവർമ്മ,  
ഇൻഫർമേഷൻ ആന്റ്  
പബ്ലിക്കേഷൻ വകുപ്പ്,  
കേരള സർക്കാർ

- 8. ഭരണ ശബ്ദാവലി - കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
- 9. വൃത്താന്തപത്രപ്രവർത്തനം - സ്വദേശാഭിമാനി രാമകൃഷ്ണപിള്ള, മാളുബെൻ പബ്ലിക്കേഷൻസ്
- 10. ലിനിക്കൽ ബാലഡ്സിന്റെ ആമുഖം - വില്യം വേർഡ്സ്വർത്ത്, വിവ: ഡോ.തോന്നയ്ക്കൽ വാസുദേവൻ, എം.എൻ.വിജയൻ സാസ്ക്കാരിക വേദി
- 11. സാഹിത്യവിദ്യ - കുട്ടികൃഷ്ണമാരാർ, മാരാർ സാഹിത്യ പ്രകാശം, കോഴിക്കോട്.
- 12. കാമികന്റെ പണിപ്പുര - എം.ടി.വാസുദേവൻ നായർ, ഡി.സി.ബുക്സ്
- 13. ഉയരു യവനിക - സി.ജെ.തോമസ്, മാളുബെൻ 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.വിശ്വനാഥയ്യർ,  
കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്
26. തർജ്ജമയുടെ താരകോശം - സി.വി. വാസുദേവഭട്ടതിരി,  
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
27. നല്ല മലയാളം - സി.വി.വാസുദേവഭട്ടതിരി,  
ലിപി പബ്ലിക്കേഷൻസ്, കോഴിക്കോട്
28. [http://en.wikipedia.org/wiki/media\\_influence](http://en.wikipedia.org/wiki/media_influence)
29. [http://en.wikipedia.org/wiki/creative\\_writing](http://en.wikipedia.org/wiki/creative_writing)
30. <http://www.du.ae.in/du/course creative-writing.pdf>.

## **Language Course IX (Additional Language IV)**

### **15UHN411.1: Poetry, Translation and Communicative Hindi**

**No. of credits: 4**

**No. of instructional hours per week: 5**

#### **Aim of the Course / Objectives**

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

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

#### **Module 1**

Poetry – Prescribe a poetry collection (Ancient and Modern)

#### **Module 2**

##### **Translation (Prescribe a text book)**

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

#### **Module 3**

##### **Communicative Hindi (Prescribe a textbook)**

Procedure for the development of communicative skills of students.

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

### **Prescribed Textbooks**

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

Poems to be studied

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

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

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

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

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

# Language Course IX (Additional Language IV)

## 15UFR411.1: Culture and Civilization

**No. of credits: 4**

**No. of instructional hours per week: 5**

### **AIMS:**

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

### **OBJECTIVES:**

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

### **SYLLABUS:**

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

Publisher : Didier

Module 4 : Se situer dans le temps

Unit 10 : Au jour le jour

Unit 11 : Roman

Unit 12 : Je te retrouverai

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

### **Reference books :**

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



## Core Course III

### 15UBO441: BRYOLOGY, PTERIDOLOGY, GYMNOSPERMS AND PALEOBOTANY

No. of credits: 3

No. of instructional hours per week: 5

#### BRYOLOGY

8 hrs

1. Introduction and classification- general account
- 2 Study of habit, thallus organization, vegetative and sexual reproduction and alternation of generation of the following types (Developmental details are not required) *Riccia*, *Marchantia*, *Anthoceros*, *Funaria*
- 3 .Economic importance of Bryophytes

#### Practical

09Hrs

1. *Riccia*- Habit- Internal structure of thallus- V.S.of thallus through archegonia, antheridia and sporophyte
2. *Marchantia*-Habit- thallus with Archegonial receptacle, Malereceptacle V.S, Female receptacle V.S. T.S of thallus through gemma, Sporophyte V.S
3. *Anthoceros*-Habit
3. *Funaria*-Habit V.S. of archegonial cluster, V.S of Antheridial cluster, Sporophyte V.S

#### PTERIDOLOGY

18hrs

1. Introduction: General characters morphological and phylogenetic classification
2. Study of the habitat habit, internal structure, reproduction and life cycle of the following types (Developmental details not required).  
*Psilotum*, *Selaginella*, *Pteris* and *Marselia*
3. General topics: Stellar evolution in Pteridophytes. Economic importance of Pteridophytes

#### Practical

16hrs

1. *Psilotum* - External features, Stem T.S., Synangium T.S.

2. *Selaginella* -Habit, stem and rhizophore, T.S., V.S. of strobilus, Megasporephyll and Microsporophylls
3. *Pteris* -Habit, Rachis T.S. Sporophyll T.S., Prothallus
4. *Marselia* -Habit, Rhizome and Petiole T.S., Sporocarp T.S. ,V.S.

## **GYMNOSPERMS**

**14hrs**

1. Introduction –General characters and classification of Gymnosperms
2. Study of the habit, anatomy, reproduction and life cycle of the following types (Developmental details are not required) *Cycas*, *Pinus* and *Gnetum*
3. Evolutionary trends in gymnosperms, Economic importance of Gymnosperms

### **Practical**

**10hrs**

1. *Cycas*- T.S of leaf, T.S. of coralloid root. Micro and megasporephyll, VS of ovule
2. *Pinus*- T.S. of stem, T.S. of needle, male and female cone, V.S.
3. *Gnetum*-Habit, stem T.S, (young and mature),leaf T.S, male and female strobilus ,V.S of male and female cone ,ovule V.S and seed.

## **PALAEOBOTANY**

**04 hrs**

1. Geological time scale, Fossil formation, types of fossils.
2. Fossil Pteridophytes- *Rhynia*, *Lepidodendron*, *Lepidocarpon*. Fossil gymnosperms- *Lygnopteris*.

### **Practical**

**01 hr**

1. Fossil Pteridophytes- *Rhynia* stem, *Lepidodendron*, *Lepidocarpon*.
2. Gymnosperm- *Lygenopteris*

## **REFERENCES**

1. Chopra R.N. and Kumra P.K. 1988 Biology of Bryophytes. Wiley Eastern Ltd. New Delhi
2. Parihar N.S. 1965. An introduction to Bryophyta. Central Book Depot. Alahabad.

3. Vashishta B.R., Sinha A.K. and Adarsha Kumar. 2008. Botany for Degree Students: Bryophyta. S. Chand & Company Ltd., New Delhi.
4. Coulter. J.M. and Chamberlain C.J. 1958. Morphology of Gymnosperms. Central Book Depot, Allahabad
5. Gupta V.K. and Varshneya U.D. 1967. An Introduction to Gymnosperms. Kedarnath, Ramnath, Meerut.
6. Smith G.M. 1955 Cryptogamic Botany – Vol. II. Mc Graw Hill Co. New Delhi
7. Sporne K.R. 1966. Morphology of Pteridophytes. Hutchin University Library, London.
8. Sporne K.R. 1967. Morphology of Gymnosperms. Hutchin University Library, London
9. Vashista B.R. 1993. Pteridophyta. S.Chand and co. New Delhi
10. Vashista B.R. 1993. Gymnosperms. S. Chand and co. New Delhi
11. Andrews H.N. 1967. Studies on Palaeobotany. C .J. Felix.
12. Arnold C.A. 1947. Introduction to Palaeobotany -McGraw Hill Co. New Delhi.

## **Complementary Course VII**

### **15UCH431.2: Organic Chemistry**

**No. of credits: 3**

**No. of instructional hours per week: 5**

#### **Module - 1 - 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 vice versa.

#### **Module - II - 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.

### **Module III -Vitamins, Hormones, Lipids (9 Hrs)**

Classification of Vitamins, structure, function and deficiency diseases of Vitamin A, C and D, Deficiency diseases, Hormones -cholesterol, bile acids, artificial hormones(only elementary study), Lipids – classification of oils, fats and iodine value, saponification value, phospholipids (no structural elucidation).

### **Module IV -Alkaloids and Terpenes (9 hrs)**

Alkaloids: General methods of isolation, general properties, classification, physiological action of alkaloids. Structure of conine, morphine and nicotine (no structural elucidation)

Terpenes: classification, isoprene rule, essential oils, elementary study of Citral and Geraniol (no structural elucidation), elementary idea of the natural rubber, synthetic rubber, synthesis of Buna - N, Buna - S, neoprene and thiokol.

### **Module IV- Insecticides and pesticides (9Hrs)**

Pesticides, insecticides, herbicides, fungicides, Classification of Insecticides, Phosphorus, chlorine and carbamates, detection and identification of insecticides by TLC. Structure and synthesis of DDT, BHC, malathion, carbamates, Toxicity.

### **Module V– Heterocyclics, Drugs (9 hrs)**

Heterocyclics : An outline study of the preparation and properties of furan, pyrrole, thiophene, pyridine. Hoffmann's exhaustive methylation. Classification of drugs- analgesic, antipyretic, antibiotic, hypnotics, suhadrugs, antacids, antimalarials. Drugs of plant origin anticancer compounds from plants.

### **REFERENCES FOR SEMESTER IV**

1. Organic Chemistry of Natural Products, Chatwal, Gurdeep.R, Himalaya Publications
2. Chemistry of natural products, P.S. Kalsi, New Age International Private Ltd
3. Elementary organic spectroscopy, Y.R Sharma, S chand & Company
4. Organic Chemistry Vol I and II – I.L. Finar
5. Principles of Organic Chemistry – M. K. Jain, S. Nagin & Co

6. Text Book of Pharmaceutical Chemistry, Atherden L.M, Bentley and Driver, Oxford. University Press

## **Complementary Course VIII**

### **15UZO431.2: Applied Zoology**

**No. of credits: 3**

**No. of instructional hours per week: 5**

#### **Aim of the course**

To introduce the methodology and perspectives of applied branches of zoology with a view of educating youngsters on the possibilities of self employment

#### **Objectives of the course**

- To learn the basic principles involved in the culture and breeding of common edible and ornamental fishes of Kerala and the art of aquarium keeping.
- To get a basic understanding of human genomics and reproductive biology including stem cell research and prenatal diagnostic techniques

#### **Module I**

**17hrs**

Aquaculture: Traditional methods of aquaculture, fishing crafts and gears, common fishes used for culture in Kerala, Catla, Etroplus, Tilapia and Mugil; capture fishes- sardine, mackerel. Pond culture: Construction, maintenance and management; carp culture, shrimp culture, shellfish culture, compositefish culture and pearl culture Ornamental fish culture: Fresh water ornamental fishes – biology, breeding habits, spawning, hatching and rearing techniques. Construction and maintenance of aquarium: Construction of home aquarium, materials used, setting up of freshwater aquaria, aquarium plants, ornamental objects, cleaning the aquarium, maintenance of water quality, control of snail and algal growth.

#### **Module II**

**10hrs**

Sericulture: Brief account of morphology and life history of silkworm, va-

rieties of silkworm, rearing technique, mulberry cultivation, diseases and pests of silkworm. Processing of cocoon, reeling and marketing of silk.

Apiculture: Species of honey bees, social organization of honey bees, apiary management and maintenance, bee keeping equipments, bee pasturage, honey and bees wax and their uses.

### **Module III**

**8hrs**

Live Stock Management: Poultry farming, poultry breeds: mention American, Asiatic, Mediterranean, English and indigenous breeds. Poultry breeding and poultry products; rearing of chicks, growers, layers, broilers, ducks, turkeys and quails; diseases of poultry.

Dairy farming: Types, loose housing system and conventional barn system; advantages and limitations of dairy farming; establishment of dairy farm and choosing suitable dairy animals, feed, diseases of dairy animals.

### **Module IV**

**7hrs**

Human Genetics: Normal chromosome complements; karyotype study, pedigree analysis. Syndromes- autosomal syndromes (Down's syndrome and Edwards syndromes), sex chromosomal syndromes (Turners syndrome and Klinefelter's syndrome), genetic disorders- single gene disorders (sickle cell anemia and phenyl ketonuria), multifactorial disorders (cleft lip, and cleft palate), genetic counseling.

### **Module V**

**12hrs**

Developmental Biology and Biotechnology : Types of egg; fertilization; types and pattern of cleavages, blastulation - different types of blastula, gastrulation- morphogenetic movements (epiboly and emboly); brief description of organizers and embryonic induction. Cloning experiments in animals and man. Embryonic stem cell research. Prenatal diagnostic techniques- amniocentesis, chorionic villus sampling, ultrasound scanning. Test tube babies, gene cloning, human genome project, human gene therapy.

### **References**

- Bard, J. (1986). Handbook of Tropical Aquaculture.
- Gardner, E.J. (1983). Human heredity, John Wiley and Sons, New York
- Hawkins, A.D. (1981). Aquarium Systems, Academic Press
- Lewin, B. (1983). Genes, John Wiley and Sons, New York.

- Mishra, R.C. (2002). Perspectives in Indian Apiculture, Agro
- Philips, E.F. (2003). Bee Keeping, Agro
- Santhanam, R. A Manual of Aquaculture.
- Shukla and Upadhyay. (2002) .Economic Entomology.
- Tembhare, D.B. (1997). Modern Entomology, Himalaya Publishing House.
- Zuka, R.I and Hamiyn. (1971). Aquarium fishes and plants

## **Complementary Course IX**

### **15UCH432.2: 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**

A. 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)

## **B. Permanganometry**

- a. Standardization of  $\text{KMnO}_4$  by oxalic acid/sodium oxalate and Mohr's salt
- b. Estimation of oxalic acid/sodium oxalate
- c. Estimation of Mohr's salt
- d. Estimation of calcium

## **C. Dichrometry**

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

## **D. Iodimetry and Iodometry**

- a. Standardisation of sodium thiosulphate using std potassium dichromate
- b. Estimation of copper in a solution
- c. Estimation of iodine

## **E. Complexometric titrations**

- a. Standardisation of EDTA using std  $\text{Mg}^{2+}$  or  $\text{Zn}^{2+}$  ion solution.
  - b. Estimation of any one metallic ion from  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Zn}^{2+}$  or  $\text{Ni}^{2+}$
- 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 X

## 15UZO432.2: Practical

**No. of credits: 4**

**No. of instructional hours per week:**

### **Aim of the course**

To provide an hands- on training experience in anatomy through simple dissections 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.
- To study and carry out routine clinical analysis of blood and urine

### **Animal Diversity I & II**

Study specimens

1. Protista :Noctiluca, Paramecium, Entamoeba, Trichonympha[any 3]
2. Porifera :Sycon
3. Cnidaria :Obelia, Aurelia, Sea anemone (Adamsia)
4. Platyhelminthes :Bipalium, Fasciola, Taeniasolium
5. Nematoda :Ascaris, Ancylostoma
6. Annelida :Nereis, Hirudinaria
7. Arthropoda :Limulus, Scorpion, Scolopendra, Sacculina,Leptocorisa, Oryctes, Larval stages of prawn[any 5]
8. Mollusca : Freshwater mussel, Sepia, Pila
9. Echinodermata : Starfish, Sea urchin, Brittle star, Sea cucumber, sea lily[any 3]
10. Chordates :Branchiostoma (entire),Ascidia.

Petromyzon Scoliodon, Narcine, Echeneis, Hippocampus, Anguilla[any 3]  
Ichthyophis, Amblystoma, Rhacophorus[any 2] Chamaeleon, Bungarus, Naja, Vipera, Chelone[any 4] Pigeon – different types of feathers Pteropus

Minor Practicals (Mounting) – any three

1. Earthworm : Setae in situ
2. Penaeus: Appendages
3. Cockroach :Mouth parts
4. Nereis :Parapodium
5. Shark :Placoid scales

Major Practicals(Dissection) – any two

1. Earthworm : Alimentary canal and associated glands
2. Penaeus: Nervous system
3. Cockroach : Alimentary canal

Osteology

Study of the skeleton of frog

1. Vertebrae (typical, 8th, 9th and urostyle)
2. Limb girdles: pectoral girdle with sternum, pelvic girdle, astragalus&calcaneum.

Functional and Applied Zoology

Functional Zoology

1. Preparation of human blood smear to study the different types of WBCs.
2. Human blood grouping: ABO and Rh Systems.
3. Urine analysis for abnormal constituents: albumin and glucose.
4. Study of slides/models of different types of eggs, blastula and gastrula of animals.

Applied Zoology

1. Study of beneficial insects

Apis(worker, drone and queen), Bombyx(life cycle, silk)

2. Study of the following items of economic importance:

Perna, Pinctada, Penaeus, Sardinella, Rastrelliger

Human Genetics

Study of the following using charts/photographs

1. Study of normal human karyotype.
2. Study of abnormal human karyotypes. [Klinefelter's, Turner's, Down's and Edward'ssyndrome]

## References

- Brusca R.C. and Brusca G.J. (1990) Invertebrates. Sinauer Associates, Sunderland,MA
- Chandler, A.C. and Read. Parasitology.
- Hickman C.P. and Roberts L.S. (1994) Animal Diversity. Wm. C. Brown, Dubuque,IA Living Invertebrates Blackwell scientific Publications, California.
- Ruppert E.E., Fox R and Barnes R.D. (2004) Invertebrate Zoology. ThomsonBooks.Cole. USA>

**SEMESTER V**  
**Core Course IV**  
**15UBO541: ANGIOSPERM MORPHOLOGY,**  
**SYSTEMATIC BOTANY, ECONOMIC BOTANY,**  
**ETHNO BOTANY AND PHARMACOGNOSY**

**No. of credits: 4**

**No. of instructional hours per week: 4**

**MORPHOLOGY**

**10 hrs**

1. Brief account on the various types of inflorescence including special types (Cyathium, Verticillaster, Hypanthodium, Coenanthium and Thyrsus) with examples.
2. Floral morphology-Flower-as a modified shoot, Flower parts, their arrangements, relative position, numeric- plan, cohesion, adhesion, symmetry of flower, aestivation types, placentation types; floral diagram and floral formula
3. Fruit types: simple, aggregate and multiple.
4. Seeds: albuminous and exalbuminous.

**SYSTEMATIC BOTANY**

**38 hrs**

1. Definition, scope and significance of Taxonomy
2. Historical development of the systems of classification:
  1. Artificial- Linnaeus sexual system
  2. Natural - Bentham and Hooker (detailed account)
  3. Phylogenetic- APG System (Brief account only)
4. Basic rules of Binomial Nomenclature and International Code of Botanical Nomenclature (ICBN).
5. Importance of Herbarium, Herbarium techniques and Botanical gardens.
6. A brief account on the Modern trends in taxonomy; Chemotaxonomy and Molecular taxonomy
7. A study of the following families with emphasis on the morphological peculiarities and economic importance of its members (based on Bentham & Hooker's system)
  - (1) Annonaceae                      (13) Apocynaceae
  - (2) Nymphaeaceae                (14) Asclepiadiaceae

- |                   |                    |
|-------------------|--------------------|
| (3) Malvaceae     | (15) Solanaceae    |
| (4) Rutaceae      | (16) Acanthaceae   |
| (5) Anacardiaceae | (17) Verbenaceae   |
| (6) Fabaceae      | (18) Lamiaceae     |
| (7) Myrtaceae     | (19) Amaranthaceae |
| (8) Cucurbitaceae | (20) Euphorbiaceae |
| (9) Apiaceae      | (21) Orchidaceae   |
| (10) Rubiaceae    | (22) Musaceae      |
| (11) Asteraceae   | (23) Liliaceae     |
| (12) Sapotaceae   | (24) Arecaceae     |
| (25) Poaceae      |                    |

### **Practical**

**45 hrs**

1. Study on various types of inflorescences, Flowers and fruits with vivid record of practical work.
2. Students must be able to identify the angiosperm members included in the syllabus up to the level of families. 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.
3. Students must submit practical records, Herbarium sheets (25 Nos:) and Field book at the time of practical examination.
4. Field trips are to be conducted for three days either as continuous or one day trips.

### **ECONOMIC BOTANY**

**12 hrs**

1. Study of the major crops in Kerala with special reference to their Botanical description, morphology of the useful part and economic importance—

Cereals and millets	: Paddy, Wheat and Ragi
Pulses	: Black gram and Bengal gram
Sugar yielding Plants	: Sugar cane
Spices	: Pepper and Cardamom
Beverages	: Coffee, Tea
Fibre yielding plant	: Cotton
Dye Yielding plants	: Henna and Bixa orellana
Resins	: Asafoetida
Tuber crops	: Tapioca, Dioscorea

Oil yielding Plants	: Coconut, Sesame and Ground nut
Latex yielding plant	: Rubber
Medicinal plants	:Sida, Zingiber officinalis, Aloe vera and Vinca rosea
Insecticides	:Neem

**Practical** **06 hrs**

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

**ETHNOBOTANY** **06 hrs**

1. Definition — importance, scope, categories and significance.
2. Study of various methods to collect Ethno botanical data.
- 3 Medicinal plants used by tribes in their daily life as food, clothing, shelter and agriculture.
4. Study of common plants used by tribes.  
*Aegle marmelos, Ficus religiosa, Cynadon dactylon, Ocimum sanctum and Trichopus zeylanicus*

**PHARMACOGNOSY** **06 hrs**

1. Definition and scope of Pharmacognosy
2. Sources of crude drugs – roots, rhizome, bulb, corm, leaves, stems, flowers, fruits and seeds

**Practical** **03 hrs**

1. Visit a tribal area and collect information on their traditional method of treatment using crude drugs
2. Observe the plants of ethno botanical importance

**REFERENCES**

1. Sivarajan V.V. 1993. Introduction to the principle of plant taxonomy. Oxford and IBH Publishing Company
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11. Singh. G. 1999. Plant Systematics: Theory and practice. Oxford & IBH Pvt. Ltd., New Delhi.
12. Jeffrey, C. 1982. An Introduction to Plant Taxonomy. Cambridge University Press, Cambridge, London.
13. Stace. C.A. 1989. Plant Taxonomy and Biosystematics. 2nd ed. Edward Arnold, London.
14. Woodland. D.E. 1991. Contemporary Plant Systematics. Prentice Hall, New Jersey.
15. Jain S.K. 1981. Glimpses of Ethnobotany. Oxford and IBH Publishing Company, New Delhi.
17. Jain, S.K. 1987. A Manual of Ethnobotany. Scientific Publishers, Jodhpur

**Core Course V**  
**15UBO542: ENVIRONMENTAL**  
**STUDIES AND PHYTOGEOGRAPHY**

**No. of credits: 4**

**No. of instructional hours per week: 5**

**ENVIRONMENTAL STUDIES**

**81 hrs**

1. Definition- Scope and relevance.
2. Natural Resources - Renewable and Non renewable - Land & Soil, Water, Energy, Minerals, Food and agriculture , Forests.

3. Degradation of natural resources -Land degradation, degradation of water resources, Loss of flora and fauna. Causes – population explosion, over exploitation, deforestation, agriculture mismanagement, desertification, overgrazing, soil erosion, mining, urbanization and industrialization- change in land use, depletion of water resources
4. Conservation of Natural resources Land and soil- afforestation, regeneration of waste land Water - Rain water harvesting, ground water dams Energy - Promoting use of renewable resources-solar, hydel, tidal and wind; biofuels. Forests- Reforestation, Community forestry programmes
5. Role of an individual in conservation of natural resources, sustainable life styles.
6. Ecosystems - Concept, definition, structure and function; components- biotic and abiotic; energy flow
7. Food chains -Food web & ecological Pyramids, biogeochemical cycles - Carbon and Phosphorous cycle
8. Ecological succession-Definition, primary and secondary succession, climax concept, hydrosere and xerosere.
9. Plant adaptations- Morphological, anatomical& physiological adaptations of –Hydrophytes, Xerophytes, Halophytes, Epiphytes, Parasites
10. Introduction- types, characteristic features, structure and functions of the following ecosystems.
  1. Forest ecosystem 2. Grassland ecosystem 3.Desert ecosystem 4. Aquatic ecosystems- Ponds, Streams, Rivers, Oceans, Estuaries (brief account only)
10. Biodiversity and its conservation Introduction
11. Definition- genetic, species and ecosystem diversity.
12. Terrestrial (Tropical rain forest) and Aquatic Biomes (mangroves).
13. Hot-spots of biodiversity; India as mega-diversity nation.
14. Threats to biodiversity: land use changes & habitat destruction, poaching of wild life- hunting & export, Overuse of pesticides, invasive species.
15. IUCN, Red data Book; Extinct and Threatened species- endangered & Rare; Endemic species of Western Ghats.



16. Conservation of biodiversity: In-situ(National parks and Wild life sanctuaries) and Ex-situ conservation (botanical gardens); Biosphere Reserves & World Heritage Sites in India-Ramsar sites.
17. Global initiatives in biodiversity conservation-Stockholm Conference, Montreal Protocol, Convention on Biological diversity Regional initiatives- Chipko movement, A brief account on conservation efforts in Kerala- People Biodiversity Register.
18. Biodiversity issues of Kollam district.
19. Environmental pollution - Definition causes, effects and control measures of – 1. Air pollution 2.Water pollution 3.Soil pollution 4.Marine pollution 5.Noise pollution 6.Thermal pollution 7.Nuclear hazards.
20. Solid Waste Management- waste minimization, Recycling and Re-use, Consuming environment friendly products. E-waste management.
21. Environmental Issues- Climate change, Global warming, Acid rain, Ozone layer depletion.
22. Environmental Legislations - Environment protection Act (1986); Air [prevention and control of pollution] Act (1981; Amended 1987); Water [prevention and control of pollution] Act (1974; Amended 1988); Wildlife Protection Act (1972); Forest conservation Act (1980). (Scope and relevance only)
23. Environmental Organisations–UNEP, IPCC, WWF, Central Pollution Control Board

## **PHYTOGEOGRAPHY**

**09 hrs**

1. Concept & Definition
2. Vegetation in India – Forests- tropical, temperate, sholas, sub alpine, alpine, mangroves & Grasslands.
3. Phytogeographical regions of India - Western and eastern Himalayas, Dessert, Western Ghats, Deccan Peninsula, Gangetic Plain, North East India,Coasts & Islands.

## **Practical**

**36 hrs**

1. Visit a local polluted site and report major pollutants.
2. Study of ecological and anatomical modifications of Xerophytes, Hy-

drophytes, Halophytes, Epiphytes and Parasites.

3. Observation and study of different ecosystems mentioned in the syllabus.
4. Phytogeographical regions of India- Photos/ Diagrams

#### REFERENCES

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2. Erach Bharucha 2005. Text book of environmental Studies for undergraduate Courses. Universities Press, University Grants Commission
3. Ahluwalia V.K. and Sunitha Malhotra 2009.Environmental science. Ane Books Pvt. Ltd.
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**Core Course VI**  
**15UBO543: CELL BIOLOGY, GENETICS**  
**AND EVOLUTIONARY BIOLOGY**

**No. of credits: 3**

**No. of instructional hours per week: 4**

**CELL BIOLOGY**

**25 hrs**

1. Introduction
2. Ultra structure and functions of the cell components and organelles  
Cell wall; The cell membrane, Endoplasmic reticulum, Ribosomes, Golgi apparatus, Lysosomes, Peroxisomes, Vacuole, Mitochondria, Chloroplast & Nucleus.
3. The chromosomes- Chromosome morphology- Eukaryotic chromosomes and its organization. Chromatin - composition and structure; hetero chromatin and euchromatin; Chemical organization. Nucleo-proteins – histones and non –histones. Nucleosome model of DNA organization.
4. Special types of chromosomes- Salivary gland, Lamp brush and B chromosomes
5. Variation in Chromosome number (Numerical aberrations)- aneuploidy and Euploidy- haploidy, polyploidy- significance
6. Variation in Chromosome structure (Structural aberrations) - deletion, duplication, inversion and translocation; significance
7. Mitosis and Meiosis. cell cycle : Significance of mitosis and meiosis

**Practical**

**12 hrs**

1. Make acetocarmine squash preparation of onion root tip and to identify different stages of mitosis.
2. Make squash preparation of the flower buds of any of the following plants. Rhoeo, Capsicum (To identify Meiosis)

**GENETICS**

**36 hrs**

1. Mendelian Genetics- Mendel and his experiments, Reasons for Mendel's success, Mendelian principles, Mendelian ratios, monohybrid and dihybrid crosses, back cross and test cross

2. Genetics after Mendel- Modified Mendelian ratios; Incomplete dominance –Flower color in *Mirabilis* ; Interaction of genes- Comb pattern in poultry. 9:3:3:1. Epistasis - Recessive. Coat color in mice. 9:3:4; Dominant epistasis. Fruit colour in summer squash. 12:3:1; Complementary genes. Flower color in *Lathyrus* 9:7; Duplicate gene with cumulative effect. Fruit shape in summer squash. 9:6:1; Duplicate dominant genes in shepherd's purse. 15:1; Inhibitory factor. Leaf color in Paddy. 13:3
3. Multiple alleles-General account. ABO blood group in man.Rh factor.
4. Quantitative characters- General characters of quantitative inheritance, polygenic inheritance; Skin color in man, ear size in Maize.
5. Linkage and crossing over- Linkage and its importance, linkage and independent assortment. Complete and incomplete linkage. Crossing over – a general account, two point, three point cross. Determination of gene sequence.Interference and coincidence.Mapping of chromosomes.
6. Sex determination- Sex chromosomes, chromosomal basis of sex determination XX- XY, XX-XO mechanism. Sex determination in higher plants (*Melandrium album*) Sex chromosomal abnormalities in man. Klinefelter's syndrome, Turner's syndrome. Sex linked inheritance. Eye color in *Drosophila*, Hemophilia in man.
7. Extra nuclear inheritance General account, maternal influence. Plastid inheritance in *Mirabilis*. Shell coiling in snails, kappa particle in *Paramecium*.

## Practical

24 hrs

Work out problems in

1. Monohybrid cross (Dominance and incomplete dominance)
2. Dihybrid cross (Dominance and incomplete dominance)
3. Gene interactions (All types of gene interactions mentioned in the syllabus)
  - a. Recessive epistasis 9: 3: 4.
  - b. Dominant epistasis 12: 3: 1
  - c. Complementary genes 9: 7
  - d. Duplicate genes with cumulative effect 9: 6:1

- e. Inhibitory genes 13: 3
- f. Duplicate dominant gene 15: 1
- g. Comb pattern in poultry 9:3: 3:1
- 4. Linkage and crossing over
- 5. Two point and three point crosses
- 6. Construction of genetic map.

## **EVOLUTIONARY BIOLOGY**

**11 hrs**

- 1. Progressive and Retrogressive evolution.
- 2. Parallel and Convergent evolution.
- 3. Micro and Macro evolution.
- 4. Theory of Lamarck, Wiesman and De Vries, Darwinism, Neo- Darwinism
- 5. Isolation, Mutation, Genetic drift, Speciation
- 6. Variation and Evolution – Hybridization and Evolution – Polyploidy and evolution– Mutation and evolution.

## **REFERENCES**

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- 2. Veer Bala Rastogi 2008. Fundamentals of Molecular Biology Ane Books Pvt. Ltd
- 3. Taylor 2008. Biological Sciences. Cambridge University Press India Pvt. Ltd
- 4. Nicholl T. 2007. An Introduction to Genetic Engineering, Cambridge University Press India Pvt. Ltd.
- 5. Durbin 2007. Biological Sequence Analysis. Cambridge University Press India Pvt. Ltd
- 6. John Ringo 2004. Fundamental Genetics. Cambridge University Press India Pvt. Ltd.
- 7. Darnel J., Lodish H. and Baltimore D. 1991. Cell and molecular biology. Lea and Fibiger, Washington.
- 8. De Robertis, E.D.P and Robertis, E.M.P. 1991. Cell and molecular biology Scientific American Books.

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12. Gerald Karp 1985. Cell biology, Mc Graw Hill company.
13. Gupta P.K. 2014. Genetics, Rastogi Publications.
14. Lewin B. 2015. Genes IX. Jones and Bartlett Publishers.
15. Roy S.C. and Kalayan kumar De 1997. Cell biology. New Central Books, Calcutta.
16. Gupta P. K. 2014. Genetics. Rastogi publications.
17. Sharma A.K and Sharma A. 1980. Chromosome techniques: Theory and practice, Aditya Books, New York
18. Swanson C.P. 1957. Cytology and Genetics. Englewood cliffs, New York.

## **Open Course**

### **15UBO551.1: HORTICULTURE**

**No. of credits: 2**

**No. of instructional hours per week: 3**

#### **MODULE I**

**10 hrs**

1. Introduction
2. Divisions of horticulture
3. Importance and scope of horticulture.
4. Principles of garden making
5. Types of pots and containers
6. Potting mixture and potting media – soil, sand, peat, sphagnum moss.
7. Vermiculite
8. Soil types, Soil preparation
9. Irrigation methods
10. Hydroponics

**MODULE II****12 hrs**

1. Propagation methods
  - i. Cuttings
  - ii. Layering – Air layering, Ground layering (Tip, Trench and Compound)
  - iii. Budding – T- budding, Patch Budding
  - iv. Grafting – Approach grafting, Bridge grafting, whip and tongue grafting.
2. Garden tools and implements
3. Manures and fertilizers
4. Farmyard manure, compost, vermicompost and biofertilizers.
5. Chemical fertilizers – NPK.
6. Time and application of manures and fertilizers.
7. Foliar sprays

**MODULE III****12 hrs**

1. Components of Garden
2. Lawns and landscaping Trees, shrubs and shrubberies, climbers and creepers
3. Flower beds and borders, ornamental hedges, edges Drives, roads, walks and paths , Carpet beds, topiary, trophy, rockery
4. Conservatory or green houses, Indoor garden, Roof garden
5. Bonsai

**MODULE IV****10 hrs**

1. Flower Arrangement
2. Containers and requirements for flower arrangements  
Free style, Shallow and Mass arrangement
3. Japanese – Ikebana
4. Bouquet and garland making
5. Dry flower arrangement
6. Harvesting Methods, Storage
7. Marketing of Fruits, vegetables and flowers
8. Preservation and processing of fruits and vegetables

**MODULE V****10 hrs**

1. Growth regulators in horticulture
2. Rooting hormones , Growth promoters , Flower induction , Parthenocarp

3. Plant protection Common diseases of fruits and vegetable crops (Mango, Tomato)

4. Weedicides, Fungicides, Pesticides

Field Study: Visit to a Botanical garden under the guidance of the teacher is encouraged.

#### **REFERENCES**

1. Arora J.S. 1990. Introductory Ornamental Horticulture. Kalyani Publications
2. Bailey L.H. 1901. The Standard Cyclopaedia of Horticulture Volume 1,2 and 3, Macmillan Publications.
3. Bose T.K. and Mukerjee D. 1987. Gardening in India. Oxford Book House
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6. Manibhushan Rao K. 1991. Text Book of Horticulture. Macmillan Publications
7. Shujnroto 1982. The Essentials of Bonsai. David & Charles, Newton.



# SEMESTER VI

## Core Course IX 15UBO641: PLANT PHYSIOLOGY AND BIOCHEMISTRY

**No. of credits: 4**

**No. of instructional hours per week: 5**

### **PLANT PHYSIOLOGY**

**60 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 aspects 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: Gross chemical analysis of the plant body, ash analysis, criteria for essentiality of elements, macro and micro elements, role of essential elements and their deficiency symptoms. Culture methods - sand culture, hydroponics and aeroponics. Mechanism of mineral absorption (a) passive absorption- ion exchange and Donnan equilibrium (b) active absorption- carrier concept, Lundegardh hypothesis.
4. Photosynthesis: Introduction, significance and general equation; Photosynthetic apparatus, structure and function of chloroplast, quantasomes - solar spectrum and its importance - Fluorescence and phosphorescence; Red drop, Emerson effect; 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 C<sub>3</sub>,

C4, and CAM plants; Photorespiration Bacterial photosynthesis and chemosynthesis (Brief account only)

5. Factors affecting photosynthesis - Law of limiting factor.
6. Respiration: Introduction, definition and 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. Nitrogen metabolism: Source of nitrogen - Biological nitrogen fixation – symbiotic and asymbiotic. Nitrogen fixation by blue green algae -rotation of crops. Nif genes - Leghaemoglobin.
9. Growth: Phases of growth - vegetative and reproductive growth - growth curve - plant growth regulators - Auxins, Gibberellins, Cytokinins, Ethylene, Abscissic acid - synthetic plant hormones - practical applications. Senescence and abscission. Photoperiodism
10. Vernalization - phytochrome and its significance. Physiology of bud and seed dormancy, germination.
11. Plant movements: Tropic and nastic movements. Circadian rhythm and biological clock.
12. Stress physiology: water stress, salt stress.

### **Practical**

**20hrs**

1. Water potential of onion peel / Rhoeo peel by plasmolytic method.
2. Imbibition of water by different types of seeds.
3. Effect of temperature on permeability.
4. Papaya petiole osmoscope.
5. Determination of stomatal index.
6. Determination of water absorption and transpiration ratio.
7. Measurement of rate of transpiration using Ganong's potometer or Farmer's potometer.
8. Evolution of oxygen during photosynthesis.
9. Measurement of photosynthesis by Wilmot's bubbler.
10. Ganong's respirometer and measurement of R .Q.
11. Simple respiroscope.

12. Alcoholic fermentation using Kuhn's fermentation vessel.
13. Geotropism using clinostat.
14. Measurement of growth using Arc auxanometer.

## **BIOCHEMISTRY**

**30 hrs**

1. Molecules and life.
2. Carbohydrates - Classification, occurrence, structure and functions of monosaccharides (glucose and fructose), oligosaccharides (sucrose and maltose), polysaccharides (starch and cellulose), synthesis of glycosidic bonds – Enzymatic hydrolysis of glycosidic bonds – amylases and invertases.
3. Amino acids- classification based on polarity, structure - Amphoteric property of Amino acids - peptide formation – Amino acid metabolism – reductive amination and transamination
4. Proteins – Structure, classification, properties and function; Role of bonds in stabilizing protein structure - hydrolysis of proteins.
5. Lipids- classification – Simple lipids- fats & oils, waxes; Compound lipids- phospholipids, spingolipids and glycolipids; Derived lipids- Cholesterol and terpenes; Fatty acids – Alpha-oxidation and Beta-oxidation; Synthesis of ester bonds.
6. Enzymes - general account - structure, classification and nomenclature (recommended by Commission on Enzymes); Mechanism of enzyme action - inhibition of enzymes - regulation of enzymes - allosteric inhibition - Isoenzymes, coenzymes and cofactors
7. Secondary Plant Products – Introduction – classification and function [General account]

## **Practical**

**16 hrs**

1. Qualitative test for carbohydrates - Molisch's test, Benedict's test (for reducing sugar)
2. Iodine test for starch/Seliwanoff's test.
3. Test for proteins - Biuret test

## **REFERENCES**

1. Nagini S. 2009. Instant Biochemistry. Ane Books Pvt. Ltd
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3. Kochhar P.L. and Krishnamoorthy H.N. 1995.Plant Physiology. Atmaram & Sons- Delhi ,Lucknow.
4. Richard F Venn 2004. Principles and Practice of Bioanalysis. Taylor & Francis, Lomdon.

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11. William G. Hopkins 2008. Introduction to Plant Physiology. John Wiley & Sons, New York.
12. Keith Wilson and John Walker 2008. Principles and techniques of Biochemistry and Molecular Biology, 6th Edition. Cambridge University Press, India Pvt. Ltd.
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**Core Course X**  
**15UBO642: MOLECULAR BIOLOGY,**  
**GENERAL INFORMATICS AND BIOINFORMATICS**

**No. of credits: 4**

**No. of instructional hours per week: 4**

**MOLECULAR BIOLOGY**

**28 hrs**

1. DNA as genetic material- experimental evidence- Griffith's experiment on Bacterial transformation, Avery's experiment, Hershey-Chase Experiment.
2. DNA- Chemical Composition, Chargaff's rules, molecular structure of DNA-Watson & Crick's Double Helical Model of DNA, Salient features of double helix, Biological Significance of Double Helical Model of DNA; Forms of DNA - A, Band Z forms; Satellite and repetitive DNA

3. Replication of DNA- An overview, General principles and features, Semi conservative model- Meselson and Stahl experiment; Leading strand and lagging strand synthesis, okazaki fragments, replication fork and origin of replication; Unidirectional and Bidirectional replication; Enzymology of replication: topoisomerase, helicase, primase, polymerase and ligase; DNA repairing mechanism- photoreactivation.
4. RNA- Structure, Properties and functions of tRNA, mRNA and rRNA; Genetic code.
5. Synthesis of protein: Transcription; RNA modifications- introns, exons, removal of introns, spliceosome; Translation -Central dogma-reverse transcription
6. Regulation of gene expression in prokaryotes and eukaryotes- lac operon; transcriptional gene regulation in eukaryotes-promoters, enhancers, transcription factors; RNA interference.
7. Concept of gene -Units of a gene, cistron, recon, muton; Types of genes- House keeping genes (constitutive genes), Luxury genes (non constitutive genes), overlapping genes.
8. Transposable genetic elements- General account, Characteristic, Transposons (jumping genes), Cellular oncogenes (general account only).

### **Practical**

**12 hrs**

1. Identification of semiconservative replication of DNA through micrographs/schematic representations.
2. Work out problems in molecular biology based on DNA structure and replication

### **GENERAL INFORMATICS**

**22 hrs**

1. Information Technology: Definition, brief history, Modern personal Computer (Hardware and Software) and peripherals, computer network and internet, overview of operating systems- Windows & Linux, and application softwares-Excel, Power point, MS word.
2. Knowledge skill for Higher Education: Data information and knowledge management- Internet as a knowledge repository, academic search techniques, creating your cyber presence, open access initiatives, open access publishing models, basic concepts of IPR, copy rights and patents, plagiarism, introduction to use of IT in teaching and learning, case study of educational software, Aca-

demic services-INFLIBNET, NICNET and BRNET.

3. 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, guidelines for proper usage of computers, internet and mobile phones. Localization issues-IT and Regional languages-IT for the disabled, the free software debate.

### **Practical**

**12 hrs**

1. Create, Copy and Save a document with Header, Footer, Page Number, Date and Time using Word processing
2. Insert a table in the above Document
3. Prepare the mark list of students in a class using Excel
4. Prepare five slides each using power point with different design templates

### **BIOINFORMATICS**

**22 hrs**

1. Introduction: Definition, Origin of concept of Bioinformatics; Brief history, Importance of bioinformatics, Wet lab and Web lab.
2. Basics of Genomics, Proteomics & metabolomics
3. Databases-definition, DBMS-brief account only.  
Biological databases:  
A. Biomolecular databases  
Nucleic acid databases ( EMBL, Gen Bank, DDBJ)  
Protein sequence databases. (PDB, PIR, SWISS PROT, UNIPROT )  
Enzyme databases  
B. Model organism databases  
C. Biodiversity databases
4. Sequence analysis and alignment (brief account only), Global and local alignments, Pair wise sequence alignment, multiple sequence alignment, Sequence Alignment Tools: BLAST, CLUSTAL X. FASTA format
5. Molecular visualization- Bioinformatics in relation to Biomolecular structure, use of Ras mol
6. Molecular Phylogeny and Phylogenetic trees- Advantages of Molecular phylogeny and phylogenetic analysis- PHYLIP.

**Practical****12 hrs**

1. Students are expected to work with at least any one of the commercial / scientific packages, to explore the WEB and able to find, recognize, download, install and use software in various areas useful to the research in Biology.
2. Blast Search
3. Molecular visualization using Rasmol

**REFERENCES**

1. Karp G. 2010. Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
2. De Robertis E.D.P and Robertis E.M.P. 1991. Cell and molecular biology. Scientific American books.
3. Veer Bala Rastogi 2008. Fundamentals of Molecular Biology. Ane Books Pvt. Ltd.
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7. Twymann R.M. 1998. Advanced molecular biology. Viva books New Delhi.
8. Selzer P.M., Marhofer R.J. and Rohwer A. 2009. Applied Bioinformatics. Springer- Verlag Berlin Heidelberg, Germany.
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10. Venkatarajan S. Mathura and Pandjassarame Kanguane 2009. Bioinformatics- a concept based introduction. Springer-Verlag, Berlin Heidelberg, Germany.
11. Agrawal S. 2009. Bioinformatics for Beginners: Introduction to Bioinformatics. Ane Books India Pvt. Ltd.
12. Niel C Jones and Pavela Pevzner 2009. An introduction to Bioinformatics Algorithms. Ane Books India Pvt. Ltd
13. Selzer 2008. Applied Bioinformatics: An Introduction. Ane Books India Pvt. Ltd
14. Kolchanov 2008. Bioinformatics of Genome regulation and Structure. Ane Books India Pvt. Ltd.

15. Joseph Seckback and Eitan Rubin 2007. The New Avenues in Bioinformatics. Ane Books India Pvt. Ltd.
18. Jin Xiong 2007. Essential Bioinformatics. Cambridge University Press India Pvt. Ltd.
19. Higgs 2005. Bioinformatics and Molecular evolution. Ane Books India Pvt. Ltd.
20. Ethan Cerami 2005. XML for Bioinformatics. Springer International Edition
21. Mani K. and Vijayraj N. 2000. Bioinformatics a practical Approach. Aparna Publications, Coimbatore.
21. Mukerjee D.P. 2000. Fundamentals of Computer Graphics and Multimedia. Prentice Hall of India Pvt. Ltd.

#### WEB RESOURCES

- [www.fgcu.edu/support/office2000](http://www.fgcu.edu/support/office2000)
- [www.openoffice.org](http://www.openoffice.org) Open office official website
- [www.microsoft.com/office](http://www.microsoft.com/office) MS Office website
- [www.lgta.org](http://www.lgta.org) Office online lessons
- [www.learntheneth.com](http://www.learntheneth.com) Web Primer
- [www.computer.org/history/timeline](http://www.computer.org/history/timeline)
- [www.computerhistory.org](http://www.computerhistory.org)
- <http://computer.howstuffworks.com>
- <http://vmoc.museophile.org> Computer history
- [www.dell.com](http://www.dell.com) Dell Computers
- [www.intel.com](http://www.intel.com) Intel
- [www.ibm.com](http://www.ibm.com) IBM
- [www.keralaitmission.org](http://www.keralaitmission.org) Kerala Govt. IT Dept.
- [www.technopark.org](http://www.technopark.org)
- [www.studentworkzone.com/question.php?ID=139](http://www.studentworkzone.com/question.php?ID=139)



**Core Course XI**  
**15UBO643: HORTICULTURE,**  
**PLANT BREEDING AND RESEARCH METHODOLOGY**

**No. of credits: 4**

**No. of instructional hours per week: 4**

**HORTICULTURE** **35 hrs**

1. Introduction - Divisions of horticulture- Importance and scope of horticulture.
2. Principles of garden making- types of pots and containers- Potting mixture and potting media – soil, sand, cocopeat, sphagnum moss, vermiculite- Soil types, Soil preparation- Irrigation methods
3. Propagation methods- Conventional (Cuttings, True Seeds); Non-Conventional (Layering – Air layering, Ground layering (Tip, Trench and Compound), Budding – T- budding, Grafting – Approach grafting, Bridge grafting, whip and tongue grafting).
4. Garden tools and implements- Lawn mower, nursery spade, secateurs, pruning shears, budding knives, springlers
5. Manures and fertilizers- organic manure, compost, vermicompost and biofertilizers; Chemical fertilizers – NPK; Time and application of manures and fertilizers- Foliar sprays
6. Components of Garden- Landscaping principles; Lawns, Trees, shrubs and shrubberies, climbers and creepers, Flower beds and borders, and ornamental hedges, Carpet beds, topiary, trophy, rockery, Conservatory or green houses
7. Indoor garden, Roof garden (Brief account only)
8. Bonsai
9. Flower Arrangement- Containers and requirements for flower arrangements- Free style, Shallow and Mass arrangement- Japanese- Ikebana. Dry flower arrangement

**Practical** **20 hrs**

1. Familiarise the garden tools and implements mentioned in the syllabus

2. Students must be trained to do Cutting/ layering/ grafting/ budding.
3. Visit to a Botanical garden under the guidance of the teacher is recommended

## **PLANT BREEDING**

**20 hrs**

1. Introduction, objectives in plant breeding- Important national and international plant breeding institutes
2. Plant introduction. Agencies of plant introduction in India, Procedure of introduction - Acclimatization - Achievements.
3. Selection- mass selection, pure line selection and clonal selection. Genetic basis of selection and methods.
4. Hybridization: Procedure of hybridisation, inter generic, inter specific, inter varietal hybridisation with examples. Composite and synthetic varieties.
5. Heterosis and inbreeding depression- genetic basis; male sterility
6. Mutation breeding – method – achievements in India.
7. Polyploidy breeding
8. Breeding techniques and achievements with reference to the following crops in India: a. Rice b. Rubber c. Pepper d. Coconut

### **Practical**

**16 hrs**

1. Techniques of emasculation and hybridization of any bisexual flower.

## **RESEARCH METHODOLOGY**

**17 hrs**

1. Introduction; Need for research; Stages of Research– Definition of problem, execution of the problem, interpretation of results
2. Characteristics of Research, Types of research- Qualitative & quantitative.
3. Experimental design, components of experimental designs- Randomized blocks, completely randomized designs.
4. Preparation of a project report : Data analysis and consolidation of photographs, illustrations, tables and graphs, Title, introduction, review of literature, materials and methods, results, discussions, summary, references, acknowledgements; Bibliography – Method of citing and arrangement of references.

## REFERENCES

1. Arora J.S 1990. Introductory Ornamental Horticulture. Kalyani Publications
2. Bailey L.H. 1901. The Standard Cyclopaedia of Horticulture Volume 1,2 and 3. Macmillan Publications.
3. Bose T.K. and Mukerjee D. 1987. Gardening in India. Oxford Book House
5. Kumar N. 1989. introduction to Horticulture. Rajalakshmi Publications
6. Manibhushan Rao K. 1991. Text Book of Horticulture. Macmillan Publications
7. Shujnroto 1982. The Essentials of Bonsai. David & Charles, Newton.
8. Allard R.W. 1999. Principles of Plant Breeding (2nd Edition). John Wiley and Sons.
9. Acquaah G. 2007. Principles of Plant Genetics and Breeding. Blackwell Publishing Ltd. USA.
10. Singh B.D. 2001. Plant Breeding. Kalyani Publishers.
11. Gurumani N. 2006. Research Methodology: For Biological Sciences. MJP Publishers.
12. Kothari C.R. 2004. Research Methodology New Age International.

### **Elective Course**

### **15UBO661.1: BIOTECHNOLOGY AND NANO BIOTECHNOLOGY(Elective)**

**No. of credits: 2**

**No. of instructional hours per week: 3**

#### **MODULE- I**

**12 hrs**

1. Introduction – History- major achievements-Biotechnology in India.
2. Plant Tissue culture – Totipotency- definition and importance – differentiation and redifferentiation. Cytodifferentiation.

3. Culture media, composition, preparation and sterilization.
4. Callus and suspension culture, meristem culture- Somaclonal variation- Somatic embryogenesis and organogenesis. Synthetic seeds – anther culture and production of haploids – protoplast culture – somatic hybrids – cybrids.

## **MODULE- II**

**12 hrs**

1. Recombinant DNA technology: General account of cloning vehicles – plasmid, bacteriophages, cosmids and phagemids. Cutting and joining of DNA molecules – restriction endonucleases, ligases – Gene library.
2. Brief account of gene transfer techniques – Direct DNA uptake by protoplast –vector method Agrobacterium mediated, physical method- electroporation- shot gun method – microinjection.

## **MODULE III**

**12 hrs**

1. Methods in Biotechnology.
  - a. Isolation and purification of DNA from plant cells.
  - b. Agarose gel electrophoresis
  - c. PCR, RFLP, DNA sequencing-Sanger's method, Southern blotting, ELISA.
2. Application of biotechnology in
  - a. Medicine – edible vaccines from plants, gene therapy.
  - b. Agriculture – nif genes, GMO foods.
  - c. Industry and environment (brief account only)
3. Biosafety and ethical issues, Intellectual Property Rights (IPR)

## **MODULE IV**

**10 hrs**

1. Microbes in biotechnology.
2. Microbial culture methods of culturing, media and composition (LB and PDA)
3. Application of recombinant microbes.
4. Industrial microbiology: Production of alcohol, vinegar, bread, dairy products & single cell protein. (brief account only)

## **MODULE V**

**08 hrs**

1. Introduction-background and definition of nanotechnology
2. Nanosystems in nature

3. Nanoscaled biomolecules (nucleic acids and proteins)
4. Technologies for visualization of biological structures at the nano scale-atomic force microscope, SEM & TEM
5. Nanoparticles- Quantum dots, Paramagnetic iron Oxide Crystals, Dendrimers, Carbon nanotubes.
6. Application of nanobiotechnology in life sciences;

#### Field Study

- Visit to a well equipped biotechnology laboratory to familiar with the use of equipments and glasswares. Petri dishes, conical flasks, culture tubes, Pasteur pipettes, forceps, scalpels, hot air oven, autoclave, platform shaker, pH meter and laminar air flow system.
- Preparation of media, sterilization, inoculation and callus induction (demonstration only).

#### REFERENCES

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2. Abhilasha S. Muthuriya 2009. Industrial Biotechnology. Ane Books Pvt. Ltd.
3. Misra S.P. 2009. Plant Tissue Culture. Ane Books Pvt. Ltd
4. Victoriano Valpuesta 2004. Fruit and Vegetable Biotechnology. CRC Press. New York.
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7. Jayaraman 2007. Concepts in Biotechnology. University Press India Pvt. Ltd.
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12. Kumar H.D. 2000. Molecular Biology & Biotechnology. Vikas publishing.
13. Kesavachandran K. and Peter K.V. 2008. Plant Biotechnology. University Press India Ltd.
14. Timir Baran Jha and Biswajit Ghosh 2007. Plant Tissue Culture. University Press India Ltd.
15. Ramawat K.G. 2014. Plant Biotechnology. S. Chand & company.
16. Razdan M. K. 1983. An introduction to Plant Tissue Culture. Oxford and I B H publishers.
17. Bharat Bhushan 2004. Hand book of nanotechnology. Springer-verlag, Berlin.
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