

  
**UNIVERSITY OF MYSORE**

**REGIONAL INSTITUTE OF EDUCATION**  
**[National Council of Educational Research and Training, New Delhi]**

**Regulations governing the Programme**

**1.0 Programme and Duration :**

Integrated Programme of Teacher Education titled ‘**Bachelor of Science Education**’ (**B.Sc.Ed.**) degree programme. The programme will be of four year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of 16 weeks of instruction excluding examination.

**1.1 Equivalence:**

The programme contents related to Physics/ Chemistry/ Mathematics/ Botany/ Zoology offered in B.Sc.Ed. are equivalent to that of B.Sc. (PCM/CBZ) of University of Mysore. The programme contents related to education components in B.Sc.Ed. are equivalent to that of B.Ed. of University of Mysore. This degree B.Sc.Ed. is equivalent to B.Sc. and B.Ed. degrees of the University of Mysore.

Students who pass this programme are considered eligible to pursue Masters Degree in the respective subjects in the Departments of the University of Mysore.

**2.0 Eligibility for admission to B.Sc.Ed.**

**2.1** Candidates seeking admission to the B.Sc.Ed. programme should have passed CBSE Senior Secondary examination/ Pre-University examination of Karnataka or an equivalent examination of Kerala, Andhra Pradesh, Tamil Nadu, Pondicherry or the UT of Lakshadweep with 45% marks in the aggregate. Relaxation upto 5% of marks shall be given to the SC/ST candidates.

**2.2** Candidates should have passed the qualifying examination with the following combinations of subjects. For admission to the PCM stream : Physics, Chemistry, Mathematics/ and any other subject approved by University of Mysore; For admission to CBZ stream : Physics, Chemistry, Mathematics, Biology / Physics, Chemistry, Biology / Chemistry, Botany, Zoology.

**2.3** Admission shall be regulated through selection on the basis of marks in the qualifying examination or performance in a specially designed selection test or both as per the admission policies of NCERT from time to time. The selection test shall consist of Multiple Choice Questions with equal weightage to the three content areas of the combination of subjects at PUC/ CBSE level.

Admission will be in accordance with administrative policies related to proportionate representation (based on the latest available census report) to

different States in the region. It will also be governed by the reservation policies of Govt. of India as prevalent at the time of admission.

2.4 Institutions other than RIE, Mysore offering the programme shall follow the admission rules of Under Graduate Programmes of the University of Mysore.

### **3.0 Scheme of Instruction :**

Details of courses and scheme of study, duration, etc. are provided in Table 1. Courses of Study are organized under the following three categories :

- a) Common Courses
- b) Core Courses
- c) Electives

### **3.1 Common Courses :**

Comprises of courses that are mandatory for all students.

- a) Regional Language : Any one of the following languages – Kannada/ Hindi / Tamil / Telugu / Malayalam.
- b) English
- c) Environmental Education, Information and Communication Technology (ICT) in Education, Indian Constitution, Health and Physical Education and Theatre, Art and Heritage Craft Traditions.

### **3.2 Core Courses**

For PCM students: five courses in Education, two courses one in Pedagogy of Physical Sciences and another in Pedagogy of Mathematics, Physics, Chemistry and Mathematics.

For CBZ Students: five courses in Education, two courses one in Pedagogy of Physical Sciences and another in Pedagogy of Biological Sciences, Chemistry, Botany and Zoology.

The programme also includes a comprehensive school attachment programme, the internship in teaching.

### **3.3 Electives**

Comprises three courses in education and two in mathematics, of which student should opt one in education and one in Mathematics (for PCM candidates only)

### **4.0 Attendance**

Every student has to attend a minimum of 75% of the classes conducted of each course. If a candidate has failed to put in a minimum of 75% attendance in a course, he is deemed to have dropped the course and is not allowed to write the semester end examination of that course. He has to attend the classes of that course in the subsequent years whenever it is offered.

### **5.0 Medium of Instruction:**

The medium of instruction and examination shall be English.

## 6.0 Course Structure of B.Sc.Ed. RIE Scheme

**Table 1**

### PANORAMA OF THE EIGHT-SEMESTERS (PCM)

Sl.No.	COURSE	NO. OF CREDITS PER WEEK IN EACH SEMESTER								Total Credits L + T + P (Split)	Total No. of Credits	Total Contact Hours
		I L+T+P	II L+T+P	III L+T+P	IV L+T+P	V L+T+P	VI L+T+P	VII L+T+P	VIII L+T+P			
<b>COMMON COURSES:</b>												
1	English	2+1+0	2+1+0	2+1+0	2+1+0	-	-	-	-	8+4+0	12	16
2	Regional Language	2+1+0	2+1+0	2+1+0	2+1+0	-	-	-	-	8+4+0	12	16
3	Holistic Education	0+0+1	-	-	-	-	-	-	-	0+0+1	1	2
4	Environmental Studies	-	0+0+1	-	-	-	-	-	-	0+0+1	1	2
5	Theatre, Art and Heritage, Craft Traditions	-	0+0+1	-	-	-	-	-	-	0+0+1	1	2
6	ICT	-	-	0+0+1	-	-	-	0+0+1	-	0+0+2	2	4
7	Indian Constitution & Human Rights	-	-	-	-	-	-	-	0+1+0	0+1+1	1	2
<b>CORE COURSES</b>												
8	Maths	(2+1+0)2	2+1+0	2+1+0	2+1+0	2+1+0	2+1+0	(1+1+0)2	2+1+0	18+10+0	28	38
9.	Physics	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	2+0+1	1+1+1	21+1+8	30	47
10.	Chemistry	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	2+0+1	1+1+1	21+1+8	30	47
11.	Pedagogy of Maths	-	-	-	-	2+2+0	2+2+0	-	-	4+4+0	08	12
12.	Pedagogy of Physical Sci.	-	-	-	-	2+2+0	2+2+0	-	-	4+4+0	08	12
13.	Internship Methodology I	-	-	-	-	-	-	0+0+4	-	0+0+4	4	8
14.	Internship Methodology II	-	-	-	-	-	-	0+0+4	-	0+0+4	4	8
15.	Understanding Education and its Perspectives	-	1+1+0	-	-	-	-	-	-	1+1+0	02	03
16.	Psychology of Learner & Learning	-	-	2+1+0	-	-	-	-	-	2+1+0	03	04
17.	Assessment of Learning	-	-	-	1+1+0	-	-	-	-	1+1+0	02	03
18.	Teaching Approaches and Strategies	-	-	-	-	2+1+0	-	-	-	2+1+0	03	04
19.	Secondary Education in India: Status, Challenges and Strategies	-	-	-	-	-	-	-	2+1+0	2+1+0	03	04
<b>Electives</b>												
20	Guidance and Counselling / Inclusive Education/Curriculum and School	-	-	-	-	-	-	-	2+1+0	2+1+0	03	04
21.	Mathematics: Numerical Analysis/ Graph Theory	-	-	-	-	-	-	-	1+1+0	1+1+0	02	03
	Total Credits	21	21	21	19	22	19	19	18	160	160	241
	Total Contact Hours	30	32	30	28	32	28	34	29	241		

**PANORAMA OF THE EIGHT-SEMESTERS (CBZ)**

Sl.No.	COURSE	CREDITS PER WEEK IN EACH SEMESTER								Total Credits L + T + P	Total No. of Credits	Total Contact Hours
		I L+T+P	II L+T+P	III L+T+P	IV L+T+P	V L+T+P	VI L+T+P	VII L+T+P	VIII L+T+P			
<b>COMMON COURSES:</b>												
1	English	2+1+0	2+1+0	2+1+0	2+1+0	-	-	-	-	8+4+0	12	16
2	Regional Language	2+1+0	2+1+0	2+1+0	2+1+0	-	-	-	-	8+4+0	12	16
3	Holistic Education	0+0+1	-	-	-	-	-	-	-	0+0+1	1	2
4	Environmental Studies	-	0+0+1	-	-	-	-	-	-	0+0+1	1	2
5	Theatre, Art and Heritage, Craft Traditions	-	0+0+1	-	-	-	-	-	-	0+0+1	1	2
6	ICT			0+0+1	-	-	-	0+0+1	-	0+0+2	2	4
7	Indian Constitution And Human Rights	-	-	-	-	-	-	-	0+1+0	0+1+0	1	2
<b>CORE COURSES</b>												
8	Botany	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	2+0+1	1+1+1	21+1+8	30	47
9.	Zoology	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	2+0+1	1+1+1	21+1+8	30	47
10.	Chemistry	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	3+0+1	2+0+1	1+1+1	21+1+8	30	47
11.	Pedagogy of Biological Science	-	-	-	-	2+2+0	2+2+0	-	-	4+4+0	08	12
12.	Pedagogy of Physical Sci.	-	-	-	-	2+2+0	2+2+0	-	-	4+4+0	08	12
13.	Internship Methodology I	-	-	-	-	-	-	0+0+4	-	0+0+4	4	8
14	Internship Methodology II	-	-	-	-	-	-	0+0+4	-	0+0+4	4	8
15.	Understanding Education and its Perspectives	-	1+1+0	-	-	-	-	-	-	1+1+0	02	03
16.	Psychology of Learner & Learning	-	-	2+1+0	-	-	-	-	-	2+1+0	03	04
17.	Assessment of Learning	-	-	-	1+1+0	-	-	-	-	1+1+0	02	03
18.	Teaching Approaches and Strategies	-	-	-	-	2+1+0	-	-	-	2+1+0	03	04
19.	Secondary Education in India: Status, Challenges and Strategies	-	-	-	-	-	-	-	2+1+0	2+1+0	03	04
<b>Electives</b>												
20	Guidance and Counselling / Inclusive Education/ Curriculum and School	-	-	-	-	-	-	-	2+1+0	2+1+0	03	04
	Total Credits	19	22	22	20	23	20	18	16	<b>160</b>	<b>160</b>	<b>247</b>
	Total Contact Hours	28	33	32	29	34	30	33	28	247		

L : (Number of hours engaging a student in lectures in a semester) / 16

T : (Number of hours engaging a student in tutorials in a semester) / 32

P (Number of hours engaging a student in practicals in a semester) / 48 for science subjects

P: (Number of hours engaging a student in practicals in a semester) / 32 for other subjects

L + T + P = V The credit Value of a course

Note : VII Semester consists of 6 weeks of internship exclusively and the available time for classroom instruction is 10 weeks only. So, in science, the number of credits shown for L = 2, but the contact hours is 3 per week and for mathematics the number of credits shown for L = 1, but the contact hours is 2 hours per week.

## 7.0 Change of Stream

Once chosen, change of stream is not permissible under any circumstances during that or subsequent semesters.

## 8.0 Scheme of Examination

8.1 There shall be a University Examination at the end of each semester.

8.2 Detailed Scheme of Examination along with course titles and breakup of marks course- wise is as given below.

### B.Sc.Ed. RIE New Scheme

#### SCHEME OF EXAMINATION

Sem	Course No.	Subject	Sessional		C <sub>3</sub> Theory=X	C <sub>3</sub> Practical=Y	M	P = C <sub>1</sub> + C <sub>2</sub> + M
			C <sub>1</sub>	C <sub>2</sub>				
I	I # E.1	English	25	25	50	-	50	100
	I # RL.1.1	Reg.Lang.-Hindi	25	25	50	-	50	100
	I # RL.2.1	Reg.Lang.-Kannada	25	25	50	-	50	100
	I # RL.3.1	Reg.Lang.-Malayalam	25	25	50	-	50	100
	I # RL.4.1	Reg.Lang.-Tamil	25	25	50	-	50	100
	I # RL.5.1	Reg.Lang.-Telugu	25	25	50	-	50	100
	I # HE.1	Holistic Education	25	25	.	50	50	100
	I # M.1	Mathematics : Differential Calculus and Analytical geometry (Paper – I)	25	25	50	-	50	100
	I # M.2	Mathematics : Number Theory, Theory of Equations and Matrices (Paper – II)	25	25	50	-	50	100
	I # P.1	Physics : Mechanics – I	25	25	50	50	50	100
	I # C.1	Chemistry: Atomic Structure and Bonding	25	25	50	50	50	100
	I # B.1	Botany: Diversity of Microbes	25	25	50	50	50	100
	I # Z.1	Zoology: Animal Diversity – I	25	25	50	50	50	100
	<b>Total PCM/ CBZ</b>							<b>700/600</b>
II	II # E.2	English	25	25	50	-	50	100
	II #RL.1.2	Reg.Lang.-Hindi	25	25	50	-	50	100
	II #RL.2.2	Reg.Lang.-Kannada	25	25	50	-	50	100
	II #RL.3.2	Reg.Lang.-Malayalam	25	25	50	-	50	100
	II #RL.4.2	Reg.Lang.-Tamil	25	25	50	-	50	100
	II #RL.5.2	Reg.Lang.-Telugu	25	25	50	-	50	100
	II # EE.1	Environmental Studies	25	25	.	50	50	100
	II # TAHCT.2	<b>Theatre, Art and Heritage, Craft Traditions</b>	25	25	.	50	50	100
	II # Edu.1	Understanding Education	25	25	50	-	50	100

		and its Perspectives						
	II # M.3	Mathematics: Partial Differentiations and Integral Calculus	25	25	50	-	50	100
	II # P.2	Physics: Elasticity, Waves, Heat and Thermodynamics	25	25	50	50	50	100
	II # C.2	Chemistry: States of Matter and Nuclear Chemistry	25	25	50	50	50	100
	II # B.2	Botany: Diversity of Cryptogams	25	25	50	50	50	100
	II # Z.2	Zoology: Animal Diversity - II	25	25	50	50	50	100
		<b>Total PCM / CBZ</b>						<b>800/800</b>
<b>III</b>	III # E.3	English	25	25	50	-	50	100
	III #RL.1.3	Reg.Lang.-Hindi	25	25	50	-	50	100
	III #RL.2.3	Reg.Lang.-Kannada	25	25	50	-	50	100
	III #RL.3.3	Reg.Lang.-Malayalam	25	25	50	-	50	100
	III #RL.4.3	Reg.Lang.-Tamil	25	25	50	-	50	100
	III #RL.5.3	Reg.Lang.-Telugu	25	25	50	-	50	100
	III # Edu.2	<b>Psychology of Learner &amp; Learning</b>	25	25	50	-	50	100
	III# ICT.1	<b>ICT in Education</b>	25	25	.	50	50	100
	III # M.4	<b>Mathematics: Real Analysis</b>	25	25	50	-	50	100
	III # P.3	Physics: Electricity and Electromagnetism	25	25	50	50	50	100
	III # C.3	Chemistry: Organic Chemistry – I	25	25	50	50	50	100
	III # B.3	Botany: Gymnosperms and Reproductive Biology of Angiosperms	25	25	50	50	50	100
	III # Z.3	Zoology: Animal Divesity – III and Comparative Anatomy of Vertebrates	25	25	50	50	50	100
		<b>Total PCM/CBZ</b>						<b>700/700</b>
<b>IV</b>	IV # E.4	English	25	25	50	-	50	100
	IV # RL.1.4	Reg.Lang.-Hindi	25	25	50	-	50	100
	IV # RL.2.4	Reg.Lang.-Kannada	25	25	50	-	50	100
	IV # RL.3.4	Reg.Lang.-Malayalam	25	25	50	-	50	100
	IV # RL.4.4	Reg.Lang.-Tamil	25	25	50	-	50	100
	IV # RL.5.4	Reg.Lang.-Telugu	25	25	50	-	50	100
	IV #Edu.3	Assessment of Learning	25	25	50	-	50	100
	IV # M.5	Mathematics: Differential Equations	25	25	50	-	50	100
	IV # P.4	Physics: Optics	25	25	50	50	50	100
	IV # C.4	Chemistry: Thermodynamics, Equilibrium and Solutions	25	25	50	50	50	100
	IV # B.4	Botany: Anatomy, Ecology and Evolution	25	25	50	50	50	100
	IV # Z.4	Zoology: Animal Physiology and Endocrinology	25	25	50	50	50	100
		<b>Total PCM/CBZ</b>						<b>600/600</b>
<b>V</b>	V # Edu.4	Teaching Approaches and Strategies	25	25	50	-	50	100
	V # POPS.1	Pedagogy of Physical Science	25	25	50	-	50	100
	V # POM.1	Pedagogy of Mathematics	25	25	50	-	50	100
	V # POBS.1	Pedagogy of Biological Science	25	25	50	-	50	100
	V # M.6	Mathematics:	25	25	50	-	50	100

		Multivariate Calculus and Vector Calculus						
	V # P.5	Physics: Basic Electronics	25	25	50	50	50	100
	V # C.5	Chemistry: Transition Elements, Coordination Compounds and Chemical Kinetics	25	25	50	50	50	100
	V # B.5	Botany: Botanical Nomenclature, Angiosperm Taxonomy and Utilization of Plants	25	25	50	50	50	100
	V # Z.5	Zoology: Animal Ecology and Ethology	25	25	50	50	50	100
		<b>Total PCM/CBZ</b>						<b>600/600</b>
<b>VI</b>								
	VI# POPS.2	Pedagogy of Physical Science	25	25	50	-	50	100
	VI # POM.2	Pedagogy of Mathematics	25	25	50	-	50	100
	VI # POBS.2	Pedagogy of Biological Science	25	25	50	-	50	100
	VI # M.7	Mathematics: Group Theory	25	25	50	-	50	100
	VI # P.6	Physics: Relativity and Quantum Mechanics	25	25	50	50	50	100
	VI # C.6	Chemistry: Organic Chemistry - II	25	25	50	50	50	100
	VI # B.6	Botany: Plant Physiology	25	25	50	50	50	100
	VI # Z.6	Zoology: Developmental Biology and Applied Zoology	25	25	50	50	50	100
		<b>Total PCM/CBZ</b>						<b>500/500</b>
<b>VII</b>	<b>VII # ICT.2</b>	<b>ICT in Education</b>	25	25	-	50	50	100
	VII # M.8	Mathematics: Rings and Fields	25	25	50	-	50	100
	VII # M.9	Mathematics: Linear Algebra	25	25	50	-	50	100
	VII # P.7	Physics: Atomic and Molecular Physics	25	25	50	50	50	100
	VII # C.7	Chemistry: Electrochemistry and Photochemistry	25	25	50	50	50	100
	VII # B.7	Botany: Cell Biology and Genetics	25	25	50	50	50	100
	VII # Z.7	Zoology: Cell Biology, Molecular Biology and Immunology	25	25	50	50	50	100
	<b>VII # IP.1</b>	<b>Internship Methodology I</b>	25	25	-	50	50	100
	<b>VII # IP.II</b>	<b>Internship Methodology II</b>	25	25	-	50	50	100
		<b>Total PCM/CBZ</b>						<b>700/600</b>
<b>VIII</b>								
	VIII # IC.1	Indian Constitution And Human Rights	25	25	50	-	50	100
	VIII # Edu.5	Secondary Education: Status, Issues and Concerns	25	25	50	-	50	100
	<b>VIII # Edu.6</b>	<b>Inclusive Education/ Guidance and Counselling/Curriculum &amp; School</b>	25	25	50	-	50	100
	VIII # M.10	Mathematics: Complex Analys (Paper I)	25	25	50	-	50	100
	VIII # M.11	Mathematics: (Paper II) Numerical Analysis	25	25	50	-	50	100

	(Optional) / Graph theory (Optional)							
VIII # P.8	Physics: Nuclear and Solid State Physics	25	25	50	50	50	50	100
VIII # C.8	Chemistry: Spectroscopy, Natural Products and Heterocyclics	25	25	50	50	50	50	100
VIII # B.8	Botany: Molecular Biology, Biochemistry and Biotechnology	25	25	50	50	50	50	100
VIII # Z.8	Zoology: Genetics and Evolution	25	25	50	50	50	50	100
<b>Total PCM/CBZ</b>								<b>700/600</b>

8.3 *Duration of semester end examination for all theory courses will be of 2 hours and for practical examination, it is of 3 hours.*

*Each theory paper comprises of 5 questions of 10 marks each with internal choice covering the entire syllabus.*

**9.0 Question paper setting, valuation etc.,**

**9.1 Question paper setting for C<sub>3</sub>.**

- (i) There shall be a separate Board of Examiners for each subject for preparing, scrutinising and approving the question papers and scheme of valuation for the use at the next examination/s.
- (ii) The question papers shall be drawn from the question bank, through a computer.



## 9.2 Coding of Answer Scripts:

Before valuation, the answer scripts shall be coded using false numbers. For each paper code separate false number shall be given.

## 9.3 Valuation and Classification of Successful Candidates

*All papers including practicals will be valued by an internal examiner and there will be single valuation.*

*The performance of a student in a course will be assessed for a maximum of 100 marks as explained below.*

*A semester is divided into three discrete components namely  $C_1$ ,  $C_2$  and  $C_3$ . The evaluation of the first component  $C_1$  will be done during the first half of the semester while the first 50% of the syllabus is being covered. This will have a weightage of 25%. This will be consolidated during the 8<sup>th</sup> week of the semester. The evaluation of the second component  $C_2$  will be done during the second half of the semester while the next 50% of the syllabus is being covered. This will have a weightage of 25%. This will be consolidated during the 16<sup>th</sup> week of the semester. In general  $C_1$ , and  $C_2$  should be evaluated through Test/seminar/dissertation/presentation/assignment.*

*Between the 18<sup>th</sup> and 20<sup>th</sup> week of the semester, the semester end examination will be conducted by the University and this forms the third component of evaluation  $C_3$  with weightage of 50%.*

*If a candidate has not scored atleast 30% in  $C_1$  and  $C_2$  put together, he/she is not allowed to appear for  $C_3$ .*

*It should be noted that evaluated papers/assignments of  $C_1$  and  $C_2$  of assessment are immediately returned to the candidates after obtaining acknowledgement in the register maintained by the concerned teacher for this purpose.*

*For the courses that has both Theory and Practical components, then as part of  $C_3$ , both theory and practical examinations shall be conducted for 50 marks each.*

*The final marks of a course  $M$  of  $C_3$  will be computed as per the following table :*

	<i>Distribution</i>	<i>Formula</i>
1.	$L : T : P$	$M = ((L+T)*X + (P*Y)) / (L+T+P)$
2.	$L : T : P = 0$	$M = X$
3.	$L : T = 0 : P$	$M = (L*X + P*Y) / (L+P)$
4.	$L = 0 : T : P$	$M = Y$
5.	$L : T = 0 : P = 0$	$M = X$
6.	$L = 0 : T = 0 : P$	$M = Y$
7.	$L = 0 : T : P = 0$	$M = Z$

*where*

*X is the marks scored out of 50 in  $C_3$  in Theory*

*Y is the marks scored out of 50 in  $C_3$  in Practical*

*Z is the marks scored out of 50 in  $C_3$  in Tutorial*

The total marks in a course is  $P = C_1 + C_2 + M$  (after rounding to nearest integer). The grade (G) and grade point (G.P) will be calculated as follows where V is the credit value of the course.

P	G	GP = V × G
90 – 100	10	V × 10
80 – 89	9	V × 9
70 – 79	8	V × 8
60 – 69	7	V × 7
50 – 59	6	V × 6
40 – 49	5	V × 5
30 – 39	4	V × 4
0 -29	0	V × 0

If a candidate scores in  $C_1 + C_2 \geq 30\%$ ,

$$M \geq 30\%$$

and  $G \geq 5$  in a course, then he is considered to be successful in that course.

After successful completion of the required number of credits, then the overall cumulative grade point average (CGPA) of a candidate is calculated using the formula  $CGPA = \Sigma GP / \text{Total number of credits}$  and the class is declared as follows :

CGPA	FGP	
	Numerical Index	Qualitative Index
$4 \leq CGPA < 5$	5	Second Class
$5 \leq CGPA < 6$	6	
$6 \leq CGPA < 7$	7	First Class
$7 \leq CGPA < 8$	8	
$8 \leq CGPA < 9$	9	Distinction
$9 \leq CGPA \leq 10$	10	

Overall percentage =  $10 * CGPA$  or is said to be 50% in case  $CGPA < 5$ .

However, if  $C_1 + C_2 \geq 30\%$ ,  $M \geq 30\%$  and with grade  $G = 4$ , then a candidate has three options namely conditional success or make up of a course or dropping a course.

**Conditional Success:** A candidate is said to be successful conditionally in a course if his score in  $C_1 + C_2 \geq 30\%$ ,  $M \geq 30\%$  and grade  $G = 4$ . But this benefit will be available upto a maximum 16 credits for the entire programme of B.Sc.Ed. of 4 years. The candidates has to exercise this option within 10 days from the date of notification of results.

*Make Up of a Course: Under the following circumstances, a candidate can have option to choose MAKE-UP OPTION for C<sub>3</sub>:*

1. *scores  $\geq 30\%$  in C<sub>1</sub> + C<sub>2</sub> and M < 30%*
2. *scores  $\geq 30\%$  in C<sub>1</sub> + C<sub>2</sub>; M  $\geq 30\%$  but with grade G = 4*

*The candidate has to exercise this option within 10 days from the date of notification of results. Once he has chosen the option he has to write the examination which will be conducted within 25 days from the date of notification of results. And there can be two or more examinations on the same day and they may be held on Saturdays and Sundays also.*

*If the candidate is unsuccessful in make up, also then he/she is deemed to have withdrawn / dropped the course.*

#### ***Dropping a Course***

*Under the following circumstances a candidate is said to have DROPPED a course, If the candidate :*

1. *fails to put in 75% attendance in the course,*
2. *decides to discontinue/ withdraw to study the course,*
3. *scores less than 30% in C<sub>1</sub> + C<sub>2</sub> together,*
4. *scores in*
  - i) *C<sub>1</sub> + C<sub>2</sub> is  $\geq 30\%$  and M < 30% or*
  - ii) *C<sub>1</sub> + C<sub>2</sub> is  $\geq 30\%$ , M  $\geq 30\%$  and Grade G = 4 and exercises option to drop the course within 10 days from the date of notification of final results,*
- *5. is unsuccessful in the MAKE-UP examination.*

*A candidate who has dropped a course has to re-register for the course soft core/select an alternate when the course is offered again by the Department or Section.*

**9.4** *Each student can go with a normal pace of 20 credits per semester. However he/she has provision to go with a slow pace of 12 credits per semester and an accelerated pace of 26 credits per semester. In any case it should not exceed 26 credits including reregistered courses.*

**9.5** *The tuition fee and the examination fee of a semester will be in accordance with the number of credits registered by each student in that semester.*

**9.6** *The student may avail a maximum of two blank semesters in one stretch. However, he has to pay a nominal fee for maintaining a semester blank to the institution.*

#### **10.0 Provision for Appeal**

A candidate, if dissatisfied with the grades that he/she has got with a feeling that he/she is unnecessarily penalized can approach the grievance cell with the written submission together with all facts, factual and all the assignments, test papers etc. which were evaluated. He/She can do so before the semester-end

examination (based on 2 continuous assessment components already completed) or after the semester-end examination. The grievance cell is empowered to review the grades if the case is genuine and is also empowered to penalize the candidate if his/her submission is found to be baseless and unduly motivated. This Cell may recommend to take disciplinary/corrective action on an evaluator if he/she is found guilty. The decision taken by the Grievance Cell is final.

The Registrar (Evaluation) will be the Chairman and Convenor of the Grievance Cell. For every subject there will be one grievance cell. The composition of the Grievance Cell is as follows:

1. Three senior faculty members (other than those concerned with the evaluation of the paper concerned) drawn from the Department/ discipline and /or from the sister departments/ sister disciplines.
2. Three senior faculty members/subject experts drawn from outside the University Department.
3. The Registrar (Evaluation) ex-officio Chairman/Convenor.
4. The Dean of the respective faculty.
5. Additional lady faculty member (in case not covered by 1,2,3,4,6 and 7).
6. Additional faculty member from a minority community (in case not covered by 1,2,3,4,5 and 7) and
7. The Chairman, BoS, Chairman, DoS and Chairman, BoE.

The appropriate fee as fixed by the University shall be collected from the candidate who goes for an appeal to the Grievance Cell.

#### **11.0 Marks Cards:**

- 11.1 The marks card shall be laminated after affixing the hologram only when a candidate passes (at the time of passing) all papers of a particular semester.

#### **12.0 Barring of Simultaneous Study**

- 12.1 No student admitted to a degree course in a college under the jurisdiction of this university, shall be permitted to study simultaneously in any other course leading to a degree (regular, evening, morning) offered by this university.
- 12.2 If a candidate gets admitted to more than one course, the university shall cancel without giving prior notice his/her admission to all the courses to which he/she has joined.

#### **13.0 Miscellaneous:**

- 13.1 These revised regulations will apply to the candidates admitted for the academic year 2011-12 and onwards for the courses mentioned in Regulation No.1.0 above.

- 13.2 Other regulations not specifically mentioned above are as per the Regulations of the University as applicable from time to time.
- 13.3 Any other issue not envisaged above, shall be resolved by the Vice-Chancellor in consultation with the appropriate Bodies of the University, which shall be final and binding.

# I SEMESTER

## I#E.1 ENGLISH

**Credits : 3 (2L + 1T+0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives :**

Students develop proficiency in English which equips them to:

- Understand the demands of audience, subject, situation and purpose and the
- Use of language for effective communication.
- Analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- Examine authentic literary and non literary texts and develop insight and appreciation.
- Gain an understanding of study and reference skills.
- Plan, draft, edit and present a piece of writing.

### **Transaction Mode:**

Lecture –cum-discussion, using language in context, interactive session, materials to be chosen from newspapers, magazines and journals. Use of dictionaries and encyclopaedia, library work.

### **COURSE CONTENT:**

#### **Unit I : Descriptive Grammar**

##### **Tenses:**

- a) Simple Present: Habitual action, General truths, Future time, Verbs of state, Verbs of perception, Verbs of sensation, Narration, Use of simple present for demonstration and commentaries, Present perfect, present perfect continuous, Present continuous also indicative of future action.
- b) Simple past : Past time reference, Present time reference, Future time reference, Past continuous, Past perfect, past, perfect continuous

#### **Unit II : Skills in Communication**

Negotiating a point of view – learning to talk persuasively so as to get across one's perspective.

Debating on an issue – agreeing / disagreeing.

#### **Unit III : Study and Reference Skills**

Note making; Note- taking; Summary writing.

#### **Unit IV : Literature – Prose & Skills of Communication**

Extract from Abdul Kalam's *Wings of Fire*.; Somerset Maugham – *The Ant and the Grasshopper*

Listening effectively; Talking about one self (likes, dislikes, interests, beliefs, personality traits, ambitions); Expressing an opinion about personal belief on a current issue.(Ability to speak fluently for 3-4 minutes. Focus would be on organized, logical, sequential presentation of thought through spontaneous speech).

#### **Sessional Work :**

Politeness competitions- students with partners take turns in using a given number of utterances for negotiation / requests/complaints/small talk.

Students introduce themselves though using symbols/ metaphors.

Students collect newspaper/magazine cuttings on topical and/ or cultural issues of interest-write and share their opinion with peers.

#### **Suggested Readings:**

Block, C.C.(1997). *Teaching the Language Arts*, 2<sup>nd</sup> Ed. Allyn and Bacon

Mckay. et al. (1995). *The Communication Skills Book*, 2<sup>nd</sup> Ed. New Harbinger Publications.

Hornby,A.S.(2001).*Oxford Advanced Learner's Dictionary*,OUP

Thomsan,A.J. & Martinet.(2002).*A Practical English Grammar*.OUP

## **REGIONAL LANGUAGES**

### **I # RL.1.1 HINDI**

**Credits : 3 (2L + 1T +0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

#### **Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

## **COURSE CONTENT :**

### **Unit I : Descriptive Grammar**

Sandhi ( Agama, Adesa, Dwitwa etc) A suitable book on Sandhi will be followed in the classroom

**Reference:** Hindi Vyakaran by N Nagappa.

### **Unit II: Functional Language**

(a) Group Discussion: Introduction-Definition-characteristics-types of discussions-round-table –symposium-panel-lecture forum etc.-relevance of group Discussions –Exercises.

(b) Conversation: Definition-styles of conversation-formats of conversation-telephonic conversation, etc-Exercises

**Reference:** Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

### **Unit III: Modern Poetry:**

i) Kavya Kusumaakar - First eight Poets (Modern)  
Prasaranga, University of Mysore, Mysore

### **Unit IV : Prose : Collection of Short Stories:**

Katha Kousthubh (Ed). Dr Tippeswamy

### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

## **I # RL.2.1 KANNADA**

**Credits : 3 (2L + 1T +0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.



## **COURSE CONTENT :**

### **Unit I : Descriptive Grammar**

**Sandhi** (Agama, Adesa, Dwitva, etc) A suitable grammar book on Sandhi will be followed in the classroom.

**Reference:** Kannada Kaipidi, Prasaranga Publication, University of Mysore.

### **Unit II : Functional Language**

a) **Group Discussion :** Introduction – Definition – characteristics – types of discussions – round-table symposium – panel – lecture forum etc. – relevance of Group Discussion – exercises.

b) **Conversation :** Definition – styles of conversation – formats of conversation – telephonic conversation, etc. – Exercises

**Reference:** Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

### **Unit III: Modern Poetry**

- i) Kalki – Kuvempu
- ii) Sabhyata Devate – Kuvempu
- iii) Thungabhadre – K S Narasimhaswamy
- iv) Kaniveya muduka – Pu Thi Na
- v) Nanna avathara – M Gopalakrishna Adike

Selected from Aunika Kannada Kavya Part I, University of Mysore, Mysore

### **Unit IV: Prose : Collection of short stories**

Collection of Short Stories

- i) Mochi – Bhartaipriya
- ii) Kallina Kolalu – Chaturanga
- iii) Radheya Kshame – Ananda
- iv) Cappaligalu – Sara Abubakkar

Selected from Sanna Kathegalu, Mysore University, Mysore

**Sessional work :**In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

## I # RL.3.1 MALAYALAM

**Credits : 3 (2L + 1T +0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Unit I : Descriptive Grammar - Sandhi**

Ref : Kerala Panineeyam By A R Rajaraja Varma, NBS, Kottayam

### **Unit II: Functional Language**

Group Discussion- Introduction – Definition – characteristics – types of discussions – round-table symposium – panel – lecture forum etc. – relevance of Group Discussion – exercises

1. Conversation - Definition – styles of conversation – formats of conversation – telephonic conversation, etc. – Exercises

**Reference:** Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

### **Unit III: Modern Poetry**

Lessons from “ Kavya Mala, University of Kerala Publications, Kerala

1. Mazhuvinte Katha
2. Sabhalamee yaatra
3. Shanta
4. Kochiyile Vrikshangal
5. Bharatheeyam

### **Unit IV: Literature**

Collection of Short Stories:

From Katha malika, University of Kerala publications

1. Kadal theerathu
2. Shavadaham
3. Ammayum makanum
4. Perumazhayude pittenu
5. Chaya

### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

## I # RL.4.1 TAMIL

**Credits : 3 (2L + 1T +0P)**  
**Contact hrs per week: 4**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

### **Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

### **Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

### **COURSE CONTENT :**

#### **Unit I: Descriptive grammar – Sandhi**

Ref: Tamil Ningalum Thavarillamal Ezuthalam- Dr. Porko

#### **Unit II: Functional Language**

**Group Discussion:** Introduction-Definition-Characteristics-types of discussions-round table-symposium-panel-lecture forum etc.-relevance of group Discussions – Exercises

**Conversation:** Definition-styles of conversation-formats of conversation-telephonic conversation, etc-Exercises

**Reference:** Effective Group Discussion – Theory and Practice  
Gloria J. Galanes, McGraw Hill Company (Publishers).

#### **Unit III: Poetry:Modern Poetry**

Ikkalak Kavithaikal

Kannan En Sevegan

Thiru Arutpa

An Anthology of Tamil Poetry

(For First Year Degree Classes)

University of Mysore, Mysore.

#### **Unit IV: Prose: Collection of Short Stories**

Naatru – ( Collection of Short Stories)

Vaanathi Pathippagam, 13 Deenadayalu Street

T. Nagar, Chennai 600 017

**Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

**I # RL.5.1 TELUGU**

**Credits : 3 (2L + 1T +0P)**  
**Contact hrs per week: 4**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

**Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

**Transaction mode :**

Lecture cum discussion , group discussion, panel discussion, seminar group work, library work.

**COURSE CONTENT :****Unit I : Descriptive Grammar—Sandhi**

Ref : Balavyakaranam of Paravastu Chinnaya suri and “ Telugu vyakarana chandrika “ by P V K Prasada Rao, Sri Mahalakshmee book enterprises, Museum road, Governor pet, Vijayawada )

**Unit II: Functional Language**

Group Discussion-Introduction – Definition – characteristics – types of discussions – round-table symposium – panel – lecture forum etc. – relevance of Group Discussion – exercises

Conversation - Definition – styles of conversation – formats of conversation – telephonic conversation, etc. – Exercises

**Reference:** Effective Group Discussion – Theory and Practice by Gloria J.Galanes, McGraw Hill Company (Publishers).

**Unit III: Modern Poetry**

Lessons from “Telugu Sahitya Sravanthi “

Published by Prasaranga,

University of Mysore, Mysore

Madhava varma

Desha charitralu

**Unit IV: Literature**

Literature:

Collection of Short Stories:

From **Tilak kathalu :**

By Devarakonda Balagangadhara Tilak

Published by : Vishalandhra Publications, Abids, Hyderabad.

**Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

**I # HE.1 HOLISTIC EDUCATION**

**Credits : 1(0L + 0T +1P )**

**Contact hrs per week: 2**

**Marks : 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

**Objectives:**

- The course is designed to help the student teachers to-
  - understand the modern concept of physical education, its aims, objectives and educational dimensions
  - understand the importance of fitness and the components of physical fitness and training methods of developing physical fitness
  - develop interest in participating in games and athletics and improve competencies to perform skills and play different games for using their leisure time in a productive manner
  - acquire knowledge to conduct intramural competitions, annual sports and recreational activities in schools.
  - understand the meaning of health, dimension of health and factors that promote and affect health
  - understand the concept of health education and implement school health programmes
  - understand the meaning of yoga, its importance in maintaining good physical , mental and emotional health.

**Transaction mode:**

Lecture cum demonstration and discussion, group practice , group work, performance, simulated teaching, school visits.

## **COURSE CONTENT:**

### **UNIT I: Health & Physical Education**

- (a) Meaning and definition of health- Dimensions of health- physical, mental, social and emotional and their inter relatedness
- (b) Factors that promote and affect health- Biological, environmental and socio-cultural
- (c) Concept of Health Education- School Health Programmes- Promoting Health Instruction, Healthful School Living and Health Services Programmes.
- (d) Modern concept of Physical education,- Definition, Aims, Objectives and Educational Dimensions of Physical Education- develop and appreciate the values of physical education programme and develop leadership qualities and all-round personality
- (e) Physical Fitness- Components of Physical Fitness, Training methods for developing Physical fitness.
- (f) Physical education programme at high schools- selection of activities in games and athletics based on physiological, psychological and sociological characteristics of students
- (g) Basics in Yoga- Meaning, importance , different stages of yoga, principles of yoga- do's and don't's during practice of yogic exercises, yogasanas and pranayamas and its effect on different systems of the body and benefits of meditation to reduce stress.

### **UNIT II: Practicals In Health And Physical Education and Yoga**

- (a) Practice of Skills and rules of different games- Basketball, Football, Volleyball, Handball, Kho-Kho, Shuttle Badminton, Cricket, Table Tennis, Throwball, Tenni Koit-(Any two activities)
- (b) Practice of Skills and rules of different Athletic Track and Field Events- Sprints and middle distance runs: 100 mtrs,200 Mtrs. 400 Mtrs, 800 mtrs and 1500 mtrs.  
Field Events: Shotput, Discus throw, Broad jump and High jump ( Any one event from track events and one from Field Events)
- (c) Marking of playfields/ track . Organising Intramural competitions, Officiating matches, Drawing fixtures for different type of tournaments, and maintaining of records
- (d) Health Appraisal of School Students
- (e) Practice of Yogic Exercises and Yogasanas- Mudras, Suryanamasakara and a minimum of 25 simple asanas
- (f) Practice of Pranayama- and techniques of doing Meditation and Relaxation.
- (g) Simulated teaching of Yogasanas

### **Sessional Work:**

- (a) Preparation of Health Appraisal Report of School students
- (b) Learning to teach any five yogasanas
- (c) Officiating Games and Athletic events during practice of games and

- intramural competitions
- (d) Performing the skills taught in different games
  - (e) Organisation of competitions at class level and participating in Trekking to learn organizing skills and leadership qualities.

**References:**

1. B.K S Iyengar (1976) Light on Yoga, New York, Schocken Books.
2. B.D.Bhatt and S.R.Sharma (1993) Teaching of Physical and Health Education, Delhi, Kanishka Publishing House.
3. V.Krishnamerthy and N Parameshwara Ram (1992) Educational Dimensions of Physical Education, New Delhi, Sterling Publishers Pvt. Ltd.
4. Edward F. Voltmer and Arthur A.Esslinger (1964) The Organisation and Administration of Physical Education, Bombay, The Times of India Press.
5. Byrd W.B. (1981) Healtyh, Philadelphia, Saunders Co.
6. Bucher Charles, Foundation of Physical Education, St.Louis, The C.V.Mosby and Co., Ltd.
7. Uni Kishan Lal (1997) Preksha Dhyana Yogic Kriyayen, Ladnun, Tulsio Adhyatma Nigam.
8. Seetharam A.R. (1996) Yoga for Healthy Living. Mysore , Paramahansa Yogashram.
9. Muni Mahendra Kumar (1994) Prekksha Meditation, Ladnun, Jain Vishva Bharathi.
10. U.K.Singh, A K Nayak (2005) Health Education, New Delhi, Commonwealth Publishers.
11. V.K.Rao, (2003) Physical Education, New Delhi, A,P H Publishing Corporation.
12. B.N.Dash(2003) Health and Physical Education, New Delhi, Neelkamal Publication Pvt. Ltd.
13. N.Govindarajulu (2005) Management of Physical Education and Sports Programme. New Delhi Friends Publications.
14. Williams J.F. and Brownell C L: The Administration of Health Education and Physical Education , Philadelphia, W.B.Saunders Company.
15. Knapp and Leonard, (1968) Teaching Physical Education in Secondary Schools, New York, McGraw Hill Series.

**I#M.1 MATHEMATICS**  
**Paper – I**  
**DIFFERENTIAL CALCULUS AND ANALYTICAL GEOMETRY**

**Credits : 3 (2L + 1T +0P)**  
**Contact hrs per week: 4**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub>+ C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**COURSE CONTENT:**

**Unit I: Continuity and Differentiation - I**

Limits, one-sided limits, Infinite limits and limits at infinity, Continuous functions, Discontinuous functions, Continuity theorems, Uniform continuity.

Differentiation, Linear approximation theorem, Higher derivatives, Leibnitz's theorem.

Monotone functions, Maxima and Minima, Concavity, Convexity and Points of inflection.

**Unit II: Differentiation - II**

Polar coordinates, angle between the radius vector and the tangent at a point on a curve, angle of intersection between two curves.

Differentiability theorems, Rolle's theorem, Lagrange's Mean Value theorem, Cauchy's Mean Value Theorem, Taylor's theorem, Maclaurin's theorem, Generalised Mean Value theorem, Taylor's Infinite series and power series expansions, Maclaurin's infinite series, Indeterminate forms.

**Unit III: Analytical Geometry – I**

Cartesian coordinates in three dimensional spaces, Relation between Cartesian coordinates and position vector, Distance formula (Cartesian and Vector form), Direction cosines, Direction ratios, Projection on a Straight line, angle between two lines, Area of Triangle, Volume of a tetrahedron. Straight line, equations and straight lines (Cartesian and Vector form).

**Unit IV: Analytical Geometry – II**

Planes, Equations of Planes (Cartesian and Vector form), Normal form, Angle between planes, Coaxial planes, Parallel and Perpendicular planes, Length of a Perpendicular from a point to a plane, Bisectors of angles between two planes, Mutual, Position of lines and planes, Shortest distance between two skew lines.

Translation and Rotation of Cartesian axes in plane, Curves of second degree, Discriminant and Trace, Theorem on Discriminant and trace, Generalisation of second degree in two variables represents either empty set or a point or a line or a pair of lines or a parabola or an ellipse or a hyperbola.



## References :

1. Calculus by Anton, Addison-Wiley.
2. Calculus with Analytical Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry, Thomas and Finney, S.Chand and Co. Ltd.
4. First Course in Calculus, Serge Lang, Addison-Wiley
5. Calculus by Lipman Bers, Vols. 1 and 2, IBH.
6. Advanced Calculus, Frank Ayres, Schaum Publishing Co.
7. Higher Algebra by Bamard and Child, MacMillan India Ltd.
8. Integral Calculus by Shanthinarayan, S.Chand and Co.Ltd.
9. Differential Calculus by Gorakhprasad, Pothishala Ltd.
10. Elements of Analytical Solid Geometry by Shanthinarayan
11. Calculus and Analytical Geometry by Thomas – Finney, Narosa Publishing House.
12. Introduction to Calculus and Analytical Geometry by Courant and John.
13. The Calculus with Analytical Geometry (5<sup>th</sup> Edition) by Louis Leithold, Harper International.
14. Analytical Geometry (Three Dimensions) by T K Manicavachagam Pillay and T Natarajan, S.Vishwanath and Co.
15. Elements of Vector Algebra and Analytical Geometry by Kanthi Kumar Varma.
16. Analytical Geometry by P K Mittal.
17. Analytical Geometry of two and Three Dimensions and Vector Analysis by R M Khan.
18. Solid Geometry by M L Khanna, Jaico

## I#M.2 MATHEMATICS

### Paper 2

### NUMBER THEORY, THEORY OF EQUATIONS AND MATRICES

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

### COURSE CONTENT:

#### Unit I: Theory of Numbers

Division Algorithm – Prime and Composite Numbers – proving the existence and uniqueness of GCD and the Euclidean Algorithm – fundamental theorem of Arithmetic - the least common multiple – congruences – linear congruences – Wilson’s theorem – Simultaneous congruences – Theorem of Euler – Fermat and Lagrange.

#### Unit II : Theory of Equations

Relation between roots and coefficients, Symmetric functions, Transformations, Reciprocal equations, Descarte’s rule of signs, Multiple roots, Solving cubic

equations by Cardon's method, Solving quartic equations by Descarte's method and Ferrari's method.

### **Unit III: Matrices – I**

Matrices of order  $m \times n$ , Algebra of matrices, Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, Determinants Adjoint of a square matrix, Singular and non-singular matrices, Rank of a matrix, Elementary row / column operations, Invariance of rank under elementary operations, Inverse of a non-singular matrix by elementary operations.

### **Unit IV : Matrices - II**

System of  $m$ -linear equations in  $n$ -unknowns, Matrices associated with linear equations, Trivial and non-trivial solutions, Criterion for existence of non-trivial solution of homogeneous and non-homogeneous systems, Criterion for uniqueness of solutions.

Eigen values and Eigen vectors of a square matrix, Characteristic equation of a square matrix, Eigen values and Eigen vectors of a real symmetric matrix properties, Diagonalisation of a real symmetric matrix, Cayley – Hamilton theorem, Applications to determine the powers of square matrices and Inverse of non-singular matrices.

### **References :**

1. Elementary Number Theory by David M. Burton.
2. Algebra by Natarajan, Manicavachagon Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
3. Theory of Equations by Uspensky, McGraw Hill Book Co. Ltd.
4. Matrices by Frank Ayres, Schaum Publishing Co.
5. Textbook of Matrix Algebra by Suddhendu Biswas.

**I#P.1 PHYSICS  
THEORY - MECHANICS - I**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives :** To enable students to :

- understand Newtonian mechanics.
- apply Newton's laws to explain natural physical phenomena.

**COURSE CONTENT:**

**Unit I : Particle Dynamics and Work and Energy**

**Review of the following:**

Vectors – the language of Physics, Vector addition, subtraction, resolution, vector and scalar products. Particle kinematics, equations of motion under constant acceleration  $\lambda$  under free fall,

*Motion in a plane:* Motion in a plane with constant acceleration , projectile motion, tangential and radial acceleration in circular motion, relative velocity and acceleration.

**Particle dynamics** (review), Newton's First, Second and Third Law of Motion, Newton's I Law as a basic kinematical law defining a frame of reference, Newton's II Law as a basic dynamical law of mechanics and Newton's III law as an interaction law, Frames of reference, inertial and non inertial, pseudo forces, Force laws, weight and mass, static procedure for measuring forces, Application of Newton's law, importance of free body diagrams representing forces on the body and frictional forces. Discussion of importance of friction in daily life.

**Work and Energy:** Work done by a constant force and by a variable force – one and two dimensional cases. Kinetic energy and work-energy theorem, Significance of the work-energy theorem, power. The importance of language in Physics to be highlighted by differentiating the meaning of 'work', 'power', 'energy' as defined in Physics and in daily life.

**Unit II : Conservation Laws and Collisions**

**Conservation Laws:** Introduction, conservative forces, potential energy, complete solution for one, two and three dimensional systems, non-conservative forces, conservation of energy, conservation of energy to be seen as a spreading out and appearing in different forms, mass and energy.

**Conservation of Linear Momentum:** Centre of mass, motion of the center of mass, linear momentum of a particle, linear momentum of a system of particles, conservation of linear momentum, some applications of momentum principle, systems of variable mass – Rocket equation.

**Collisions:** Definition and types of collisions. Impulse and momentum, conservation of momentum during collisions, collision in one and two dimensions. Illustration with examples of collisions during accidents and collisions at atomic and sub-atomic level.

### **Unit III : Gravitation and Central Force**

**Gravitation :** Historical Introduction, Newton's law of Universal Gravitation, Universal Gravitation constant 'G', inertial and gravitational mass, variation in acceleration due to gravity with altitude and depth, motion of planets and satellites, gravitational field and potential, gravitational potential energy, potential energy for many particle systems, calculations of field and potential for (a) a spherical shell, (b) a sphere, energy consideration in the motion of planets and satellites.

**Central Force:** Kepler's laws of planetary motion, the inverse square law, Rutherford's problem, derivation of Kepler's Law from Universal law of Gravitation.

### **Unit IV : Rotational Kinematics**

Rotational variables, angular velocity, angular acceleration. Rotation with constant angular acceleration, Linear and angular variables, kinetic energy of rotation, rotational inertia, calculation of rotational inertia – of a rod, sphere and cylinder, torque, Newton's laws of rotation, work, power and work – kinetic energy theorem.

### **References:**

1. Fundamentals of Physics, 6<sup>th</sup> Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley and Sons Inc.
2. University Physics, Revised Edition, Harris Benson, John Wiley and Sons, Inc.

## **PHYSICS PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

**Objectives :** To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.

### **COURSE CONTENT:**

(A minimum of TEN experiments out of the following)

1. Study of the motion of an air bubble.
2. Study of the rate of flow of water through a capillary tube under different pressure heads.
3. To study the relation between force and extension produced in a stretched spring.
4. To study the relation between length and time period of a simple pendulum.

5. Study of the motion of a freely falling body.
6. Study of the dependence of the period of oscillation of a spring-mass system on mass.
7. Study of the acceleration of a body subjected to different unbalanced forces.
8. Study of accelerations of different masses under a constant unbalanced force.
9. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
10. Study of conservation of momentum and energy of a collision in a plane.
11. Conservation of momentum in an explosion.
12. Study of the relation between pressure and volume of a gas at constant temperature.

**References:**

1. PSSC Physics Laboratory Guide.
2. Physics Department Instruction Sheets, RIE, Mysore
3. Practical Physics, E Armitage, John Murray.

**I # C.1 CHEMISTRY  
THEORY - ATOMIC STRUCTURE AND BONDING**

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

**Objectives :**

To develop an understanding of principles of Atomic structure and Chemical Bonding.

**COURSE CONTENT**

**Unit I: Atomic Structure**

Discuss the processes on an atomic scale and show how the familiar concepts of classical mechanics have their basis in quantum theory. List the Characteristics of Black-body radiation- Planck's radiation law, photoelectric effect, heat capacity of solids, Compton effect and explain how quantum theory accounts for them. Bohr's model of hydrogen atom and its limitations. Summarise the evidence for the wave nature of matter and state de Broglie hypothesis and Heisenberg uncertainty principle Schrodinger wave equation and its importance, physical interpretation of the wave function, significance of  $\Psi$  and  $\Psi^2$ , postulates of quantum mechanics, particle in one dimensional box. Radial wave functions, angular wave functions. Quantum numbers and their importance, atomic orbitals and shapes of s, p, d orbitals , Multi-electron

atoms, Aufbau and Pauli exclusion principles and Hund's multiplicity rule-Electronic configurations of the elements, effective nuclear charge. Slaters' rule, Energy level diagram for multi-electron atoms.

## **Unit II: Periodic Properties and s and p-Block Elements**

Periodic table as an expression of regularity as a basis for organising information. Atomic radius, Covalent, ionic and Vander waal radii-explanation with examples. Atomic and ionic radii, ionization energy, electron affinity and electronegativity – definition, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behaviour. Factors influencing ionization energy in a group and a period. Electronegativity – Variation in a group and a period, Relationship between Electronegativity, Ionisation Energy and Electron Affinity. Pauling Scale of Electronegativity.

Comparative study of s-Block Elements, diagonal relationships, an introduction to alkyls and aryls –salient features of hydrides, Action of Liquid Ammonia, Properties of solutions of alkali metals in Liquid Ammonia, Anomalous properties of Lithium and Beryllium,.

To appreciate the wide variety in Physical and Chemical characteristics of p-Block elements and their compounds. Comparative study (including diagonal relationships) of groups 13-17 elements, compounds like hydrides, oxides, oxyacids and halides of groups 13-16. tetrasulphur tetranitride, basic properties of halogens, interhalogens and polyhalides.

## **Unit III: Chemical Bonding I**

Chemical bond as a basis for predicting the properties which should be expected for a given chemical substance. Ionic Solids – Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule, Metallic bond-free electron, valence bond and band theories. Weak interactions – Hydrogen bonding, van der Waals forces. Covalent Bond – Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to  $\text{NH}_3$ ,  $\text{H}_3\text{O}^+$ ,  $\text{SF}_4$ ,  $\text{ClF}_3$ ,  $\text{ICl}_2$ , and  $\text{H}_2\text{O}$ .

## **Unit IV: Molecular Orbital theory, boranes and Xenon compounds**

Approaches to understand the properties and stabilities of molecules as viewed by different theories of bonding. Molecular orbital theory, basic ideas – criteria for forming M.O. from A.O., construction of M.O's by LCAO –  $\text{H}_2^+$  ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of  $\sigma$ ,  $\sigma^*$ ,  $\pi$ ,  $\pi^*$  orbitals and their characteristics. Hybrid orbitals –  $sp$ ,  $sp^2$ ,  $sp^3$ ; calculation of coefficients of A.O.s used in these hybrid orbitals. Introduction to valence bond model of  $\text{H}_2$ , comparison of M.O. and V.B. Models. Discussion about homonuclear ( $\text{He}_2$ ,  $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{F}_2$ ,  $\text{C}_2$ ) and heteronuclear ( $\text{CO}$  and  $\text{NO}$ ) diatomic molecules, bond Order and bond energy, percentage ionic character from dipole moment and electronegativity difference.

Hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, silicates (structural principle), - Chemistry of xenon: structure and bonding in xenon compounds.

**References :**

1. University Chemistry : Bruce Mahan
2. Concise Inorganic Chemistry : J D Lee
3. An Introduction to Inorganic Chemistry : Mackay and Mackay

**CHEMISTRY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

**COURSE CONTENT :**

**TITRATIONS**

1. Stoichiometry of neutralization reactions of Sulphuric, Hydrochloric and Nitric acids with Sodium Hydroxide.
2. Estimation of Sodium Carbonate and Sodium Bicarbonate in a mixture.
3. Estimation of Ammonia in Ammonium Salt by Back Titration.
4. Estimation of Ferrous ions using Potassium Permanganate
5. Estimation of Oxalic acid using Potassium Permanganate
6. Estimation of Ferrous ions Using Potassium Dichromate with Internal & External Indicators.
7. Standardisation of Sodium Thiosulphate using Potassium Dichromate and estimation of Iodine.
8. Estimation of Copper in a Copper salt by Iodimetry
9. Standardisation of EDTA solution using Zinc Sulphate and determination of Mg or Ca
10. Standardization of EDTA and estimating the hardness of water.
11. Determination of Alkali content of antacids.

**Reference :**

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel

## I # B.1 BOTANY

### THEORY : DIVERSITY OF MICROBES

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To acquaint students with the diversity that exists in microorganisms;
- To understand the morphology, organization, structure, and reproduction in microbes;
- To appreciate the role and significance of microbes in human welfare and environment;
- To study the symptoms of selected diseases caused by microbes.

#### **COURSE CONTENT:**

##### **Unit I :**

- a) Brief account of history, discovery, characteristics of viruses, viroid, virusoid and prions.
- b) Structure, types and reproduction of Bacteriophages;  
A brief account of diseases caused by 1. Virus – yellow mosaic of bean and HIV, 2. Prions – BSE, Cruzefteldt Jacob disease, Kuru disease; d) Role of viruses in human welfare – a brief account.
- c) Brief account of history, discovery, occurrence, ultrastructure, modes of nutrition, reproduction and economic importance. Review of classification based on morphology and flagellation;
- d) Role of bacteria in human welfare ; Environment – decomposition and bioremediation; Agriculture – biofertilizers (*Rhizobium*) biopesticides (*B. thuringiensis*); Pharmaceuticals – antibiotics and probiotics; industrial – organic acids.
- e) Brief account of bacterial diseases of plants (Citrus Canker)
- f) A general account of Mycoplasma (e.g. sandal spike disease) and Rickettsiae.
- g) *Cyanobacteria*:
  - i) General account, occurrence, structure, reproduction and economic importance – nutritive value, biofertilizers (N<sub>2</sub> fixation, role of heterocyst), algal blooms as biological indicators.
  - ii) Study of *Spirullina*, *Nostoc* and *Oscillatoria*.

##### **Unit II :**

General account of occurrence, structure, thallus organization, reproduction, economic importance and classification (classification of Fritsch).

- b) Study of the structure, reproduction and life-cycle of the following.  
Chlorophyceae : *Oedogonium*, *Chara*  
Xanthophyceae : *Vaucharia*



- Phaeophyceae : *Sargassum*  
 Rhodhophyceae : *Polysiphonia*  
 Bacillariophyceae : General account, structure and reproduction of pennate diatom, economic importance.

**Unit III :**

General characters, thallus organization, reproduction, economic importance and classification (Alexopoulos and Mims),

- a) Study of structure, reproduction, life-cycle and phytopathology and/or economic importance of the following :  
 Myxomycetes - *Stemonites*  
 Phycomycetes - *Albugo*  
 Ascomycetes – Yeast, *Penicillium*

**Unit IV :**

- a) Study of structure, reproduction, life-cycle, phytopathology and economic importance of the following :  
 Basidiomycetes – *Puccinia*, *Agaricus*  
 Deuteromycetes – *Cercospora*, *Colletotrichum*
- b) Lichens – General characters, distribution, types, structure, reproduction, economic and ecological importance.

**References:**

1. Smith, G.M., 1971, Cryptogamic Botany Vol.I, Algae & Fungi, TMH Publishing Co., New Delhi.
2. Sharma, O.P., 1992, Text book of Thallophytes, TMH Publishing House, New Delhi.
3. Pondey, B.P., A Text book of Algae, Sultanchand & Co., New Delhi.
4. Sharma, P.D. 2005, The Fungi, Rastogi Publications, Meerut.
5. Singh, V., P.C.Pande & D.K.Jain, 2007, Diversity of Microbes and Cryptogams, Rastogi Publications, Meerut.
6. Singh.V., P.C.Pande & D.K.Jain, 2006. A Text book of Botany, Rastogi Publications, Meerut.
7. Kumar, H.D., A Textbook of Algae.
8. Alexopoulos.C.J. Introductory Mycology.
9. Dubey H.D. A Text book of Fungi, Bacteria and Viruses.
10. Chopra, A Class book of Fungi, S.Nagin & Co., Jullandar.

**BOTANY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

**Objectives :**

- To develop skill of handling dissection and compound microscope.
- To develop the skill of staining and mounting microbes.
- To develop the skill of drawing and labeling.

- To develop the skill of identifying the symptoms and diseases caused by microbes.
- To develop the skill of observing and identifying microbes using temporary and permanent slides.

**COURSE CONTENT:**

1. Gram staining of bacteria.
2. Preparation of bacterial media and culture of bacteria.
3. Study of genera included in theory under Cyanobacteria, algae and fungi by making temporary micropreparations and using permanent slides.
4. Study of crustose, foliose and fruticose lichens.
5. Observation of disease symptoms in hosts infected by virus, mycoplasma and bacteria.

**I SEMESTER B.Sc.Ed.**

**Z-1: ZOOLOGY  
THEORY – ANIMAL DIVERSITY-I**

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

**Objectives:**

To enable students to understand invertebrates, the organizational hierarchies and complexities; the evolutionary trends in external morphology and internal structure; identification and classification with examples; to enable them to understand various modes of adaptations in animals

**COURSE CONTENT:**

**Unit I: Animal Classification, Protozoa and Porifera**

**a) Principles of classification:** Binomial nomenclature and outline classification of animal kingdom (1).

**b) Protozoa:** General characters and classification of Phylum Protozoa up to classes with examples (1); Type study: *Entamoeba histolytica* – External morphology, lifecycle and pathogenicity (2); Nutrition in Protozoa – Holozoic, holophytic, saprozoic and parasitic nutrition (1); Locomotion in Protozoa – Locomotor organelles and types of movement (1); Reproduction in Protozoa: Asexual – fission, budding, sporulation; Sexual – conjugation (amphimixis), syngamy and autogamy (1)

**c) Porifera:** General characters affinities and classification of Phylum Porifera up to classes with examples (1); Type study: *Sycon* – External morphology and cellular organization (1); Skeletal system in sponges (1); Canal system – Ascon, sycon and leucon types (1); Reproduction in sponges: Budding and gemmule formation, life cycle with reference to *Amphiblastula* and *Parenchymula* larvae (1).

**Unit II: Cnidaria and Acnidaria**

**a) Cnidaria:** General characters and classification of Phylum Cnidaria up to classes with examples (1); Type study: *Obelia* – External morphology, metagenesis and life cycle (2); Mesenteries in *Metridium* (1); Polymorphism in Cnidaria (2); Corals and coral reefs, their types, formation, theories and importance (3).

**b) Acnidaria (Ctenophora):** General characters and classification of Phylum Acnidaria up to classes with examples (1); Type study – *Pleurobrachia* (1), Affinities of Acnidaria (1).

### **Unit III: Helminthes – Platyhelminthes and Nemathelminthes**

**a) Platyhelminthes:** General characters and classification of Phylum Platyhelminthes up to classes with examples (1); Type study: *Dugesia* – External morphology, digestive system, excretory system and reproductive system – asexual, sexual and regeneration (3).

**b) Nemathelminthes:** General characters and classification of Phylum Nemathelminthes up to classes with examples (1); Type study: *Ascaris* – External morphology, digestive system, excretory system, reproductive system and life-cycle (3); Mode of infection and pathogenicity of i) *Fasciola hepatica*, ii) *Taenia solium*, iii) *Ancylostoma duodenale*, iv) *Trichinella spirallis* (2); Host parasite relationship and parasitic adaptation in Helminthes (2).

### **Unit 5: Annelida**

General characters and classification of Phylum Annelida up to classes with examples (1); Type study: *Nereis* – External morphology, coelom, locomotion, digestive system, blood vascular system, excretory system, reproductive system, life-history and regeneration (5); Comparative study of a) digestive system, b) coelomoduct and nephredia in *Pheretima*, *Nereis* and *Hirudinaria* (4); Trochopore larva (1); metamerism in Annelida (1).

### **References:**

1. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (Rastogi Publications, Meerut, 10<sup>th</sup> Revised Edition).
2. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal – (Rastogi Publications, Meerut).
3. Invertebrate Zoology by E.L.Jordon and P.S. Verma – S. Chand & Co., Delhi.
4. Invertebrate Zoology by J.K. Dhama and P.S. Dhama – S. Chand & Co., Delhi).
5. A Textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad).
6. Life of Invertebrates by Russel and Hunter – (Macmillan)
7. Invertebrate Zoology by R.D. Barnes – (W.B.Saunders, Philadelphia)
8. A manual of Zoology, Vol.1 by Ekambernatha Ayyar (Vishwanathan, Madras).
9. The invertebrate series of L.H.Hyman – (McGraw Hill)
10. A student's textbook of Zoology by Adam Sedgwick Vol. I, II & III – (Central Book Depot, Allahabad).
11. A Text book of Zoology vol.1 by Parkar and Haswell – (Macmillan)

## ZOOLOGY PRACTICALS

Exam Duration : 3 hrs

C<sub>3</sub> : 50

### Objectives:

To develop in students the skills; of staining and mounting of materials (temporary and permanent); of dissection, display and labelling; of preparation of cultures of invertebrates by using common culture methods; of laboratory observation of animals

### COURSE CONTENT:

1. Study of microscopes: Simple and compound, handling of microscopes, use of Micro-image projection system.
2. Preparation of culture media of *Paramecium*.
3. i) Study of permanent slides of Protozoa:  
a) *Amoeba*    b) *Entamoeba*    c) *Euglena*    d) *Paramecium*  
e) *Paramecium* conjugation    f) *Foramenifera*    g) *Plasmodium*
4. Studies on effect of various stimuli on the behaviour of *Paramecium*.
5. Preparation of permanent and stained slides:  
a) *Obelia* colony    b) Sponge spicules    c) Sponge gemmules
6. Study of specimens and permanent slides of Porifera:  
a) *Sycon*    b) *Spongilla*    c) Finger sponge (*Haliclona*)  
d) *Euplectella*    e) Sponge spicules of various types    f) Spongin fibres  
g) Sponge gemmule    h) T.S. and L.S. of *Sycon*.
7. Study of specimens and permanent slides of Cnidaria:  
a) *Hydra*    b) *Obelia* colony    c) *Obelia* medusa  
d) *Tubularia*    e) *Pennaria*    f) *Metridium*  
g) T.S. of *Metridium*    h) *Aurelia*  
i) Ephyra larva.
8. Study of specimens of Cnidaria:  
a) *Physalia*    b) *Porpita*    c) *Varella*  
d) *Pennatula*    e) *Zoanthus*    f) *Alcyonium*  
g) *Madrepora*    h) *Meandrina*    i) *Astrea*  
j) *Tubipora*    k) *Gorgonia*.
9. Study of specimens of Helminthes:  
a) *Dugesia*    b) *Fasciola*    c) *Taenia solium*    d) *Ascaris*  
e) *Enterobius*    f) *Ancylostoma*    g) *Trichinella*.
10. Annelida: i) Dissection of *Pheretima* (Study of dissected specimens)  
a) Digestive system    b) Nervous system
11. Dissection of *Hirudinaria* (Study of dissected specimens)  
a) Digestive    b) Reproductive system
12. Study of specimens and permanent slides of Annelida:  
a) *Pheretima*    b) *Nereis*    c) *Heteronereis*  
d) *Hirudinaria*    e) *Aphrodite*    f) *Sipunculus*  
g) T.S. of *Pheretima*    h) T.S. of *Nereis*    i) T.S. of *Hirudinaria*  
j) Parapodium of *Nereis*.

(Note: During the study of specimens and permanent slides, emphasis may be given for morphological, anatomical, adaptive, biological and economic importance)

# II SEMESTER

## II#E.2 ENGLISH

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

### **Objectives :**

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the
- use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

### **Transaction Mode :**

Interactive sessions with group dynamics, peer assessment, self-valuation, participatory learning.

### **COURSE CONTENT:**

#### **Unit I : Descriptive Grammar**

Function of Auxiliaries; Modals; Question form

#### **Unit II : Development of Language Competence**

To be based on the use of multiple texts which address issues of multiculturalism, gender, racism and texts which relate with current issues and contemporary trends. Short stories, comic strips, cartoons and animations (both print and non-print media) to be used. Speeches of famous persons, diaries, travelogues can also be used.

#### **Unit III : Writing for Functional Purposes**

Letter-writing (Professional / Personal)

#### **Unit IV : Literature – Short Poems**

Walter de la Marc – The Listeners

Tennyson – Charge of the Light Brigade

Robert Frost – Stopping by Woods.

Nissim Ezekiel – Poet, Lover, Bird-watcher.

**Sessional Work:**

Students write letters to the editor of a newspaper about their opinion with respect to an issue which is currently being debated.

Groups collect folklore, tales and legends of their region/ language. They relate them in class focusing on fluency, logical arrangement of information and the use of body language in story telling.

**Suggested Readings:**

1. Chan. et al. (1997) *Professional Writing Skills*, San Anselma, CA
2. Fiderer, A. (1994) *Teaching Writing: A Workshop Approach*. Scholastic.
3. Block, C.C.(1997). *Teaching the Language Arts*, 2<sup>nd</sup> Ed. Allyn and Bacon
4. Mckay. et al. (1995). *The Communication Skills Book*, 2<sup>nd</sup> Ed. New Harbinger Publications.

**REGIONAL LANGUAGES****II # RL.1.2 HINDI****Credits : 3 (2L + 1T + 0P)****Contact hrs per week: 4****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub> : 50****C<sub>3</sub> : 50****Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

**Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

**COURSE CONTENT:****Unit I : Descriptive Grammar**

**Samasa and Alankara** ( Yamak, Shlesh, Upama, Rupak, Apahnuti, Utpreksha, Drishtanta, Virodhabasa, Arthantharanyas, Ananvaya)

Reference Book : a) Hindi Vyakaran—N.Nagappa, b) Kavya ke Vibhinna Ang --  
Dr. Krishna Narayan Prasad Magadh

## **Unit II: Functional Language:**

**News reporting:** Characteristics-Definition-language of news reporting-model of news report-patterns-role of media in news reporting-exercises.

**Interview:** Characteristics-definitions-preparation for interview-various types of interviews ( business-employment-literary etc)-exercises.

**References:** a) Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.  
b) The Perfect Interview by Max Eggert, Random House, UK.

## **Unit III : Medieval Poetry**

Text- **Pracheen evam madhyakaleen Hindi Kavya**

Prof Poornachand Tandan (Ed.) Published by Rajpal and sons, Kashmiri gate, Delhi 110006

Following poets' work will be taught : **Tulasidas, Surdas, Meerabai** (one poem of each poet)

## **Unit IV : Collection of Essays:**

**Shresht Nibandh-** Dr. Aalok Gupta (Ed.) published by Shiksha Bharathi, Madarasa Road, Kashmiri Gate, Delhi –06

Prescribed essays:

- Sahitya ki mahatta
- Pahla safed bal
- Gehun banam gulab
- Devdary
- Sahitya aur Jeevan

## **II # RL.2.2 KANNADA**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

## **Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

## **COURSE CONTENT :**

### **Unit I : Descriptive Grammar**

#### **Samasa and Alankara**

**Reference:** Kannada Kaipidi, Prasaraanga Publication, University of Mysore

### **Unit II : Functional Language**

- a) **News reporting :** Characteristics – definition – language of news reporting – model of news report – patterns – role of media in news reporting – exercises.
- b) **Interview :** Characteristics – definitions – preparation for interview – various types of interviews (business – employment – literary etc) – exercises.

**References:** a) Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.

b) The Perfect Interview by Max Eggert, Random House, UK.

### **Unit III: Medieval Poetry**

- i) Enna Devange Jagavella Henu Noda - Akkamahadevi
- ii) Thnna Bhaktana Belavigeya Madianu – Kumaravyasa.
- iii) Parahimseyam Madi Manavam Baldapane - Laksheesha  
( **Kaavya Sanchaya – 3- Mysore University, Mysore**).

### **Unit IV : Collection of Essays**

- i) Chatavannu kurithu – B G L Swamy
- ii) Manushya – G R Lakshmana Rao
- iii) Manasu – M Shivaram
- iv) Janapatha Geethe – C P K  
(Selected from Gadya Vihara Part III) Mysore University, Mysore

## **II # RL.2.3 MALAYALAM**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Unit I. Descriptive Grammar**

#### **Samasa and Alamkara**

(Ref : Bhashaa bhushanam and Kerala Paanineeeyam , NBS , Kottayam )

### **Unit II : Functional Language**



1. News reporting- Characteristics – definition – language of news reporting – model of news report – patterns – role of media in news reporting – exercises
2. Interview- Characteristics – definitions – preparation for interview – various types of interviews (business – employment – literary etc) – exercises.

**References:** a) Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.  
b) The Perfect Interview by Max Eggert, Random House, UK.

### **Unit III: Poetry - Medieval**

VEENA POOVU By Kumaaran ashan, Published by Devi Book Stall, Kodungalloor

### **Unit IV: Collection of Essays**

Lessons from “ Bharatha Paryatanam By Kutti Krishna Maraar, Published by Maraar Sahitya Prakasha , Kozhikode

1. Yudhathinte parinaamam
2. Amba
3. Karnante arangettram
4. Markandeyante chiri

### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

## **II#RL.4.2 TAMIL**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

**Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

**COURSE CONTENT :****Unit I: Aspects of Style**

Styles of writing

Idioms, Phrases and Proverbs

Reference: Tamil Ningalum Thavarillamal Ezhuthalam, Dr. Porka

**Unit II: Functional Language:**

News Reporting: Characteristics-Definition-language of news reporting-model of news reporting-patterns-role of media in news reporting –exercises.

Interview: Characteristics-definition-preparation for interview-various types of interviews (business-employment-literary etc)-exercises

References:

- i) Fundamentals of journalism, Report Writing and editing by R. Thomas Berner, Maruette Books LLC, Washington.
- ii) The perfect Interview by Max Eggert, Random House, UK.

**Unit III: Medieval Poetry**

Periya Puranam Selection of poems

Naladiyar – Selection of poems

An Anthology of Tamil Poetry

For First Degree Classes

University of Mysore, Mysore

**Unit IV:Collection of Essays**

Ariviyal Tamilzhakkam- S.V. Shanmugham

New Century Book House (P) Ltd,

41 – B SIDCO Industrial Estate

Chennai 600 017.

**II#RL.5.2 TELUGU**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

**Objectives:**

- To enable the students to acquire basic skills in functional language .

- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

**Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

**COURSE CONTENT :**

**Unit I: Descriptive Grammar**

Samasa and Alamkara

(Ref : Balavyakaranam by Paravastu chinnaya suri and “Telugu vyakarana chandrika” by P V K Prasada Rao, Sri Mahakakshmee book enterprises, Museum road, governor pet, Vijayawada

**Unit II : Functional Language**

News reporting- Characteristics – definition – language of news reporting – model of news report – patterns – role of media in news reporting – exercises.

2..Interview-Characteristics – definitions – preparation for interview – various types of interviews (business – employment – literary etc) – exercises.

**References:** a) Fundamentals of Journalism, Report Writing and Editing by R.Thomas Berner, Marquette Books LLC, Washington.

b) The Perfect Interview by Max Eggert, Random House, UK.

**Unit III: Poetry - Medieval**

Lessons from “Telugu Patagalu“ Published by Prasaranga,  
University of Mysore, Mysore

Pravaruni Katha by Allasani Peddana

Vyasa nishkasanamu by Srinatha

**Unit IV: Collection of Essays**

Lessons from “Telugu Sahitya Sravanthi “, Published by Prasaranga,  
University of Mysore,

Mysore

Andhrula Sanghikaacharalu

Tirupati Venkata kavula Avadhana vidya

## II # EE.1 ENVIRONMENTAL STUDIES

**Credits : 1(0L + 0T + 1P)**  
**Contact hrs per week: 2**

**Total : 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

### **Objectives:**

- To develop understanding of environmental problems, issues and concerns.
- To appreciate the need for protection and conservation of living and non-living environmental resources and sustainable development.
- To understand the harmful effects of environmental pollution and preventive measures.
- To understand the impact of population growth on environment and Human Health.
- To understand the governmental and non-governmental initiatives to protect and conserve the environment.
- To develop rational thinking abilities for participatory environmental management.

### **Unit I : Environment : Natural Resources, Biodiversity and their Conservation**

- a. Multidisciplinary Nature of Environment: Studies, concept, Scope and Importance.
- b. Natural Resources - renewable and non-renewable (Forest, water, mineral, food, energy and land resources); Associated problems and strategies for Conservation and Sustainable Development.
- c. Ecosystem – concept, components, energy flow, types of ecosystem
- d. Biodiversity – Genetic, species and ecosystem diversity; status of Biodiversity – global, national and local; Utilitarian values and ethics of biodiversity; Hotspots of biodiversity and associated threats of habitat destruction; endangered and endemic species of India; In-situ and ex-situ conservation of Biodiversity.
- e. Disaster Management; Floods, earthquakes, cyclone and landslides.

### **Unit II : Environmental Concerns and Legislative Measures**

- a. From unsustainable to sustainable development, urban problems related to energy, water conservation, rain water harvesting, watershed management, resettlement and rehabilitation of people; its problems and concerns.
- b. Environmental ethics : Issues and possible solutions,

- c. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust; Wasteland reclamation. Consumerism and waste products.
- d. Population growth, variation among nations; Population explosion – Family Welfare Programme; HIV / AIDS; Environment and human health
- e. Environmental pollution- Air, water, soil, marine, noise and thermal pollution, nuclear hazards; solid waste management and conservation, preventive measures of pollution.
- f. Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation; Public awareness).

### **Sessional activities**

- a. Visit to document environmental assets - river / forest / grassland/ hill/national parks.
- b. Visit to a local polluted site : Urban / Rural / Industrial / Agricultural
- c. Study of common plants, insects, birds
- d. Study of simple ecosystems – pond, river, hill slopes, etc.
- e. Project on environmental pollution in the nearby sites
- f. Preparation of exhibits on environmental themes and organize an exhibition
- g. Conduct a survey of environmental problems of the community

### **References:**

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
3. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
4. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993. Water in Crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H & Weston, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284 p.
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p

16. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
17. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science
20. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Standards, Vol I and II, Enviro Media (R)
21. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (TB)
22. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p

## **II #TAHCT.1 THEATRE, ART AND HERITAGE CRAFT TRADITIONS**

**Credits : 1(0L + 0T + 1P)**

**Contact hrs per week: 2**

**Total : 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Course Objectives:**

The student teachers will be able perform the following through the course:

- Develop an awareness of various art forms and their cultural bases
- Develop aesthetic sensibilities with regard to stage craft puppetry, characterization and mask making and a sense of their applicability in creating learning situations contextually in schools.
- Develop skill in use of various art tools and instruments
- Discover their own preferences through exposures to a variety of materials and various means of art communication (verbal and non-verbal)
- Express their own imagination, originality and style of presentation through performance or preparation of various art activities
- Appreciate the cultural diversity reflected in various heritage crafts and folk art forms
- Participate in the different art and theatre activities organized
- Understand and execute the different strategies to teach theatre and other art forms to school learners
- Develop the skills of organizing cultural and Art activities in schools.
- Use this skills of verbal and non-verbal communication in learning contexts

### **Transaction Mode:**

Lecture cum discussion, Group practice, Group Work, performance.

## **COURSE CONTENT:**

**Unit: I:** Concept of theatre: Eastern and Western, Natyashashtra, Doctrine of Rasa, Tragedy, Catharsis, Folk and Classical art forms

**Unit :II** Forms of Theatre: Drama, Stage Plays. Skits, Mime, Street Plays  
Introduction to the History of Word Art, Magical Art, Amusement Art.

### **Sessional Work:**

- a. Expression, Body Language, Modulation and Creativity
- b. Act for any situation
- c. Preparation of script
- d. Organization of Competitions at class level and exhibition in the Institute

## **II#EDU.1 UNDERSTANDING EDUCATION AND ITS PERSPECTIVES**

**Credits : 2 (1L + 1T +0P)**

**Contact hrs per week: 3**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

This course is designed to help student teachers to

- Gain an understanding of the concept, meaning, aims and functions of education
- Reflect upon the educational thoughts of Indian and Western thinkers and explore their implications for school practices
- Critically examine the issues and concerns of education in the socio-economic contexts of India

### **Transaction Mode:**

Lecture cum discussion, group presentation, symposium and readings on educational thinkers.

## **COURSE CONTENT:**

### **Unit I : Basic Concepts of Education**

Concept, meaning, aims and functions of education; Education and its related concepts – Training, Instruction and Teaching; Education as a discipline and its interdisciplinary nature; Education as value development;

### **Unit II : Educational Thoughts and Practices**

Relevance of educational thoughts of Indian and Western Educationists to the present education system.

- a) Indian: Gandhiji, Rabindranath Tagore, Aurobindo, Jiddu Krishnamurthy
- b) Western: Plato, Rousseau, John Dewey, Montessori and Paulo Friere

### **Unit III : Education and Socio-Cultural Context**

Education as an instrument of social change; Influence of education on society, family and their practices; Socio-cultural influences on the aims and organization of education; Emerging trends in societies and their repercussions on education: Globalization and internationalization of education

### **Unit IV: Issues and Concerns in Education**

Equalization of education opportunities; Constitutional problems for ensuring and equality Nature and forms of inequality including dominant and minor groups, gender in equalities in schools; public – private; Rural urban – tribal; Democracy, Secularism, National and Emotional Integration; Inclusive Education

### **Sessional Work:**

- Readings on educational thinkers and presentation on the contribution of one of the thinkers (group work followed by discussion)
- Reading on education in Ancient India – Vedic, Buddhism and Jainism

### **References:**

1. Pathak, Avijit (2002) social Implications of Schooling, Delhi Rainbow Publishers.
2. Kumar Krishna (2004) What is Worth teaching/ 3<sup>rd</sup> Edition Orient Longman
3. Saraswathi T S (1999) Culture, Socialization and Human Development, Sage Publication.
4. Krishnamurthi J Education and the Significance of life, KFI Publications.
5. R.S. Peters: Concept of Education.
6. Anand, C L and et al (1993) Teacher and Education in the Emerging Indian Society, NCERT, New Delhi.
7. Delors, Jacques (1996) Learning the Treasure Within, Report to UNESCO of the International Commission on Education for Twenty-first Century, UNESCO.
8. Dewey J. (1952) Experience in Education Collier Macmillan.
9. Dewey J (1966) Democracy in Education, New York, Macmillan.
10. Gandhi M K (1956) Basic Education, Ahmedabad, Navajivan.
11. Govt. of India (1952) Report of the Secondary Education Commission, New Delhi
12. Govt. of India, MHRD (1986, Revised 1992) National Policy of Education, New Delhi.
13. Govt. of India, MHRD (1992) Programme of Action (Draft) New Delhi, Aravali Printers and Publishers.
14. Mani R S (1964) Educational Ideas and Ideals of Gandhi and Tagore, New Book Society New Delhi.



**II #M.3 MATHEMATICS**  
**PARTIAL DIFFERENTIATIONS AND INTEGRAL CALCULUS**

**Credits : 3 (2L + 1T + 0P)**  
**Contact hrs per week: 4**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**COURSE CONTENT:**

**Unit I: Partial Derivatives – I**

Functions of two or more variables, Limits, Continuity, Partial derivatives, Differentiable functions, Linear approximation theorem.

**Unit II: Partial Derivatives - II**

Homogeneous functions, Euler's Theorem, Chain Rule, Change of Variable, Directional Derivative, Partial Derivatives of higher order, Taylor's Theorem, Derivate of Implicit functions, Jacobians.

**Unit III: Curves and Surfaces**

Quadratic Curves, surfaces, sphere, cylinder, cone, Ellipsoid, Hyperboloid, Paraboloid, Ruled surfaces.

**Unit IV: Integration**

The integral of a function, The area under a curve, The fundamental theorem of Calculus, Techniques of integration, Integration of Rational Functions, Rationalizable Integrals.

Definite Integral, Properties, Definite integral as the limit of a sum, Reduction formulae, Area Volume and Length.

**References :**

1. Calculus by Anton, Wiley.
2. Calculus with Analytic Geometry by S K Stein, McGraw Hill.
3. Calculus and Analytical Geometry by Thomas and Finney, S.Chand and Co. Ltd.
4. First Course in Calculus by Serge Lang, Addison-Wiley.
5. Calculus, Vols. 1 and 2 by Lipman Bers, IBH.
6. Introduction to Calculus and Analytical Geometry by Courant and John, Narosa Publishing House.
7. Advanced Calculus by Frank Ayres, Schaum Publishing Co.
8. Higher Algebra by Bamard and Child, Macmillan India Ltd.
9. Integral Calculus by Shanthinarayan, S.Chand and Co. Ltd.
10. Differential Calculus by Gorakhprasad, Pothishala Ltd.

## II#P.2 PHYSICS

### THEORY - ELASTICITY, WAVES, HEAT AND THERMODYNAMICS

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

**Objectives :** To enable students to

- see relation between linear and rotational motion.
- understand the production and propagations of waves in elastic media.
- understand the laws of thermodynamics and its applications.

#### **COURSE CONTENT:**

##### **Unit I : Elasticity and Waves**

Hooke's law, Moduli of elasticity, Relation between elastic constants. Poisson's ratio – limiting values. Elastic potential Energy, bending moment. Theory of the cantilever. Torsion – calculation of couple per unit twist. The torsional pendulum. Static torsions, Searle's double bar experiment.

**Oscillations :** Simple Harmonic Motion (SHM), the restoring force along with its kinematical model, force law, SHM equation and idea of phase and phase difference, energy considerations in simple harmonic motion. Superposition of the SHMs, Lissajous figures, Equation for damped vibrations, forced vibrations. Analysis of complex waves. Fourier Series, Application to square wave, triangular wave.

**Waves in elastic media:** Review of Mechanical waves, types of waves, travelling waves, the superposition principle, wave speed, power and intensity in wave motion, expression for transverse waves in a stretched string, interference of waves, standing waves, resonance, simulation and demonstrations using ripple tank.

**Sound Waves:** Audible, ultrasonic and infrasonic waves, propagation and speed of longitudinal waves, travelling longitudinal waves, standing longitudinal waves, vibrating systems and source of sound, beats and Doppler effect, wave equation for sound pressure, sound power and measuring unit (decibel).

Model of sound being a pressure wave caused by longitudinally oscillating particles must be developed.

##### **Unit II : Kinetic Theory of Gases**

Introduction, Kinetic Theory of Gases, kinetic theory as particle model and usefulness of the model in explaining the regular structure of crystals (Review), an ideal gas – a macroscopic description, an ideal gas – a microscopic description, kinetic calculation of pressure, kinetic interpretation of temperature, ideal gas scale, intermolecular forces, specific heat of an ideal gas, law of equipartition of energy.

Mean free path, Maxwell' distribution law, distribution of molecular speeds, van der Waal's equations of State, critical constants, application to liquefaction of gases.

**Unit III : Heat and First Law of Thermodynamics**

Thermal equilibrium, Zeroth law of thermodynamics, ideal gas temperature scale, heat as a form of energy, quantity of heat and specific heat, molar heat capacities of solids, the mechanical equivalent of heat, heat and work; First law of thermodynamics, Discussion on usefulness of First Law of Thermodynamics in Meteorology, some special cases of the first law of thermodynamics – (i) adiabatic process, (ii) isothermal process, (iii) isochoric process, (iv) cyclic process, (v) free expansion.

**Unit IV : Entropy and Second Law of Thermodynamics**

Introduction, reversible and irreversible processes, the Carnot cycle, Carnot engine, Carnot theorem, absolute scale of temperature, second law of thermodynamics, efficiency of engines, the thermodynamic temperature scale, entropy in reversible and irreversible processes, entropy and the II law, entropy and disorder, consequences of II and III law of thermodynamics, Second law of thermodynamics as a probabilistic statement.

Low temperature Physics – Porous Plug experiment, temperature of inversion, principle of regenerative cooling, liquefaction of air by Linde's method.

**References :**

1. Fundamentals of Physics, 6<sup>th</sup> Edition, David Halliday, Robert Resnick and Jay Walker, John Wiley and Sons, Inc.
2. University Physics, Revised Edition, Harris Benson, John Wiley and Sons Inc.
3. Heat and Thermodynamics, Zemansky, McGraw Hill.
4. Physics of Vibration and Waves, H J Pain.

**PHYSICS PRACTICALS****Exam Duration : 3 hrs****C<sub>3</sub> : 50**

**Objectives:** To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.

**COURSE CONTENT:**

(A minimum of TEN experiments out of the following).

1. Study of velocity of waves on a slinky under tension.
2. Study of the oscillations of a column of water as a function of its length and study of damped oscillation.
3. To determine the velocity of sound at 0° C and the end correction by setting up a resonance column (first resonance length).
4. Study of the variation of the time period of a bar pendulum with different length and determination of 'g' at the given place.
5. Study of torsional oscillations of a loaded wire and determination of the rigidity modulus of the material of the wire.
6. Study of the motion of a steel sphere in a viscous liquid and determination of the coefficient of viscosity of the liquid.

7. Study of transverse vibrations on a sonometer. To determine the frequency by (i) absolute method, (ii) Comparison method.
8. Study of Newton's law of cooling.
9. Melde's experiment – determination of frequency.
10. Determination of solar constant.
11. Study of variation of pressure and temperature of a gas at constant volume.
12. J by Joules Calorimeter.
13. Lees and Charlton disc – Thermal conductivity of a bad conductor.
14. Specific heat of a solid by the method of mixtures.

**References :**

1. PSSC Physics Laboratory Guide.
2. Physics Department Instruction Sheets, RIE, Mysore.
3. Practical Physics, E. Armitage, John Murray.

**II#C.2 CHEMISTRY  
THEORY  
STATES OF MATTER AND NUCLEAR CHEMISTRY**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives :**

- Illustrate how a scientific model can be constructed based on the experimental observations of the behaviour of gases and to explain the properties in terms of microscopic organization.
- To develop an understanding of properties of Gases, Liquids and Solutions.
- To understand the shapes of molecules in terms of symmetries and to relate the properties of the matter in solid state to the structure.
- To develop an Understanding of the Periodic Trends, Preparation, properties and uses of s and p block elements and their Compounds in terms of structure and bonding.

**COURSE CONTENT**

**Unit I : Gaseous and Solid State**

Explanation of the macroscopic properties of solids in terms of structure, bonding and defects. Definition of space lattice, unit cell.

Laws of crystallography – (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices, (iii) Law of symmetry. Symmetry elements in crystals.

X-ray diffraction by crystals. Derivation of Bragg equation. Predicting crystal structure . Defects in solids , Dielectric properties. Review a perfect gas connecting temperature with kinetic theory. Postulates of kinetic theory of gases, deviation from ideal behaviour, van der Waals equation of state. Critical Phenomena : P-V isotherms of real gases, continuity of states, the isotherms of van der Waals equation, Derive a relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state.

Molecular Velocities: Root mean square, average and most probable velocities. Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter. Liquefaction of gases (based on Joule-Thomson effect).

**Unit II : Liquids and Colloids**

Accounting the Isotropic and intermediate behaviour of liquids as a link between solids and gases. Also tracing the role of liquids as solvents and reaction regulators Intermolecular forces, structure of liquids (a qualitative description).

Structural differences between solids, liquids and gases.

Liquid crystals: Difference between liquid crystal, solid and liquid. Classification, structure of nematic and cholestric phases. Thermography and seven segment cell.

Definition of colloids, classification of colloids.

Solids in liquids (sols) : Properties – kinetic, optical and electrical; stability of colloids, protective action, Hardy – Schulze law, gold number.

Liquids in liquids (emulsions) : Types of emulsions, preparation. Emulsifier.

Liquids in Solids (gels) : Classification, preparation and properties, inhibition, general applications of colloids.

### **Unit III : Acids and bases**

A discussion on changing concepts of acids and bases involving concentrations and effects of solvent medium. Arrhenius, Bronstead-Lowry and Lewis concepts of acids and bases.

Hard and Soft Acids and Bases (HSAB) -Classification of acids and bases as hard and soft. Pearson's HSAB concept, acid-base strength and hardness and softness. Symbiosis, theoretical basis of hardness and softness, electronegativity and hardness and softness.

Non-aqueous Solvents- Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid  $\text{NH}_3$  and liquid  $\text{SO}_2$ .

### **Unit IV : Nuclear Chemistry**

To familiarise with the nuclear properties and phenomenon in order to understand the mechanism of some chemical reactions and synthesis of new elements. Fundamental particles of Nucleus, Concept of Nuclides isotopes, isobars and isotones (with specific examples), Qualitative idea of stability of the nucleus (n/p ratio), Natural and artificial radioactivity, Radioactive Disintegration, half life, average life, artificial transmutation, nuclear fusion and fission. Application of Radioactivity and Radio isotopes as tracers in analysis, Reaction mechanism through tracer chemistry in medicines, in biological field, in agriculture and industry.

### **References :**

1. Sl.nos 1 to 6 of I Semester.
2. Principles of Physical Chemistry : Marron and Prutton
3. Elements of Physical Chemistry : Samuel Glasstone and Lewis
4. Physical Chemistry : P W Atkins

## **CHEMISTRY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

**COURSE CONTENT:**

1. To evolve a scheme of analysis of anions and cations based on solubility products and common ion effect.
  - a) classification of anions and cations.
  - b) Quantitative inorganic analysis of mixtures containing four radicals.
2. Determination of density by specific gravity bottle and viscosity of the given liquid by Ostwald's viscometer.
3. Determination of density by specific gravity bottle and surface tension of the given liquid by stalagmometer.
4. Measurement of vapour pressure of pure liquids and solutions ,finding enthalpy of vapourisation of water .
5. Determination of refractive index of pure liquids and mixtures .
6. Determination of concentration of a given substance by colorimetry.

**References :**

1. A Text Book of Quantitative Inorganic Analysis, A I Vogel
2. Practical Physical Chemistry, A Findlay

**II # B.2 BOTANY**  
**THEORY**  
**DIVERSITY OF CRYPTOGAMS**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:**

- To acquaint students with the structure, classification and life history of Bryophyta and Pteridophyta.
- To understand the Geological time scale and the importance of fossils.
- To understand the evolutionary trends among Pteridophytes.

**COURSE CONTENT :**

**Unit I :**

- a) General characters, distribution, structure, reproduction, alternation of generation, classification and economic importance.
- b) Study of morphology, anatomy and reproduction in Hepaticopsida: *Marchanti*
- c) Study of morphology, anatomy and reproduction in Anthocerotopsida : *Anthoceros*  
Bryopsida : *Funaria*
- d) Origin and affinities of bryophytes – brief account.

**Unit II :**

- a) General account of geological time scale, types of fossils, fossilization process, radioactive carbon dating, and importance of fossils.
- b) Study of *Rhynia*, *Lepidodendron*, *Lepidostrobus*.

**Unit III :**

- a) General characters, distribution, reproduction, life cycle and classification.
- b) Study of morphology, anatomy and reproduction in Psilopsida : *Psilotum*  
Lycopsida : *Lycopodium*, *Selaginella*  
Sphenopsida : *Equisetum*

**Unit IV :**

- a) Study of morphology, anatomy and reproduction in Pteropsida : *Marsilea*
- b) Evolution of steles in Pteridophytes
- c) Origin and significance of heterospory and seed habit.



## References:

1. Smith.G.M.,1971, Cryptogamic Botany Vol.II, TMH Publishing House, New Delhi.
2. Sporne, K.R., 1974 Morphology of Pteridophytes, Hutchinson & Co., London.
3. Rashid, A. An Introduction to Pteridophyta.
4. Pandey, Mishra & Trivedi, A Textbook of Botany Vol.II, Rastogi Publications, Meerut.
5. Singh,V., P.C.Pande & D.K.Jain 2006, A Textbook of Botany, Rastogi Publications, Meerut.
6. Singh V., P.D.Pande & D.K.Jain 2005, Diversity and Systematics of Seed plants, Rastogi Publications, Meerut.
7. Parihar, N.S., Bryophyta.
8. Parihar, N.S., Introduction to Embryophyta Vol.II Pteridophyta.
9. Vashishta, P.C.1982, Peridophyta, S.Chand & Co. Ltd., New Delhi.
10. Gangulee H.C., Kar and Ashok Kumar,1982, College Botany Vol.II, Central Book Agency, Calcutta.
11. Anrold, Introduction to Palaeobotany, McGraw Hill, London.

## BOTANY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### Objectives :

- To develop the skill of freehand sectioning, staining and mounting Bryophyta and Pteridophyta materials.
- To observe and identify temporary micropreparations and permanent slides.
- Study of the genera included under bryophytes and pteridophytes by observing temporary micropreparations and permanent slides.
- To prepare permanent, double-stained micropereparations.

### COURSE CONTENT:

1. Study of the morphology, anatomy and reproductive structures of genera included in Byophytes and Pteridophyta.
2. Preparation and submission of 2 double-stained slides.

## II SEMESTER B.Sc.Ed.

### Z-2: ZOOLOGY THEORY – ‘ANIMAL DIVERSITY-II’

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

To enable students to understand invertebrates and vertebrates, their organizational hierarchies and complexities; the evolutionary trends in external morphology and internal structure; identification and classification with examples; to enable them to understand various modes of adaptations in animals

#### **COURSE CONTENT:**

##### **Unit I: Arthropoda and Onychophora**

**a) Arthropoda:** General characters and classification of Phylum Arthropoda up to classes with examples (1), Outline classification of the class Insecta with emphasis on i) Diptera, ii) Coleoptera, iii) Hymenoptera, iv) Lepidoptera and v) Hemiptera (2); Type study: *Palaemon* – External morphology, digestive system, circulatory system, respiratory system, excretory system and reproductive system (3); Mouth parts in Insects (2); Metamorphosis in insects (1); Crustacean larvae (Nauplius, Zoea, Mysis and Megalopa) and their significance (1).

**b) Onychophora:** Salient features of *Peripatus*, systematic position and phylogeny of Onychophora (2).

##### **Unit II: Mollusca**

General characters and classification of Phylum Mollusca up to classes with examples (1); Type study: *Unio* – External morphology, digestive system, respiratory system and life cycle (5); Modifications of foot in Mollusca (2); Comparative account of shells in Mollusca (2); Torsion and detorsion in Mollusca (2).

##### **Unit III: Echinodermata**

General characters and classification of Phylum Echinodermata up to classes with example (1); Type study: *Asterias* – External morphology, digestive system, water-vascular system, haemocoelomic system and reproductive system (5); Life-cycle and metamorphosis (2); Pedicellaria (1); Skeletal system in Echinoderm (1), Echinoderm larvae and their significance (2).

##### **Unit IV: Chordata – Protochordata and Cyclostomata**

**a) Chordata:** General characters and outline classification of Phylum Chordata up to classes with examples (1)

**b) Protochordata:** i) *Balanoglossus* and its affinities (1); Tornaria larva (1); ii) *Ascidia* – Circulatory system and retrogressive metamorphosis (2); iii) *Amphioxus* – Digestive system, circulatory system and nervous system (2).

c) Cyclostomata : General characters, affinities and classification of Class **Cyclostomata** up to orders with examples (1); Type study: *Petromyzon* – External morphology, digestive system and respiratory system (2); Structure and metamorphosis of Ammocoetes larva (1); Comparison of organ systems between *Petromyzon* and *Myxine* (1).

### References:

1. Invertebrate Zoology by E.L.Jordon and P.S. Verma – S. Chand & Co., Delhi).
2. Invertebrate Zoology by J.K.Dhami and P.S.Dhami – S. Chand & Co., Delhi).
3. Invertebrate Zoology series (Protozoa to Echinodermata) by R.L. Kotpal – (Rastogi Publications, Meerut, 2008).
4. A Textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad).
5. A life of Invertebrates by Russel and Hunter – (MacMillan)
6. Invertebrate Zoology by R.D.Barnes – (W.B.Saunders, Philadelphia)
7. A manual of Zoology, Vol.1 by Ekamberantha Ayyar – (Vishwanathan, Madras).
8. Imm's General Text Book of Entomology Vol. & II by O.W. Richards and R.G. Davies – (Chapman and Hall, London).
9. General and Applied Entomology by K.K.Nayar and T.N.Ananthkrishan – (Tata McGraw Hill, New Delhi).
10. The Invertebrate series of L.H.Hyman – (McGraw Hill).
11. A student's textbook of Zoology by Adam Sedgwick Vol. I, II & III – (Central Book Depot, Allahabad).
12. A Textbook of Zoology vol.1 by Parkar and Haswell – (MacMillan).
13. Destructive and Useful Insects- Their habits and control by Metcalf and Flint – (Tata McGraw Hill, New Delhi).
14. Protochordates by K.S. Bhatia.
15. Modern Textbook of Zoology Invertebrates by R.L. Kotpal – (Rastogi Publications, Meerut, 10<sup>th</sup> Revised Edition, 2008).
16. Modern Textbook of Zoology: Vertebrates by R.L. Kotpal – (Rastogi Publications, Meerut, 3<sup>rd</sup> Edition, 2008).

## ZOOLOGY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

### Objectives:

To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and labelling; of collection, preservation, mounting, identification and labelling of collected specimens; of field observation of animals

## COURSE CONTENT:

1. i) Dissection of *Palaemon* (study of dissected specimens):
  - a) Digestive system
  - b) Nervous systemii) Mounting of appendages.
2. Study of specimens of Arthropoda and Onychophora:
  - a) *Lepas*
  - b) *Balanus*
  - c) *Hippa*
  - d) *Cancer*
  - e) *Limulus*
  - f) *Scolopendra*
  - g) *Spirobolus*
  - h) *Peripatus*
3. i) Study of mouth parts:
  - a) *Culex/Anopheles*
  - b) *Periplaneta*
  - c) *Apis*
  - d) butterflyii) Study of Crustacean larvae:
  - a) Nauplius
  - b) Zoaea
  - c) Mysis
  - d) Megalopa
4. Preparation of permanent slides of fresh water and marine crustacean specimens.
5. Identification and classification of any common insects belonging to five different orders.
6. i) Study of specimens and permanent slides of Mollusca:
  - a) *Pila*
  - b) *Unio*
  - c) *Sepia*
  - d) *Octopus*
  - e) *Chiton*
  - f) *Dentalium*
  - g) Radula of *Pila*
  - i) T.S. of Ctenidium
  - j) Glochidium
7. Dissection and mounting of *Pila* (Study of dissected specimen):
  - a) Nervous system
  - b) radula
8. Study of specimens and permanent slides of Echinodermata:
  - a) *Astropecten / Asterias*
  - b) *Ophiothrix*
  - c) *Echinus*
  - d) *Holothuria*
  - e) *Antedon*
  - f) Bipinnaria larva
  - g) Ophiopluteus larva
  - h) Echinopluteus larva
  - i) Pedicellaria
9. Study of specimens and permanent slides of Protochordata:
  - i) *Balanoglossus*:
    - a) Entire
    - b) T.S. through proboscis
    - c) T.S. through collar
    - d) T.S. through trunk region
  - ii) *Ascidia*
  - iii) *Doliolum*
  - iv) *Salpa*
  - v) *Amphioxus*:
    - a) Entire
    - b) T.S. through oral cirri
    - c) T.S. through pharynx
    - d) T.S. through intestine
    - e) T.S. through tail
10. Study of specimens of Cyclostomata:
  - a) *Petromyzon*
  - b) *Myxine*
11. Identification of five gastropods and five bivalves using keys for identification.

(Note: During the study of specimens and permanent slides, emphasis may be given for morphological, anatomical, adaptive, biological and economic importance)

**Submission of report on Insect and Molluscan specimens (each five)**

## III SEMESTER

### III#E.3 ENGLISH

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives :**

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the
- use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

#### **Transaction Mode:**

Lecture-cum-discussion, interactive session, group dynamics, role-play, peer-assessment, self-valuation.

#### **COURSE CONTENT :**

##### **Unit I : Language Work**

Clauses : Noun Clause; Reported Speech and Change of Voice.

##### **Unit II : Comprehension Skills**

Extracts from literary, scientific and educational journals.

##### **Unit III : Advanced Writing Skills**

Writing advertisement copy; Writing a project proposal and Writing Resume, sending an application.

##### **Unit IV : Skills of Communication (Tutorials)**

Presenting oneself at an interview, participating in group discussion.

**Sessional Work :**

Students read sample advertisements from magazines. Discuss in groups and then prepare their own advertisement.

Students discuss and prepare interview schedules. Mock interviews are conducted.

Editing literary pieces in groups and then re-editing what has been edited by other groups after discussion

**Suggested Readings:**

1. Calkins, L (1994). *The Arts of Teaching Writing*. Heinemann
- 2 Chan. et al. (1997) *Professional Writing Skills*, San Anselma, CA
- 3 Fiderer, A. (1994) *Teaching Writing: A Workshop Approach*. Scholastic.
4. Block, C.C.(1997). *Teaching the Language Arts*, 2<sup>nd</sup> Ed. Allyn and Bacon
5. Mckay. et al. (1995). *The Communication Skills Book*, 2<sup>nd</sup> Ed. New Harbinger Publications.

**REGIONAL LANGUAGES****III # RL.1.3 HINDI****Credits : 3 (2L + 1T + 0P)****Contact hrs per week: 4****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub> : 50****C<sub>3</sub> : 50****Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

**Transaction mode :**

Lecture cum discussion , group discussion ; panel discussion, seminar group work , library work.

## **COURSE CONTENT:**

### **Unit I : Functional Language:**

- a) Letter Drafting-Types of letters-E mails-language of letters-letters of famous people-exercises.
- b) Essay writing- Characteristics –Definition-Format-format of essay-types of essays ( literary, scientific etc)-models, exercises

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

### **Unit II: Translation from English to Hindi**

**References :** Anuvad Vignan-Bholanath Tiwari

- a) About Translation by Peter Newmark, MultiLingual Motters, Clavedon, UK.
- b) Aspect of Translation by K V V L Narasimha Rao, CIIL, Mysore

### **Unit III: Medieval Literature :**

Text- **Pracheen evam madhyakaleen Hindi Kavya**

Prof Poornachand Tandan (Ed.) Published by Rajpal and sons, Kashmiri gate, Delhi 110006. Following poets' work have been prescribed for study **Bihari, Ghananand, Dev** (One poem of each poet)

### **Unit IV: Novel**

**Subhah, Dopahar, Sham** by Kamaleshwar, Published by Rajpal and sons, Kashmiri gate, Delhi

### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

### III # RL.2.3 KANNADA

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

#### **COURSE CONTENT :**

##### **Unit I : Functional Language :**

###### **a) Letter drafting**

Characteristics – types of letters – Emails - language of letters – letters of famous people – exercises.

b) **Essay writing** – Characteristics – Definition – format of essay – types of essays (literary, scientific etc) – models, exercises

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

##### **Unit II : Translation from English to Regional Language.**

**Reference:** a) About Translation by Peter Newmark, MultiLingual Motters, Clavedon, UK. b) Aspect of Translation by K V V L Narasimha Rao, CIIL, Mysore.c0 Bhashanthara kale by Dr.Pradhana gurudatt, B M Sri Memorial foundations , 54, 3<sup>rd</sup> cross, gavipuram extension , Bangalore

##### **Unit III : Medieval and Folk Literature**

i) Halatorege Bellada kearu - Basavanna

ii) Chintayemuppu santhoshave javvana – Rathnakaravarne

iii) Adavanama jola Ulidava Namahadu – Folk

(Selections from Kavya Sanchaya Part III), Mysore University, Mysore

##### **Unit IV : Novel**

Bettada Jeeva by Shivarama Karantha



### III # RL.3.3 MALAYALAM

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Unit I: Functional Language**

1. Letter drafting- Characteristics – types of letters – language of letters – letters of famous people – exercises
2. Essay writing- Characteristics – Definition – format of essay – types of essays (literary, scientific etc) – models, exercises

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

#### **Unit II: Translation (English to Malayalam)**

( Ref: Tharjama-Siddhanthavum Prayogavum Malayathil , Current Books, Trichur.)

#### **Unit III: Poetry and Folk literature**

Text : 1. Sishyanum makanum By Vallathol Narayana Menon, NBS , Kottayam

Text 2: Othenanum ponniam pada nilatha angavum, Shantha Book stall, Kodungalloor

#### **Unit IV: Novel**

BALYA KALA SAKHI by Vaikkam Muhammed Basheer, DC Books, Kottayam

#### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

### III#RL.4.3 TAMIL

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works

- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

**Transaction mode :**

Lecture cum discussion , group discussion; panel discussion , seminar group work , library work.

**COURSE CONTENT :**

**Unit I: Functional Language:**

Letter Drafting – Types of letters- Emails -language of letters- letters of famous people-exercises

Essay Writing- Characteristics –Definition-Format- format of essay-types of essays (literary, scientific etc)-models, exercises

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

**Unit II :Translation from English to Tamil:**

**References: Mozhi Peyarppiyal**

Siva Shanmugam, Annam Publications, Siva Gangai (T.N)

About Translation by Peter Newmark, Multilanguage Motters,

Clavedon, UK.

B) Aspect of translation by K V V L Narasimha Rao,

CIIL, Mysore

**Unit III : Medieval Literature**

Thirukkural ii) Silappathikaram

An Anthology of Tamil Poetry

(for Second Year Degree Classes)

University of Mysore, Mysore.

**Unit IV :Novel**

**Onpadhu Rypaai Nottu**

Ekkattut Thangal, Chennai 600 017

### III#RL.5.3 TELUGU

**Credits : 3 (2L + 1T + 0P)**  
**Contact hrs per week: 4**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

#### **Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

#### **Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

#### **COURSE CONTENT :**

##### **Unit I: Functional Language**

Letter drafting- Characteristics – types of letters – language of letters – letters of famous people – exercises

Essay writing- Characteristics – Definition – format of essay – types of essays (literary, scientific etc) – models, exercises

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

##### **Unit II: Translation (English to Telugu)**

( Ref: Anuvada samsyalu by Rachamalla Ramachandra Reddy  
Published by: Vishalandhra Publications, Abids, Hyderabad.)

##### **Unit III: Poetry and Folk literature**

Lessons from “Telugu Sahitya Sravanthi “, Published by Prasaranga,  
University of Mysore,  
Mysore

Vamana charitra

Subhadra parinayamu

Folk songs from Triveni and “Rayala seema Ragaalu “ ( Published by Telugu Academy, Himayath Nagar, Hyderabad. )

#### **Unit IV: Novel**

#### **ASAMARTHUNI JEEVA YATRA**

By Tripuraneni Gopichand (Available at : Visalandhra Book House, Abids, Hyderabad)

#### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

### **III # ICT.1 - Information and Communication Technology in Education- I**

**Credits : 1(0L + 0T + 1P)**

**Contact hrs per week: 2**

**Marks : 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives**

On completion of the course the students will be able to:

1. Explain ICT and its application in Education
2. Identify and demonstrate an understanding of the main components of the computer hardware in use
3. Differentiate various operating system and explain main functions of the system software environment
4. Use a word processor, spread sheet, drawing and presentation software skillfully and intelligently to produce various teaching learning resources for educational use
5. Use internet technologies efficiently to access remote information, communicate and collaborate with others
6. Understand the social, economic, security and ethical issues associated with the use of ICT
7. Plan, develop, and evaluate multimedia based learning content
8. Develop learning objects using open source authoring software

#### **Course Content**

##### **Unit I: Basics in ICT and Computer Applications**

Information and Communication Technology: Meaning, nature and advantages  
Emergence of new information technology- convergence of computing and telecommunications

Computer hardware fundamentals (anatomy, input devices, output devices, storage devices, display devices), hardware troubleshooting and diagnosis

Operating system-meaning and types, types of computers,

Computer Network-LAN, WAN. Internet - concept and architecture ; Locating internet resources - navigating, searching, selecting, evaluating, saving and bookmarking

Use of digital camera, camcorder, scanner, interactive white board, and multimedia projector for creating and using multimedia resources

Computer security: hacking, virus, spy ware, misuse, abuse, antivirus, firewall, and safe practices

## **Unit II: Basic Computer Software Applications**

Software –meaning and types (system software, application software, proprietary software, open source software, shareware and freeware)

Open source software: concept, philosophy, types, and advantages. Open source educational software

Introduction to MS-Windows- navigating the desktop, control panel, file manager, explorer, and accessories

Introduction to MS Office and Open Office

Basic microcomputer applications (word processing, spreadsheets, presentations, and drawing) and its educational applications

Utility tools: pdf creator, file archiving, file converter, antivirus

Multimedia: meaning, types, advantages and evaluation of multimedia resources. Development and use of multimedia in education

E-content: design, development, standards, learning objects and reusability, and authoring tools

### **Sessional Work**

Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices

Practice in installing various system and application software

Using word processor, spread sheet, and presentation software to produce various teaching learning resources.

Locating internet resources - navigating, searching, selecting, saving and evaluating (use standard internet evaluation criteria)

Social bookmarking of internet resources using any social bookmarking tools (diigo,delicious,stumbleupon)

Comparative study of ICT syllabus of school education and teacher education of various organizations

Evaluating multimedia CD ROMs using standard criteria and study the multimedia evaluation reports available at <http://www.teem.org.uk/>

Developing a multimedia e-content for a topic using eXe Learning

### **Suggested Reading**

1. Bharihok Deepak. (2000). Fundamentals of Information Technology. Pentagon Press: New Delhi
2. Conrad, Keri (2001). Instructional Design for Web based Training. HRD Press
3. Crumlish Christian (1999). The Internet No Experience Required. BPB Publications: New Delhi
4. Evant, M: The International Encyclopedia of Educational Technology.
5. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft Word for Beginners. NISCOM, CSIR: New delhi
6. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft Excel for Beginners. NISCOM, CSIR: New delhi
7. Jain Amit; Sharma Samart; & Banerji Saurab (2002). Microsoft PowerPoint. NISCOM, CSIR: New delhi
8. James,K.L. (2003). The Internet: A User's Guide. Prentice Hall of India Pvt.Ltd: New Delhi
9. Lee, William W., Dianna, L. Owens, (2001) Multimedia based Instructional design: Computer Based Training. Jossey-Bass
10. Sanders Donald, H. (1998). Computers Today. McGraw Hill Book Company: New Delhi
11. Sarkar, S.K. & Gupta, A.K.(1998). Elements of Computer Science. S.Chand & Company: New Delhi
12. Saxena Sanjay. (2000). A First Course in Computers. Vikas Publishing House Pvt.Ltd: New Delhi
13. Mishra, S.(Ed.) (2009). STRIDE Hand Book 08: E-learning. IGNOU:New Delhi. Available at [http://webserver.ignou.ac.in/institute/STRIDE\\_Hb8\\_webCD/STRIDE\\_Hb8\\_index.html](http://webserver.ignou.ac.in/institute/STRIDE_Hb8_webCD/STRIDE_Hb8_index.html)
14. Tahenbaum Andrews (2003). Modern Operating Systems. Prentice Hall of India Pvt.Ltd: New Delhi

## Web Resources

Microsoft Office Online, Word 2003 Tutorials at <http://office.microsoft.com/en-us/training/CR061958171033.aspx>

Microsoft Office Online, Excel 2003 Tutorials at <http://office.microsoft.com/en-us/training/CR061831141033.aspx>

Microsoft Office Online, PowerPoint 2003 Tutorials at <http://office.microsoft.com/en-us/training/CR061832731033.aspx>

### III # Edu.2 PSYCHOLOGY OF LEARNER & LEARNING

**Credits: 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration: 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

The course is designed to help student teachers to

- Understand nature of learner as a developing individual
- Be able to assess the individual differences among learners by employing testing and non-testing methods.
- Understand and nurture the development of a learner as a member of classroom group.
- Understand and appreciate different perspectives of learning – Behavioral, Social, Cognitive and Humanistic.
- Know various types and strategies of learning
- Understand different conditions for learning and acquire the skills to facilitate them.
- Understand the approaches and strategies for managing learning

#### **Transaction Mode:**

Lecture cum Discussion; Seminar/ Panel discussion; Observation of actual situations/ simulating situations); Conducting case studies.

A combination of the above approaches may be adopted depending upon the appropriateness and feasibility.

#### **COURSE CONTENT:**

##### **Unit I: Nature of the Learner**

- Concept of growth, development-principles, characteristics of the child & adolescent, maturation and learning;
- Factors contributing to development such as heredity, nutrition, child-rearing practices, siblings and peers; concept of normal development, variations in development
- Classroom as a miniature society: understanding the group dynamics in a classroom: sociometry as a technique for understanding inter-personal relationships in a classroom
- Leadership, conforming behavior, and social adjustment in classroom: concept and ways of developing them

##### **Unit II: Individual differences & Assessment of Differences between Learners**

- Differences between individual learners: learning styles, multiple intelligence, self-concept, self esteem, attitude, aptitude, skills and competencies, interest, values, study habits, locus of control and personality

- Understanding learners with a difference: gifted, creative and talented learners, slow learners and dyslexic learners, socially disadvantaged learners, at risk and traumatized learners
- Methods of assessing individual differences: tests for measuring intelligence, aptitude and personality,
- observation schedules, rating scales ,self-reports

### **Unit III: Learning: Its Nature, Types and Strategies**

- Concept & Nature of Learning, Concept learning, skill learning, verbal learning, social learning, principle learning, problem solving
- Basic Assumptions and analysis of the relevance of Learning Theories – Behavioral, Social, Cognitive & Humanistic learning theories;
- Learning as a process of construction of knowledge - Constructivist Approach to learning
- Relationship of learning with school performance and ability of the learner

### **Unit IV: Factors affecting Learning & Management of Learning**

- Concept of Motivation; types, techniques of enhancing motivation,
- Health, sleep, difficulty of task, content and study habits as factors Influencing learning
- Influence of method of learning: part and whole learning; superficial and in-depth learning; Influence of prior learning on present learning; Strategies for transfer of learning
- Forgetting classroom learning – meaning and its causes; strategies for Improving retention of learning
- Meaning of learning to learn skills; Ways of developing self study

### **Sessional Work:**

#### **Each work/activity should carry equal weightage of marks.**

- Observe some of the variations in development among a group of students And prepare a report with emphasis on educational implications (individual activity).
- Development of a profile of students of a class by using appropriate Assessment procedures (Individual activity).
- Identify differences in socio-emotional characteristics among a group of students by using rating scales & inventories available in the psychology laboratory of the Institute & prepare a report by using scoring.
- Visit some special schools meant for children with disabilities and prepare a report about the approaches followed in meeting their special needs (report may be prepared by a small group of students)
- Analyze the type of strategies adopted by a classroom teacher in organizing learning



- Identify students who have motivation problem and analyse the causes and prepare a report (small group activity).
  - Prepare a plan of action for any one type of learning (concept learning, skill learning, attitudinal learning)
1. Kenneth T. Henson, 2000, Educational Psychology for Effective Teaching, Wordsworth Publishing Company.
  2. Patricia Murphy (Ed.), 1999, Learners, Learning & Assessment, Paul Chapman Publishing Ltd.
  3. Dennis Coon, Essentials of Psychology, 9th Ed. 2003, Wadsworth/Thomson Learning.
  4. Howard S. Friedman & Miram W. Schustack, 2004, Personality, Classic Theories &
  5. Modern Research, Second Ed. Reason Education & Pvt. Ltd.

### **III#M.4 MATHEMATICS**

#### **Real Analysis**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **COURSE CONTENT:**

##### **Unit I: Real Numbers**

The field axioms; Theorems about field properties, Order in R-Absolute value, Completeness, some important subsets of Intervals, Countable and Uncountable sets.

##### **Unit II: Neighborhoods and Limit Points**

Introduction, Neighborhoods, Open Sets, Closed Sets, Limit points of a set, Closure of a set, Interior of a set, Compactness, Connectedness.

##### **Unit III: Sequences**

Introduction, Convergent sequences, Divergent sequences, Oscillatory sequences, Bounded sequences, Some important limit theorems, Cauchy sequences, Monotonic sequences, Cluster points of a sequence, Limit superior and limit inferior of a sequence, Subsequences.

##### **Unit IV: Infinite Series**

Introduction, Sequence of partial sums of a series, Convergent series, Cauchy's general principle of Convergence for Series, A necessary condition for convergence, Series of positive terms, A fundamental result for series of positive terms, Geometric series, Comparison test, Cauchy's nth root test, D'Alembert's Ratio test, Raabe's test, Maclaurin's integral test.

**References:**

1. Real Analysis by J.M.Howie, Springer 2007.
2. Real Analysis by Malik, Wiley Eastern.
3. Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.
4. Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
5. Real Analysis by Royden, Prentice Hall of India Pvt. Ltd.
6. Mathematical Analysis by T M Apostol, Addison Wesley, Narosa, New Delhi, 2<sup>nd</sup> Edition.
7. Principles of Mathematical Analysis by Walter Rudin, 2<sup>nd</sup> Edition, McGraw Hill Book Company, 1984.
8. Analysis I and II, Torence Tao, Hindustan Book Agency, India, 2006.
9. Elementary Analysis – The Theory of Calculus, Kenneth A Ros, Springer International Edition, 2004.
10. Real Functions by G. Goffman.

**III#P.3 PHYSICS  
THEORY****ELECTRICITY AND ELECTROMAGNETISM****Credits : 4 (3L + 0T +1P)****Contact hrs per week: 6****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub>: 50****C<sub>3</sub> : 50**

**Objectives :** To enable students to acquire a broad conceptual framework of electromagnetic phenomena.

**COURSE CONTENT:****Unit I : Electrostatics & Electric Currents**

**Vector Calculus :** Scalar and Vector fields, Gradient of a Scalar, Divergence and Curl of a vector, Line, surface and volume integrals.

Review of Coulomb's law – Electric field and potential – Field due to a monopole, dipole, torque on a dipole in uniform and non-uniform  $\vec{E}$  fields, Flux of an electric field. Gauss's law, applications to deduce electric fields, P.E. of a system of two charges, of many charges.

Basic circuit analysis – Kirchoff's laws. Voltage and Current divider Rules. Single loop and two loop circuits, Mesh analysis, RC circuits, Maximum power transfer theorem.

**Unit II: Electric Fields in Matter**

**Electric Fields:** Capacitance, parallel plate capacitor, calculation of capacity of a spherical and cylindrical capacitor, energy stored in a capacitor, capacitor with dielectric, atomic view of dielectrics, polarization, electric field due to a polarised material, Gauss's law in dielectrics, Dielectric constant, Energy density of an electrostatic field (with and without dielectric).

Polarisability and susceptibility – Frequency dependence of polarisability, Clausius-Mossotti equation.

### **Unit III : Magnetostatics**

Review of Ampere's law,  $\vec{B}$  near a long wire, Magnetic lines of induction, force between two parallel conductors, definition of ampere,  $\vec{B}$  for a solenoid, Biot-savart's law, applications.

The magnetic field, Lorentz force and definition of magnetic field, magnetic induction, magnetic force on a current element, circulating charges, Cyclotron resonance frequency, Cyclotron. Magnetisation, magnetisation current density, magnetic field intensity, magnetic susceptibility and permeability.

### **Unit IV : Electromagnetic Induction**

Review of Faraday's law, Faraday's experiment, Lenz's law, Time varying magnetic fields, Application in betatron.

**Inductance:** Self inductance, LR circuit, energy in a magnetic field, magnetic energy density.

**AC circuits:** Sinusoidal voltage, current voltage relation in resistance, capacitance and inductance, Reactance and impedance, Power in AC circuits, RMS values, Power factor, LR and CR circuits. Series and parallel LCR circuits. Resonance, mutual inductance and transformers.

### **References**

1. Electricity and Magnetism, Fewkes and Yarwood.
2. Electricity and Magnetism : A N Matveev, Mir Publishers, Moscow.
3. Fundamentals of Physics, 6<sup>th</sup> Edition, David Halliday, Robert Resnick and Jearl Walker, John Wiley, Inc.
4. Electricity and Magnetism, F.W.Sears, Addison Wesley Co.
5. Fundamentals of Electricity and Magnetism : A F Kipp, McGraw Hill.

## **PHYSICS PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

### **Objectives :**

To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.

### **COURSE CONTENT:**

(A minimum of TEN experiments to be selected from the following.)

- A. Resistance measurements.
- B. Capacitance measurements.
- C. EMF measurements.
- D. RC circuits.
- E. Magnetic Induction measurements
- F. Ampere's Law

**References:**

1. Advanced Practical Physics, Worsnop and Flint.
2. Physics Laboratory Instructions, RIE, Mysore.

**III#C.3 CHEMISTRY**  
**THEORY**  
**ORGANIC CHEMISTRY – I**

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

**Objectives:**

To develop an understanding of chemistry of hydrocarbons and their halogenated derivatives.

**COURSE CONTENT:**

**Unit I: Stereochemistry of Organic Compounds**

Review of Concept of Isomerism and Types of isomerism with examples.

**Optical Isomerism:** Structural changes responsible for properties: elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization and asymmetric synthesis.

Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature.

**Geometric isomerism:** Determination of configuration of geometric isomers. Cis – trans and E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds.

**Conformational isomerism:** Difference between configuration and conformation. Conformational analysis of ethane and n-butane; conformations of cyclohexane, axial and equatorial bonds, conformation of mono alkyl substituted cyclohexane derivatives. Review of Newman projection and Sawhorse formulae, Fischer and flying wedge formulae.

## Unit II: Aliphatic Hydrocarbons

**Alkanes:** Review of IUPAC nomenclature of branched and unbranched alkanes. Isomerism in alkanes and industrial source. Methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation), physical properties and chemical reactions of alkanes (halogenation, nitration, sulphonation, oxidation and isomerisation reactions) Mechanism of free radical halogenation of alkanes : orientation, reactivity and selectivity.

**Cycloalkanes:** Nomenclature, methods of formation (from acetoacetic ester / malonic ester and Dieckmann reaction), chemical reactions (halogenation), Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings. The case of cyclopropane ring: banana bonds.

**Alkenes:** Accounting for Reactions due to unsaturation in compounds. Nomenclature of alkenes, methods of formation (by dehydration, dehydrohalogenation and dehalogenation) with mechanism. Regioselectivity in alcohol dehydration. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes – mechanism of hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration followed by oxidation, oxymercuration – reduction. Epoxidation, ozonolysis, hydration, hydroxylation and oxidation with  $\text{KMnO}_4$ . Polymerization of Alkenes. Substitution at the allylic and vinylic positions of alkenes.

**Cycloalkenes:** Methods of formation and chemical reactions of cycloalkenes.

**Alkadienes:** Nomenclature and classification of dienes : Isolated, conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions – 1,2 and 1,4 additions. Diels-Alder reaction.

**Alkynes:** Nomenclature, structure and bonding in alkynes. Methods of formation (alkylation of acetylene and by elimination reactions). Acidity of alkynes. Chemical reactions of alkynes: Mechanism of electrophilic and nucleophilic addition reactions, hydroboration – oxidation, metal-ammonia reductions, oxidation and polymerization.

## Unit III: Aromatic Hydrocarbons

Factors responsible for the characteristic reactions of Aromatic compounds. Nomenclature of benzene derivatives. Structure of benzene : molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity : The Huckel rule, aromatic ions.

Aromatic electrophilic substitution: General pattern of the mechanism, role of  $\sigma$ - and  $\pi$ - complexes. Mechanism of nitration, halogenation, sulphonation, mercuriation and Friedel-Crafts reaction. Energy profile diagrams. Activating and deactivating substituents, orientation and ortho/ para ratio. Side chain reactions of benzene derivatives. Birch reduction.

Methods of formation and chemical reactions of alkylbenzenes, alkynylbenzenes and biphenyl.

## Unit IV: Alkyl and Aryl Halides

**Alkyl halides:** A study of Alkyl halides highlighting its synthetic applications. Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms of nucleophilic substitution reactions of alkyl halides  $S_N2$  and  $S_N1$  reactions with energy profile diagrams. Polyhalogen compounds : chloroform, carbon tetrachloride.

**Aryl halides:** Methods of formation of aryl halides, nuclear and side chain reactions. The addition- elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions.

Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides. Synthesis and uses of DDT and BHC.

**References :**

1. Organic Chemistry : Seyhand N Ege
2. Organic Chemistry : Morrison and Boyd
3. Organic Chemistry : I L Finar
4. Organic Chemistry : Hendricson, Cram and Hammond
5. Organic Chemistry : Stanley H. Pine

## CHEMISTRY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

**Objective:**

To develop basic skills in organic synthesis and purification of organic compounds

**Laboratory Techniques:**

1. Calibration of Thermometer using naphthalene / acetanilide / urea
2. Determination of melting point of Benzoic acid / cinnamic acid / *m* – dinitro benzene / *p*- dichlorobenzene
3. Determination of boiling point of aniline / nitrobenzene / chlorobenzene
4. Distillation of water – alcohol mixture using water condenser; Distillation of chlorobenzene – nitrobenzene mixture using air-condenser
5. Crystallization: Benzoic acid from hot water, naphthalene from ethanol
6. Sublimation of camphor / phthalic acid / succinic acid

**Electrophilic Substitution Reactions**

1. Preparation of Iodoform from ethanol / acetone
2. Preparation of *m*-dinitrobenzene from nitrobenzene by nitration
3. Preparation of *p*-bromoacetanilide from acetanilide by bromination
4. Preparation of 2,4,6-tribromo phenol from phenol / 2,4,6-tribromoaniline from aniline
5. Preparation of Acetanilide from aniline by acetylation

**References :**

A Text Book of Qualitative organic Analysis, A I Vogel

**III # B.3 BOTANY****THEORY****GYMNOSPERMS AND REPRODUCTIVE BIOLOGY OF ANGIOSPERMS****Credits : 4 (3L + 0T +1P)****Contact hrs per week: 6****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub>: 50****C<sub>3</sub> : 50****Objectives:**

- To acquaint students with the morphology, anatomy, reproduction and classification of Gymnosperms;
- To acquaint students with the structure, development and processes associated with Angiosperm embryology;
- To acquaint students with the techniques, branches and applications of plant tissue cultures.

**COURSE CONTENT:****Unit I :**

- a) General characters, distribution, classification, affinities and economic importance.
- b) Study of morphology, anatomy and reproduction in  
Cycadopsida : *Cycas*, *Cycadeoidea*

Study of morphology, anatomy and reproduction in

Coniferopsida : *Pinus*

Gnetopsida : *Gnetum*

**Unit II :**

- a) Flower – Review of structure, morphology, embryological perspective.
- b) Microsporangium – Development of wall layers, tapetal types, microsporogenesis, tetrad types.
- c) Male gametophyte – Development and structure; vegetative and generative cells; male gametes.
- d) Megasporangium (ovule): Development, types, megasporogenesis, tetrad types.
- e) Female gametophyte : Development, ultrastructure, mono, bi and tetrasporic embryo sacs.

**Unit III :**

- a) **Pollination and fertilization** : Definitions, types of pollination, pollen-pistil interaction, self-incompatibility, double-fertilization.
- b) **Endosperm** : Definition, types – cellular, nuclear and helobial; endosperm haustoria.
- c) **Embryo** : Classification, types, development of Crucifer type.
- d) **Fruit and seed** : Development, structure of monocot and dicot seeds, dispersal mechanisms, importance.
- e) Brief account of apomixis and polyembryony.

#### **Unit IV :**

- a) Brief history, cellular totipotency, culture media and techniques.
- b) Brief account of anther/ pollen culture, endosperm, embryo and protoplast culture, Applications of tissue culture.

#### **References:**

1. Sporne, K.R.,1974, Morphology of Gymnosperms, Hutchinson & Co., London.
2. Gangulee, S.C., Kar and Ashok Kumar, College Botany Vol.II, Central Book Agency, Calcutta.
3. Singh V., P.C.Pande & D K Jain 2006 Diversity and Systematics of Seed Plants, Rastogi Publications, Meerut.
4. Pandey, Mishra and Trivedi, 2000, A Text book of Botany Vol.II.
5. Chopra G.L.,1972, Gymnosperms, S. Nagin & Co., Jullandar.
6. Bhojwani S S and S P Bhatnagar,000. The Embryology of Angiosperms, Vikas Publishing House, Delhi.
7. Raven P.H, R.F.Evert and S.E.Eichhorn, 1999, Biology of Plants, 5<sup>th</sup> Ed., W.H.Freeman and Co., Worth Publishers, New York.
8. Swamy B.G.L. and K.V.Krishnamurthy, 1980, From Flower to Fruit, TMH Publishing House, New Delhi.
9. Johri B.M.(Ed.),1984, Embryology of Angiosperms, Springer-Verlag, Germany.

## **BOTANY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To develop skills of free hand sectioning, staining and mounting Gymnosperm plant materials and embryological materials.
- To observe and identify temporary and permanent slides of Gymnosperms and Embryology.
- To acquaint students with procedures in plant tissue culture.



**COURSE CONTENT:**

1. Study of morphology, anatomy and reproductive structures of genera of Gymnosperms included in theory syllabus.
2. Study of structure of anther, microsporogenesis and pollen grains using permanent slides and mounts.
3. Study of structure of ovules and embryosac development (monosporic type) using permanent slides.
4. Examination of a wide range of flowers for study of pollination.
5. *In vitro* germination of pollen grains.
6. Preparation of culture medium and familiarization with tissue culture procedures.
7. Mounting the endosperm of *Cucumis* and embryos of *Crotalaria*.

**III SEMESTER B.Sc.Ed.****Z-3: ZOOLOGY****THEORY – ‘ANIMAL DIVERSITY–III AND COMPARATIVE ANATOMY OF VERTEBRATES’****Credits : 4 (3L + 0T +1P)****Contact hrs per week: 6****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub>: 50****C<sub>3</sub> : 50****Objectives:**

To enable students to understand in respect of vertebrates; their organisational hierarchies and complexities; the evolutionary trends in external morphology and comparative studies of internal structures; Identification and classification with examples; to enable them to understand various modes of adaptations in animals

**COURSE CONTENT:****Unit I: Pisces and Amphibia**

**a) Pisces:** General Characters and Classification of Superclass Pisces up to classes with examples and comparison of chondrichthyes and osteichthyes (2); Type study: *Scoliodon* – External morphology, respiratory system, structure of heart and arterial system, structure of brain and lateral line system (4); Dipnoi, air bladder, migration in fish (3)

**b) Amphibia:** General characters and classification of class Amphibia, origin of Amphibia, parental care in Amphibia (3)

**Unit II: Reptilia, Aves and Mammalia**

**a) Reptilia:** General characters and classification of class Reptilia up to orders with examples, arcade and temporal fossae (2)

**b) Aves:** General characters and classification of class Aves up to orders with examples (5 important orders only), salient features of Archaeornithes and Neornithes, flight adaptation and migration in birds (4)

**c) Mammalia:** General characters and classification of class Mammalia up to orders with examples (1); General characters of Prototheria (1); Adaptive radiation in Marsupialia and Primates (1); Adaptive features of Chiroptera and Cetacea (2); Dentition in mammals (1)

### **Unit III: Type study – Rabbit and Comparative Anatomy–I**

**a) Type study: *Oryctolagus* (Rabbit) – Respiratory system and structure of brain (2)  
Sense organs – eye and ear (2)**

**b) Comparative studies in amphibians, reptiles, birds and mammals:**

i) Digestive system and associated glands (2)

ii) Respiratory organs (2)

**c) Evolution of heart in vertebrates (2)**

**d) Evolution of aortic arches in vertebrates (2)**

### **Unit IV: Comparative Anatomy–II**

**a) Comparative studies in amphibians, reptiles, birds and mammals:**

i) Brain (2)

ii) Eye and ear of birds and mammals (2)

iii) Cranial and spinal nerves, Autonomous nervous system (2)

**b) Different types of vertebrae in vertebrates (1)**

**c) Structure and evolution of kidneys in vertebrates (2)**

**d) Structure of gonads and gonoducts formation (2)**

### **References:**

1. Modern Textbook of Zoology: Vertebrates by R.L. Kotpal – Rastogi Publications, Meerut, 3<sup>rd</sup> edition, 2008.
2. A Text Book of Zoology Vol.II by Parkar and Hasswel – (MacMillan).
3. A Text Book of Zoology Vol.II by R.D.Vidyardhi – (S. Chand & Co., Delhi).
4. Life of Vertebrates by J.Z.Young – (Oxford University Press).
5. The Vertebrate Body by A.S.Romer – (Vakils, Ferrer & Simons, Bombay).
6. Elements of Chordate Anatomy by Weichert – (McGraw Hill).
7. The Birds by R.L Kotpal (4<sup>th</sup> edition) – (Rastogi Publications, 2008).
8. Bird Migration by D.R. Griffin – (Doubleday, Garden City, USA).
9. The Book of Indian birds by Salim Ali
10. Hand Book of the Birds of India & Pakistan by Salim Ali, Ripley, Dillon – (Oxford University Press, Delhi).
11. Fish and Fisheries by K. Pandey and J.P. Shukla (2<sup>nd</sup> Edition) (Rastogi Publications, 2008).
12. Indian Fishes by Qureshi and Qureshi – (Brij Brothers, Bhopal).
13. Comparative anatomy of the vertebrates by George C Kent – 3<sup>rd</sup> saint Louis: The C.V. Mosby Company, 1973.

## **ZOOLOGY PRACTICALS**

**Objectives:**

To develop in the students the skills of staining and mounting of materials (temporary and permanent); of dissection, display and labelling; of microtechniques (fixing, embedding, section cutting, staining and mounting); of collection, preservation, mounting, identification and labelling of collected specimens; field observation of animals

**COURSE CONTENT:**

1. Study of specimens of Chondrichthyes:
  - a) *Zygaena*
  - b) *Pristis*
  - c) *Narcine*
  - d) *Trygon*
  - e) Skate
2. Study of specimens of Osteichthyes:
  - a) *Echeneis*
  - b) *Clarias*
  - c) *Hippocampus*
  - d) *Anguilla*
  - e) *Belone*
  - f) *Synaptura*
  - g) *Tetradon*
  - h) *Diodon*
3. Mounting of fish scales:
  - a) Placoid scales
  - b) Cycloid scales
4. Dissection of *Scoliodon* (Study of dissected specimens):
  - a) Afferent and efferent branchial system.
  - b) Cranial nerves (5th, 7th, 9th and 10th).
5. Study of specimens of Amphibians:
  - a) *Rana*
  - b) *Bufo*
  - c) *Hyla*
  - d) *Rhachophorus*
  - e) *Salamander*
  - f) *Ichthyophis*
  - g) Axolotl larva.
6. Study of specimens of Reptilia:
  - a) Chameleon
  - b) *Varanus*
  - c) *Draco*
  - d) Tortoise
  - e) Crocodile
7. Identification of poisonous and non-poisonous snakes:
  - a) Cobra
  - b) Krait
  - c) Rat snake
  - d) Viper
  - e) *Dryophis*
  - f) *Hydrophis*
8. Study of specimens of Aves:
  - a) Barn owl
  - b) Water hen
  - c) Wood pecker
  - d) Cattle egret
  - e) Koel
  - f) King fisher
9. Local field visit to identify and classify 10 fauna (common birds and mammals); submission of report.
10. Dissection of rat (demonstration):
  - a) Digestive system
  - b) Urinogenital system
  - c) Arterial system
11. Osteology:
  - a) Study of skulls of Frog, *Varanus/Calotes*, Bird and Rabbit.
  - b) Study of fore and hind limb bones of Frog, *Varanus/Calotes*, Bird and Rabbit
12.
  - a) Study of different types of vertebrae:
  - b) Study of pectoral and pelvic girdles of Frog, *Varanus/Calotes*, Bird and Rabbit

13. Microtomy: Fixing, block making, section cutting, staining, mounting and submission of two slides of any organs of Frog.
14. Study of stained slides of mammals – T.S. of a) Stomach            b) Intestine  
c) Kidney            d) Liver
15. Assignment on fishes:  
a) Morphological adaptation            b) Accessory respiratory organs  
c) Parental care

**(Submission of 2 permanent slides)**

# IV SEMESTER

## IV#E.4 ENGLISH

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives :**

Students develop proficiency in English which equips them to:

- understand the demands of audience, subject, situation and purpose and the
- use of language for effective communication.
- analyse language in context to gain an understanding of grammar, vocabulary, spelling, punctuation and speech.
- examine authentic literary and non literary texts and develop insight and appreciation.
- gain an understanding of study and reference skills.
- plan, draft, edit and present a piece of writing.

### **Transaction Mode :**

Lecture-cum-discussion, interactive session, group dynamics, role-play, peer-assessment, self-valuation.

### **COURSE CONTENT :**

#### **Unit I : Creative Skills in Writing**

Writing dialogues

Writing poems

Writing essays

#### **Unit II : Basic Phonetics (Tutorials)**

Articulatory, Acoustics, Stress, Intonation

(for B A Ed course)

*Review of Books : Fiction, non-fiction, films*

#### **Unit III : Literature – Drama**

Ibsen – A Doll’s House

#### **Unit IV : Literature – Drama**

Girish Karnad – Naga Mandala

**Sessional Work :**

Students participate in group discussion focusing on taking turns and speaking persuasively.

Students stage a play choosing one of the plays prescribed. The end can be changed to express their perspective about the theme of women and their evolution/ freedom.

**Suggested Readings:**

1. Merriam, E. (1964). It Doesn't Always Have to Rhyme. Atheneum.
2. Hyland, Ken (2004) Second Language Writing. University of Michigan Press.
3. Graves, D (1992). Explore Poetry: The reading /writing teacher's companion. Heinemann
4. Stone Douglas (1999). Difficult conversations : How to discuss what Matters Most, New York.: Penguin Books.
5. Gabor Don (2001). How to start a Conversation and Make Friends, New York: Fireside.

**REGIONAL LANGUAGES****IV # RL.1.4 HINDI****Credits : 3 (2L + 1T + 0P)****Contact hrs per week: 4****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub> : 50****C<sub>3</sub> : 50****Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalise grammar rules so as to facilitate fluency in speech and writing .
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

**Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

**COURSE CONTENT:****Unit I : Functional Language:**

**Precis Writing:** Characteristics-definition-steps to précis writing-models-exercises

**Book Reviewing**-characteristics-definition-format-models-exercises

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

**Unit II: Technical Writing**

Definition-characteristics-format-models-Language used in the writing-Terminology-Process of writing-planning of document- Styles of writing-Techniques of writing-exercises

**Reference:** (a) Technical Writing by Richard W.Smith, Barnes and Noble Inc., New York, (b) Technical Report Writing Today –Daniel G.Riordan, 19-A, Ansari Road, New Delhi 110 002.

**Unit III:Ancient Poetry:**

Text- **Pracheen evam madhyakaleen Hindi Kavya**

Prof Poornachand Tandan (Ed.) Published by Rajpal and sons, Kashmiri gate, Delhi 110006.

Following poets' work have been prescribed for study Kabir, and Vidyapathi.

**Unit IV: Drama**

**Malava Kumar Bhoj** by Dr.Ramkumar Varma, Published by Rajpal and sons, Kashmiri gate, Delhi -06

**Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

**IV # RL.2.4 KANNADA**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

**Objectives:**

- To enable the students to acquire basic skills in functional language.
- To develop independent reading skills and reading for appreciating literary works.
- To internalize grammar rules so as to facilitate fluency in speech and writing.
- To develop functional and creative skills in language.
- To develop values of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region.

## **COURSE CONTENT :**

### **Unit I : Functional Language**

- a) **Book Review** : Characteristics – definition – format – models – exercises.
- b) **Precis-writing**: Characteristics – definitions – steps to précis writing – models – exercises.

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

### **Unit II : Technical Writing**

Definition – characteristics – format – models – Language used in the writing – Terminology – Process of writing – Planning of document – Styles of writing – Techniques of writing – exercises.

**Reference:** (a) Technical Writing by Richard W.Smith, Barnes and Noble Inc., New York, (b) Technical Report Writing Today –Danel G.Riordan, 19-A, Ansari Road, New Delhi 110 002.

### **Unit III : Ancient Poetry**

1. Melpu belpanaligum- Pampa
2. Paligum paapakkam anjadhavar eegaiyyar- Nagachandra  
( **Kaavya Sanchaya-3 –Mysore University, Mysore**)

### **Unit IV : Drama**

Beralge koral- Kuvempu

## **IV # RL.3.4 MALAYALAM**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Unit I: Functional Language**

1. Book Review- Characteristics – definition – format – models – exercises.
2. Precis-writing: Characteristics – definitions – steps to précis writing – models – exercises.

### **Unit II: Technical Writing**

Definition-characteristics-format-models-Language used in the writing-Terminology-Process of writing planning of document-Styles of writing-Technologies of writing-exercises.



### **Unit III: Ancient Poetry**

Text : Karna Parvam ( Krishna Darshanam ) By Ezhuthachan, NBS , Kottayam

### **Unit IV: Drama**

SAKETHAM by C. N. Sreekantan Nair, Current Books , Trichur

### **Sessional work :**

In the internal class during the different activities the performance of the student will be assessed by the teacher. Test, assignments and small projects works may be given .

## **IV#RL.4.4 TAMIL**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

### **Transaction mode :**

Lecture cum discussion , group discussion ;, panel discussion , seminar group work , library work.

### **COURSE CONTENT:**

#### **Unit I: Functional Language:**

Precise Writing: Characteristics-definition-steps to précis writing – models-exercise

Book Reviewing: characteristics-definition-format-models-exercises

Reference: A Handbook of writing Activities, Prasaranga,  
University of Bangalore.

## **Unit II :Technical Writing**

Definition-characteristics-format-models-Language used in the writing-Terminology-Process of writing-planning of document-Styles of writing-Technologies of writing-exercises.

Reference Book: a) **Language in Science** M S Thirumalai

Geetha Book House, Mysore

b) **Technical Report Writing Today** – Danel G.Riordan, 19-A,  
Ansari Road, New Delhi 110 002.

## **Unit III:Ancient Poetry:**

Nedunal Vaadai 2) Kalithogai

An Anthology of Tamil Poetry

(for Second Year Degree Classes)

University of Mysore, Mysore.

## **Unit IV : Drama**

Tanneer tanneer-Komal Swaminathan,

Vaanathi Pathippagan, 13, Deenadayalu Street.

T. Nagar, Chennai 600 017

## **IV#RL.5.4 TELUGU**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

- To enable the students to acquire basic skills in functional language .
- To develop independent reading skills and reading for appreciating the literary works
- To internalize grammar rules so as to facilitate fluency in speech and writing
- To develop functional and creative skills in language.
- To develop value of liberalism and an insight into the cultural heritage of the region which remains embodied in the literary output of the region .

### **Transaction mode :**

Lecture cum discussion, group discussion ; panel discussion , seminar group work , library work.

### **COURSE CONTENT :**

#### **Unit I: Functional Language**

1.Book Review- Characteristics – definition – format – models – exercises.

2. Precis-writing: Characteristics – definitions – steps to précis writing – models – exercises.

**Reference:** A Handbook of Writing Activities, Prasaranga, University of Bangalore.

### **Unit II: Technical Writing**

Definition-characteristics-format-models-Language used in the writing-Terminology-  
Process of writing-planning of document-Styles of writing-Technologies of writing-  
exercises.

(Ref: Science Vyasalu by Kodavati ganti kutumba rao, Published by Vishalandhra  
Publications, Abids, Hyderabad )

### **Unit III: Ancient Poetry**

Lessons from “Telugu Sahitya Sravanthi “ , Published by Prasaranga,  
University of Mysore, Mysore  
Damayanthee swayamvaram  
Padmavyuha bhedanam

### **Unit IV: Drama**

**Kanyashulkam** By Gurazada Apparao (Available at Vishalandhra Publications,  
Abids, Hyderabad )

## **IV SEMESTER IV # Edu.3 ASSESSMENT OF LEARNING**

**Credits: 2 (1L + 1T + 0P)**

**Contact hrs per week: 3**

**Exam Duration: 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

This course is designed to help student teachers to

- Understand the nature of assessment and evaluation and their role in teaching-learning process.
- Understand the importance of assessment in continuous and comprehensive manner
- Develop assessment tasks and tools to assess learner’s competence and performance
- Acquire skill of constructing an achievement test
- Devise marking, scoring and grading procedures,
- Devise ways of reporting on student performance
- Analyse, manage and interpret assessment data.
- Develop the habit of reflecting-on and self-critiquing to improve performance.

## **COURSE CONTENT:**

### **Unit I : Introduction to Assessment & Evaluation**

- (a) Concept of test, measurement, examination, appraisal, evaluation and their inter relationships.
- (b) Purpose and objectives of assessment- for placement, providing feedbacks, grading promotion, certification, diagnostic of learning difficulties.
- (c) Forms of assessment : -
  - (i) (Formative, Summative, prognostic; diagnostic; Norm referenced; Criterion referenced based on purpose)
  - (ii) (Teacher made; Standardized based on nature & scope)
  - (iii) (Oral, written, performance based on mode of response)
  - (iv) (Internal, External, self, peer, & teacher based on context)
  - (v) Based on nature of information gathered (Quantitative, Qualitative)
- (d) Importance of assessment & evaluation for Quality Education – as a tool in Pedagogic decision making on as writing instructional objectives, selection of content, teaching learning resources, methodology, strategies & assessment procedures followed.
- (e) Authentic assessment; school based assessment

### **Unit II: Assessment of Learning**

- (a) Concept of Cognitive, Affective, Psychomotor domain of learning
- (b) Revised taxonomy of objectives (2001) and its implications for assessment and stating the objectives.
- (c) Constructing table of specifications & writing different forms of questions – (VSA, SA, ET & objective type, situation based)
- (d) Construction of achievement tests- steps, procedure and uses
- (e) Construction of diagnostic test – Steps, uses & limitation

### **Unit III: Assessment for Learning**

- (a) Need for CCE its importance and problems faced by teachers
- (b) Meaning & Construction of process-oriented tools – observation schedule; check-list; rating scale; anecdotal record;
- (c) Assessment of group processes – Nature of group dynamics; Socio-metric techniques; steps for formation of groups, criteria for assessing tasks; Criteria's for assessment of social skills in collaborative or cooperative learning situations.
- (d) Quality assurance in tools – Reliability (Test-retest; equivalent forms, split-half) & Validity (Face, content, construct) – Procedure to establish them; Item – analysis.
- (e) Portfolio assessment – meaning, scope & uses; developing & assessing portfolio; development of Rubrics.

#### **Unit IV: Construction Interpretation and Reporting of student's performance**

- (a) Interpreting student's performance
  - (i) Descriptive statistics (measures of central tendency & measures of variability, percentages)
  - (ii) Graphical representation (Histogram, Frequency Curves)
  - (iii) NPC – percentile.
- (b) Grading – Meaning, types, and its uses
- (c) Role of feedback to stake holders (Students, Parents, Teachers) and to improve teaching – learning process; Identifying the strengths & weakness of learners.
- (d) Reporting student's performance – Progress reports, cumulative records, profiles and their uses, Portfolios.

#### **Sessional Works to be carried out in Tutorial Sessions**

1. Discussion on existing assessment practices in schools and submitting the report.
2. Constructing a table of specification on a specific topic (subject specific)
3. Constructing a unit test using table of specifications and administering it to target group and interpreting the result.
4. Construction of any one of the process oriented tools and administering it to group of students & interpreting it.
5. Analysis of question papers( teacher made)

#### **References:**

1. Linn, Robert and Norman E Gronland (2000); Measurement and Assessment in teaching, 8<sup>th</sup> edition, by Prentice Hall, Inc, Pearson Education, Printed in USA
2. Ved Prakash, et.al. (2000): Grading in schools, NCERT, Published at the publication Division by the secretary, NCERT, Sri Aurobindo Marg, New Delhi
3. Tierney, R. J., Carter, M. A., & Desai, L. E. (1991). Portfolio Assessment in the Reading – Writing Classroom. Norwood, MA: Christopher-Gordon Publishers
4. Glatthorn, A. A. (1998). Performance Assessment and Standards-based Curricula: the Achievement Cycle. Larchmont, NY: Eye no Education
5. Gredler, M. E. (1999). Classroom Assessment and Learning. USA: Longman.
6. Likert, R. (1932). A technique for the Measurement of Attitudes. Archives Psychology, 40.
7. Mehrens, W. A. & Lehmann, I. J. (1991). Measurement and Evaluation in Education and Psychology (8<sup>th</sup> ed.): Chapter 10: Describing Educational Data.
8. Oosterhof, A. (1994). Classroom Applications of Educational Measurement (Second Edition). New York: Macmillan College Publishing Company Inc.
9. Payne, D. A (2003). Applied Educational Assessment. Australia: Wadsworth: Thomson Learning.
10. Popham, W.J. (1981). Modern Educational Measurement. New Jersey, Engle wood Cliffs: Prentice-Hall Inc.

11. Popham, W. J. (2002). Classroom Assessment: What teachers need to know (Third Edition). Boston: Allyn & Bacon.
12. T.V.Somashekar (2006) Educational Psychology & Evaluation, Bangalore, Nirmala Prakashana.

#### **IV #M.5 MATHEMATICS DIFFERENTIAL EQUATIONS**

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **COURSE CONTENT:**

##### **Unit I:**

Definition, Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Integrating factors, Homogeneous form – Reducible to homogeneous form, Linear equations, Bernoulli's equation, Exact equations, Equations reducible to exact equations.

##### **Unit II:**

Equations of the first order and higher degree, Clairaut's equation solvable for x and y and p, Orthogonal trajectories in polar and Cartesian form, Operator D, Rules for finding the particular integral, Cauchy-Euler differential equation, Legendre's differential equations, Simultaneous differential equations.

##### **Unit III:**

Equations which do not contain x, Equation whose one solution is known, Equations which can be solved by changing the independent variable and dependent variable, Variation of parameters, Total differential equation :  $Pdx + Qdy + Rdz = 0$ , Simultaneous equations of the form  $dx/P = dy/Q = dz/R$ .

##### **Unit IV:**

Formation by elimination of arbitrary constants, Formation by elimination of arbitrary functions, Solution by direct integration, Lagrange's linear equations  $Pp + Qq = R$ , Standard types of first order non-linear partial differential equations, Charpit's method, Homogeneous linear equations with constant coefficients, Rules for finding the complementary functions, Rules for finding the particular integral, Separation of variables.

#### **References :**

1. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
2. An Introduction to Partial Differential Equations by Stephenson, ELBS.
3. A Short Course in Differential Equations by Rainville and Bedient, IBH.
4. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.

5. Introductory Course in Differential Equations by Murray, Orient Longman.
6. Differential Equations by Simmons, TMH.
7. Differential Equations by Ayres, Schaum Publishing Company.
8. Ordinary and Partial Differential Equations by Raisinghania, S. Chand and Co.
9. Differential Equations by Vasishta and Sharma, Krishna Prakashan Mandir.
10. A Textbook of Differential Equations by Mittal, Har Anand Publications.

**IV#P.4 PHYSICS  
THEORY  
OPTICS**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:**

To enable students to

- understand that light is a wave phenomenon;
- apply the understanding of wave phenomenon to light.

**COURSE CONTENT:**

**Unit I : Wave Nature of Light and Interference**

Light-electromagnetic spectrum, Rotating mirror method of determination of speed of light, Huygen's principle, explanation of reflection and refraction, Fermat's Principle, Phase change on reflection, total internal reflection.

Young's experiment - coherence, intensity distribution and visibility of fringes, Newton's rings, Fresnel's Biprism, interference in thin films, colours of thin films, interference at an air wedge, Michelson's interferometer.

**Unit II : Diffraction**

Fraunhoffer and Fresnel : Diffraction, Diffraction at a single slit, double slit, Diffraction by multiple slits, Diffraction grating, Resolving power – Rayleigh's criterion, Resolving power of a grating and telescope.

Fresnel diffraction, half period zone, zone plate, diffraction at a circular aperture and at a straight edge (qualitative treatment only).

**Unit III : Polarisation**

Polarization by reflection, Brewster's law, Malus law, Double refraction, Production and detection of linearly, circularly and elliptically polarized light, Quarter and half wave plates, Polarioids, Discussion on use of Polaroid sheets in preparing tinted sunglasses, Optical activity.

#### **Unit IV : Scattering of Light and Lasers**

A brief discussion on Tyndall, Rayleigh and Raman scattering of light. Blue of the sky and ocean. A qualitative account of fluorescence and phosphorescence, the Raman Effect experiment and its explanation, intensity and polarisation of Raman lines, some applications of Raman Effect.

**Introduction to Lasers:** Spontaneous and stimulated emission, density of states, Einstein's A and B coefficients. Ratio of stimulated to spontaneous transitions in a system in thermal equilibrium, condition for amplification, population inversion, methods of optical pumping, energy level schemes of He-Ne and Ruby Laser. Properties and uses of Lasers.

Basic concepts of holography – construction of hologram – Discussion on the use of holograms in daily life - Recording and reproduction of holograms.

#### **References:**

1. Textbook of Optics, Brijlal and Subramaniam
2. Optics, A K Ghatak.
3. Fundamentals of Optics, Jenkins and White.
4. Fundamentals of Optics, Khanna and Gulati.

### **PHYSICS PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

#### **Objectives:**

To provide training in the broad methodology of science through investigatory type and open-ended laboratory exercises.

#### **COURSE CONTENT:**

- A. Refraction at Spherical Surfaces
- B. Spectrometer experiments using prism
- C. Experiments on Interference
- D. Experiments on Diffraction
- E. Experiments on Polarisation
- F. Experiments on resistance/capacitance using ballistic galvanometer
- G. Network theorems
- H. Phase relationships for a.c.

#### **References:**

1. Advanced Practical Physics, Worsnop and Flint.
2. Physics Laboratory Instructions, RIE, Mysore.



## IV#C.4 CHEMISTRY THEORY

### THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

#### Objectives:

1. To understand that conservation of energy is the central concept which governs all the changes and to appreciate its role in various thermochemical equations.
2. Explain the origin of the driving force of physical and chemical changes and evolution of second law of thermodynamics and related concepts.
3. Apply the concept of equilibrium to construct and interpret the phase diagrams.

#### COURSE CONTENT

##### Unit I: Thermodynamics – I

Concept of Energy, Historical perspectives, Generalisation of laws of Thermodynamics based on human experience with Nature and natural Processes. Language of thermodynamics : system, surroundings, etc. Types of system, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work.

First Law of Thermodynamics : Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule, Joule–Thomson coefficient and inversion temperature. Calculation of  $w$ ,  $q$ ,  $dU$  and  $dT$  for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.

Thermochemistry : Standard state, standard enthalpy of formation. Hess's Law of heat summation and its applications. Heat of reaction at constant pressure and at constant volume. Enthalpy of neutralization. Bond dissociation energy and its calculation from thermo-chemical data, temperature dependence of enthalpy, Kirchhoff's equation.

##### Unit II : Thermodynamics – II

Discussion of experiential knowledge to account for the spontaneity in changes around us.: need for the Second law of thermodynamics , different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.

Concept of Entropy : Entropy as a state function, entropy as a function of  $V$  &  $T$ , entropy as a function of  $P$  &  $T$ , entropy change in physical changes, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in

ideal gases and mixing of gases. Gibbs and Helmholtz functions: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities. A and G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.

Third law of thermodynamics : Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data.

### **Unit III : Chemical Equilibrium and Phase Equilibria**

Recognising a system at Chemical Equilibrium. Attributes of Chemical Equilibrium, Thermodynamic derivation of law of mass action, Equilibrium constant and free energy. Factors that affect the chemical equilibrium and Le Chatelier's principle. Calculations involving equilibrium constant Ionic equilibria in aqueous solutions, sparingly soluble salts, solubility product common ion effect, selective precipitation, applications in qualitative analysis

Ionisation of water, pH scale, weak acids and bases, hydrolysis, buffer solutions, acid Base indicators, acid base titrations and multi stage equilibria. Reaction isotherm and reaction isochore

*To establish a systematic way of discussing the changes systems undergo when they are heated and cooled and when their composition is changed. Clapeyron equation and Clausius – Clapeyron equation, applications. Statement and meaning of the terms – phase, component and degree of freedom, derivation of Gibbs phase rule, phase equilibria of one component system – water, CO<sub>2</sub> and S systems.*

*Phase equilibria of two component system – solid-liquid equilibria – simple eutectic – Bi – Cd. Pb-Ag. Systems, desilverisation of lead. Simple eutectics, systems forming compounds with congruent melting points.*

### **Unit IV: Solutions**

To unify the equilibrium properties of simple mixtures on the basis of chemical potential. Solutions of Gases in liquids. Henry's law and its applications, solutions of solids in liquids. Distribution law, application of distribution law to association, dissociation and extraction.

Dilute Solution : Colligative properties, Osmosis, Osmotic pressure, Vant Hoff Theory, Lowering of Vapour Pressure, Depression in Freezing point and Elevation in Boiling Point, Vant Hoff Factor.

Solid solutions – compound formation with congruent melting point (Mg – Zn) and incongruent melting point (NaCl – H<sub>2</sub>O), (FeCl<sub>3</sub> – H<sub>2</sub>O) and (CuSO<sub>4</sub> – H<sub>2</sub>O) system. Freezing mixtures, acetone dry ice.

Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes – HC – H<sub>2</sub>O and ethanol – water systems.

Partially miscible liquids – Phenol-water, trimethylamine – water, nicotine – water systems. Lower and upper consolute temperature. Effect of impurity on consolute temperature.

Immiscible liquids, steam distillation. Nernst distribution law – thermodynamic derivation, applications.

### **References :**

1. Sl.nos 1 to 6 of I Semester
2. Sl.nos 2-6 of II semester

## CHEMISTRY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

### **COURSE CONTENT:**

1. Determination of heat of neutralization of acids and bases.
2. Verification of Hess's law of constant heat summation.
3. Determination of solubility of sparingly soluble salt at various temperature, calculation of enthalpy of solution.
4. pH titration of acid versus base (observation of change in pH).
5. Construction of phase diagram for a two component system. (solid-solid, liquid-liquid).
6. Determination of equivalent constant of hydrolyses of an ester.
7. Determination of dissociation constant of a weak acid.
8. A comparative study on methods of finding pH using universal indicator, pH paper strips (both wide and narrow range), pH meter.
9. Determination of solubility product constant (K<sub>sp</sub>) of a sparingly soluble salt.
10. Determination of dissociation constant of phenol phthalin/methyl orange by colorimeter.
11. Determination of molecular weight of a given liquid by steam distillation.
12. Determination of percentage composition of NaCl by critical solution temperature method (phenol-water system).
13. Determination of distribution coefficient of benzoic acid between water and toluene or acetic acid between water and 1-butanol.
14. Determination of transition temperature of a given salt hydrate.
15. Determination of molecular weight of the given substance by Rast's method.

### **References :**

Same as in II Semester

**IV # B.4 BOTANY**  
**THEORY**  
**ANATOMY, ECOLOGY AND EVOLUTION**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:**

- To acquaint students with development, organization and functions of tissues in plants;
- To understand the histological complexity in plants;
- To understand the dynamics of environment and its delicate balance;
- To understand the influence of human beings on quality of environment.

**COURSE CONTENT:**

**Unit I :**

- a) **Meristems** – characteristics, classification, theories of meristematic activity, organization of shoot-apex.
- b) **Epidermis** : Structure and functions, stomatal types, trichomes.
- c) **Simple tissues** : Definition, types – parenchyma, collenchyma, sclerenchyma - structure, functions.
- d) **Vascular tissues** : Structure of xylem and phloem, functions, primary and secondary vascular tissues, types of wood.
- e) Review of anatomy of stem, root and leaf of dicot and monocot.
- f) Secondary growth in root and stem. Brief account of anomalous secondary growth – *Bougainvillea*, *Dracaena*.

**Unit II :**

- a) **Ecological Factors** : Brief account of Edaphic, climatic, physiographic and biotic factors and their ecological importance.
- b) **Ecosystem** : Structure, abiotic and biotic components, bio-energetic approach, food chain, food web, ecological pyramids, bio-geo-chemical cycles of carbon, nitrogen and phosphorus.
- c) **Community ecology** : Community characteristics, frequency, density, cover, life forms.
- d) **Plant succession** : General features, events in succession, brief account of xerarch succession.

**Unit III :**

- a) Morphological, anatomical and physiological adaptations of plants to environment – hydrophytes, xerophytes, halophytes.

- b) Biodiversity : General account, types and characteristics, biodiversity conservation efforts, WCU, Red databook, brief account of Intellectual Property Rights (IPR) and patent laws.
- c) Environmental pollution – a brief account of causes, effects and remedies of air, water, soil, radioactive and noise pollution.

**Unit IV :**

- a) Brief account of origin of life and concept of evolution. Evolutionary theories – Lamarckism, Darwinism, germ plasm and mutation theories, Neo Darwinism, isolation, mutation, speciation, genetic drifts.
- b) Vegetation types of India and Karnataka.

**References:**

1. Esau, K., 1977, Anatomy of Seed Plants, 2<sup>nd</sup> Ed., John Wiley & Sons, New York.
2. Fahn, A. 1974, Plant Anatomy 2<sup>nd</sup> Ed., Pergamon Press, Oxford.
3. Mouseth J.D., 1988, Plant Anatomy. The Benjamin/cummings Publishing Co. Inc., California, USA.
4. Singh V., P.C.Pande & D K Jain 2006, Angiosperms, Rastogi Publications, Meerut.
5. Vashishta, P.C. A Text book of Plant Anatomy, Predeep Publications, Jullandar.
6. Gangulee S.C. & Kar. 1980, College Botany Vol.I, Central Book Agency, Calcutta.
7. Sharma, P.D., 2006, Environmental biology, Rastogi Publications, Meerut.
8. Mitra, J.N., An Introduction to Systematic Botany and Ecology, World Press, Calcutta.
9. Odum, E.P. 1983, Basic Ecology, Saunders, Philadelphia.
10. Kormondy, E.J. 1996, Concepts of Ecology, Viva Books Pvt. Ltd., New Delhi.
11. Misra, R. 1968, Ecology Work Book, Oxford & IBH, New Delhi.
12. Moore P.W. and S.B.Chapman, 1986, Methods in Plant Ecology, Blackwell Scientific Publications.
13. Krebs, C.J. 1989, Ecological Methodology, Harper and Row, New York.

**BOTANY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

**Objectives :**

- To develop the skill of free hand sectioning, staining and mounting of plant parts for anatomical study.
- To observe the identify different types of tissues using temporary and permanent slides.
- To perform simple experiments in ecology.

**COURSE CONTENT:**

1. Study of a common dicot and monocot stem, root and leaf to understand the body plan, tissue systems and modular type of growth.
2. Study of L.S. of shoot tip to understand cyto-histological zonation.
3. Study of epidermal tissue system, stomata and trichome types.
4. Study of density, diversity, frequency of herbaceous species by quadrat method and to compare the frequency distribution with Raunkair's Standard Frequency Diagram.
5. To estimate Importance Value Index on the basis of relative frequency, relative density and relative biomass.
6. To determine moisture content and water holding capacity of soils.
7. To estimate transparency, pH and temperature of different water bodies.
8. To estimate salinity of different water samples.
9. Study of ecological anatomy of hydrophytes, xerophytes, halophytes, epiphytes and parasites.
10. Field study of diversity in leaf shape, size, thickness and surface properties.

**IV SEMESTER B.Sc.Ed.****Z-4: ZOOLOGY****THEORY – 'ANIMAL PHYSIOLOGY AND ENDOCRINOLOGY'****Credits : 4 (3L + 0T +1P)****Contact hrs per week: 6****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub>: 50****C<sub>3</sub> : 50****Objectives:**

To enable students to comprehend the modern concepts of physiological aspects on various organs and systems of animals and human being; to comprehend chemical nature, biological molecules and physiological roles

**COURSE CONTENT:****Unit I: Enzyme, Digestion and Respiration**

**a) Enzymes** – Nomenclature and classification, mechanism of enzyme action, Coenzymes (2)

**b) Digestion** – Physiology of digestion, absorption of carbohydrates, proteins and lipids; Role of vitamins and minerals in normal health (4)

**c) Respiration** – Mechanism of breathing (external respiration) in man; Respiratory pigments – haemoglobin, haemocyanin, haemerythin and chlorocruorin; Transport of gases - oxygen transport, oxygen equilibrium curve, Bohr effect; Transport of carbon dioxide, chloride shift; Control and regulation of respiration; Review of cellular respiration (6)

## **Unit II: Circulation, Excretion and Homeostasis**

**a) Circulation:** Blood – Composition and physiology of blood clotting (1); Lymphatic system (1), myogenic and neurogenic hearts, structure and functioning of human heart, blood pressure (2)

**b) Excretion:** Nitrogenous waste products – Ammonotelism, ureotelism, uricotelism; Ornithine cycle, structure of human kidney and nephron, physiology of urine formation, counter-current multiplier system (5)

**c) Homeostasis** – Meaning; Osmoconformers and osmoregulators in marine and freshwater animals; thermoregulation in animals – Poikilotherms, heterotherms and homeotherms, adaptive changes in animals (3)

## **Unit III: Neuro-muscular co-ordination**

**a) Nervous Co-ordination** – Structure of neuron and neuroglia (1), Physiology of transmission of impulse along non-myelinated and myelinated axons (4); Synapses – Structure, types and mode of impulse transmission (2)

**b) Muscle contraction** – Types of muscles, ultrastructure of striated muscle, Contractile and regulatory proteins, Mechanism of muscle contraction, Neuro-muscular junction and relaxation, sliding filament theory, chemical changes during muscle contraction (5).

## **Unit IV: Endocrinology and Hormonal Control of Reproduction**

**a) Endocrinology** – Outline views of endocrine glands – Pituitary, thyroid, adrenal and pancreas, their structures, secretion and mode of hormone action (steroid and peptides); hormone feedback mechanism (6).

**b) Gonads** – Microscopic structure, hormones produced and their role (2); Hormonal regulation of a) Estrous cycle, b) Menstrual cycle, c) Implantation (3); Family planning - Need and methods of contraceptives (1).

## **References:**

1. Animal Physiology by A. MariaKuttikan & N. Arumugam – (Saras Publication, Nagercoil, Tamil Nadu).
2. Developmental Zoology, Ecology, Animal Physiology and Evolution by N. Arumugam – (Saras Publication, Nagercoil, Tamil Nadu).
3. Animal Physiology and Biochemistry by K.V. Sastry – (Rastogi Publications, 2008).
4. Regulatory mechanism in Vertebrates by Kamleshwar Pandey and J.P. Shukla - (Rastogi Publications, 2008).
5. Animal Physiology by K.A. Goyal and K.V. Sastry – (Rastogi Publications, 2008).
6. Endocrinology and Reproductive Biology by K.V. Sastry – (Rastogi Publications, 2008).
7. Animal Physiology by Arora M.P. (1989) – Himalaya Publishing House.
8. Textbook of Medical Physiology by Guyton A.C. & Hall J.E. (1996) – (W.B. Saunders & Co.).
9. General and Comparative Physiology by Hoar W.S. (1983) – (Prentice Hall Publication).

10. A textbook of Animal Physiology by Hurtkat P.C. & Mathur P.N. (1976) – (S. Chand & Co.).
11. Textbook of Animal Physiology by Nagabhushanam R. & Kodarkar M.S. (1978) – (IBH).
12. General Endocrinology by Turner C.D. & Gangara J.T. (1971) – (W.B. Saunders & Co.).

## **ZOOLOGY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives:**

To enable students to analyse biochemically the foodstuffs and urine; to analyse the biochemical action of enzymes and to develop the skills of separation of macromolecules using chromatography and electrophoresis; to demonstrate physiological experiments; to develop the skills of haematology and endocrinology

### **COURSE CONTENT:**

1. Effect of temperature and pH on the salivary amylase enzyme activity.
2. Detection of various enzymes in the digestive tract of cockroach.
3. Preparation of blood smears of Frog and man
4. Total count of RBC
5. Total count of WBC
6. Differential count of Leucocytes
7. Estimation of haemoglobin by Sahlis method
8. A) Human urine analysis for a) Nitrogenous substances, b) Normal inorganic constituents, c) Abnormal constituents – (i) glucose, (ii) protein, (iii) ketone bodies.  
B) Analysis of nitrogenous wastes in bird and fish.
9. Separation and analysis of amino acids in body fluids and food using paper chromatography.
10. Demonstration of heart beat in Frog – a) Preparation of simple cardiogram, b) Effect of various chemicals on heartbeat.
11. To set up simple experiments to find out the rate of respiration in terrestrial animals like cockroach and rat.
12. Qualitative and quantitative estimation of carbohydrates, proteins and lipids in food
13. Demonstration of separation of proteins/enzymes with electrophoresis.
14. Study of permanent slides of mammals: a) Pituitary, b) Adrenal gland, c) Thyroid, d) Testis, e) Ovary, f) Placenta, g) Pancreas.
15. Demonstration of endocrine glands in rat and man (Chart).



# V SEMESTER

## V # Edu. 4 TEACHING APPROACHES AND STRATEGIES

**Credits: 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration: 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives:**

On completion of the course, the student teacher will be able to:

- Demonstrate his/her understanding of the role of a teacher in different phases of teaching.
- Identify various kinds of subject matter content in a textbook.
- Write instructional objectives for teaching of a topic.
- Demonstrate his/her understanding of different skills and their role in effective teaching.
- Use instructional skills effectively.
- Organise learning with active participation of learners – individually and in groups.

### **Transaction Mode**

Lecture cum discussion, demonstration through audio video mode, panel presentation, team teaching, individual and group practice of skills.

### **COURSE CONTENT:**

#### **Unit I: Understanding Teacher and Teaching**

Teaching as a planned activity – elements of planning.

Assumptions underlying teaching and their influence on the planning for teaching.

Proficiency in Teaching: Meaning and place of awareness, skills, competencies and commitment.

Assumptions underlying effectiveness in teaching – Behaviouristic, Humanistic and Constructivist perspectives.

An analysis of teacher functions, skills and competencies in the three phases : Pre-active phase – visualizing, decision-making on outcomes, preparing and organization; interactive phase – facilitating and managing learning; post-active phase – assessment of learning outcomes, reflecting on pre-active, interactive and post-active processes

Characteristics associated with effective teachers.

Impact of one's own socialization processes, awareness of one's own shifting identities as 'student', 'adult' and 'student teacher' and their influence on 'becoming a teacher'.

Teacher's professional identity – what does it entail?

## **Unit II: Planning for Teaching**

An analysis of teacher's roles and functions in the pre-active phase – visualizing, decision-making on outcomes, preparing and organisation.

Visualizing: The learner and learning readiness characteristics, the subject matter content and their inter-linkages, the learning resources, approaches/ strategies.

Decision-making on outcomes: Establishing general instructional goals, specification of objectives and standards for learning, allocation of instructional time for various activities/ tasks – instructional time as a variable in learning.

Decision-making on instructional approaches and strategies: Expository or Inquiry, Individualized or Small Group or Whole Class – skills required for learner engagement in the context of the strategy decided.

Preparing for instruction: Identifying and selecting available learning resources or developing required learning resource.

Preparation of a Plan: Unit Plan and Lesson Plan.

## **Unit III: Skills and Strategies of Teaching**

An analysis of teacher's roles and functions in the interactive phase – facilitating and managing learning.

Introducing a lesson – need and various possibilities.

Motivating the learners and sustaining their attention – importance of stimulus variation and reinforcement as skills.

Questioning, Illustration and explanation as teacher competencies influencing student-learning in the classroom;

Strategy of Teaching – a) Expository Strategy as approach to teaching for understanding: Presentation – discussion – demonstration, the Advance Organiser Model; b) Inquiry Strategy as approach to teaching thinking skills and construction of knowledge : Concept attainment / Concept formation, Inductive thinking, Problem based learning/ Project Based Learning.

## **Unit IV: Approaches to Organizing Learning**

Approaches to Individualised Instruction: Computer Managed Instruction, Programmed Instruction and Learning Activity Packages, Approaches to Small Group and Whole group Instruction: Cooperative and Collaborative approaches to learning, Brain storming, Role Play and Dramatization, Group Discussion, Simulation and Games, Debate, Quiz and seminar.

### **Sessional Work:**

- Comparative study of syllabi of various subjects to identify content categories.
- Writing instructional objectives of a lesson under domains and levels.
- Practice on the skills of introducing, questioning, stimulus variation, illustrating and organizing learning activity.
- Design learning episodes / activities and organize them in the classroom.

### References:

1. Austin, F M (1961) *Art of Questioning in the Classroom*, University of London Press Ltd., London.
2. Brown, J.S., Collins, A. and Duguid, S. (1989). Situated cognition and the culture of learning, *Educational Researcher*, 18(1), 32-42.
3. Davis, Irork (1971), *The Management of learning*, McGraw Hill, London.
4. C. Fosnot (Ed.) (1996) *Constructivism: Theory, Perspectives and Practice*, (pp.8-33), New York : Teachers College Press.
5. L.Steffe and J. Gale (Eds.) 1995). *Constructivism in Education*, New Jersey : Lawrence Erlbaum Associates Inc.
6. B.Wilson, (1996) *Constructivist Learning Environments*, New Jersey : Educational Technology Publications.
7. Resnick, L. and Collins, A. (1996). Cognition and Learning. In T.Plomp and D.Ely, (Ed.) *The International Encyclopaedia of Educational Technology*, 2<sup>nd</sup> Ed. Oxford : Pergamon Press.
8. Vygotsky, L. (1978). *Mind in Society : The Development of Higher Psychological Processes*, MA : Harvard University Press.
9. G.Boomer, N. Lester, C. Onore and J.Cook (Eds.) (1992). *Negotiating the curriculum : Educating for the 21<sup>st</sup> century*, London : The Falmer Press.
10. Dewey, J. (1916). *Democracy and Education*. New York : The MacMillan Company.
11. Kelly, G.A. (1991). *The psychology of personal constructs Volume one – A Theory of Personality*, London : Routledge.
12. Langer, J. and Applebee, A.N. (1987). *How writing shapes thinking : A Study of Teaching and Learning*, National Council of Teachers of English.
13. Lindfors, J. (1984). How children learn or how teachers teach? A Profound confusion: *Language Arts*, 61 (6), 600-606.
14. J. Mezirow and Associates (1990), *Fostering critical reflection in adulthood: A guide to transformative and emancipatory learning*: San Francisco: Jossey – Bass Publishers.
15. Smith, K. (1993). Becoming the “guide” on the side : *Educational Leadership*, 51(2), 35-37.
16. Darling – Hammond, Linda, et. Al. *Excellence in Teacher Education : Helping Teachers Develop Learner – Centered School*. Washington, D.C. National Education Association School Restructuring Series, 1992.
17. Savery, J. and Duffy, Thomas M. (1995). Problem based learning : An instructional model and its constructivist framework. *Educational Technology*, 35, 31-38.
18. Fosnot, Catherine Twoomey, *Constructivism : Theory, Perspective and Practice*. New York : Teachers College Press, 1989.
19. Vygotsky, L.S. *Thought and Language*, Cambridge, MA : MIT Press, 1962.

### Resource Websites:

- <http://www.thirteen.org/edonline/concept2class/constructivism/index.html>.
- [www.ipn.uni-kiel.de/projekte/esera/book/b001-cha.pdf](http://www.ipn.uni-kiel.de/projekte/esera/book/b001-cha.pdf)
- <http://www.ericdigests.org/1999-3/theory.htm>
- <http://www.ncrel.org/sdrs/areas/issues/students/atrisk/at6lk36.htm>

- <http://saskschoolboards.ca/research/instruction/97-07.htm>
- [http://www.ed.psu.edu/CI/Journals/1998AETS/t1\\_7\\_freeman.rtf](http://www.ed.psu.edu/CI/Journals/1998AETS/t1_7_freeman.rtf)
- [http://en.wikipedia.org/wiki/Constructivist\\_teaching\\_methods](http://en.wikipedia.org/wiki/Constructivist_teaching_methods)
- <http://www.ncrel.org/sdrs/areas/issues/envrnmnt/drugfree/sa3const.htm>
- <http://vathena.arc.nasa.gov/project/teacher/construc.html>
- <http://www.grout.demon.co.uk/Barbara/chreods.htm>
- <http://vathena.arc.nasa.gov/project/document/teacher.html>
- [http://www.disciplineassociates.com/ClassroomDiscipline\\_101.aspx](http://www.disciplineassociates.com/ClassroomDiscipline_101.aspx)
- <http://online.sfsu.edu/~foreman/itec800/finalprojects/eitankaplan/pages/classroom.htm>

## **V#POPS.1 PEDAGOGY OF PHYSICAL SCIENCE**

**Credits : 4(2L+2T +0P)**

**Contact hrs per week : 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### **Objectives :**

On completion of the course, the student teacher will be able to :

- gain an understanding of the nature of knowledge in Physical Science and its validity.
- gain an understanding of the structure of physical science.
- review the contributions of Physicists and Chemists to the knowledge domain of Physical Science.
- integrate knowledge in Physical Science with other school subjects.
- trace the changing trends in learning of Physical Science with respect to its goals and approaches to learning.
- analyse the content in Physical Science with respect to its categories, process skills, knowledge organization and other critical issues.
- develop concept maps representing units, themes and inter relatedness among concepts.
- develop process oriented objectives based on content themes/ units.
- identify alternative conceptions held by students and teachers in general.
- Examine the content to understand that different themes require differential treatment.
- Examine the different ways in which learning situations can be created to learn concepts in Physical Science.
- Formulate meaningful inquiry episodes, problem solving situations, investigatory projects based on secondary school science.
- Examine different pedagogical issues in the content of learning Physical Science.

**Transaction Mode:**

Short lectures, organizing inquiry activities/ open-ended activities for learning Physical Science, Group work on analysis of content in selected topics in Physical Science at the secondary level from both State and CBSE textbooks. Reading biographies of Physicists and Chemists, articles on gender issues, social and ethical issues, inclusiveness and their presentation in the classroom. Use of CDs related to Physical Science at the secondary level.

**COURSE CONTENT :****Unit I: The nature and scope of knowledge in Physical Science**

What is Science? Nature of Science. Development of scientific knowledge – observation, experimentation, classification.

Concepts, facts, theories and generalizations.

Historical status of Physical science concepts and theories.

Contributions of Indian and International Physicists and chemists to the knowledge domain of Physical Science with special reference to the methods of discovery/ investigation adopted.

The place of physical science in the school science curriculum.

Integration of knowledge in Physical Sciences with the other school subjects.

Application of Physical science knowledge in daily life.

**Unit II : The Changing emphasis in learning of Physical Science**

The changing trends in the goals and objectives of learning of Physical science in 21<sup>st</sup> century.

Development of process skills (Observation, classification, interpretation, control of variables, measuring, experimenting, hypothesizing, inferring, predicting and communicating).

Stating objectives in terms of learning process.

Metacognitive thinking and learning of physical science.

Learner as a constructor of knowledge

Alternative conceptualizations (misconceptions) of students and teachers in Physical Science (some examples).

**Unit III : Approaches to constructing knowledge in Physical Science**

Approaches to concept learning, conceptual change model (reconstructing ideas about certain Physical science concepts).

Different types of inquiry methods; problem solving strategies; investigatory approach; guided discovery approach; inductive method; learning through projects.

Concept mapping as a tool of learning.

Cooperative and collaborative learning; group investigation;

Use of analogies in evolving the meaning of a Physical science concept.

**Unit IV : Focus pedagogical issues**

Role of Language in Science

Science, society and technology their influence on school curriculum.

Science related social and ethical issues-Inclusiveness in learning.

Learning beyond Textbooks- Self learning strategies. Multi Media; interactive learning approach

### **Units for Pedagogic Analysis**

**Light :** Rectilinear propagation of light, Reflection and refraction of light, image formation in lenses and mirrors, optical instruments, dispersion of light, rainbow formation (primary and secondary), nature of light, electromagnetic spectrum.

**Gravitation :** Universal law of gravitation, acceleration due to gravity 'g' as intensity of the gravitational field, escape velocity, weightlessness in space, Kepler's Laws of planetary motion and its applications.

**Electronic Configuration :** Electronic configuration of atoms, atomic properties and periodic classification of elements.

Any other unit chosen by the teacher.

### **Sessional Activities:**

- Content analysis of units and statement of objectives in terms of process skills.
- Presentation of contributions of Physicists and Chemists to Physical Science.
- Planning learning experiences to develop different skills and their presentation.
- Identification of students and teachers, alternate conceptions in Physical Science and methods to re-conceptualise them.
- Concept mapping in selected units in Physical Science Planning learning situations for constructing knowledge in Physical Science.
- Group Discussion on pedagogical issues.
- Development of PowerPoint presentations in selected units in Physical Science.

### **References:**

1. National Curriculum Framework 2005, NCERT, New Delhi.
2. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
3. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
4. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
5. NCERT Textbook in Physics for XI and XII Students.
6. State Textbook in Physics for XI and XII students.
7. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
8. History of Physics in the 20<sup>th</sup> Century, Internet Browsing.
9. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.

10. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc., Columbus Ohio.
11. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children : Methods for Constructing Understanding, Allyn and Bacon, London.
12. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
13. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
14. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.

### **V#POM.1 PEDAGOGY OF MATHEMATICS**

**Credits : 4(2L+2T +0P)**  
**Contact hrs per week : 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

#### **Objectives:**

On completion of the course the students will have

- Understanding of the characteristics of Mathematical language and its role in Science
- Understanding of the nature of axiomatic method and mathematical proof.
- Knowledge about aims and general objectives of teaching secondary school mathematics.
- Ability to state specific objectives in behavioural terms with reference to concepts and generalizations.
- Ability to teach different kinds of mathematical knowledge consistent with the logic of the subject
- Ability to evaluate learning of concepts and generalization
- Ability to identify difficulties in learning concepts and generalization and provide suitable remedial instruction.

(All transactions to be made based on the appropriate contents listed in Unit 5).

#### **COURSE CONTENT:**

##### **Unit I: Nature and Scope of Mathematics**

Meaning and dimensions of mathematics, the nature of mathematical propositions; truth values, compound propositions; truth tables; open sentences; truth sets; Venn diagram; logically valid conclusions; use of quantifiers. Implications - one way and two way - necessary and sufficient conditions; A mathematical theorem and its variants - converse, inverse and contra positive, undefined terms in mathematics; quasi definitions and definitions in mathematics; the defining properties of a

definition; Difference between proof and verification; Difference between pure and applied mathematics; History of mathematics with special emphasis on Indian mathematics.

## **Unit II : Aims and Objectives of Teaching Secondary School Mathematics and Planning for Instruction**

Need for establishing general objectives for teaching mathematics, Study of the aims and general objectives of teaching mathematics vis-à-vis the objectives of secondary education. Writing specific objectives of different content categories in mathematics. Selecting the content for instruction, identifying teaching points for a mathematics lesson; organization of content.

Stating instructional objectives for a mathematics lesson and identifying learning outcomes in behavioural terms.

Designing – learning experiences; appropriate strategies; teaching aids; evaluation tools, etc.

Writing lesson plans for mathematics lessons.

Planning a unit of instruction in mathematics.

## **Unit III : Strategies for Learning Mathematical Concepts**

Nature of concepts, concept formation and concept assimilation, Moves in teaching a concept - defining, stating necessary and/or sufficient condition, giving examples accompanied by a reason. Comparing and contrasting; giving counter examples; non examples; Use of Concept Attainment and Advance Organizer Models, planning and implementation of strategies in teaching a concept.

## **Unit IV : Teaching of Generalisation**

**By exposition:** Teaching by exposition, Moves in teaching a generalization; introduction, Introduction moves - focus move, objective move, motivation move - Assertion move, application move, interpretation moves, justification moves - planning of expository strategies of teaching generalizations.

**By guided discovery:** Nature and purpose of learning by discovery, Inductive, deductive - guided discovery strategies, Maxims for planning and conducting discovery strategies; planning of strategies involving either induction or deduction or both.

### **Sessional Work:**

1. Analysis of a unit/chapter in a mathematics textbook to identify the concepts, principles and processes and to understand the underlying mathematical structures.
2. Stating specific objectives for a mathematics lesson.
3. Identification and evaluation of moves and teaching skills used in a lesson/lesson plan.
4. Planning and implementation of appropriate strategies for teaching mathematical concepts and generalizations in simulated and real classroom situations.
5. Construction of appropriate test items to measure different outcomes of learning concepts and generalization.
6. Identification of students' learning difficulties and their remediation.



**References:**

1. Butler and Wren (1965). , The Teaching of Secondary Mathematics, London: McGraw Hill Book Company.
2. Cooney, T.J. and Others (1975), Dynamics of Teaching Secondary School Mathematics, Boston: Houghton Mifflin.
3. Kapfer, Miriam B (1972). Behavioural objectives in Curriculum Development: Selected Readings and Bibliography. Englewood Cliffs, NJ: Educational Technology.
4. Mager, Robert (1962). Preparing instructional objectives, Palo Alto, C A: Fearon.
5. NCERT, A textbook of Content-cum-Methodology of Teaching Mathematics, New Delhi: NCERT.
6. Polya, George (1957) How to solve it, Garden City, New York: Doubleday.
7. Servas, w and T. Varga. Teaching School Mathematics - UNESCO Source Book.
8. State text books in Mathematics of Southern Region from Class VI to X.

**Periodicals**

Journal of Research in Mathematics  
Mathematics Teaching  
School Science and Mathematics  
The Mathematics Teacher

**V # POBS.1 PEDAGOGY OF BIOLOGICAL SCIENCE**

**Credits : 4(2L+2T +0P)**  
**Contact hrs per week : 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

**Course Objectives:**

- The student teachers will be able to
- understanding of the nature of knowledge and its validity in Biological Science.
  - review the contributions of Biologists to the knowledge domain of Biological Science.
  - trace the changing trends in learning of Biology with respect to its goals, and approaches to learning.
  - analyze the biological content with respect to its content categories, process skills, knowledge organization and other critical issues.
  - develop concept maps representing units, themes and interrelatedness among concepts.
  - develop process-oriented objectives based on the content themes/ units.

- identify the biological concepts that are alternatively conceptualized by teachers and students in general.
- examine the content to seek an understanding that different themes require differential treatment.
- explore the different ways of creating learning situations in learning of biological concepts and plans accordingly.
- formulate meaningful inquiry episodes, problem solving situations, investigatory projects based on secondary school biology.

**Transaction Mode :** Short Lectures wherever necessary; Use of inquiry episodes related to approaches to teaching of biology; Group work followed by Presentations ; Use of Films to raise issues and discussions related to conserving animals and plants : Use of audio tapes on Scientific attitude to generate inquiries related to certain myths and superstitions followed by group work and analysis and presentations; Demonstrations of different approaches with examples from biology units at secondary level; Use of NCERT and state text books ; Reading of articles based on social and ethical issues , gender issues related to science followed by presentations. School visits to observe Biology lessons and write observations.

## **COURSE CONTENT :**

### **Unit I: Foundations of Biological sciences**

#### **A. Nature and scope of knowledge in Biological Science**

- Meaning and branches of biological science and their relevance to knowledge and technological domains
- Nature of knowledge in Biological Science- empirical, experiential, knowledge categories: Biological concepts, facts, principles, generalizations and theories.
- Historical evolution of biological concepts and theories with special emphasis to those included in the school curriculum; Ancient Indian views on classification and existence of life forms and evolution of life,
- Contributions of Indian and International Biologists to the knowledge domain of biological science with special reference to the methods of discovery/ investigation adopted.
- Application of the knowledge of biology for human welfare.

#### **B. Learning of Biological science**

- Implications of different perspectives of learning by Piaget, Bruner, Ausubel Vygotsky and Suchman to teaching and learning of Biology
- Constructivist's approach to learning of Biology
- Metacognitive thinking and learning of biology

### **Unit II : The Changing emphasis in learning biology**

- The changing trends in the goals and objectives of learning Biology (with reference to national and international Biology curriculum at school level)

- Development of process skills (Observation, classification, interpretation, control of variables, measuring, experimenting, hypothesizing, inferring, predicting and communicating) through learning Biology
- Need for stating objectives; relating subject/unit specific objectives to the main science curriculum goals; classification of objectives-cognitive ( revised taxonomy); affective and psycho motor; use of action verbs
- Stating objectives based on revised taxonomy of objectives; standard based biology curriculum
- Development of scientific attitude and environmental values through the processes of learning Biology.

**Environment as a rich learning site to construct meanings and concepts related to Biology through observational and exploratory activities.**

### **Unit III: Strategies for teaching Biological science**

- Approaches to concept learning: concept learning and attainment models;
- Alternative conceptualizations (misconceptions) of students and teachers in Biology conceptual change model (reconstructing ideas about certain biological concepts);
- Approaches to learning of generalizations: Expository; inductive approach
- Learning by Inquiry: Different types of inquiry methods;
- Learning by Discovery: experimental, field observations; guided discovery approach
- Problem solving strategies; investigatory approach; group investigation
- Learning through projects: Different types of projects in biology
- Constructivist learning designs ( any 3 )
- Use of Multi Media and interactive learning approaches in learning of Biology.
- Cooperative and collaborative learning strategies and their use in constructing knowledge,
- Use of different approaches to develop scientific attitude and environmental attitude and important values through Biology ( examples – conserving environment, ,care for animals, cleanliness of surroundings , removal of certain social taboos related to diseases, reproduction, health etc.)

### **Unit IV: Pedagogical analysis for teaching Biological science**

- **Content analysis :** Identification of units, themes, concepts, generalizations, problems or issues, knowledge organization in CBSE and State textbooks of VIII, IX and X Standards; identification of concepts and teaching points, themes or issues through which scientific attitude or important values can be developed. (structure of plant and animal cell, tissues, life processes, Diversity of living organisms, conservation of Biodiversity, why we fall sick? Crop improvement, Control and Co-ordination, How do organisms reproduce?, Our Environment , Heredity and Evolution)
- Different types of concepts – examples from Biology units; concept analysis;
- Concept mapping of the lesson/unit/theme to be taught
- Writing learning objectives on the selected lesson/unit

**Sessional Work :**

- Content analysis of Biology units, concept mapping , and writing of learning objectives
- Assignment on Contribution of Biologists ( Indian and Western ) to the knowledge domain of Biology
- Identification of Process skills on the selected Biology units
- Exploration of alternative conceptions held commonly by students and planning of approaches towards reconceptualizations – Project
- Assignment on writing lessons using different strategies of teaching

**References:**

1. Devereux, Jane (2000): Primary Science – Developing subject knowledge, Sage publications Inc, London.
2. Esler, K. William & Mark. K. Esler (2001): Teaching Elementary Science ( 8<sup>th</sup> edition ) Wadsworth group, Thomas learning, Printed in the USA.
3. Heiss, E.D. Obourn E.S and Hoffmann C W (1961): Modern Science teaching by Macmillan publication, New York.
4. Jakab, Cheryl (1990): Exploring together (Revised Edition) – A science course for Primary schools, Phoenix Education Private Limited.
5. Jennings T (1986): The young scientist investigates- Teacher's Book of Practical work, Oxford University Press, Oxford.
6. Judith Beunet (2003): Teaching and Learning Science – A guide to recent research and its applications
7. Keith skamp (ed) (2004): Teaching primary science constructively -2<sup>nd</sup> edition, Thomson, by Nelson Australia Private Ltd.
8. Mason M & Ruth T. Peters: Teacher guide for Life sciences, Published by D. Van Nostrand Company, Inc, New york.
9. NCERT text books (2005) science for classes from VIII to X
10. New UNESCO Source Book for teaching science, UNESCO, Paris, Richardson, J.S. Science teaching in secondary schools; New york; prentice hall.
11. Novak. D.J & D. Bob Gowin (1984): Learning how to Learn, published by the press syndicate of the University of Cambridge, Printed in the USA.
12. Robin Millan (1984): Doing Science: Images of Science in Science education, the Falmer Press, London.
13. Saunders, N.H. (1962) The teaching of General science in Tropical secondary schools; London; Oxford University press.
14. State text Books for classes VIII to X.
15. Steve Alsop, Keith Hicks (2007): Teaching Science: A Handbook for Primary and Secondary school teachers, Kogan Page, N. Delhi
16. Synik, K.M: Living in the Environment – A source book for Environment al Education, UNESCO.
17. Turner, T & W. Dimarco (1988); learning to teach science in the secondary school – a companion to school experience, Published by Routledge, USA.

## V #M.6 MATHEMATICS

### MULTIVARIATE CALCULUS & VECTOR CALCULUS

**Credits: 3 (2L + 1T + 0P)**  
**Contact hrs per week: 4**  
**Exam Duration: 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

#### **COURSE CONTENT:**

##### **Unit I: Line and Double Integrals**

Definition of a line integral and basic property, Evaluation of line integrals, Definition of double integral, Conversion to iterated integrals, Evaluation of Double integral, change of variables, Surface areas.

##### **Unit II: Triple Integrals**

Definition of a triple integral, Evaluation, Volume of a Triple integral.

##### **Unit III: Improper Integrals**

Improper integrals of the first and second kinds, Convergence, Gamma and Beta functions, Connection between Beta and Gamma functions, Application to Evaluation of Integrals, Duplication formula, Sterling formula.

##### **Unit IV: Vector Calculus**

Vectors, Scalars, Vector field, Scalar field, Vector differentiation, The Vector Differential operator del, gradient, curl, Vector integration, The Divergence theorem of Gauss, Stoke's Theorem, Green's Theorem in plane.

#### **References**

1. Calculus by Lipman Bers, Vols 1 and 2.
2. First Course in Calculus by Serge Lang
3. Calculus – Single and Multivariable by Hughes Hallet
4. Calculus by Thomas and Finny.

**V#P.5 PHYSICS  
THEORY**

**BASIC ELECTRONICS**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives :** To enable students to understand the physics of semiconductors and their applications in basic electronic circuits.

**COURSE CONTENT:**

**Unit I : Semiconductor Characteristics and Applications**

Review : Intrinsic and extrinsic semiconductors, electrons and holes in intrinsic and extrinsic semiconductors, conduction by electrons and holes, conductivity of a semiconductor, Energy bands in semiconductors. Carrier concentrations in intrinsic and extrinsic semiconductors, Fermi level, donor and acceptor levels in extrinsic semiconductors.

P-N junction diode – depletion layer, conduction in PN junction diode, characteristics, diode resistance.

Half wave and full wave rectifiers, power output and efficiency, Ripple factors.

Breakdown in diodes – Zener breakdown, Zener diode characteristics and application in voltage regulation.

LEDs, photo diodes, LDRs and Solar cells.

**Unit II : Transistors and Applications**

Bipolar junction transistor (PNP and NPN) transistors, different configurations and characteristics, current components in CE configuration, large signal and small signal dc current gains, transistor biasing – self bias circuit, Load line and operating point.

Transistor as an amplifier : Transistor as a two port device, h-parameters and analysis of CE amplifier using h parameter equivalent circuit, simplified h-parameter circuit, stabilization of voltage gain in CE amplifiers, Two stage amplifiers, RC coupling, frequency response of CE amplifier. Comparison of transistor configurations.

Emitter follower circuit and its use. Transistor as Power amplifier.

FET construction and its characteristics – MOSFET characteristics.

Concept of feedback in amplifiers and advantages of negative feedback.

Requirements for oscillation, Barkhausen criterion, Hartley and Colpitts oscillators.

**Unit III : Digital Electronics**

Binary to decimal and decimal to binary conversion, Binary addition and subtraction, Octal number system, Hexadecimal system and conversions.

Construction and working of AND and OR logic gates using diodes. Construction of NOT gate using transistor. Symbols and truth table for AND, OR, NOT, NAND

NOR and Ex-OR logic gates. Boolean algebra, Boolean laws, D’morgan’s theorem. NAND and NOR as universal gates.

Introduction to OP-AMP. Differential amplifiers, principle of OP-AMP, OP-AMP parameters, Applications – Addition, Subtraction, differentiation and integration.

#### **Unit IV : Communication Electronics**

Basic theory of amplitude modulation, Power in modulated carrier, single side band transmission, Basic idea of frequency and phase modulation. Modulated class C amplifier, demodulation, PN diode as demodulator linear and square law detection.

Propagation of radio waves, different layers of ionosphere and their functions,

#### **References:**

1. Electronic Devices and Circuits, Millman and Halkias.
2. Electronic Principles, Malvino.
3. Basic Electronics, Theraja B L
4. Basic Electronics, Mittal G K.
5. Digital Principles and Applications, Malvino and Leech.
6. Principles of Communication Systems, Taub and Schilling.

## **PHYSICS PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

**Objectives:** To develop the ability to design and connect simple electronic circuits and to collect and analyse the data using these circuits;

To develop skills in using electronic instruments like multimeters and oscilloscopes.

#### **COURSE CONTENT:**

(A minimum of TEN experiments to be selected from the following.)

Experiments on :

- A. Junction diode characteristics
- B. Zener diode characteristics
- C. Junction Transistor characteristics
- D. FET characteristics
- E. Rectifier circuits
- F. Transistor amplifier CE configuration
- G. Transistor amplifier Emitter follower
- H. Transistor Oscillator
- I. Logic gates
- J. Experiments on OP-AMP
- K. Lissajous figures
- L. Experiments on modulation and demodulation

**Reference :** 1. Physics Laboratory Instructions, RIE, Mysore.

## V#C.5 CHEMISTRY THEORY

### TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

#### **Objectives:**

To develop an understanding of Principles of Chemical Kinetics and Surface Chemistry. To explain the properties of d and f block elements and their compounds in terms of their electronic configuration and bonding. To understand the properties of coordination compounds in terms of bonding theories.

#### **COURSE CONTENT**

##### **Unit I: d-block and f-block elements**

To relate the electronic configuration to the properties and structure of transition metals and their compounds. Characteristic properties of d-block elements.

Properties of the elements of the first transition series, their binary compounds and complexes illustrating relative stability of their oxidation states, coordination number and geometry.

Chemistry of Elements of Second and Third Transition Series

General characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behaviour, spectral properties and stereochemistry. Powder metallurgy – extraction of tungsten. Position of lanthanides and actinides in the periodic table, lanthanide contraction, spectral and magnetic properties of lanthanides, separation of lanthanides and actinides.

Extraction of Thorium, Uranium and Plutonium from burnt nuclear fuels.

##### **Unit II : Coordination Compounds**

To apply theories that explain certain properties and structure of transition metal complexes. Werner's coordination theory and its experimental verification, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of VBT. Elementary treatment of crystal field theory, splitting of d-orbitals in square planar, tetrahedral and octahedral complexes, factors affecting crystal field parameters, Explanation of magnetic behavior and color of complexes using CFT, effective atomic number concept. Metal carbonyl, 18 electron rule, Preparation, structure and reactions of Ni(CO)<sub>4</sub>, Fe(CO)<sub>5</sub> and V(CO)<sub>6</sub>, nature of bonding in metal carbonyls.

##### **Unit III: Chemical Kinetics**

Understanding the factors that influence a chemical reaction and rationalising them on the basis of known theories of reaction rates. Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates, mathematical



characteristics of simple chemical reactions – zero order, first order, second order, pseudo order, half life and mean life. Determination of the order of reaction – differential method, method of integration, method of half-life period and isolation method. Radioactive decay as a first order phenomenon.

Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy, .Simple collision theory based on hard sphere model, transition state theory (equilibrium hypothesis). Expression for the rate constant based on equilibrium constant and thermodynamic aspects.

#### **Unit IV : Surface Phenomena**

Study of Characteristics of Solid surface, surface phenomenon to explain various applications in daily life situations. Catalysis, characteristics of catalysed reactions, classification of catalysis, miscellaneous examples. Physical and Chemical adsorptions. Derivation of Langmuir Adsorption Isotherm. Statement and explanation of BET and Gibbs Isotherms. Determination of surface area of adsorbent using Langmuir equation. Adsorption theory of Catalysts using Langmuir's Equation

#### **References :**

1. Sl.nos 2 and 6 of I Semester
2. Sl.nos 2 and 6 of II Semester
3. Inorganic Chemistry : James Huhey

## **CHEMISTRY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> :50**

#### **COURSE CONTENT :**

##### **Chemical Kinetics**

1. Iodination of Acetone by titration and Colorimetry.
2. Acid Hydrolysis of Ester
3. Reaction between Potassium Peroxydisulphate and Potassium Iodide.
4. Base Hydrolysis of an Ester by Titration and Conductometry
5. Iodine clock reaction
6. Solvolysis of Tertiary Butyl Chloride by Titrimetry, conductometry and pH metry
7. Inversion of Cane Sugar

##### **Coordination Complexes**

Preparation of Cobalt and Chromium Complexes and analysing them titrimetrically and Spectrophotometrically.

#### **References :**

Same as in I and II semester.

## V # B.5 BOTANY

### THEORY

#### BOTANICAL NOMENCLATURE, ANGIOSPERM TAXONOMY AND UTILIZATION OF PLANTS

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To understand the principles of plant nomenclature;
- To appreciate the evolution of taxonomic thought and the various systems of classification;
- To understand the diversity that exists among angiosperms;
- To make detailed study of selected families;
- To appreciate the utility of plants and plant products in human welfare.

#### **COURSE CONTENT**

##### **Unit I :**

- a) ICBN, principles and aims; type concept, concept of genus and specific epithet, Principle of priority, units of classification.
- b) Brief account of regional, national and international herbaria, significance of herbaria; identification keys and floras.
- c) Brief history, development of taxonomic thought, outlines of artificial, natural and phylogenetic systems of classification.
- d) Salient features and outline classification of Bentham and Hooker and Cronquist.

##### **Unit II :**

Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families :

- |                    |                    |
|--------------------|--------------------|
| i) Magnoliaceae    | ii) Capparidaceae  |
| iii) Malvaceae     | iv) Fabaceae       |
| v) Rutaceae        | vi) Apiaceae       |
| vii) Euphorbiaceae | viii) Amarantaceae |

##### **Unit III :**

Study of the diagnostic features, salient vegetative and floral characteristics and economically important plants of following families :

- |                  |                   |
|------------------|-------------------|
| ix) Apocyanaceae | x) Asclepiadaceae |
| xi) Acanthaceae  | xii) Solanaceae   |
| xiii) Lamiaceae  | xiv) Liliaceae    |
| xv) Poaceae      | xvi) Arecaceae    |

#### Unit IV:

Brief account (botanical name, family, extraction/ processing where necessary) and uses of the following :

- a) Cereals and Pulses : Rice, wheat, maize, millets, pigeon, pea, Bengal gram, green gram, black gram.
- b) Fibres : Cotton, jute, linen, coir.
- c) Vegetable oils : Groundnut, coconut, sunflower, safflower, castor.
- e) Timber and bamboos : Rosewood, teakwood, honne, canes and bamboos.
- f) Beverages : General account, coffee, tea, cocoa.
- g) Spices and condiments : General account, cardamom, clove, pepper, ginger, cinnamon, saffron, turmeric, mustard.
- h) Rubber : General account, *Hevea*, *Ficus*.
- i) Medicinal plants : Brief account of ethnobotany, uses of *Cinchona*, *Rauwolfia*, *Phyllanthus*, *Catharanthus*, *Ocimum*, *Tylophora* and other locally available medicinal plants.

#### References:

1. Jones, A.B. and A.Luchsinger, 1979, Plant Systematics, McGraw Hill Book Co., New York.
2. Priti Shukla and Misra, 1988, Taxonomy of Angiosperms, Vikas Publishing House, New Delhi.
3. Hutchinson, J., The families of Flowering Plants, Clarendon Press, Oxford.
4. Davis, P.H. and V.H.Heywood, 1963, Principles of Angiosperm Taxonomy, Oliver and Boyd, London.
5. Heywood, V.H. and D.M.Moore (Ed.)1984, Current concepts in Plant Taxonomy, Academic Press, London.
6. Singh, G.1999, Plant Systematics : Theory and Practice, Oxford and IBH Pvt. Ltd., New Delhi.
7. Stace, C.A. 1989, Plant Taxonomy and Biosystematics (2<sup>nd</sup> Ed.), Edward Arnold, London.
8. Singh V. and D.K.Jain, 2005, Taxonomy of Angiosperms, Rastogi Publications, Meerut.
9. Kochhar S.L.1981, Economic Botany in the Tropics, MacMillan India Ltd., Delhi.
10. Vashista P.C. 1980, Taxonomy of Angiosperms, Sultanchand & Co., New Delhi.
11. Lawrence, G.H.M. 1950 Taxonomy of Vascular Plants, MacMillan, London.

## BOTANY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives:**

- To acquaint students with the technical terms and identification keys for describing and identifying angiosperms.
- To familiarize with local plants belonging to families included in the study.
- To be able to describe the vegetative and floral characteristics, draw floral diagram and write floral formulae of angiosperms.
- To familiarize with common plants/plant products of economic importance.
- To develop the skill of undertaking field study and preparing herbarium sheets.

### **COURSE CONTENT :**

1. Study of selected technical terms and their definitions (used in the description of plant).
2. Detailed study of at least one plant specimen per family as given in theory syllabus.
3. Field study (3-5 days) to a nearby forest, for collection, identification and submission of 5 herbarium sheets;
4. To recognize the botanical name, family, part used and products of economic importance as per theory syllabus;
5. Preparation and submission of an illustrated inventory of 5 medicinal plants used in indigenous systems of medicine and allopathy (Write their botanical name, family, part used, active principle and diseases/disorders for which they are prescribed).

**V SEMESTER B.Sc.Ed.**

**Z-5: ZOOLOGY  
THEORY – ‘ANIMAL ECOLOGY AND ETHOLOGY’**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:**

To enable students to understand the energy sources, flow of energy and conservation; to understand the recycling of minerals and nutrients in ecosystems; to understand the dynamics of population; to understand causes of pollution and suggest measures; to understand behavioural patterns in animals

**COURSE CONTENT:**

**Unit I: Environment and Ecosystem**

- a) **Environment** – Atmosphere, lithosphere and hydrosphere as habitats (1)
- b) **Abiotic factors:** Temperature and light – as ecological factors; limiting factors; Liebig – Blackman’s law of limiting factors; Shelford’s law of tolerance, Factor – compensation (2)
- c) **Biotic community:** Definition and structure, Ecotone, edge effects, niche, community stability; Ecological succession (3); Intra and Interspecific interaction – All types of animal associations – as biotic factors (2)
- d) **Population:** Definition and attributes – density, mortality, natality, vital index, age distribution, growth patterns, migration, dispersal and dispersion; Environmental resistance, carrying capacity of environment (4)

**Unit II: Ecosystem and Habitat Ecology**

- a) **Ecosystem** – Definition, structure, functions and examples (1)
- b) **Types – i) Freshwater ecosystem:** Types and examples, Physico-chemical properties and biotic communities of lake and rivers (2)
- ii) **Marine Ecosystem** – Zones, physico-chemical properties, biotic communities; Adaptation of plankton, nekton and benthos (3)
- iii) **Terrestrial ecosystem** – Types and physico-chemical properties; biomes, comparison between aquatic and terrestrial ecosystems for physico chemical properties and biotic communities (3)
- c) **Dynamics of Ecosystem** – Ecological pyramids (review), energy flow in ecosystem, productivity; Biogeochemical cycle – nitrogen and sulphur cycles; recycling of organic nutrients (3).

**Unit III: Man and Environment**

**a) Pollution** – Definition and types (air, water, soil, pesticide, noise and thermal pollutions); causes, types of pollutants, sources, effects and control measures for air, water and soil pollutions (6).

**b) Environmental conservation:** Natural resources and conservation - mineral and energy resources and conservation; soil and conservation; environmental crisis; biodiversity and its importance; wildlife of India and conservation; National parks, sanctuaries and bioserves of India; National and International efforts for conservation of wildlife (6).

#### **Unit IV: Ethology**

Aims and Methods; Contributions of Lorenz, Tinbergen and C V Frisch (2); Concept of motivation and releaser in behaviour; Innate behaviour, taxes, reflexes, instinctive behaviour (3); Learned behaviour, imprinting and its significance (2); biological clocks (1); Social behaviour in birds and primates (2); Aggressive behaviour (1); Control of behaviour (1)

#### **References:**

1. Fundamentals of Ecology by E.P. Odum – W.B. Saunders, Philadelphia).
2. Environmental Studies by S.V.S. Rana – (Rastogi Publications, 2008).
3. Animal Ecology by S.P. Singh, 6<sup>th</sup> Revised Edition – (Rastogi Publications, 2008).
4. Basic Ecology by E.P Odum (Holt, Rinehart & Winston, New York).
5. Ecology by S.K.Charles – (Prentice Hall Of India, New Delhi)
6. Animal Behaviour by V.G.Dethier and E Stellar -(Prentice hall of India, New Delhi)
7. Current Problems in Animal Behaviour by W.H. Thorpe and L.Zangwill
8. Experimental Animal Behaviour-A selection of Lab. Exercises by H Hansell and J J Aitken – (Blakie & Sons, Glasgow)
9. The study of Instinct by N Tinbergen.
10. The Dancing Bees by K V Frisch
11. Learning and Instincts in Animals by W H Thorpe and W Homan.
12. Animal behaviour: An evolutionary approach by AICOK J (1984) – Sinauer Associates.
13. Ecology: Principles and Applications by Chapman E (1988) – Cambridge University Press.
14. Modern Concept of Ecology by Kumar HD (1986) – Vikas Publishing House.
15. Ecology and Environment by Sharma PD (1991) – Rastogi Publications.
16. Environmental Biology by Trivedi PR & Gurudeep Raj (1992).

## ZOOLOGY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

### **Objectives:**

To enable students to analyse for the physico-chemical and biological factors of water and soil samples; to identify and estimate quantitatively the aquatic and terrestrial organisms and their adaptation; to observe the population growth pattern; to have the skill of conducting experiments for observing animals behaviours

### **COURSE CONTENT:**

1. Estimation of dissolved oxygen in the pond water.
2. Estimation of dissolved alkalinity in the pond water.
3. Estimation of dissolved salinity in the pond water.
4. Gut content analysis in fish.
5. Qualitative analysis of marine plankton to identify the most common mero- and holo- plankton.
6. Identification of the most common benthos, and Nekton in aquatic environment (marine and fresh water).
7. Population study of Local insects and ciliates in the culture medium for growth pattern (logistic and exponential curves).
8. Collection and qualitative and quantitative analysis of soil organisms – Depiction of histogram and pie diagram.
9. Animal adaptation in different habitats- Study of specimens:  
a) Morphological      b) physiological adaptation with respect to excretion
10. Study of Preferences, a) Preening behaviour in birds, b) Photo-, chemo-, and Geotaxes in *Drosophila* (Project work).
11. a) Stimuli eliciting aggressive displays in male Siamese fighter fish; b) colour change in female Siamese fighter fish (demonstration).
12. Experiments with maze for studying behavioural motivation in rat.

***The students will undertake a study cum collection tour to study, collect, identify and preserve marine and terrestrial animals***

## VI SEMESTER

### VI#POPS.2 PEDAGOGY OF PHYSICAL SCIENCE

**Credits : 4(2L+2T +0P)**  
**Contact hrs per week : 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

#### **Course Objectives :**

On completion of the course, the student teachers will be able to

- plan learning designs based on problem situations, inquiry and projects to facilitate learning of Physical Sciences.
- realise his/her role as a facilitator in enhancing Physical Science learning in the real classroom situation.
- explore the use and relevance of different learning resources and materials in learning different units in Physical Science.
- develop learning materials on selecting units to facilitate learning in Physical Science.
- identify themes in Physical Science for which community can be used as a learning resource.
- conduct Physical Science related activities through science clubs, science fairs, science exhibitions during school attachment.
- study science laboratory in schools, facilities and materials available in class that facilitate learning of Physical Science.
- familiarize with different types of curricular projects in physical science, their purpose and themes.
- become aware of various professional organizations and professional development programs in Physical Science.
- reflect upon his/her own experiential knowledge in the different processes of becoming a Physical Science teacher.

#### **Transaction Mode:**

Lectures when required, group work on pedagogic analysis of content, concept mapping and planning learning designs, group work followed by presentation, discussion on different methods of grouping and execution of the learning designs to help students to construct knowledge, perform exemplar laboratory activities, prepare science kits and exemplar materials, improvise apparatus, visit science laboratories, schools for observing lessons, science museum, science park.

#### **COURSE CONTENT:**

##### **Unit I : Pedagogy planning in learning Physical Science** **Visualising learning situations**

Content analysis – writing process objectives.



Planning lessons (integrating the processes: engage, explore, explain, elaborate and evaluate).

Different ways of grouping learners for collaborative learning, creating learning situations.

### **Teachers' Role as a facilitator**

Providing multiple learning contexts and opportunities, encouraging student ownership of knowledge and engagement in the learning process, effective ways of questioning, engaging in learning episodes, helping learners to develop the attitudes of the rational problem solver, taking account of students' prior knowledge – encouraging students' inquiry abilities, valuing students' ideas and small group work, different ways of scaffolding and negotiating.

### **Unit II : Learning Resources and Preparation of Materials**

PSSC curriculum projects; Nuffield Physics (O Level); Nuffield Chemistry; Harvard Project Physics; ChemStudy. National Curriculum Frameworks – NCERT – proposed themes and integrated nature for Physical Science at secondary level. Journals -School Science Review, School Science(NCERT)

Preparation and use of learning aids contextually.

Audio-visual materials – charts, models, science kits, etc.

Visits to Museum, Science Park and community as a resource site for learning physics. Self-learning materials – worksheets.

Websites on physical science content, interactive websites, online learning

Planning of science labs – facilities, equipments, materials and manuals, records maintenance and management of science labs.

### **Unit III : Assessment of Learning in Physical Science**

Construction of test items (unit test) to assess simple factual knowledge, higher thinking and application abilities; use of observation techniques, Student-Teacher Profile, recording and evaluating procedures to assess the performance of students' activities, projects, laboratory skills; group assessment; self and peer assessment; assessment of worksheets; students' journals; use of rubrics in assessment. Portfolio assessment. Teacher's reflections in the process.

### **Unit IV : Professional Development of Physical Science Teachers**

Professional competencies of Physical science teachers.

Need for updating content and pedagogical science competencies;

Participation in planning of science fairs, exhibitions and activities, planning contextual activities (celebration of Science Day, birthdays of great physicists and chemists), seminars, conferences, online sharing, distance learning, membership of Professional Organisations – NSTA, IPA, IAPT, Indian Chemical Society, INSC, Action Research, NCERT and VP activities for Teachers, NCERT journals, Publications in Science Education journals.

### **Units for Pedagogic Analysis**

**Heat** : Heat as molecular motion, concept of heat and temperature, specific heat, latent heat, change of state, transfer of heat, thermal expansion.

**Current Electricity :** Concept of electric current, Ohm's law, Resistances in series and parallel, effects of electric current, magnetic effects, Oersted's experiment, electromagnetic induction.

**Dalton's atomic Theory :** Laws of chemical combination – atomic weight – molecular weight and mole concept.

**Chemical Bonding :** Why and how atoms combine – covalent bond, electrovalent bond, shapes and polarities of molecules.

Any other unit chosen by the teacher.

### References:

1. National Curriculum Framework 2005, NCERT, New Delhi.
2. Steve Alsop, Keith Hicks (2007). Teaching Science : A Handbook for Primary and Secondary School Teachers, Kogan Page, New Delhi.
3. Judith Bennett (2003) Teaching and Learning Science : A guide to recent research and its applications, Continuum, London.
4. Robin Millar (1984) Doing Science : Images of Science in Science Education, The Falmer Press, London.
5. NCERT Textbook in Physics for XI and XII Students.
6. State Textbook in Physics for XI and XII students.
7. Nathan S Washton (1967). Teaching Science Creatively, Saunders Company, London.
8. Novak D J and D Bob Gowin (1984) Learning how to learn, Press Syndicate of the University of Cambridge, Ohio.
9. Carin A and B R Sund (1964), Teaching Science through Discovery, Charles E. Merrill Books Inc., Columbus Ohio.
10. Ralph Martin, Colleen Sexton, Kay Wagner, Jack Gerlovich (2000) Science for All Children : Methods for Constructing Understanding, Allyn and Bacon, London.
11. School Science Review, The Association for School Education, College Lane, Hatfield, Hertfordshire, AL 109 AA, UK.
12. Physics Education, Institute of Physics Publishing, Dirac House, Temple Block, Bristol BS1 6BE, UK.
13. Physics Teacher, American Association of Physics Teachers, Department of Physics and Astronomy, University of Maryland, College Park, MO 20742.

## VI#POM.2 PEDAGOGY OF MATHEMATICS

**Credits : 4(2L+2T +0P)**

**Contact hrs per week : 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

### Objectives:

On completion of the course the student will have

- Understanding of mathematical proof in the context of secondary school mathematics

- Understanding of nature, importance and strategies of problem-solving
- Ability to teach proof of theorem and solution of problem to develop relevant skills.
- Ability to evaluate understanding of proof of a theorem and problem-solving skills.

## **COURSE CONTENT:**

### **Unit I : Teaching of Proof**

**Proof:** Developing an intuition about the nature of proof - to make the transition from concrete thinking to more formal reasoning and abstract thinking as they progress from class to class, kinds of proof - proof by mathematical induction, proof by contradiction, proof by cases, the contrapositive, conjectures, disproof by counter example.

### **Unit II : Teaching of Problem Solving**

Definition of a problem, problem solving and teaching problem solving; importance of teaching problem solving posing a problem, discovering or exploring various options for solving the problem i.e. developing heuristics, carrying out the plan and generating and extending a good problem.

### **Unit III: Evaluation of Learning in Mathematics**

Stating measurable objectives of teaching concepts and generalizations, construction of appropriate test items, Diagnosing basic causes for difficulties in learning concepts and generalizations, planning remedial instruction based on the diagnosis.

### **Unit IV : Learning Resource in Mathematics**

Meaning, Types and purposes of instructional materials in Mathematics, Plan for preparation and utilization of instructional materials. Preparation of instructional materials. Designing teaching aids in mathematics; psychological basis; Rationale and limitations.

### **Pedagogical Analysis of Secondary School Mathematics**

In order to explain the different pedagogical aspects of teaching mathematics, the following topics in mathematics which are presently taught at secondary school level are included. (As and when there are changes in topics to be taught in Mathematics at school level, the corresponding changes in topics should be made).

#### ***Arithmetic:***

Development of number system; Modular Arithmetic, Ratio and proportion, time and work.

#### ***Algebra:***

Sets, Relations, Functions and Graphs, Systems of linear equations and their graphical solutions, quadratic equations, Linear inequations and graphical solutions and their applications, Theory of Indices and logarithms, Cyclic factorization, Factor theorem and Remainder Theorem, Matrices, Axioms of Groups and Fields with examples from Number Systems.

**Geometry :**

Axioms of Euclidian Geometry, Polygons and Circles, Congruency and similarity of triangles, Polyhedrons and Prisms, Introduction to transformation geometry of two dimensions (straight lines only), Construction of geometrical figures.

**Trigonometry:**

Trigonometric ratios, simple identities and elementary problems on heights and distances, solution of simple trigonometric equation.

**Statistics:**

Tabular and Graphical representation of Data, Measures of Central Tendency and Variability.

**Computing:**

Computer devices, flow charts and algorithms.

**Sessional Work:**

Observation and analysis of strategies followed in teaching proof and problem-solving  
Preparation of atleast one lesson plan in each of teaching proof, and problem solving  
and practice of the strategies in simulated situation/real classroom situations.

Construction of unit test in mathematics.

Construction of a diagnostic test and an achievement test.

Planning and Implementation of remedial instructional strategies.

**References:**

1. Butler and Wren (1965). , The Teaching of Secondary Mathematics, London McGraw Hill Book Company.
2. Cooney, T.J. and Others (1975) , Dynamics of Teaching Secondary School Mathematics, Boston : Houghton Mifflin.
3. Iglewicz, Boris and Stoye, Judith (1973). An Introduction to Mathematical Reasoning, New York : The MacMillan Co.
4. Kapfer, Miriam B (1972). Behavioural objectives in Curriculum Development: Selected Readings and Bibliography. Englewood Cliffs, NJ: Educational Technology.
5. Mager, Robert (1962). Preparing instructional objectives, Palo Alto, C A : Fearon.
6. NCERT, A textbook of Content-cum-Methodology of Teaching Mathematics, New Delhi : NCERT.
7. Polya, George (1957) How to solve it, Garden City, New York: Doubleday.
8. Servas, W and T. Varga. Teaching School Mathematics - UNESCO Source Book.
9. State text books in Mathematics of Southern Region from Classes VI to X.

## VI # POBS.2 PEDAGOGY OF BIOLOGICAL SCIENCE

**Credits : 4(2L+2T +0P)**  
**Contact hrs per week : 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

### **Course Objectives:**

The teacher-learner will be able to

- plan learning designs(lessons) based on problem-situations, inquiry episodes and projects using 5Es' to facilitate learning of biology.
- explore the use and relevance of different learning resources and materials in learning different Biological concepts and themes..
- develop learning materials on selected units/themes that facilitate learning of biology in the classroom
- identify the biological themes for which community can be used as a learning site.
- organise Biology related activities through eco or science club during school attachment.
- study the science laboratories in schools – lay out, facilities, equipments, and materials, specimens, models, and other learning aids available that facilitate learning of Biology.
- familiarize with the different types of curricular projects in biology and their purposes ,themes, learning materials, resources etc
- become aware of various professional development programmes in biology.
- reflect upon his/her own experiential knowledge in the different processes of becoming a Biology teacher.
- develop biology projects using ICT.

### **Transaction Mode:**

Short Lectures wherever necessary; Use of exemplary learning designs; workshops to do content analysis, concept mapping and planning of learning designs; Group work followed by Presentations ; Demonstrations of grouping and creating learning situations and executing learning designs; School visits to observe Biology lessons and write observations ; lab activities in Biology; Use of different text books, other curricular materials; science kits as exemplary material; Visit to a National park or some other ecological sites to get hands-on experience as a teacher in planning and organizing biological tours with an objective of observing the environment and develop investigatory skills.

### **COURSE CONTENT:**

#### **Unit I : Pedagogic planning in learning Biology**

- Concept of and need for a lesson plan
- Content analysis ; concept mapping;writing Learning objectives.

- Planning of lessons using different approaches of learning Biology (already covered in 5<sup>th</sup> semester) **Examples of units:** structure of plant and animal cell, tissues, life processes, Diversity of living organisms, conservation of Biodiversity, Why we fall sick? Crop improvement, Control and Co-ordination, How do organisms reproduce?, Our Environment , Heridity and Evolution)
- Planning of multiple learning contexts and opportunities based on the concepts, themes, issues and problems related to Biology; creating learning scenarios and episodes to engage the learners; encouraging; planning effective ways of questioning, taking account of students' prior knowledge; plan for students' inquiry abilities in Biology; planning for small group work, different ways of scaffolding and negotiating in understanding of Biological knowledge.
- Role of teacher's reflections in the process of planning and transacting the lesson .
- Planning of a unit and its importance

### **Unit II : Learning Resources and Preparation of Materials**

- Preparation and use of learning aids contextually.
- Audio-visual materials: charts, models, aquaria, terraria, school garden, museum, herbarium, supplementary books, handbooks, laboratory guides, science kits, etc.
- Field trips, National parks, study tours and community as a resource sites for learning biology.
- Self-learning materials , and planning of worksheets.
- Using ICT in learning biology, websites on biology, interactive websites, online learning, and preparation of projects on Biology units using ICT.
- Use of science labs – facilities, equipments, materials and manuals, science records.
- Planning of exhibitions on conservation of environment; saving the planet; learning aids in Biology; contextual activities (Environmental Day, Earth Day, Wild Life Week, etc). Planning of fairs, eco-clubs and activities.
- Environment and community as a rich learning site to construct meanings and concepts related to Biology through observational and exploratory activities.

### **Unit III : Curriculum reforms and Assessment in Biology learning**

#### **A. Curriculum reforms in Biology**

- Exemplary prototype inquiry science programs (NSES), US; Project 2061 NSTS – SSC (Scope, Sequence and Coordination).
- BSCS curriculum projects
- Nuffield Biology curriculum projects
- National Curriculum Frameworks – NCERT – proposed themes and integrated nature for Biological science at secondary level.

- Critical appraisal of National and state level syllabi related to biology themes and units; Basic criteria of validity of a science curriculum; critical analysis of biology textbooks /biology content in the science textbooks and other curricular materials such as teachers handbook, source book and manuals

#### **B. Assessment of and Assessment for learning Biology**

- Periodic/continuous assessment: preparation and use of worksheets; use of observation techniques, recording and evaluating procedures to assess the performance of students' activities, projects, laboratory skills, drawing skills in biology; group assessment; self and peer assessment; assessment of worksheets; students' journals; use of rubrics in assessing students' performance based activities; feedback for improving learning; diagnosing learning difficulties in biology and planning for alternative learning strategies; Planning for Portfolio assessment in Biology
- Construction of different types of test items and questions to assess content specific- simple factual knowledge, higher order thinking and application abilities; preparation of blue print/table of specifications; Planning for a Unit test in Biology

#### **Unit IV : Professional Development of Biology Teachers**

- Professional competencies of Biology teachers.
- Need for updating content and pedagogical science competencies; participation in seminars, conferences, online sharing, distance learning, membership of Professional Organisations – NSTA, INSC, Action Research, Projects and Publications in Science Education journals.
- Role of reflection in professional development.

#### **Sessional Activities:**

- Planning of atleast 2 lessons and a unit plan on the Biology units /themes of VIII, IX, X classes
- Teaching Biology in real classroom /simulated situation .
- Preparation of learning aids and organizing an exhibition on the Annual Day of the Institution.
- Identifies the different community resources that can be used for learning Biology
- Analysis of Biology text books, and other curricular materials.
- Project work using ICT on any Biology lesson (using any one of the approaches – inquiry, investigatory etc.) and use it in the class during school attachment programme.
- School visits to study existing Lab facilities for learning Biology – Project
- Construction of assessment items and tools to assess content-specific tasks and demonstrations, observations, drawing skills, group discussions, Brain storming.
- Planning Performance tasks, Data recording sheets, Prediction activity sheets, and individual experiments and tools to assess embedded products and processes in activities..
- Reading of curriculum projects in groups and presentation
- Group work on professional competencies of Biology teachers
- Identification of Professional organizations for Biology teachers, Biology Journals and magazines

### References:

1. BSCS Curriculum Projects (Latest)
2. Carin.A & B.R. Sund (1964): Teaching Science through Discovery, Charles E. Merrill Books, Inc., Columbus, Ohio.
3. Esler, K. William & Mark. K. Esler (2001): Teaching Elementary Science (8<sup>th</sup> edition) Wadsworth group, Thomas learning, Printed in the USA.
4. Hein, E. George & S. Price (1994) : Active assessment for Active science- a guide for Elementary school teachers, Published by Heinemann, Printed in the USA.
5. Heiss, E. D. Obourn E. S and Hoffmann C W (1961): Modern Science teaching by Macmillan publication, New York.
6. Jakab, Cheryl (1990): Exploring together (Revised Edition) – A science course for Primary schools, Phoenix Education Private Limited.
7. Jennings T (1986): the young scientist investigates- Teacher's Book of Practical work, Oxford University Press, Oxford.
8. Keith skamp (ed) (2004): Teaching primary science constructively -2<sup>nd</sup> edition, Thomson, by Nelson Australia Private Ltd.
9. Mason M & Ruth T. Peters: Teacher guide for Life sciences, Published by D. Van Nostrand Company, Inc, New york.
10. NCERT (2005): National Curriculum Framework, 2005.
11. NCERT text books (2005) science for classes from VIII to X
12. Novak. D.J & D. Bob Gowin (1984): Learning how to Learn, published by the press syndicate of the University of Cambridge, Printed in the USA.
13. Nuffield Biology curriculum Projects (Latest)
14. Saunders, N.H. (1962) The teaching of Genereal science in Tropical secondary schools; London; Oxford University press.
15. State text Books for classes VIII to X.
16. Turner, T & W. Dimarco (1988); learning to teach science in the secondary school – a companion to school experience, Published by Routledge, USA.

## VI#M.7 MATHEMATICS

### GROUP THEORY

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

### COURSE CONTENT:

#### Unit I: Group Theory – I

Properties, Permutations, group Permutation, Alternating Group, Powers and Index laws, Order of an element of a group, Sub-groups.



## **Unit II: Group Theory – II**

Cyclic groups, Coset decomposition of a Group, Index of a subgroup, Lagrange's theorem, Consequences, Caley's Theorem.

## **Unit III: Group Theory – III**

Cayley's Theorem, Structure of finite and infinite cyclic groups, Normal subgroups, Quotient groups, Groups of Transformations.

## **Unit IV: Group Theory – IV**

Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, Dihedral groups, Fundamental theorem of Homomorphism.

### **References :**

1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
3. Modern Algebra by Vasishta, Krishna Prakashan Media Pvt. Ltd.
4. Higher Engineering Mathematics by Kreyszig, Wiley
5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
6. Basic Abstract Algebra, 2<sup>nd</sup> Edition by P.B.Bhattacharya, S K Jain and S R Nagpaul, Cambridge University Press.
7. Linear Algebra by K. Hofman and R. Kunze, Pearson Education.
8. Modern Algebra – An Introduction by Durban, 5<sup>th</sup> Edition, Wiley.
9. Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
10. A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

## **VI#P.6 PHYSICS THEORY**

### **RELATIVITY AND QUANTUM MECHANICS**

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

**Objectives :** To enable students to understand the essentials of relativity and quantum mechanics, the two theories of 20<sup>th</sup> century.

## **COURSE CONTENT:**

### **Unit I : Theory of Relativity**

Galilean transformation and Newtonian relativity, Earth as an inertial frame of reference, Ether hypothesis, speed of light, Michelson-Morley experiment, Einstein's principle of relativity, Lorentz transformations - derivation, time dilation and length contraction, velocity addition theorem, variation of mass with velocity, relativistic momentum, energy and momentum conservation, relativistic energy, mass energy equivalence, examples from chemical and nuclear reactions, fission and fusion, Doppler effect in light.

### **Unit II : Origin of Quantum Theory**

Inadequacies of Classical Physics – black body radiation and photoelectric effect, Planck's hypothesis and explanation of black body radiation, Einstein's explanation of photoelectric effect, Wave-particle duality, de Broglie's hypothesis of matter waves, concept of group velocity and phase velocity and their relationship, experimental evidence for matter waves – Davisson and Germer experiment, electron diffraction experiment. Uncertainty Principle. Illustrations -  $\gamma$ -ray microscope.

### **Unit III : Development and Application of Schrodinger Equation**

Wave function, interpretation of wave function, postulates of q mechanics, probability density, Eigen functions and eigen values, expectation values, Normalization of wave functions, development of time dependent and time independent Schrodinger wave equation, operator method of deriving Schrodinger equation.

Applications of Schrodinger wave equation – one dimensional infinite potential well, finite potential well, phenomenon of tunneling, one dimensional harmonic oscillator, rigid rotator, hydrogen atom (only qualitative discussion).

### **Unit IV : Quantum Statistics**

Limitations of classical statistics, phase space, phase cells, postulates of quantum statistics, indistinguishability, Bose-Einstein statistics – derivation of distribution function, Application to Photon concept, derivation of Planck's radiation formula. Elementary idea of Bose-Einstein condensation.

Fermi Dirac statistics – derivation of distribution function, Application of FD statistics to free electrons in metals – Fermi energy. Comparison of classical and quantum statistics.

### **References**

1. Perspectives of Modern Physics, Beiser.
2. Introduction to Quantum Mechanics, Pauling and Wilson.
3. Statistical Mechanics, K Huang.

## PHYSICS PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives:**

To develop the ability to set up apparatus, collect data and to analyse the data for determining the desired physical quantity.

### **COURSE CONTENT:**

Experiments on:

- A. Electromagnetic induction
- B. A.C. and D.C. Bridges
- C. Laser diffraction
- D. Ballistic galvanometer
- E. Elasticity
- F. Galvanometers

### **References**

1. Advanced Practical Physics, Worsnop and Flint.
2. Physics Laboratory Instructions, RIE, Mysore.

## VI#C.6 CHEMISTRY THEORY ORGANIC CHEMISTRY – II

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

### **Objectives:**

To develop an understanding of the chemistry of Functional groups and mechanisms of Organic Reactions.

### **COURSE CONTENT:**

#### **Unit I: Alcohols and Phenols**

Monohydric alcohols: Nomenclature, methods of formation (reduction of aldehydes, ketones, carboxylic acids and esters). Hydrogen bonding, Acidic nature. Reactions of alcohols (oxidation, esterification, dehydration).

Dihydric alcohols: Nomenclature, methods of formation (from alkenes and alkyl dihalides), chemical reactions of vicinal glycols - oxidative cleavage [ $\text{Pb}(\text{OAc})_4$  and  $\text{HIO}_4$ ] and Pinacol-pinacolone rearrangement.

Trihydric alcohols: Nomenclature and methods of formation (from alkenes and alkenals), chemical reactions of glycerol (with nitric acid, oxalic acid and HI).

Phenols: Nomenclature, structure and bonding, Preparation of phenol, resorcinol and 1 and 2-naphthols (one method each). Physical properties and acidic character of phenol. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols: Electrophilic aromatic substitution, acylation and carboxylation. Mechanisms of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Houben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

## **Unit II: Carbonyl Compounds**

### **Aldehydes and Ketones**

Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Use of acetals as protecting group. Baeyer-Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner,  $\text{LiAlH}_4$  and  $\text{NaBH}_4$  reductions. Halogenation of enolizable ketones. An introduction to  $\alpha$ ,  $\beta$  unsaturated aldehydes and ketones.

### **Carboxylic Acids and their Derivatives**

Nomenclature, structure and bonding. Preparation of carboxylic acids – by oxidation, using Grignard reagents and hydrolysis of nitriles. Physical properties, acidity of carboxylic acids, effect of substituents on acid strength. Reactions of carboxylic acids: HVZ reaction, synthesis of acid chlorides, esters and amides. Reduction of carboxylic acids. Mechanism of decarboxylation. Methods of formation and chemical reactions hydroxy acids – malic, tartaric and citric acids.

Unsaturated monocarboxylic acids: Methods of formation and chemical reactions

Dicarboxylic acids: Methods of formation and effect of heat and dehydrating agents.

Carboxylic acid derivatives: Structure and nomenclature of acid chlorides, esters, amides and acid anhydrides. Preparation of carboxylic acid derivatives, chemical reactions. Mechanism of esterification and hydrolysis (acid, base conditions).

## **Unit III: Organic synthesis via Carbanions**

Synthesis of ethyl acetoacetate by Claisen condensation and diethyl malonate. Acidity of  $\alpha$  – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid;  $\alpha, \beta$  – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.

Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid;  $\alpha, \beta$  – unsaturated acids – crotonic acid and cinnamic acid; antipyrine, uracil and acetyl acetone. keto-enol tautomerism of ethyl acetoacetate. Alkylation of 1,3-dithianes, Alkylation and acylation of enamines.

#### Unit IV: Organic Compounds of Nitrogen

**Nitro Compounds:** Introduction, Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanism of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid.

**Aliphatic and Aromatic amines:** Structure and nomenclature of amines, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitrites), reductive amination of aldehydic and ketonic compounds. Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactivity, physical properties, stereochemistry of amines. Separation of a mixture of primary, secondary and tertiary amines (Hinsberg's method). Structural features effecting basicity of amines. Amine salts as phase – transfer catalysts. Reactions of amines, electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. Synthetic transformations by aryl diazonium salts, azo coupling.

#### References :

Sl.nos 1 to 5 of III Semester

### CHEMISTRY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

#### Objective:

To develop basic skills of separation of organic compounds and evolve a scheme of analysis of organic compounds based on properties of functional groups for identification

#### 1. Qualitative organic analysis

- (i) Separation of organic mixtures containing two solid components using water , NaHCO<sub>3</sub>, NaOH
- (ii) Analysis of an organic compound: Detection of extra elements (N,S and X) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides) in simple organic compounds. Identification of organic compound based on functional group analysis, determination of physical constant (mp / bp).

#### 2. Chromatographic Techniques

##### (i) *Thin Layer Chromatography*

Determination of R<sub>f</sub> values and identification of organic compounds:

- (a) Separation of green leaf pigments (spinach leaves may be used)
- (b) Preparation and separation of 2,4-dinitrophenylhydrazones of acetone / 2-butanone using toluene : light petroleum (2:3 ratio)
- (c) Separation of mixture of dyes

##### (ii) *Paper Chromatography*

Determination of R<sub>f</sub> values and identification of organic compounds:

- (a) Separation of mixture of amino acids

- (b) Separation of mixture of D-galactose and D-fructose using n-butanol:acetic acid:water (4:5:1) ; Spray reagent: anilinehydrogenphthalate  
(iii) Column Chromatography: Separation of ortho and para nitroanilines

**References :**

1. A Text Book of Qualitative Organic Analysis, A I Vogel
2. A Text Book of Quantitative Organic Analysis, A I Vogel

**VI # B.6 BOTANY**  
**THEORY**  
**PLANT PHYSIOLOGY**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:**

- To acquaint students with the sub-cellular physiological phenomena in plants;
- To understand the water relations in plants;
- To understand the functioning of plant from the physiological point of view;
- To understand various facets of growth, differentiation and physiology of flowering in angiosperms.

**COURSE CONTENT:**

**Unit I :**

- a) Importance of water to plant life, properties of water.
- b) Review of diffusion, osmosis and imbibition – definitions, concept of water potential, osmotic potential, pressure potential, solute potential, role of aquaporins.
- c) **Absorption of water** : Root as an absorbing organ, mechanism and pathways of water movement from root hair to root xylem - symplast, apoplast and trans-membrane pathways.
- d) **Ascent of sap** : Vertical pathway of water in plants, structural properties of xylem, root pressure theory, cohesion – tension hypothesis.

**Unit II :**

- a) **Transpiration:** Definition, types, mechanism of stomatal opening and closing (role of K<sup>+</sup> and Abscisic acid), antitranspirants, factors and significance of transpiration, guttation.
- b) **Cellular Respiration:** Introduction, respiratory quotient, aerobic and anaerobic respiration, structure of mitochondrion, glycolysis, synthesis of

acetyl CoA, Krebs cycle, oxidative phosphorylation, electron carrier complexes, chemiosmotic hypothesis, proton pump theory, synthesis of ATP (Paul Boyer's hypothesis), pentose phosphate pathway.

**c) Photosynthesis**

Introduction, brief history, ultrastructure of chloroplast, photosynthetic pigments, absorption and action spectra, photochemical (light) reaction, photophosphorylation, Z-scheme, Calvin cycle, C<sub>4</sub> pathway, CAM pathway, photorespiration, factors and significance of photosynthesis.

**Unit III :**

**a) Transport of Organic Substances :** Ultrastructure and functions of phloem, (sieve tube), mechanism of phloem transport, source – sink relationship, theories and factors affecting photosynthesis.

**b) Mineral Nutrition:** Major and micro-nutrients, absorption of mineral salts, mechanism and theories of mineral uptake; passive absorption – mass flow, Donnan equilibrium: active absorption – carrier concept, cytochrome pump hypothesis.

Role of N, P, K, Ca, Mg, Fe, N and Zn in plant metabolism, Mineral deficiency symptoms.

**Unit IV :**

**a) Growth and Development :** Definitions, phases of growth and development, photomorphogenesis, brief account of phytochromes – discovery, physiological role and mechanism of action.

**b) Plant growth Regulators :** General account, discovery, chemical nature, physiological effects and applications of auxins, kinins, gibberellins, ethylene and abscisic acid. Brief account of plant movements.

**c) Physiology of flowering :** (i) Brief account of photoperiodism, short day, long day and day-neutral plants, night interruption phenomenon, florigen concept, role of phytochromes (ii) Brief account of vernalization.

**References:**

1. Taiz, L. and E. Zeiger, 1998, Plant Physiology (2<sup>nd</sup> Ed.), Sinauer Associates Inc. USA.
2. Salisbury, F.B. and C.W. Ross, 1992, Plant Physiology (4<sup>th</sup> Ed.) Wadsworth Publishing Co. USA.
3. Leo, P.J. and R.C. Leegood, 1999, Plant Biochemistry and Molecular Biology, John Wiley & Sons, England.
4. Hopkins, W.J. 1995, Introduction to Plant Physiology, John Wiley and Sons, Inc., New York.
5. Lehninger A.B., 1982, Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
6. John, J.L., 1994, Fundamentals of Biochemistry, Sultanchand & Co., New Delhi.
7. Srivastava, H.S., 2005, Plant Physiology, Biochemistry and Biotechnology, Rastogi Publications, Meerut.
8. Srivastava H.S. and N Shankar, 2006, Plant Physiology and Biochemistry, Rastogi Publications, Meerut.

## BOTANY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives :**

- To understand the functioning of a plant from the physiological point of view.
- To enable students to handle glasswares and equipment to set up physiology experiments.
- To study responses of plants by manipulating the variables.

### **COURSE CONTENT :**

1. Preparation of different types of solutions – molal, molar, percent and normal solutions.
2. To study the effect of temperature and organic solvents on permeability of plasma membrane.
3. Determination of osmotic potential by plasmolytic method.
4. Determination of water potential of potato tuber.
5. Calculation of stomatal index, frequency and area of stomatal aperture in the 2 surfaces of leaves.
6. Determination of the rate of transpiration in 2 surfaces of leaf by cobalt chloride method.
7. Demonstration of transpiration pull.
8. Separation of photosynthetic pigments by paper chromatography.
9. Comparison of rate of photosynthesis under different environmental conditions.
10. Demonstration of necessity of light, CO<sub>2</sub> and chlorophyll for photosynthesis.
11. Plotting the absorption spectrum of chlorophylls.
12. Quantitative estimation of chlorophylls by colorimetry.
13. Demonstration of aerobic and anaerobic respiration.
14. Demonstration of phototropism and geotropism.
15. Study the distribution of growth in roots.
16. Observation of cyclosis in plant materials.
17. Testing the germinability of seeds using TTC.



## VI SEMESTER B.Sc.Ed.

### Z-6: ZOOLOGY

#### THEORY – ‘DEVELOPMENTAL BIOLOGY AND APPLIED ZOOLOGY’

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

To enable students to comprehend the modern concepts of developmental biology; to understand the developmental sequences in vertebrates; to compare the development of organs and systems; to identify the useful animals for harvesting the benefits and preventing the harmfulness with effective control measures

#### **COURSE CONTENT:**

##### **Unit I: Gametogenesis and Early Development**

**a) Gametogenesis** – Differentiation of spermatozoa and oocyte in mammals (2); Different types of eggs, classification based on amount and distribution of yolk (deutoplasm) (1)

**b) Fertilization** – approach of gamete, interaction of gametes, monospermy, polyspermy; Parthenogenesis and its significance (3)

**c) Cleavage** – Theories and laws of cleavages (1); Types of cleavages – holoblastic, meroblastic, radial, spiral, discoidal, superficial; planes of cleavages – meridional, vertical, equatorial, latitudinal; factors influencing cleavage (2); Fate maps of blastula of Frog and chick (1)

**d) Genetic control:** Genetic control of development and differentiation - Nucleo-cytoplasmic interaction in the development of *Acetabularia*; Concept of homeo-box and homeotic genes; Trans-determination (2).

##### **Unit II: Development of Frog and Regeneration**

**a) Gastrulation** – Morphogenetic movement of cells, mechanism of gastrulation and change in cell shape (2)

**b) Neurulation** – Formation, position and fate of three germinal layers, role of microtubules and microfilaments in neurulation (2)

**c) Organizer phenomenon** – Organizer concept of Spemann, chemical nature and distribution of inductors – competence, determination and differentiation (2); Outline of organogenesis (2); metamorphosis of tadpole (1).

**c) Regeneration:** Regeneration in different animals, morpholaxis and epimorphosis; regeneration in *Dugesia* and salamander; Factors influencing regeneration (3).

##### **Unit III: Development of Chick and Mammal**

**a) Development of Chick:** Overview of early development; formation of primitive streak and germinal layers (2); Salient features of chick embryos of 13 hrs, 19 hrs, 24 hrs, 33 hrs and 48 hrs of incubation (3); Comparative account of development of a) heart, b) kidney, c) Gonads and their ducts in Frog and chick (3).

**b) Foetal membranes** – Development, structure and functions of a) amnion, b) chorion, c) yolk sac, d) allantois (2)

**c) Placenta in mammals** – Structure, classification, physiology and hormonal control of placenta (2)

#### **Unit IV: Applied Zoology**

**a) Beneficial animals:** Basic principles of practices in culturing of i) silkworms (Sericulture), ii) bees (Apiculture), iii) Aquaculture – fish, prawn and shell fish; Importance of dairy (6)

**b) Harmful animals:** Pests -morphology, life cycle, damages caused and control measures of common insect pests of stored food grains and crops, nematode pests of crops, insect vectors (each two) (3); Control – biological control and integrated pest management (IPM) (3).

#### **References:**

1. Developmental Biology by K.V.Sastry & Vinita Shukla – (Rastogi Publications, 2008).
2. Introduction to Embryology by B.I. Balinsky – (W.B. Saunders, Philadelphia, 1976).
3. Foundations of Embryology by B.M Paten and B.M.Carison.
4. Foundations of Animal Development by A.F.Hopper and N.H.Hart (Oxford University Press, New York, 1980).
5. Vertebrate Embryology by R.S.McEwen (Oxford & IBM Publishing CO., New Delhi).
6. A Hand Book of Sericulture by Iyonemura & M.N.Rama Rao.
7. C.S.I.R. Wealth of India (Supplement) on Fish and Fisheries. (CSIR, New Delhi).
8. Bee keeping by J.E.Eckert and F.R.Shaw.
9. Developmental Biology by J.W.Brookbank.
10. Patterns and Principles of Animal Development by J.W. Saunders. Jr.
11. Fish and Fisheries of India by V.G.Jhingran (Hindustan Publishing Corpn; New Delhi)
12. Economic Zoology by G.S. Shukla & V.B. Upadhyay.
13. Elements of Entomology by Rajendra Singh.
14. Embryology by Barth IG (1966) – Holt Rinehart & Winston.
15. Development by Berril N & Karp G (1978) – Tata McGraw Hill Publ. Co.
16. Modern Embryology by Bodemer CW (1960) - Holt Rinehart & Winston.
17. Fundamentals of Comparative Embryology of Vertebrates by Huettner AF (1967) – McMillan Co.
18. Chordate Embryology by Mohan Arora (1985) – Atma Ram & Sons.
19. Laboratory manual of Vertebrate Embryology by Rugh R – Allied Pacific Pvt. Ltd.
20. Chordate Embryology by Verma PS & Agarwal VK – Chand & Co.

## ZOOLOGY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives:**

To develop the skills of staining and mounting of embryos of chick and Frog; to understand the developmental patterns of chick and Frog; to have the skill of culturing silk worm, bees and fish; to identify the harmful animals for effective control measures

### **COURSE CONTENT:**

1. i) Study of different types of eggs (Insect, Frog, Hen).  
ii) Study of permanent slides of different developmental stages in Frog  
a) Section of egg, b) early cleavage, c) blastula, d) morula, e) Gastrula
2. i) Study of permanent slides of a) neural plate, b) neural fold of Frog.  
ii) Study of different developmental stages of Frog tadpole:  
a) Early tadpole, b) hind limb stage, c) hind limb and fore limb stage, d) short tailed stage, e) young Frog.
3. Preparation of window on hen's egg to study development of embryo.
4. Incubation of fertilized egg of chick, preparation of permanent mounting of embryo from incubated egg and identification of age of the embryo.
5. i) Study of permanent slides of chick embryos of  
a) 13 hrs, b) 19 hrs, c) 24 hrs, d) 33 hrs, e) 48 hrs of incubation  
ii) Study of sections of chick embryos of  
a) 19 hrs, b) 24 hrs, iii) 48 hrs of incubation
6. Rearing of two races of silkworm from egg to cocoon stages – conditions required, quality and quantity of food provided, precaution taken during feeding, moulting and spinning.
7. Harvesting cocoons, reeling of silk from the cocoons, study of some economic traits – fecundity, larval duration, cocoon weight, shell weight and silk weight.
8. Study of common insect pests of stored grains and crops.
9. Study of common nematode pests of crops.
10. Study of common insect vectors.
11. Study of economically important  
a) Fishes, b) crustaceans, c) molluscs

***Field visit to study the common practices in rearing of honeybees and fish***

## VII SEMESTER

### VII # ICT.2 Information and Communication Technology in Education- II

**Credits : 1(0L + 0T + 1P)**  
**Contact hrs per week: 2**

**Marks : 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:** On completion of the course the students will be able to:

1. Explain the different approaches of ICT integration in education
2. Plan and use various ICTs for project based/problem based, constructivist learning environment
3. Appreciate the scope of ICT for improving the personal productivity and professional competencies
4. Illustrate the use of ICT in direct teaching and multiple intelligences
5. Demonstrate the use of web conferencing/teleconferencing tools and technologies
6. Develop the e-portfolio and assessment e-rubrics for integration in to the subject
7. Use learner management system for e-learning
8. Develop skills in using various web 2.0 and e-learning tools
9. Appreciate the use ICT in improving educational administartion

#### **Unit I: ICT Integration in Teaching Learning Process**

- Approaches to integrating ICT in teaching and learning
- E-learning: concept, types, characteristics, advantages and limitations. E-learning technologies, Learning and Learning Management Systems (LMS)
- Educational use of web 2.0 technologies: e-mail, wiki, blog, podcasting, streaming, chat, social bookmarking, social networking, groups and forum
- ICI integrated Unit plan – Web 2.0 for creating constructivist learning environment
- Project/problem based learning (PBL): role of ICT, developing technology integrated PBL unit
- Webquest and virtual field trips: concept, process, and use in the classroom
- Multiple intelligences in classroom: ICT tools and applications

#### **Unit II: ICT for assessment, management and professional development**

- Electronic assessment portfolio – concept, types, tools and e-portfolio rubrics

- Educational technology standards – UNESCO,ISTE and AECT
- ICT for educational administration
- Assistive technology for special needs and inclusion: tools and process
- ICT for personal and professional development: tools and opportunities
- Electronic teaching portfolio- concept, types, tools, portfolio as a reflective tool for teacher
- Teleconferencing, EDUSAT: the Indian experiment, web conferencing- tools and techniques
- Open Educational Resources – Meaning and importance, various OER initiatives, creative common licensing

### **Sessional Work**

1. Develop a webquest on any selected topic
2. Identify a virtual field trip in your area of specialization and organize a virtual filed trip
3. Field visit to the edusat center and take part in teleconferencing
4. Organize web conferencing using Skype
5. Taking part in an ICT integrated online project based or problem based learning activity
6. Visit to local ICT laboratories of educational institutions
7. Review of ICT labs (plans and equipments/resources) in school from internet
8. Interview of computer hardware engineer/ICT specialist regarding Hardware planning, evaluation, maintenance and up gradation
9. Developing wikieducator article on assistive technology
10. Developing an electronic assessment portfolio
11. Developing an electronic teaching portfolio
12. A critical study of some e-learning courses and enrolling and completing some free e-learning courses
13. Creating account in wikispace/wikipedia/mediawiki and adding/editing content
14. Creating account in teachertube/slideshare and sharing your video/powerpoint. View and comment on others contributions
15. Developing an educational blog in [www.blogger.com](http://www.blogger.com), [www.wordpress.com](http://www.wordpress.com), or [www.edublog.com](http://www.edublog.com)
16. Downloading, installing and using free and open source antivirus(clamwin) programme

### **Suggested Reading**

1. Barton,R.(2004).Teaching Secondary Science with ICT. McGraw Hill International
2. Cabmbridge, D.(2010).E-Portfolios for Lifelong Learning and Assessment.John Wiley and Sons
3. Costantino,P.M., DeLorenzo,M.N., Kobrinski,E.J.(2006).Developing a professional teaching portfolio: a guide for success. Pearson

4. Foster, B.R., Walker, M.L., Song, K.H. (2006) A beginning teaching portfolio handbook: documenting and reflecting on your professional growth and abilities. Prentice Hall
5. Imison, T., Taylor, P.H. (2001). Managing ICT in the Secondary Schools. Heinemann: Oxford
6. Montgomery, K., Wiley, D.A. (2004). Creating E-portfolio using powerpoint- A Guide for Educators. Sage: New Delhi
7. Sanders Donald, H. (1998). Computers Today. McGraw Hill Book Company: New Delhi
8. Sarkar, S.K. & Gupta, A.K. (1998). Elements of Computer Science. S.Chand & Company: New Delhi
9. Semenov, Alexy (2005). Information and Communication Technologies in Schools. A handbook for Teachers. UNESCO
10. Mishra, S. (Ed.) (2009). STRIDE Hand Book 08: E-learning. IGNOU: New Delhi. Available at [http://webserver.ignou.ac.in/institute/STRIDE\\_Hb8\\_webCD/STRIDE\\_Hb8\\_index.html](http://webserver.ignou.ac.in/institute/STRIDE_Hb8_webCD/STRIDE_Hb8_index.html)

## Websites

Association for Educational Communications and Technology (AECT) at <http://www.aect.org/default.asp>

British Educational Communications and Technology Agency (BECTA) at <http://www.becta.org.uk/>

The International Society for Technology in Education (ISTE) at <http://www.iste.org/>

UNESCO ICT Competencies Standards for Teachers at [http://portal.unesco.org/ci/en/ev.php-URL\\_ID=2929&URL\\_DO=DO\\_TOPIC&URL\\_SECTION=201.html](http://portal.unesco.org/ci/en/ev.php-URL_ID=2929&URL_DO=DO_TOPIC&URL_SECTION=201.html)

UNESCO Bangkok ICT in Education at <http://www.unescobkk.org/index.php?id=76>

UNESCO Documents and Publications (about 350 pdf documents on ICT in Education) at [http://unesdoc.unesco.org/ulis/cgi-bin/ulis.pl?req=2&mt=100&mt\\_p=%3C&by=2&sc1=1&look=new&sc2=1&lin=1&mode=e&fut8=1&gp=1&gp=1&text=ict+in+education&text\\_p=inc](http://unesdoc.unesco.org/ulis/cgi-bin/ulis.pl?req=2&mt=100&mt_p=%3C&by=2&sc1=1&look=new&sc2=1&lin=1&mode=e&fut8=1&gp=1&gp=1&text=ict+in+education&text_p=inc)

## VII#M.8 MATHEMATICS

### RINGS AND FIELDS

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **COURSE CONTENT:**

##### **Unit I:**

Rings, Integral Domains, Division Rings, Fields embedding and ring into another ring, Field of quotients.

##### **Unit II :**

Ideals, Maximal Ideals and Prime Ideals, Principal ideals, Principal ideal ring, Divisibility in an Integral domain, Units and Associates.

##### **Unit III:**

Binomial rings, Divisibility, Irreducible polynomials, Division Algorithm, Greatest Common Divisor, Euclidean Algorithm, Unique Factorisation Theorem, Prime Ideals, Quotient rings.

##### **Unit IV :**

Homomorphism of a ring, Kernel of a ring homomorphism, Fundamental theorem of Homomorphism, Eisenstein's Criterion of irreducibility.

##### **References:**

1. Topics in Algebra by Herstein, Vikas.
2. A First Course in Abstract Algebra by Fraleigh, Addison-Wesley.
3. Modern Algebra by Vasishtha, Krishan Prakashan Media Pvt. Ltd.
4. Higher Engineering Mathematics by Kreyszig, Wiley.
5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
6. Basic Abstract Algebra, 2<sup>nd</sup> Edition by P B Bhattacharya, S K Jain and S R Nagpal, Cambridge University Press.
7. Linear Algebra by K.Hofman and R.Kunze, Pearson Education.
8. Modern Algebra – An Introduction by Durban, 5<sup>th</sup> Edition, Wiley.
9. Algebra by Michael Artin, Prentice Hall of India Pvt. Ltd.
10. A Brief Survey of Modern Algebra by Birkhoff and Maclane, IBH.

## VII # M.9 MATHEMATICS

### LINEAR ALGEBRA

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **COURSE CONTENT:**

##### **Unit I: Vector Spaces – I**

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence and Linear independence of vectors, Basis and Dimension, Finite dimensional vector space – some properties.

##### **Unit II: Vector Spaces - II**

Quotient spaces, Homomorphisms of vector spaces, Isomorphism of vector spaces, Direct sums, Inner product spaces, Euclidean vector spaces, Distance, Length, Properties, Orthogonal vectors, Gram Schmidt Orthogonalisation Process, Orthogonal complement.

##### **Unit III: Linear Transforms – I**

Linear maps as matrices, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems.

##### **Unit IV : Linear Transforms - II**

Singular and non-singular linear transformations, Elementary matrices and transformations, Similarity, Eigen values and Eigen vectors, Diagonalisation and Eigen vectors, Characteristic polynomial, Cayley, Hamilton Theorem, Minimal Polynomial.

#### **References :**

1. Theory and Problems of Linear Algebra, Seymour Lipschitz, Schaum Outline Series.
2. Introduction to Linear Algebra by Stewart, Van Nostrand Co. Ltd.
3. Modern Algebra, Vol.II, by Narayanan and Manicavachagam Pillay, S. Vishwanathan and Co.
4. Brief Survey of Modern Algebra, Birkhoff and MacLane, IBH
5. Linear Algebra by Sergr Lang, Addison Wesley Publishing company Inc.
6. Vector Algebra, Shantinarayan and P K Mittal, S Chand and Co. Ltd.
7. Linear Algebra by Larry Smith, Springer Verlag.
8. Elementary Linear Algebra with Applications, Keith Nicholson, PWS – Kent Publishing Company
9. Linear Algebra, Surjith Sinth, Vikas Publishing House Pvt. Ltd.
10. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.



**VII#P.7 PHYSICS  
THEORY**

**ATOMIC AND MOLECULAR PHYSICS**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives :** To enable students to apply the basic knowledge of classical and quantum mechanics at the atomic and molecular level.

**COURSE CONTENT:**

**Unit I : X-Rays (10 hrs)**

Continuous X-ray spectra. Duane and Hunt limit. Characteristic X ray spectra, Moseley's law and its significance, X-ray energy levels. Bragg's law and Bragg spectrometer. A brief mention of different types of crystals. Structures of NaCl and KCl crystals. Compton Effect – Expression for Compton Shift.

**Unit II : Atomic Spectra (16 hrs)**

**The Electron :** Determination of  $e/m$  of an electron by Thomson method, Determination of charge of an electron by Millikan's oil drop method.

**Atomic Spectra :** Inadequacy of Bohr atomic model, correction due to finite mass of the nucleus, Rydberg constant in terms of reduced mass, Excitation and Ionisation potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, vector model of an atom, Electron spin, space quantisation, magnetic moment of an electron due to its orbital motion. Stern-Gerlach experiment and its theory.

Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules. Pauli's exclusion principle. Electronic configuration of atoms. Valence electron and a brief mention of L-S and J-J coupling for trio electron atoms.

**Zeeman effect:** Explanation of Zeeman effect on the basis of vector model of atom, Expression for Zeeman shift and experimental details. Mention on anomalous Zeeman effect, A qualitative mention of Paschen – Back effect.

**Unit III : Molecular Spectra (10 hrs)**

Molecular formation, the  $H_2^+$  molecular ion,  $H_2$  – molecule. Salient features of molecular spectra.

Rotation, vibration and electronic spectra of molecules, associated quantum numbers and selection rules. Theory of pure rotation and rotation- vibration spectra, Raman and IR spectra, simple applications.

**Unit IV : Electromagnetic Theory And Maxwell's Equations (12 hrs)**

Displacement current, Setting up of Maxwell's equations in SI units, Hertz experiment, Travelling electromagnetic wave, Wave equations (qualitative and quantitative) – Energy transport and Poynting vector, Poynting theorem. A radiation pressure (Normal and Oblique incidence). Concept of electric dipole, magnetic dipole, expression for energy radiated by a dipole (No derivation)

**References**

1. Introduction to Modern Physics, Mani and Mehta.
2. Perspectives of Modern Physics Beiser.
3. Electromagnetism, Reitz and Milford.

**PHYSICS PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

**Objectives:**

To develop the ability to set up apparatus, to collect and analyse the data to determine the desired physical quantity.

**COURSE CONTENT:**

Experiments on :

- A. Biprism
- B. Spectrometer
- C. Series and Parallel Resonance
- D. Current balance-magnetic induction
- E. Coupled oscillations
- F. Polarimeter
- G. Interference – air wedge
- H. Resolving power
- I. Michelson interferometer

**References**

1. Practical Physics, E. Armitage, John Murray.
2. Advanced Practical Physics, Worsnop and Flint.
3. Physics Laboratory Instructions, RIE, Mysore.

## VII#C.7 CHEMISTRY THEORY

### ELECTROCHEMISTRY AND PHOTOCHEMISTRY

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

#### Objectives:

- Explain the nature of Electrolytic conduction involving theories of electrolytes.
- Understand the processes that occur at electrodes and in electrolytes and to apply emf methods to study different types of reactions.

#### COURSE CONTENT

##### Unit I: Electrochemistry – I

To study the behaviour and reactions of ions in a variety of environments through the laws that govern them. Electrical transport – conduction in metals and in electrolyte solutions, specific conductance and equivalent conductance, measurement of equivalent conductance, variation of equivalent and specific conductance with dilution.

Migration of ions Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, weak and strong electrolytes, Ostwald's dilution law, its uses and limitations. Debye-Huckel-Onsager's equation for strong electrolytes (elementary treatment only). Transport number, definition and determination by Hittorf method and moving boundary method.

Applications of conductivity measurements : Determination of degree of dissociation, determination of  $K_a$  of acids, determination of solubility product of a sparingly soluble salt, conductometric titrations.

##### Unit II: Electrochemistry – II

Types of reversible electrodes – gas-metal ion, metal-metal ion, metal-metal insoluble salt, Amalgam and redox electrodes. Electrode reactions, Nernst equation, derivation of cell E.M.F. and single electrode potential, standard hydrogen electrode-reference electrodes – standard electrode potential, sign conventions, electrochemical series and its significance.

To draw up a scheme for discussing the equilibrium position for an ionic reaction in terms of the electrode potential. Electrolytic and Galvanic cells – reversible and irreversible cells, conventional representation of electrochemical cells.

EMF of a cell and its measurements. Computation of cell EMF, Calculation of thermodynamic quantities of cell reactions ( $\Delta G$ ,  $\Delta H$  and  $K$ ), Chemical cells with and without transport.

### **Unit III : Electrochemistry – III**

Concentration cell with and without transport, liquid junction potential, application of concentration cells, valency of ions, solubility product and activity coefficient, potentiometric titrations.

Definition of pH and  $pK_a$  determination of pH using hydrogen, quinhydrone and glass electrodes, by potentiometric methods. , polarization, over potential and hydrogen over voltage Power storage, Lead Battery, Ni-Cd cells, Fuel Cells, Hydrogen – Oxygen cell. Thermodynamic and Kinetic basis of corrosion, methods of inhibition of corrosion

### **Unit IV : Photochemistry**

Discussing the Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus – Drapper law, Stark – Einstein law, Jablonski diagram showing various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radioactive processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples), Chemiluminescence.

### **References :**

Sl.nos 2 to 4 of II Semester

## **CHEMISTRY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

### **COURSE CONTENT**

1. To study the effect of dilution on Molar Conductivity of weak and strong electrolytes.
2. Conductometric titrations
3. Construction and measurement of EMF of Cells.
4. Potentiometric Titrations.

**References :** Same as in II semester

**VII # B.7 BOTANY**  
**THEORY**  
**CELL BIOLOGY AND GENETICS**

**Credits : 4 (3L + 0T +1P)**  
**Contact hrs per week: 6**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

**Objectives:**

- To understand the structural complexity of eukaryotic cell;
- To understand the functioning of cell organelles;
- To acquaint students with the structure, significance of nucleus and chromosomes;
- To review Mendelian inheritance in the light of gene interactions.

**COURSE CONTENT**

**CELL BIOLOGY**

**Unit I :**

- a) **Principles of microscopy** – Light, fluorescent, phase contrast, UV and electron microscope.
- b) Ultrastructure of prokaryotic and eukaryotic cells.
- c) **Cell- organelles** : Ultrastructure and functions of cell wall, plasmamembrane, Golgi complex, Endoplasmic reticulum, Mitochondrion.

**Unit II :**

- a) Ultrastructure and functions of chloroplast, ribosome, lysosome and microbodies.
- b) **Nucleus** – Ultrastructure of eukaryotic nucleus.
- c) **Chromosomes** – Brief account of morphology and organization of prokaryotic and eukaryotic chromosome; Nucleosome model, concept of karyotype and idiogram (brief).
- d) **Chromosomal alterations** : (i) Structural variations – Deletion, Duplication, Translocation and Inversion. (ii) Numerical Variations – Aneuploidy and euploidy.

**Unit III:**

**Cell Division** : Cell-cycle, events of cell division, karyokinesis, cytokinesis, cell-cycle; Mitosis, Meiosis and their significance.

**GENETICS**

- a) **Mendelism** – Review of Mendel's laws of inheritance, solving problems related to Mendel's laws.
- b) **Inheritance of genes** : Incomplete dominance, complementary gene action (flower colour in sweet pea), supplementary gene action (coat colour in mice), epistasis (fruit colour in summer squash), multiple factor inheritance (ear size in maize).

**Unit IV :****(12 hrs)**

- a) Sex determination in plants – *Melandrium*.
- b) **Cytoplasmic inheritance** – plastid inheritance in *Mirabilis*, cytoplasmic male sterility in maize.
- c) **Genetic variations** : Mutations – spontaneous and induced, transposable genetic elements.

**References:**

1. Snustad D.P. and M.J.Simmons 2000, Principles of Genetics, John Wiley & Sons, Inc. USA.
2. Gupta, P.K.1999, A Textbook of Cell and Molecular Biology, Rastogi Publications, Meerut.
3. Wolfe,S.L.1993, Molecular and Cell Biology, Wadsworth Publishing Co., California, USA.
4. Harris, N. and K.J.Oparka, 1994, Plant Cell Biology : A Practical Approach, IRL Press, Oxford Univ.Press, Oxford, UK.
5. Singh, S.P. and B.S.Tomar, 2006, Cell Biology, Rastogi Publications, Meerut.
6. Gupta, P.K. 2005, Elements of Genetics, Rastogi Publications, Meerut.
7. Gardner, A.,1990, Principles of Genetics (6<sup>th</sup> Ed.), John Wiley & Sons Inc., USA.
8. Gupta P.K. 2000, Cytology, Genetics and Evolution, Rastogi Publications, Meerut.
9. Atherly, A.G. J.R.Girton and J.F.MacDonald, 1999, The Science of Genetics, Saunders College Publishing, Fortworth, USA.
10. Russel,P.J. 1998, Genetics, The Benjamin/Cummings Publishing Co. Inc., USA.
11. Gunning, B.E.S. and M.W.Steer 1999, Plant Cell Biology, Structure and Function, Jones & Bartlett Publishers, Boston, Massachusettes.

**BOTANY PRACTICALS****Exam Duration : 3 hrs****C<sub>3</sub> : 50****Objectives :**

- To develop skills of staining cells and observing cell organelles.
- To prepare temporary and permanent cytological preparations of suitable plant materials to study mitosis and meiosis.
- To verify Mendelian laws of inheritance.

**COURSE CONTENT :**

1. Comparative study of cell structure in onion cells, *Hydrilla* and *Chara/Spirogyra*. Study of cyclosis in *Tradescantia* staminal cells.
2. Study of plastids to examine pigment distribution in plants (e.g. *Cassia*, *Lycopersicon* and *Capsicum*)

3. Examination of electron micrographs of virus, bacteria, Cyanobacteria. and eukaryotic cells with special reference to organelles;
4. Study of various stages of mitosis and meiosis by preparing slides of suitable plant materials (onion root tips and onion flower buds).
5. Working out the laws of inheritance using seeds/ beads.
6. Working out genetic problems related to Mendelian laws of inheritance and interaction of genes.

## VII SEMESTER B.Sc.Ed.

### Z-7: ZOOLOGY

#### THEORY – ‘CELL BIOLOGY, MOLECULAR BIOLOGY AND IMMUNOLOGY’

**Credits : 4 (3L + 0T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

To enable students to comprehend the modern concepts and applied aspects of cell biology, molecular biology and immunology

#### **COURSE CONTENT:**

##### **Unit I: Cell and Organelles – I**

- a) Cell theory; Protoplasm and its properties (2)
- b) Cell membrane – ultrastructure, fluid mosaic model and functions (2)
- c) Structures and functions of Lysosomes, Endoplasmic reticulum and Golgi complex (3)

##### **Unit II: Cell Organelles – II and Cell Cycle**

- a) Structures and functions of
  - i) Ribosomes (1)
  - ii) Mitochondria (2)
  - iii) Nucleus (2)
- b) Cell-cycle; Mitosis; Meiosis; Theory of chiasma formation (2)

##### **Unit III: Molecular Biology**

- a) **Chromosomes** - structures and karyotype, euchromatin, heterochromatin, ultra structure, molecular structure, chemical composition and functions of chromosomes; Giant chromosomes – polytene and Lampbrush chromosomes (4)

**b) Nucleic Acids:** DNA - structure and replication; RNA- types, structure, synthesis (transcription) and functions; Protein synthesis – genetic code, central dogma and translation (4).

#### **Unit IV: Immunology and Cancer Biology**

**a) Immunology:** Immunity – types and immune organs; Antigen and antibody– structures, types, and reaction (2); Humoral and cell – mediated immunities (1); Major Histocompatibility; Autoimmunity; and hypersensitivity (2); AIDS - Structure of HIV, mechanism of immune deficiency and preventive measures (1).

**b) Cytology of Cancer** – Characteristics of cancer cell, hypothesis about cancer; somatic mutation, viral mutation; types and causes of cancer, treatment (2).

#### **References:**

1. Cell and Developmental Biology by Sastry, Singh & Tomar – (Rastogi Publications, 2008).
2. Cell and Molecular Biology by P.K. Gupta – (Rastogi Publications, 2008).
3. Cell Biology by C.B.Powar – (Himalya Publishing House, Bombay).
4. Cell Biology by De Robertis *et.al* – (W.B. Saunders, Philadelphia).
5. A Textbook of Cytology by R.C.Dalela & S.R.Verma – (Jaiprashnath & Co., Meerut).
6. Cell Biology by J.D. Burke – (Scientific Book Agency, Calcutta).
7. Cell Biology: A molecular approach by R.D. Dyson – (Allyn & Bacon, Boston).
8. Cell Biology by R.M.Dowben – (Harper & Row, New York).
9. Cell function by L.L.Langley – (Affiliated East West Press, New Delhi).
10. Cytology by C.D. Darlington.
11. Immunology by S.S. Lal & Sanjeev Kumar – (Rastogi Publications, 2008).
12. Immunology by Janis Kuby.
13. Genes (Vol. I – VII) by Levin B. – CBS Publishers.
14. Cell and Molecular Biology by De Robertis EDP & De Robertis EMI. Jr (1996) – Holt WB Saunders International.
15. Essentials of Molecular Biology by Feirfelder I (1997) – Narosa Publ. New Delhi.
16. Cytology, Genetics & Evolution by Gupta PK (1992) – Rastogi Publications.
17. Molecular Cell Biology by Harvey L, Baltimore D, Berk A. *et al.*, (1999) – Scientific American Source Book.
18. Principles of Biochemistry by Lehninger AL, Nelson DL & MM Cor (1993) – Kalyani Publishers, New Delhi.
19. Cytology & Cytogenetics by Swanson CP (1972) – MacMillan Co.
20. Animal Cytology and Evolution by MJD White – Cambridge University Press.



## ZOOLOGY PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives:**

To develop the cytological techniques and preparation of slides to study mitosis and meiosis and cell structures; to develop skills of mounting giant chromosomes; to develop skill of using gel-electrophoresis for antigen-antibody reaction.

### **COURSE CONTENT:**

1. Staining of mitochondria in the buccal epithelial cells of man and ovary of earthworm using vital stain.
2. Study of mitosis in onion root tips.
3. Micrometry: Use of ocular and stage micrometers to measure cell and nuclear dimensions of human buccal epithelial cells.
4. Study of slides of grasshopper (*Poecilocera picta*) testis for the various stages of meiosis.
5. Study of salivary gland chromosomes of *Drosophila* for banding patterns.
6. Study of salivary gland chromosomes of chironomous larva.
7. Study of Karyotype and idiogram of man.
8. Isolation of DNA from kidney/spleen of rat (demonstration).
9. Demonstration of antigen-antibody reaction in gels.
10. Cytological characterization of DNA by Feulgen staining (demonstration).

**VII # IP.1 INTERNSHIP PROGRAMME**  
**METHODOLOGY 1**

**Credits: 4 (0L+ 0T+4P)**

**Marks : 100**

**C<sub>1</sub> + C<sub>2</sub> = 50**

**C<sub>3</sub> = 50**

**Objectives:**

To provide on the job/field experience to the students to develop competencies and skills required for effective classroom teaching; class management; evaluation of student learning; organization of cocurricular activities; working with the community; to enable students to develop proper professional attitudes, values and interests; to establish a closer professional link between RIE Mysore and schools in the region.

**COURSE CONTENT:**

The course is organized into activities distribution over three phases.

**Phase 1 : Pre-internship (C<sub>1</sub>)**

**Phase 2 : Internship (C<sub>3</sub>)**

**Phase 3 : Post-Internship and Critical Reflection of Internship Experience(C<sub>2</sub>)**

**VII # IP.1 INTERNSHIP PROGRAMME**  
**METHODOLOGY 2**

**Credits: 4 (0L+ 0T+4P)**

**Marks : 100**

**C<sub>1</sub> + C<sub>2</sub> = 50**

**C<sub>3</sub> = 50**

**Objectives:**

To provide on the job/field experience to the students to develop competencies and skills required for effective classroom teaching; class management; evaluation of student learning; organization of cocurricular activities; working with the community; to enable students to develop proper professional attitudes, values and interests; to establish a closer professional link between RIE Mysore and schools in the region.

**COURSE CONTENT:**

The course is organized into activities distribution over three phases.

**Phase 1 : Pre-internship (C<sub>1</sub>)**

**Phase 2 : Internship (C<sub>3</sub>)**

**Phase 3 : Post-Internship and Critical Reflection of Internship Experience(C<sub>2</sub>)**

## VIII SEMESTER

### VIII # IC.1 INDIAN CONSTITUTION AND HUMAN RIGHTS

**Credits : 1(0L + 1T + 0P)**

**Contact hrs per week: 2**

**Marks :100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

On completion of this course, the student teacher will be able to

- know the importance, preamble and salient features of Indian Constitution
- appreciate the significance of Fundamental Rights, Duties and Directive Principles of State Policy.
- develop an understanding of the strength of the Union Government.
- understand the functioning of the State Government for the unity and the strength of the Democracy.
- know the importance of local self Government and Panchayati Raj Institutions in India.
- know the meaning, significance, the growing advocacy of Human Rights.

#### **Transaction Mode:**

Through Lectures, Group discussions, Interactive sessions, field activities and use of Education Technology.

#### **COURSE CONTENT:**

##### **Unit I: Meaning and Importance of the Constitution (16 hrs)**

(a) Preamble, Salient features, Constituent Assembly and the Spirit of the Indian Constitution.

(b) Fundamental Rights, Duties and Directive Principles

Fundamental Rights, Fundamental Duties, and the Directive Principles of the state policy of the Indian Constitution.

(c) Union, State and Local Self Governments

Union Government: Parliament, the President and Prime Minister: State Government: Governor and the Council of Minister: Judiciary: Functions and Powers: Panchayat Raj System.

##### **Unit II: Human Rights (16 hrs)**

Origin and Development of Human Rights, Growing Advocacy and Declining Trends of Human Rights, Rights of Scheduled Casts, Scheduled Tribes, Minorities, Children and Women, Human Rights Defenders, Human Rights Violation and Human Rights Organisations.

**References:**

1. M.V.Pylee, **Indian Constitution**, OUP, New Delhi
2. Granville Austin, **Indian Constitution**, OUP, New Delhi
3. Rajani Kotari, **Politics in India**, OUP, New Delhi
4. Johari, J C, **Indian Government and Politics**.
5. S R Maheswari, **Local Governments in India (Latest Edition)**
6. R K Arora and Rajani Goyal, **Indian Public Administration 1995**.
7. C P Bhambri, **Introduction to Indian Constitution**.
8. Subash C Kashyap, **The Working of Indian Constitution**, NBT, New Delhi
9. Subash C Kashyap, **Our Parliament**, NBT, New Delhi
10. Granville Austin, **Functioning of the Indian Constitution**, NBT, New Delhi.
11. Bipan Chandra, **India after Independence**. Roopa, New Delhi 2000.
12. Arjun Dev, **Source Book on Human Rights**, NCERT, New Delhi.
13. **Human Rights in India : Theory and Practice**, National Book Trust, 2001.

**VIII # EDU.5 SECONDARY EDUCATION IN INDIA:  
STATUS, ISSUES AND CONCERNS**

**Credits: 3 (2L + 1T + 0P)**  
**Contact hrs per week: 4**  
**Exam Duration: 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

**Objectives :**

This course is designed to help student-teachers to understand the concept, objectives and nature of secondary education. examine the status of development of secondary education in India. understand the interventions required to solve the problems and issues in imparting quality education in secondary schools. develop the ability to identify the problems and issues of secondary school teachers.

**Transaction Mode:**

Lecture-cum-discussion, Group discussion, Panel discussion, Seminar, Group Work, Library work.

**COURSE CONTENT:**

**Unit I: Concept, Nature and Purpose of Secondary Education**

Concept of secondary education, aims, objectives, scope and nature of secondary education, functions of secondary schools, Linkages with elementary and senior secondary stages. Problems of teacher training, Role of NCTE and Curriculum Reforms; Alternative schooling; Continuing Education Centers and problems of Out of School Children.

**Unit II : Status of Secondary Education**

Present situation of secondary education in the country. Universalisation of secondary education – access, enrolment, retention and learning achievement of students, Structure and systems of schools, Concept of RMSA; Examination Reforms, administration and financing of secondary education.

**Unit III : Quality Education at Secondary Level**

Concept of quality in education; quality Indicators/related to planning and organization of learning experience, learning environment (Physical and Academic), problems and challenges to quality improvement, through setting standards of performance and monitoring, Improving internal efficiency of the school system, teacher recruitment, their working conditions and staff morale.

**Unit IV: Secondary School Teacher**

Issues related to professionalism – code of professional ethics for Teachers; changed role of the teacher in the new millennium – learning facilitator and diagnostician, Issues related to teacher motivation, working condition both in urban and rural areas, job satisfaction, issues related to teacher's role performance and role perception, role

ambiguity role over load, role stress and strain, accountability of teachers. Role of teacher organizations and unions in the development and improvement of quality education at the secondary school level.

### **Sessional Work:**

- Preparing status report on secondary education in a chosen block/district with reference to access, enrolment and dropout.
- Preparing a report on the existing status of the teachers, method of recruitment and salary structure.
- Visits to different types of secondary schools and preparation of school profiles.
  - Conduct interview with teachers/students/parents of different schools and prepare a report on problems of secondary education.
  - Visit to alternative education centers at secondary level and preparation of a report.
  - Survey of educational needs of disadvantaged/disabled.

### **References:**

1. Chopra, R.K.(1993) Status of Teachers in India, NCERT, New Delhi.
2. Govt. of India (1953) Report of Secondary Education Commission, New Delhi.
3. Govt. of India (1966) Indian Education Commission (1964-66) Report. New Delhi.
4. Govt. of India (1986/1992) National Policy of Education, 1992, Modification and their POA's MHRD, Deptt. of Education.
5. Kundu, C.L. (Ed) (1984) Indian year Book on Teacher Education, Sterling Publishers Pvt. Ltd., New Delhi.
6. Malhotra, P.L. (1986) School Education in India : Present status and Future Needs, NCERT, New Delhi.
7. NCERT (1997) Code of Professional Ethics for Teachers.
8. NCTE (1998) Competency Based and Commitment Oriented Teacher Education for Quality School Education, Pre-service and in-service programme, New Delhi.
9. NCTE (1998) Policy Perspectives in Teacher Education, New Delhi Peters, R.S. (1971) Ethics and Education, George Allen Unwin Ltd. London.
10. Singh, R.P. (Ed) Teacher Training in India-Looking Ahead Federation of Management & Educational Institutions, New Delhi.

**VIII # Edu.6(a) : INCLUSIVE EDUCATION  
(Optional)**

**Credits: 3 (2L + 1T + 0P)**  
**Contact hrs per week: 4**  
**Exam Duration: 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub> : 50**  
**C<sub>3</sub> : 50**

**Objectives**

After going through this course the student teacher would be able to

- understand the meaning, scope and importance of inclusive education
- identify the children with diverse needs in the classroom
- manage students in inclusive classroom by adapting appropriate strategies
- relate the use adaptation in assessment and evaluation strategies to ensure uniformity of the outcomes

**COURSE CONTENT:**

**Unit I : Introduction to Inclusive Education**

Concept meaning scope and challenges of inclusive education

Distinction between special education, integrated education and inclusive education and their merits and demerits

Creating inclusive environment – physical, social and emotional (barrier free environment)

Facts and myths of inclusive education with particular reference to Indian context

Factors influencing inclusive education

**Unit II: Nature and needs of Students with Diverse Needs (SWDN)**

- Definition, types and classification of SWDN (HI, VI, MR, OH, CP, neuromuscular disorders, LD, special health problems, gifted, creative, SC, ST, girl students, rural students, students from linguistic minority, street children migrant workers children and orphans)
- Characteristics and educational needs of SWDN based on research evidence
- Supportive resources and services for children with SWDN in inclusive education

**Unit III: Educational Strategies and Management**

Importance and need for adaptation (content and methodology for various subjects taught at secondary level for different categories of students coming under diverse needs)

Guidelines for adapting teaching science, social studies, mathematics and languages at the secondary level

Educational measures for effective implementation of inclusive education.



#### **Unit IV: Assessment and Evaluation of SWDN**

Teachers' role in implementing reforms in assessment and evaluation in inclusive education

Type of adaptations / adjustment in assessment and evaluation strategies used for students with diverse needs

Importance of continuous and comprehensive evaluation

Programmer of procedures used for Placement, grading, promotion, certification to bring uniformity in assessment

Role of parents, head masters and teachers in ensuring equal educational opportunities for these students

#### **Sessional work**

Tutorial - Readings on PWD Act, RTE Act, IEDSS, SSA, RMSA and their implications for inclusive education

Tutorial – visit to special schools for observing the behaviours of students with VI, HI, MR, LH.

Tutorial – Visit to AIISH to observe how to deal with assessment and for the students with diverse needs

Tutorial – Discussion of the reports of the visits to schools / AIISH

Tutorial – Lesson planning for inclusive classroom in their respective areas

#### **Reference**

1. Baker, E. T., Wang, M. C. & Walberg, H. J. (1998). 'The effect of inclusion on learning', in Nutbrown, C., & Clough, P. (2006) *Inclusion in the Early Years*, London, Sage
2. Biwako Millennium Framework for Action towards an Inclusive, Barrier-free and Rights-based Society for Persons with Disabilities in Asia and the Pacific (2002).
3. Internet Source, MHRD (2005b). 'Action Plan for Inclusive Education of Students and Youth with Disabilities',
4. Internet Source, SSA (2002). 'Basic features of SSA', Inclusive education in SSA, Retrieved from [www.ssa.nic.in](http://www.ssa.nic.in) / inclusive\_education / ssa\_plan\_manual
5. Jangira, N. K. (2002) Special educational needs of students and young adults: an unfinished agenda, in: M. Alur & S. Hegarty (Eds) *Education and students with special needs: from segregation to inclusion* New Delhi, Sage.
6. Jhulka, A. (2006) *Including students and youth with disabilities in education – a guide for practioners* NCERT, New Delhi
7. Hallahan, D.P., Kauffma, J.M., Pullen, P.C. (2009). *Exceptional Learners – An Introduction to Education* (11<sup>th</sup> Ed) Allyn & Bacon, Pearson Education, Inc. USA.
8. Kauffman, J. M. & Hallahan, D. P. (Eds): (1982). 'Handbook of Special Education', New York: Prentice Hall Inc.
9. King S. & Margaret. E. (1994). 'Curriculum based assessment in special education', California: Singular Publishing group Inc.
10. Luftig, L. R. (1989). 'Assessment of Learner with special needs' Boston, Allyn & Bacon.

11. Mani, M.N.G. (2000). *Inclusive Education in Indian Context*. International Human Resource Development Center (IHRDC) for the Disabled, Coimbatore: Ramakrishna Mission Vivekannanda University
12. Mangal, S.K. (2007). *Educating Exceptional Students – An Introduction to Special Education*. New Delhi: Prentice hall of India Pvt. Ltd.
13. Ministry of Human Resource Development (2005) *Action plan for inclusion in education of students and youth with disabilities* (New Delhi, Government of India).
14. Ministry of Social Justice and Empowerment (2006) *National Policy for persons with disabilities* (New Delhi, Government of India).
15. Narayan, J. (1997). *Grade Level Achievement Devices*, Secunderabad, NIMH.
16. Nutbrown, C. C. (2006). 'Inclusion in the early years', London: Sage Publications Ltd.
17. Oslon, J. L., and Platt, J. M. (1992). *Teaching students and adolescents with special needs*. McMillan publishing company limited, USA.
18. *Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995*
19. National Sample Survey Organisation (2003) *Disabled persons in India, NSS 58th round* (New Delhi, Government of India).
20. *Right to Education Bill (2005 Draft, enacted 2009)* Available online.
21. Rehabilitation Council of India (2005) *Annual Report, 2003–04*, Rehabilitation Council of India, New Delhi.
22. Salamanca Statement and Framework for Action on Special Needs Education (1994).
23. Smith, T .E. C., Polloway, E. A., Patton, J. R., & Dowdy, C. A. (2001) *Teaching Students with Special needs in Inclusion Setting*. (3 Ed). Allyn & Bacon.
24. Swarup, S. (2007). *Inclusive Education, Sixth Survey Of Educational Research 1993 N.Delhi.: 2000*. NCERT.
25. Wood, J. W., and Lazzari, A. M. (1997). *Exceeding the boundaries: Understanding Exceptional Lives*. Harcourt Brace and Company, USA.
26. Murphy, P.F and Gipps, C.V. (1996) *Equity in the classroom: Towards effective Pedagogy for girls and boys* (Ed) The Faluer Press, UNESCO Publishing
27. Abdelnoor, A. (1999) *Presenting Exclusions*. Heinemann Educational Publishers, Oxford
28. Ruhela S. P. (1996) *India's struggle to universalize Elementary Education* M D Publications Pvt. Ltd New Delhi
29. Burrello N. C., Lashley C, and Beatty E. E. (2001) *Educating all students together. How school leaders create Unified System*. Corwin Press, Inc., Sage Publication Company.
30. Hegarty S and Alur M (2002) *Education and Children with special needs – from Segregation to Inclusion* (Ed) Sage Publication
31. Thompson, S.J., Quenemoen R. F Thurlow M. L., Ysseldyke J. E (2001) *alternate assessments for students with disabilities*. Crowin Press, Inc and Council for Exceptional Children.
32. Rogers, B (2004) *Behavior Recovery* (2<sup>nd</sup> Ed) Paul Chapman Publishing.

33. Ainscow M and Tweddle D.A. (1979) Presenting classroom Failure – an Objective approach. John Wiley and sons
34. Sabatino D. A. and Mauser A. J. (1978) Intervention strategies for specialized secondary education. Allyn and Bacon, Inc.
35. Danforth, S. and Smith T. J. (2005) Engaging Troubled Students – A constructivist Approach. Corwia press – A Sage Publication Company
36. White W. F (1971) Tactics for teaching the disadvantaged Mcgraw – Hill book Company
37. Gearheart, B. R; Weishahn, M. W; Gearheart C. J. (1992) The Exceptional Student in the Regular classroom (5<sup>th</sup> Ed.) Macmikas Publishing company.
38. Salvia, J; Yesseldyke, J. E; Bolt, S (2010) Assessment in special and Inclusive Education (11<sup>th</sup> Ed) Wadsworth Cengage Learning U S A.

### **VIII# Edu.6(b) GUIDANCE AND COUNSELLING IN SCHOOLS (Optional)**

**Credits: 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration: 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives**

On completing the course student teachers would be able to:

- Aware about various problems faced by the students in schools;
- Recognize the need for guidance and counseling in schools;
- Familiarize with various guidance services in school;
- Develop resources for guidance activities in schools;
- Plan a minimum guidance programme for a school.
- Develop understanding about the role of school in guidance.

#### **COURSE CONTENT:**

##### **Unit I: Self-Understanding of the Learner**

- Helping learners to understand self: ones own self, strengths and weaknesses, self-esteem, self concept, self-confidence;
- Role of Guidance and Counselling: concept, need for guidance, guidance services, nature, scope and different approaches to guidance and counselling.

##### **Unit II: Needs and Problems of Learners in Schools**

- Academic: difficulties in learning, attention, underachievement, stress, indiscipline, drop-outs, school violence

- Socio-personal: behavioral, psychological, attitudinal problems,
- Vocational: career planning, career development and career information
- Differently abled, disadvantaged, creative and talented group of students

### **Unit III: Developing Resources in Schools for Guidance**

- Human resources: Role of teacher, teacher-counsellor, career master, counsellor, medical officer, psychologist and social worker;
- Physical and Material resources: career corner, career literatures including charts and posters, psychological tests, materials and their uses
- School community linkages, role of PTAs, guidance committee, referral agencies.

### **Unit IV: Minimum Guidance Programme for the School**

- Group Guidance activities: orientation programmes, class talks and career talks, career exhibitions, workshops and group discussions
- Counselling: Individual and group counselling
- Testing Programmes: Mental ability, interest, attitude and aptitude
- Development and maintenance of cumulative records

### **Sessional Work**

- Study the problems of school children and probable guidance interventions.
- Identify and prepare a list of problem of students in school that can be addressed through a teacher counsellor.
- Plan a minimum guidance programme for a school at the secondary stage.
- Identification of probable cases from school students for providing counseling services and prepares a report.
- Develop materials for organizing career information activities for primary, upper primary, secondary and higher secondary stages.
- Prepare a directory of emerging career options for the youth in India.
- Review any one psychological test under different categories such as: Intelligence, Aptitude, personality and Interest.
- Plan and conduct a class talk and a career talk for secondary school students on identified themes.
- List out the nature of job of a school counselor in terms of their major and minor duties and other responsibilities.
- Prepare a status paper on the guidance services in Indian Schools.
- Make a directory of the Courses offered by the Institutions engaged in preparing school counsellors in India.

### **References**

- Anastasi, A and Urbina, S (1997). Psychological Testing (7<sup>th</sup> Edn). Upper Saddle River, NJ: Prentice Hall.
- Bhatnagar, Asha and Gupta, Nirmala (Eds.) (1999). Guidance and Counselling: A theoretical Perspective; Volume-I, New Delhi: Vikas Publishing House Pvt. Ltd.
- Bhatnagar, Asha and Gupta, Nirmala (Eds.) (1999). Guidance and Counselling: A theoretical Perspective; Volume-II, New Delhi: Vikas Publishing House Pvt. Ltd.
- Gibson R L and Mitchell, M H (2003). Introduction to Counselling and Guidance. New Delhi: Prentice-Hall.
- Gysbers and N C and Hendrerson E (2006). Developing and Managing Your School Guidance and Counselling Programme (4<sup>th</sup> Edn.). Alexandria, VA: American Psychological Corporation.
- Saraswat, R K and Gaur J S (1994). Manual for Guidance Counsellors. New Delhi: NCERT.
- Mohan, S (1998). Career Development in India: Theory, Research and Development; New Delhi: Vikas Publishing House.
- Joneja G K (1997). Occupational Information in Guidance. Newq delhi: NCERT
- Mohan, S and sibia, A (1998). Handbook of Personality Measurements in India. New Dehli: NCERT
- Srivastava A K. (2003). Principles of Guidance and Counselling; New Delhi: Kaniksha Publishers and Distributors.

### VIII # Edu.6( c) CURRICULUM AND SCHOOL

**Credits: 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration: 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub> : 50**

**C<sub>3</sub> : 50**

#### **Objectives :**

This course is designed to facilitate student teachers to

- Understand the meaning of curriculum and its associated concepts
- Understand the influences of the knowledge categories, social, cultural, economic and the technological aspects in shaping the present school curriculum and the text books
- Identify various learning sites and resources operating as curriculum supports in the system
- Analyze the multiple roles of schools in implementation of curriculum
- Discuss the roles and responsibilities of curriculum stakeholders
- Reflect upon the role of teachers in operationalising the curriculum
- Analyze the elements, organization, scope, various perspectives, needs, priorities, curriculum concerns, changes in the pedagogical approaches, sequence, evaluation schemes and other reforms in the documents of National curriculum frame works

- Explore the school facilities , infrastructure and resources as curricular supports.
- Analyze the curricular materials with reference to NCF’s recommendations and insights into school pedagogy
- Develop an image of oneself as a curriculum informant, designer, agent, and evaluator

## **COURSE CONTENT:**

### **Unit I: Concept and determinants of curriculum**

- Meaning of Curriculum: curriculum as course content; program of studies; plan for action; planned learned experiences; The dynamics of hidden curriculum and its effects ; Core curriculum as an integrated dimension to knowledge fields and national priorities; Spiral curriculum (revisiting the concepts organized in the spiral form)
- Determinants of school curriculum : Nature of learner, needs and interests, and learning process; Forms of knowledge and disciplines, and their characterization in different school subjects ; Socio –cultural, economic, and political determinants; Multiculturalism, multilingual aspects, and societal aspirations; technological determinants
- Inequality in educational standards, need for common goals and standards; issues related to common school curriculum National goals and priorities:
- Trends in the curriculum of school education at national and state levels (with reference to National curriculum frameworks); National curricular frameworks  
Difference between curriculum framework, curriculum and syllabus

### **Unit II: Curriculum implementation in schools**

- Planning and converting curriculum into syllabus and learning activities
- Role of teacher in operationalising curriculum (Concept mapping, Long-range planning, daily lesson planning, creating learning situations, selecting learning experiences, choice of resources, planning assessments.
- Syllabus in different subject areas, time management, Text book as a tool for curriculum transaction, other learning resources such as ‘on learning’ and ICT, interactive videos, other technological resources.
- Community as a learning site in curriculum engagement
- Planning and use of curricular materials – teachers hand book, source book, work book, manuals, and other learning materials
- Role of National, Regional and State bodies in empowering the teachers in implementing curriculum

### **Unit III : School as a system for curriculum implementation**

- Concept of a school; its components; school climate, impact of different school climates. inter institutional differences
- Organization-concept, structure, components. School as an organization-mission, vision and core values. Factors influencing school environment.
- School plant,Physical and academic infrastructural facilities: Classrooms, Laboratories, Library, Auditorium, Sport fields,. Cricket pitch and ground,

tennis court, basket ball, Foot ball and Hockey grounds, Science Park, School garden and school museum and also Drinking water facility, sanitation and cleanliness in school campus.

- Human resources : competent teachers; resource from community; Community mobilization for various resources for better functioning of school and for curriculum implementation
- School as a site for conducive learning, for the overall physical, social and mental development of pupils' personality –one of the curricular goals

#### **Unit IV: Role of school in curriculum implementation**

- Planning: Types of planning-short term, annual plan; Strategic planning and goal setting; Institutional planning.  
Organization of curricular activities
  - i. Curricular-activities: Management of classroom teaching -learning activities, Managing Examination and Evaluation in school; Reducing stress and strain of students facing public examinations and enhancing their chances for better schooling; Classroom management for different types of instructional strategies; Group dynamics and its implications, Instruction in a diverse classroom
  - ii. co-curricular activities: organizing various cultural and club activities and competitions, school-level, inter-school-level, district and National level
- Planning various types of school schedules to implement the curriculum. General schedule, Alternate schedule and Innovative schedules developed by teacher and also by students; Principles involved in development of school time-schedule.
- Importance of Teacher-pupil ratio in curriculum implementation
- Monitoring and evaluation of teaching and learning, Role of supervision in improving instructional quality; feedback mechanisms for revising the curriculum-syllabus and textbooks based on the curricular practices in schools

#### **Transactional modalities**

Short lectures wherever required; engagement in curricular problems and issues followed by group work and discussions; assignments, and seminars ; Selection of readings of important curriculum articles, curriculum documents and review papers on curriculum documents which are research based followed by presentations; use of Power Points; video clippings; and films made by NCERT on NCF-2005. Use of exemplary materials such as text books, teachers handbook, source books for analysis and discussions; Documents of National Curriculum Frameworks from 1988 to the present ; Focus Group Reports related to NCF-2005; “ Learning without Burden” by Yashpal ; and organizing for school visits.

#### **Sessional activities**

Group work to analyze the curricular concepts  
school visits to study the factors required for implementing the curriculum in schools and write reflective experiences

Review of national curriculum frame works on school education and write a report for presentation and discussion...

Analysis of teachers' handbooks, text books, workbooks, source books followed by Power point presentations and report submission.

Interviews with class room practitioners and students who are the stakeholders to know their perceptions about the curriculum and the text books in use.

Readings of certain curriculum reviews and articles bearing significance to the course outlined and reflections on them

### **References :**

1. Alka Kalra (1977) Efficient School Management and Role of Principals, APH Publishing, New Delhi.
2. Bhagley Classroom Management, McMillan Co., New York.
3. Bhatnagar R P and Vearma (1978) Educational Supervision, Loyal Book Department, Meerut.
4. Buch M B Planning Education, Implementation and Development, NCERT, New Delhi. .
5. Curriculum Planning for better teaching and learning by J.G. saylor and W Alexander (Holt, Rinehart and Winston)
6. Dewey, John (1959): The child and the Curriculum, Chicago, The University of Chicago Press
7. Eugenia Hepworth Berger (1987), Parents as partners in Education : The school and home working together.
8. Giroux, Henry et.al ( 1981) : Curriculum and Instruction : Alternatives in Education by MC Cutchan Public corp, Printed in USA
9. Hilda T (1962): Curriculum and Development- Theory and Practice; Harcourt, Brace and World, Inc.
10. Howson, Geoffrey (1978): Developing a New Curriculum, London: Heinmann
11. Joseph Blasé and Jo Roberts Blasé (2003) : Empowering teachers : What successful principals do? Thousand Oaks, Cali: Corwin Press.
12. Marmar Mukhopadhyay (2005), Total quality management in Education, 2<sup>nd</sup> ed., New Delhi : Sage.
13. NCERT (1988) National Curriculum For Elementary and Secondary Education: A framework
14. NCERT (2000) National Curriculum framework For school Education
15. NCERT (2005) National Curriculum framework
16. Olivia, P (2004): Developing the curriculum (6<sup>th</sup> ed). Allyn & Bacon, Inc. ISBN: 0205412599
17. Position paper: National Focus Group on 'Curriculum, Syllabus, Textbooks', NCERT
18. Schubert W (1986): Curriculum Perspectives, Paradigms and Possibilities, Newyork: Macmillan
19. Sitaram Sharma (2005) : Educational supervision. New Delhi : Sri Sai Printographers.
20. Stuart Parker (1997). Reflective teaching in the post modern world : A manifesto for education in postmodernity. Buckingham : Open University Press



21. Sue Roffey (2004). The new teacher's survival guide to behaviour. London : Paul Chapman.
22. T K D Nair (2004). School planning and management : A democratic approach, Delhi : Shipra.
23. Thomas J Lesley, et al. (2002), Instructional Models: strategies for teaching in a diverse society, Belmont: Wordsworth.
24. Tony Bush, Ron Glatter, Jane Goodey and Colin Riches (1980), Approaches to school management, London : Harper and Row.
25. Yashpal Committee(1993): Learning without Burden , MHRD, India
26. Zias, R ( 1976): Curriculum Principles and Foundations; Newyork; Thomas Crow well

## VIII#M.10 MATHEMATICS

### Paper I

### COMPLEX ANALYSIS

**Credits : 3 (2L + 1T + 0P)**

**Contact hrs per week: 4**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives :**

To develop the understanding application of the concepts of complex analysis in problem solving situations. To enable and apply Numerical methods in solving problems related to real life situations with help of computers, which have become indispensable in modern world.

#### **COURSE CONTENT:**

##### **Unit I: Analytic Functions**

Introduction, Functions of a Complex Variable, Limits, Theorems on Limit, Continuous Functions, Differentiability, The Cauchy-Riemann Equations, Analytic Functions, Harmonic Functions, Conformal Mappings.

##### **Unit II: Transformations**

Introduction, Elementary Transformations, Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations, Some Special Bilinear Transformations, Discussion of mapping of  $w = z$ .

##### **Unit III: Complex Integration**

Introduction, Definite Integral, Cauchy's Theorem, Cauchy's integral Formula, Higher Derivatives.

##### **Unit IV : Power Series**

Introduction, Sequences and Series, Sequences and Series of Functions, Power Series, Elementary Functions.

**References:**

1. Complex Analysis by Ahlfors McGraw Hill International Edition.
2. Introduction to the Theory of Functions of a Complex Variable by Palka, Springer Verlag.
3. Complex Analysis by Serge Lang, Springer Verlag
4. Theory of Functions of a Complex Variable by Shanthinarayan, S. Chand and Co. Ltd.
5. Foundations of Complex Analysis by Ponnuswamy, Narosa Publishing House.
6. An Introduction to the Theory of Functions of a Complex Variable by Copson, Oxford University Press.
7. Complex Variables and Applications by Churchill, Brown and Verhey, McGraw Hill International Book Company.
8. Functions of One Complex Variable by Conway, Narosa Publishing House.
9. Theory and Problems of Complex Variables, Murray R. Spiegel, Schaum Outline Series, McGraw Hill Book Company.
10. Complex Analysis by Armugam, Tangapandi, Somasundaram, Scitech Publications Pvt. Ltd.

**VIII#M.11(a) MATHEMATICS****Paper II (Optional)****NUMERICAL ANALYSIS\*****Credits : 2 (1L + 1T + 0P)****Contact hrs per week: 3****Exam Duration : 2 hrs****Marks: 100****C<sub>1</sub> + C<sub>2</sub>: 50****C<sub>3</sub> : 50****COURSE CONTENT:****Unit I: Numerical Methods**

Numerical Solutions of Algebraic and Transcendental equations, Bisection Method, Method of false position, Iteration method, Newton-Raphson method, Secant Method, Numerical solutions of first order linear differential equations, Euler-Cauchy method, Modified Euler's method, Runge-Kutta fourth order method, Picard's method.

**Unit II: Finite Differences and Interpolation**

Finite differences, Forward and Backward differences, Shift operator, Derivative operator, Weierstrass theorem, Interpolation, Newton-Gregory forward and backward interpolation formulae, Divided differences, Lagrange's interpolation formula, Finding first and second derivatives using interpolation formulae, Difference equations.

**Unit III: Numerical Integration**

General quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Newton-Cotes quadrature formula, Gauss quadrature.

#### **Unit IV: Riemann Integration**

Upper and lower sums, Criterion for inerrability, Inerrability of continuous functions and monotone functions, Fundamental theorem of Calculus, Change of variables, Integration by parts, First and Second Mean Value Theorems of Integral Calculus.

#### **References**

1. Numerical Analysis by Guptha, S. Chand and Co. Ltd.
2. Finite Differnece and Numerical Analysis by Saxena, S.Chand and Co. Ltd.
3. Introductory Methods of Numerical Analysis by Shstry, PHI.
4. Numerical Methods for Scientists and Engineers, Grewal, Wiley Eastern Ltd.
5. Higher Engineering Mathematics by Grewal, Wiley Eastern Ltd.
6. Advanced Engineering Mathematics by Kreyszig, Wiley Eastern Ltd.
7. Numerical Calculus by William Edmund Milne, Princeton University Press.
8. Introduction to Numerical Analysis by Hildebrand, Tata McGraw Hill Publishing Ltd.
9. Numerical Analysis by Schield, Schaum's Outline Series.
10. Introduction to Numerical Methods by Peter A. Stark, MacMillan Co. Ltd.
11. Principles of Real Analysis by Malik, New Age International Ltd.
12. Textbook of Mathematical Analysis by Leadership Project, Bombay University, Tata McGraw Hill Publishing Media Pvt. Ltd.

### **VIII #M.11(b) MATHEMATICS Paper II (Optional) GRAPH THEORY\***

**Credits : 2 (1L + 1T + 0P)**  
**Contact hrs per week: 3**  
**Exam Duration : 2 hrs**

**Marks: 100**  
**C<sub>1</sub> + C<sub>2</sub>: 50**  
**C<sub>3</sub> : 50**

#### **COURSE CONTENT:**

##### **Unit I: Introduction**

The Konigsberg Bridge problem, Electric networks, Chemical Isomers, Around the World, The Four Colour Conjecture, Graph Theory in the 20<sup>th</sup> Century.

##### **Unit II: Graphs**

Varieties of graphs, Walks and connectedness, Degrees, the Problem of Ramsey, Extremal Graphs, Intersections graphs, Operations on graphs.

##### **Unit III: Blocks**

Cut points, Bridges and Blocks, Block graphs and cut point graphs.

##### **Unit IV: Trees**

Characterisation of Trees, centers and centroids, Block-cut point trees, Independent cycles and cocycles, Matroids.

### References

1. Introduction to Graph Theory by R.J.Wilson, 4<sup>th</sup> Edition, LPE, Pearson Education.
2. Graph Theory with Applications by J A Bondy and U S R Murty.
3. A First Look at Graph Theory by J.Clark and D.A.Holton, Allied Publishers.
4. Graph Theory with Application to Engineering and Computer Science by N.Deo, PHI.
5. Graph Theory by Frank Harary, Narosa Publishing Company, New Delhi.
6. Introduction to Graph Theory by G.Chartrand and Ping Zhang, McGraw Hill International Edition (2005).
7. Graph Theory and its Application by J Gross and J Yellen, CRC Press LLC, Boca Raton, Florida, 2000.
8. Algebraic Graph Theory by Godsil and Royle, Springer Verlag
9. Basic Graph Theory by K R Parthasarathy, Tata McGraw Hill, New Delhi
10. Introduction to Graph Theory by D B West, Pearson Education, Inc. 2001, 2<sup>nd</sup> Edition.

\* Any one of the above two papers of VIII Semester will be selected.

## VIII#P.8 PHYSICS

### THEORY

#### NUCLEAR AND SOLID STATE PHYSICS

**Credits : 3 (1L + 1T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

### Objectives :

To enable students to apply the basic knowledge of classical and quantum mechanics for an understanding of physics of nuclei and of solids.

### COURSE CONTENT:

#### Unit I : Atomic Nucleus

Nuclear structure, Failure of proton-electron hypothesis – neutron, its discovery and properties, Proton-neutron hypothesis, Basic properties of nucleus – charge, spin, radii, mass, magnetic moment. Nuclear forces and their characteristics. Yukawa's Theory (Qualitative), Packing fraction and Binding energy, Nuclear stability, Segre chart.

Nuclear Models – Liquid drop model, semi-empirical mass formula, Shell model and magic numbers (qualitative).

## **Unit II: Radioactivity and Particle Physics**

Review : Radioactive decay – Half life, mean life, Activity-decay constant. Radioactive displacement laws. Theory of  $\alpha$  decay (qualitative). Geiger-Nuttal law. Beta decay, Beta spectra. Neutrino hypothesis, K electron capture, internal conversion, Gamma decay, pair production, successive disintegration, units of radio activity, radioactive dating, uncontrolled and controlled chain reactions, nuclear fission and fusion. Energy liberated in nuclear fission, energy production in stars, Nuclear reactors.

**Particle Physics:** Particles and anti-particles, Classification of particles, Mention of the basic interactions in nature and conservation laws, Qualitative introduction to quarks, Structure of hadrons.

**Particle Accelerators and Detectors:** LINAC, Cyclotron, Betatron, GM counter.

## **Unit III : Crystal Structure and Thermal Properties of Solids**

**Crystal Structure :** Various types of bonding, cohesive energy and compressibility of ionic crystals. Madelung constant. Concepts of a lattice, unit cell and Bravais lattice. Fundamental lattice systems and their types, Miller indices, Coordination number, packing fraction for cubic crystals (sc, bcc and fcc).

**Thermal Properties:** Specific heat of solids, Einstein and Debye theories, Vibrational modes of one-dimensional monatomic system, lattice dispersion.

## **Unit IV : Electrical and Magnetic Properties Of Solids**

**Electrical Properties:** Free electron model of a metal, solution of one dimensional Schrodinger equation in constant potential, Density of states. Fermi energy, Energy bands in solids, Distinction between metals, semiconductors and insulators. Hall effect – Expression for Hall coefficients. Applications of Hall effect.

**Magnetic Properties :** Langevin's theory of dia and para magnetism, Curie-Weiss Law, Qualitative description of Ferromagnetism.

**Superconductivity :** Qualitative description, critical temperature and Meissner Effect, Applications, High temperature superconductors.

## **References**

1. Perspectives of Modern Physics, Beiser
2. Nuclear Physics, Kaplan.
3. Nuclear Physics, Subramanyam and Brijlal.
4. Concepts of Nuclear Physics, Cohen.
5. Solid State Physics, A J Dekker.
6. Introduction to Solid State Physics, C Kittel.
7. Modern Physics, Kiein

## PHYSICS PRACTICALS

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

### **Objectives:**

To develop the ability to set up apparatus, to collect and analyze data to determine the desired physical quantity.

### **COURSE CONTENT:**

Experiments on :

- A. Magnetic susceptibility
- B. e/m of electrons
- C. Rutherford model
- D. G M tube
- E. Millikan oil drop
- F. Planck's constant
- G. Energy gap of a semiconductor
- H. Fermi energy
- I. Rydberg constant
- J. Hall effect

### **References**

1. Physics Laboratory Instructions, RIE, Mysore.

## VIII#C.8 CHEMISTRY THEORY

### SPECTROSCOPY, NATURAL PRODUCTS AND HETEROCYCLICS

**Credits : 3 (1L + 1T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

### **Objectives:**

To develop an understanding of

- basic principles of Spectroscopy and apply the principles in the structural elucidation of simple organic compounds.
- chemistry of natural products, dyes and drugs, macromolecules and heterocyclic compounds

## COURSE CONTENT:

### Unit I : Spectroscopy

**UV and Visible spectroscopy:** Introduction, absorption laws, instrumentation, formation of absorption bands, types of electronic transitions, chromophores, auxochromes, absorption and intensity shifts, solvent effects, Woodward – Fieser rules for calculating absorption maximum in dienes and  $\alpha,\beta$ -unsaturated carbonyl compounds.

**IR spectroscopy:** Introduction, theory of molecular vibrations, vibrational frequency, factors influencing vibrational frequencies, finger print region and applications of IR spectroscopy.

**NMR spectroscopy:** Introduction, instrumentation, number of signals, position of signals (Chemical shift), shielding and deshielding effects, factors influencing chemical shifts- inductive effect, anisotropic effect and hydrogen bonding. Splitting of signals, spin-spin coupling, chemical exchange and coupling constant.

Structural determination of simple organic compounds using UV, IR and NMR spectral data.

### Unit II: Natural Products

**Carbohydrates:** Introduction, classification and nomenclature. Configuration of monosaccharides. Erythro and threo diastereomers. Interconversions in carbohydrates – glucose to fructose, fructose to glucose, aldopentose to aldohexose and aldohexose to aldopentose. Epimerisation, mechanism of osazone formation, Formation of glycosides, ethers and esters. Determination of ring size of monosaccharides. Structural elucidation of D(+) glucose. Mechanism of Mutarotation. Constitution of disaccharides - maltose, sucrose and lactose. Introduction to polysaccharides (starch and cellulose) without involving structure determination.

**Alkaloids :** Introduction, general methods of structural determination, structural elucidation of Conine, Nicotine and piperine

**Terpenoids :** Introduction, isoprene rule, structural elucidation of Citral and Menthol

#### **Amino acids, Peptides, Proteins and Nucleic acids**

Classification, structure and stereochemistry of amino acids. Acid-base behaviour, isoelectric point and electrophoresis. Preparation and reactions of  $\alpha$  - amino acids. Classification of proteins. Peptide structure determination - end group analysis, selective hydrolysis of peptides. Solid-phase peptide synthesis. Primary and secondary structures of proteins. Protein denaturation.

**Nucleic acids :** Introduction, constituents of nucleic acids. Ribonucleosides and Ribonucleotides. The double helical structure of DNA.

### Unit III: Dyes, Drugs and Macromolecules

**Dyes:** Introduction, Classification of dyes, Colour and constitution (electronic concept), synthesis and uses of Methyl orange, Phenolphthalein, Fluorescein and Indigo.

**Drugs:** Introduction, classification, structure and synthesis of sulpha drugs- sulphapyridine, sulphathiazole, sulphadiazine and sulphaguanidine, mechanism of action. Antimalarials – plasmaquin, mepacrine and chloroquin.

**Macromolecules:** Introduction, Classification, Types of polymerization – chain polymerization, step polymerization, free radical polymerization, co-polymerisation, Ionic polymerization, Coordination polymerization. Natural and synthetic rubbers – buna S , butyl rubber and neoprene. Synthetic fibres – nylon 6, nylon 6,6, terylene. Conducting polymers – polypropylenes and polyanilines. Bio-degradable polymers.

#### **Unit IV: Heterocyclic Compounds**

Introduction, methods of formation of five membered heterocycles – furan, thiophene and pyrrole. Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and their chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Six membered heterocycles: methods of formation of pyridine, mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Introduction to condensed five and six-membered heterocycles, preparation and reactions of Indole, quinoline and isoquinoline with special reference to Fischer indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of indole, quinoline and isoquinoline.

#### **References :**

1. Sl.nos 2 and 3 of III Semester
2. Organic Chemistry : I L Finar Vol II
3. Application of absorption Spectroscopy to Organic Compounds : John R Dyer
4. Organic Spectroscopy : William Kemp
5. Fundamentals of Molecular Spectroscopy : C N Banwell

### **CHEMISTRY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

#### **Objective:**

To develop skills of synthesis and Estimation of organic compounds

#### **1. Two step organic synthesis**

- (a) Synthesis of p-bromoaniline from acetanilide
- (b) Preparation of O-iodobenzoic acid from anthranilic acid
- (c) Preparation of m-nitrobenzoic acid from methyl benzoate
- (d) Preparation of paracetamol
- (e) Synthesis of Quinoline

#### **2. Quantitative organic analysis**

- (a) Estimation of aniline by bromate-bromide method
- (b) Estimation of glucose by Fehlings method
- (c) Determination of iodine value of an oil by V<sub>ij</sub>'s method



- (d) Determination of saponification value of an ester / oil
- (e) Estimation of amino acid by formal titration method
- (f) Estimation of ascorbic acid in Vitamin C tablets by Volumetry
- (g) Estimation of Paracetamol by titrimetric and photo spectrometric methods.
- (h) Gravimetric Analysis of Lead, Iron and Nickel

**References :** Same as in I and III semester

## **VIII # B.8 BOTANY**

### **THEORY**

#### **MOLECULAR BIOLOGY, BIOCHEMISTRY AND BIOTECHNOLOGY**

**Credits : 3 (1L + 1T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

- To understand the structure and functions of biological macromolecules;
- To understand and appreciate the importance of nucleic acid and gene research in modern times;
- To acquaint students with the tools and techniques of biotechnology, the processes involving gene manipulation and their applications.

#### **COURSE CONTENT :**

##### **Unit I :**

Discovery, brief history of DNA and RNA. (i) DNA: types, molecular structure, characteristics, structural properties and functions. Satellite and repetitive DNA, mitochondrial and plastid DNA, plasmid, DNA damage and repair, replication of DNA in prokaryotes and eukaryotes. (ii) RNA : Types, structure, characteristics, structural properties and functions, Role of RNAs in protein synthesis.

**Enzymology :** Discovery, nature, nomenclature and classification, mechanism of enzyme action, lock and key hypothesis, induce-fit hypothesis, regulation of enzyme action, inhibitors, prosthetic groups and coenzymes, factors affecting enzyme action.

##### **Unit II :**

**Nitrogen Metabolism :** Forms of nitrogen, cellular conversion of nitrates to ammonium ions, assimilation of NH<sub>4</sub><sup>+</sup> ions, biological nitrogen fixation, amino acids – nature, classification, structures, synthesis of amino acids - reductamination and transamination.

##### **Gene concept and regulation:**

- a) Gene structure and regulation in prokaryotes, operon concept – lac and tryptophan operon, genetic code.

- b) Proteins – classification, structure – primary, secondary, tertiary and quaternary, Biosynthesis of proteins – transcription, m-RNA processing, translation. Inhibitors of protein synthesis.

**Unit III :**

**Carbohydrates :** Introduction, classification, chemical structures of mono, oligo and polysaccharides, synthesis and breakdown of sucrose and starch.

**Lipids :** Introduction, classification, chemical structures, saturated and unsaturated fatty acids, synthesis and breakdown of fatty acids,  $\beta$ - oxidation.

**Unit IV :**

- a) Tools and techniques, cloning vectors, brief account of genomics and c-DNA library, interferons, transposable elements, PCR, bio-informatics.
- b) Applications of Biotechnology – functional definition and applications, brief account of DNA finger printing, Agrobacterium – mediated gene transfer, achievements in crop improvement, transgenic plants.

**References:**

1. Lea, P.J. and R.C.Leegood, 1999, Plant Biochemistry and Molecular Biology, John Wiley & Sons, England.
2. Lehninger, A.B., Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
3. Srivastava, H.S.2005, Plant Physiology, Biochemistry and Biotechnology, Rastogi Publications, Meerut.
4. Jain.J.L. 1994, Fundamentals of Biochemistry, Sultanchand & Co., New Delhi.
5. Old, R.W. and S.B.Primrose, 1989, Principles of Gene Manipulation, Blackwell Scientific Publication, Oxford, UK.
6. Lodish, H., A.Berk, S.L.Zipursky, P.Matsudaiva, D. Baltimore, and J.Darnell, 2000. Molecular Cell biology, W.H. Freeman & Co., New York.
7. Alberts, B., D.Bray, J.Lewis, M.Raff, K.Roberts and I.O.Watson, 1999, Molecular Biology of Cell, Garland Publishing Co., Inc., New York.
8. Malacinski, G.M., 2005, Essentials of Microbiology (4<sup>th</sup> Ed.), Narosa Publishing House, New Delhi.

**BOTANY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub> : 50**

**Objectives :**

- To understand the molecular mechanisms operating in cells.
- To familiarize with techniques in biochemistry and biotechnology.

### **COURSE CONTENT :**

1. Isolation of DNA from coconut endosperm.
2. Effect of pH and temperature on activity of amylase in germinating seeds.
3. Study of catalase and peroxidase enzyme activity as influenced by pH and temperature.
4. Separation of amino acids by paper chromatography.
5. Study of root nodules in leguminous plants.
6. To test for the presence of carbohydrates , proteins and lipids.

## **VIII SEMESTER B.Sc.Ed.**

### **Z-8: ZOOLOGY THEORY – ‘GENETICS AND EVOLUTION’**

**Credits : 3 (1L + 1T +1P)**

**Contact hrs per week: 6**

**Exam Duration : 2 hrs**

**Marks: 100**

**C<sub>1</sub> + C<sub>2</sub>: 50**

**C<sub>3</sub> : 50**

#### **Objectives:**

To enable students to comprehend the modern concepts of genetics; to create awareness regarding the inheritance and hereditary diseases; to comprehend origin of life and theories of evolution; to understand the evolution from the evidences

#### **COURSE CONTENT:**

##### **Unit I: Inheritance and Gene Interaction**

**a) Inheritance:** Mendel's Laws (2), (Review and solving problems in Genetics based on mono-, and dihybrid cross, test cross)

**b) Interaction of genes:** Incomplete dominance in 4 O'clock plant, co-dominance in MN blood groups; Epistasis – coat colour in mice; Complimentary genes – flower colour in sweat pea; multiple gene-inheritance of skin colour in man; Multiple alleles – eye colour in *Drosophila* and ABO blood groups in man; Extra chromosomal inheritance – inheritance of Kappa particles in *Paramecium* (6).

**c) Sex-linked inheritance:** White eye colour in *Drosophila*, colour blindness and haemophilia in man (2)

**d) Genes and their actions:** Gene mutation and its significance; detection of mutation by CIB / Muller's method (2).

##### **Unit II: General and Human Genetics**

**a) Sex determination** – Chromosomal basis of sex determinations (XX-XO, XX-XY, ZZ-ZW types); multiple sex chromosomes; Genic balance theory; Gynandromorphs and sex mosaic; Sex determining genes; Barr body (2)

**b) Linkage and crossing over:** Linkage and crossing over in *Drosophila*; Cytological evidences for crossing over; Linkage maps (3)

**c) Human Genetics:** Pedigree of Mendelian human traits (1); Eugenics, Euthenics, Euphenics; Genetic screening and counselling (2); Inborn error of metabolism –

Phenylketoneuria, Galactosemia (1); Chromosomal syndromes – Turner's, Klinefelter's and Down's syndromes (1), Lethal genes and Gene therapy (1); Human genome (1).

### **Unit III: Theories of Evolution**

- a) Origin of Life: Urey Muller's experiment (1) – Theories on origin of life (1)
- b) Theories of Evolution – Lamarckism and Darwinism (Review) Neo-Lamarckism and Neo-Darwinism, de Vries theory of mutation and its significance in evolution; Hardy-Weinberg's Law, Genetic drift, Modern synthetic theory of evolution (6); Types of species and speciation (2); Survival strategies - adaptation of animals in desert, cave and cursorial; colouration and mimicry (2).

### **Unit IV: Paleontology and Zoogeography**

- a) Geological time and its significance in evolution (1)
- b) Fossils – Fossils and fossilization (1); Living Fossils – Latemaria and Sphenodon (1) the emergence and disappearance of invertebrates and vertebrates (Trilobites, Fishes and Reptiles) (1); Paleontological history of horse, elephant and man (6)
- c) Zoogeography, with emphasis to oriental region and fauna (1)

### **References:**

1. Genetics by Stricksberger – (MacMillan).
2. Principles of Genetics by Sinnott, Dunn and Dobzhansky – (McGraw Hill).
3. Genetics by E. Altenberg – (Holt, Rinehart & Winston, New York).
4. Principles of Genetics by Gardner – (John Willey).
5. Principles of Genetics by Irwin H. Herskowitz – (Little Brown & Co., Boston).
6. Elementary Genetics by Singleton WR – (Van Nostrand).
7. Basic Human Genetics by Elain J. Mange & Arthur P. Mange – (Rastogi Publications, 2008).
8. Cytogenetics by P.K. Gupta – (Rastogi Publications, 2008)
9. Evolutionary Biology by B.S. Tomar & S.P. Singh – (Rastogi Publications, 2008).
10. The origin of life by K.John – (Reinhold Publishing Corpn).
11. The evolution of Man by G.W.Lasker – (Holt, Rinehart & Winston).
12. Organic Evolution by R.S.Lull – (MacMillan).
13. Evolution by J.M.Savage (Holt, Rinehart and Winston)
14. Genetics and Evolution by RL Kochhar (S.Nagin & Co, New Delhi 1970)
15. Evolution in Action by J.Huxley (New American Library, New S.Nagin & Co, New Delhi 1970).
16. The Origin of Species by D.I.Charles (Collier Book, New York, 1966).
17. Evolution by Ayala F.G, Stebbins G.L & Valentine J. (1965) – Sinauer Associates.
18. Animal Evolution by Carter GS (1960) – Sedgenick & Johnson Ltd.
19. Zoogeography by Hubbs CL (1962) – AAAAS Washington
20. Evolution & Genetics by Morrel DJ (1962) – Holt Rinehart and Winston.
21. Vertebrate Paleontology by Romer AS (1966) – University Chicago Press.

22. The Process of Organic Evolution by Stebbins GL (1970) – Prentice Hall Publication.
23. Genetics by Winchester AM (1966) – Oxford & IBH Publishing CO.

## **ZOOLOGY PRACTICALS**

**Exam Duration : 3 hrs**

**C<sub>3</sub>: 50**

### **Objectives:**

To develop the skill of rearing *Drosophila*; to conduct breeding experiment for identifying inheritance and mutation in *Drosophila*; to understand pattern of inheritance in human traits; to understand mimicry and adaptation in animals; to have the skill of making models of fossil forms

### **COURSE CONTENT:**

1. a) Fruit flies – Collection, handling, rearing and maintenance of culture.
  - a) Identification of sexes of *Drosophila*.
  - b) Study of the life cycle of *Drosophila*.
2. Sorting out and study of mutant flies of *Drosophila* with reference to their various contrasting characters in comparison with normal flies-vestigial wings, ebony body, curled wing, sepia eye, white eye and bar eye.
3. Study of Barr body in human buccal epithelial cells.
4. Identification of blood groups (ABO) and Rh factor in man.
5. Study of various types of beaks of local birds.
6. Study of five animals for mimicry.
7. Study of fossil models of Trilobites and fishes.
8. Study of teeth and skulls of horse, elephant and man.
9. Study of vestigial organs, models of dinosaurs, living fossils.

**Project 1:** Conducting of breeding experiments to verify the law of segregation, law of independent assortment and law of sex linked inheritance.

**Project 2:** Analysis of inheritance for various traits in samples of human population; PTU-test, blood group distribution pattern, rolling of tongue, ear lobe attachment and baldness

*Field visit to Regional Museum of Natural History and Zoo in Mysore*

\*\*\*\*\*