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 **'Master of Science Education' (Chemistry)** leading to the post-graduate degree, M.Sc.Ed. (Chemistry). The programme will be of six year duration organized on the semester pattern with 2 semesters in a year. Each semester will consist of 16 weeks of instruction excluding examination.

- **Equivalence:**

The course contents related to Physics, Chemistry and Mathematics are equivalent respectively to course content in Physics, Chemistry and Mathematics included in the syllabi for the same subjects in B.Sc.(PCM) and M.Sc.(Chemistry) of University of Mysore, taken together.

The course content related to educational components in M.Sc.Ed. (Chemistry) are equivalent to that of B.Ed. of University of Mysore and in addition, contains Professional Education components required for teaching of chemistry at senior secondary level. This degree is equivalent to M.Sc. and B.Ed. degrees of University of Mysore.

The students who pass this course are considered eligible to pursue Ph.D. degree in Chemitry in compliance with Ph.D. regulations of University of Mysore.

2.0 Eligibility for admission to M.Sc.Ed.

2.1 Candidates seeking admission to the M.Sc.Ed. Chemistry course should have passed CBSE Senior Secondary examination/ Pre-University examination of Karnataka or an equivalent examination recognized by the University of Mysore with 45% marks in 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. Physics, Chemistry, Mathematics/ Physics, Chemistry, Mathematics and any other subject.

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. 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 shall be as per the prevalent admission policies of NCERT. It will also be governed by the reservation policies of Govt. of India as prevalent at the time of admission.

2.4 The Institutions other than RIE Mysore, offering the course, shall follow the admission rules of Post-Graduate Courses of the University of Mysore.

3.0 Admission to M.Sc.Ed. (Lateral Entry)

Duration of the course under Lateral Entry Scheme is of four semesters. The candidate will be admitted directly to IX Semester of M.Sc.Ed. with the following eligibility criteria.

Candidates seeking admission into M.Sc.Ed. under Lateral Entry Scheme should have passed B.Sc. Degree with subjects Mathematics, Physics and Chemistry and B.Ed. degree with Pedagogy of Mathematics and Physical Sciences of any recognized University and are equivalent to that of B.Sc.and B.Ed. of University of Mysore with 50% marks in aggregate in each of B.Sc. and B.Ed. Relaxation upto 5% of marks shall be given to the SC/ST candidates.

1. **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
d) Open Electives

4.1 Common Courses :

Comprises of courses that are mandatory for all students.

I to VIII Semesters:

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.

IX to XII Semesters:

d) Foundations of Chemistry – I & II, Foundations of Higher Secondary Education, Teaching of Chemistry and Research in Chemistry Education.

4.2 Core Courses

Comprises of five courses in Education, two courses one in Pedagogy of Physical Sciences and another in Pedagogy of Mathematics, Physics, Chemistry and Mathematics from I to VIII Semesters and 16 courses in theory and 8 courses in practicals of Chemistry from IX to XII Semesters.

The programme also includes a comprehensive school attachment programme, the internship in teaching at VII and XI Semesters.

4.3 Electives

Comprises three courses in Education and two in Mathematics of which student should opt one in Education and another in Mathematics.

Add on Courses: Comprises of two courses viz. Communication Skills and Inclusive Education – II.

5.0 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.

6.0 Medium of Instruction:

The medium of instruction and examination shall be English

a. Course Structure of M.Sc.Ed. Chemistry RIE Scheme

Table 1
PANORAMA

a) I to VIII Semesters

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			
	COMMON COURSES:											
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+0	1	2
	CORE COURSES											
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	Intrnship 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
Electives												

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		

b) IX to XII Semesters

Sl.No.	**COURSE**	**No. of Credits per week**				**Total No. of Credits**	**Total No. of Contact Hours**
		IX L+T+P	**X** L+T+P	**XI** L+T+P	**XII** L+T+P		
	Common Papers						
	Foundations of Chemistry I	1+1+0				2	3
	Foundations of Higher Sec.Edu	2+1+0				3	4
	Foundations of Chemistry II		1+1+0			2	3
	Teaching of Chemistry		2+1+0			3	4
	Internship			0+0+3		3	6
	Research in Chemistry Edu.				2+1+0	3	4
	Core Papers						
	Methods of Chemical Analysis	2+1+0				3	4
	Concepts, Models and Structural Methods of Inorganic Chemistry	2+1+0				3	4
	Stereochemistry and Organic Reaction Mechanism	2+1+0				3	4
	Chemical Thermodynamics & Statistical Mechanics	2+1+0				3	4
	Inorganic Chemistry Practical - I	0+0+2				2	4
	Physical Chemistry Practical – I	0+0+2				2	4
	Titrimetric Analysis & Separation Techniques		2+1+0			3	4
	Advanced Inorganic chemistry		2+1+0			3	4
	Synthetic Organic Chemistry & Chemistry of Natural Products		2+1+0			3	4
	Quantum, Nuclear and Radiation Chemistry		2+1+0			3	4
	Organic Practical - I		0+0+2			2	4
	Analytical Practical – I		0+0+2			2	4
	Applied analysis			2+1+0		3	4
	Organometallics, Catalysis and industrial Inorganic Chemistry			2+1+0		3	4
	Spectroscopy			2+1+0		3	4
	Electrochemistry and Surface Chemitry			2+1+0		3	4

	Organic Practical – II			0+0+2		2	4
	Analytical Practical – II			0+0+2		2	4
	Instrumental Methods of Chemical Analysis				2+1+0	3	4
	Bio-Inorganic Chemistry				2+1+0	3	4
	Heterocyclics Molecular Rearrangements, Green Chemistry, Synthetic Drugs and Antibiotics				2+1+0	3	4
	Chemical Kinetics				2+1+0	3	4
	Inorganic Practical – II				0+0+2	2	4
	Physical Chemistry Practical – II				0+0+2	2	4
	Add on Courses:						
	Communication Skills / Inclusive Education - II			2+1+0		3	4
	Total credits	11+6+4	11+6+4	8+4+7	10+5+4	80	120

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 from I to VIII semesters
P: (Number of hours engaging a student in practicals in a semester) / 32 for other subjects in all semesters and for Science from IX to XII Semesters.
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.

8.0 Change of Stream

Change of stream is permissible after successfully completing first eight semesters and this will be decided by the academic body set up by the Principal and Dean of Instruction.

9.0 Scheme of Examination

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

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

M.Sc.Ed. Chemistry RIE New Scheme

SCHEME OF EXAMINATION

Sem	Course No.	Subject	Sessional		C_3 Theory= X	C_3 Practical= Y	M	P = C_1 + C_2 + M
			C_1	C_2				
I	I # PG E.1	English	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG RL.1.1	Reg.Lang.-Hindi	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG RL.2.1	Reg.Lang.-Kannada	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG RL.3.1	Reg.Lang.-Malayalam	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG RL.4.1	Reg.Lang.-Tamil	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG RL.5.1	Reg.Lang.-Telugu	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG HE.1	Holistic Education	**25**	**25**	-	**50**	**50**	**100**
	I # PG M.1	Mathematics: Differential Calculus And Analytical Geometry (Paper I)	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG M.2	Mathematics: Number theory, Theory of Equations and Matrices (Paper II)	**25**	**25**	**50**	**-**	**50**	**100**
	I # PG P.1	Physics: Mechanics – I	**25**	**25**	**50**	**50**	**50**	**100**
	I # PG C.1	Chemistry: Atomic Structure and Bonding	**25**	**25**	**50**	**50**	**50**	**100**
		Total						**700**
II	II # PG E.2	English	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG RL.1.2	Reg.Lang.-Hindi	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG RL.2.2	Reg.Lang.-Kannada	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG RL.3.2	Reg.Lang.-Malayalam	**25**	**25**	**50**	**-**	**50**	**100**
	II #RL.4.2	Reg.Lang.-Tamil	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG RL.5.2	Reg.Lang.-Telugu	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG EE.1	Environmental Studies	**25**	**25**	-	**50**	**50**	**100**
	II # PG TAHCT.2	**Theatre, Art and Heritage, Craft Traditions**	**25**	**25**	-	**50**	**50**	**100**
	II # PG Edu.1	Understanding Education and its Perspectives	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG M.3	Mathematics: Partial Differentiations and Integral Calculus	**25**	**25**	**50**	**-**	**50**	**100**
	II # PG P.2	Physics: Elasticity, Waves, Heat and Thermodynamics	**25**	**25**	**50**	**50**	**50**	**100**
	II # PG C.2	Chemistry: States of Matter and Nuclear Chemistry	**25**	**25**	**50**	**50**	**50**	**100**
		Total						**800**
III	III # PG E.3	English	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG RL.1.3	Reg.Lang.-Hindi	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG RL.2.3	Reg.Lang.-Kannada	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG RL.3.3	Reg.Lang.-Malayalam	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG RL.4.3	Reg.Lang.-Tamil	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG RL.5.3	Reg.Lang.-Telugu	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG Edu.2	**Psychology of Learner & learning**	**25**	**25**	**50**	**-**	**50**	**100**
	III# PG ICT.1	**ICT in Education**	**25**	**25**	-	**50**	**50**	**100**
	III # PG M.4	**Mathematics: Real Analysis**	**25**	**25**	**50**	**-**	**50**	**100**
	III # PG P.3	Physics: Electricity and	**25**	**25**	**50**	**50**	**50**	**100**

		Electromagnetism						
	III # PG C.3	Chemistry: Organic Chemistry – I	**25**	**25**	**50**	**50**	**50**	**100**
				Total				**700**
IV	IV # PG E.4	English	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG RL.1.4	Reg.Lang.-Hindi	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG RL.2.4	Reg.Lang.-Kannada	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG RL.3.4	Reg.Lang.-Malayalam	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG RL.4.4	Reg.Lang.-Tamil	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG RL.5.4	Reg.Lang.-Telugu	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG Edu.3	Assessment of Learning	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG M.5	Mathematics: Differential Equations	**25**	**25**	**50**	**-**	**50**	**100**
	IV # PG P.4	Physics: Optics	**25**	**25**	**50**	**50**	**50**	**100**
	IV # PG C.4	Chemistry: Thermodynamics, Equilibrium and Solutions	**25**	**25**	**50**	**50**	**50**	**100**
				Total				**600**
V	V # PG Edu.4	Teaching Approaches and Strategies	**25**	**25**	**50**	**-**	**50**	**100**
	V # PG POPS.1	Pedagogy of Physical Science	**25**	**25**	**50**	**-**	**50**	**100**
	V # PG POM.1	Pedagogy of Mathematics	**25**	**25**	**50**	**-**	**50**	**100**
	V # PG M.6	Mathematics: Multivariate Calculus and Vector Calculus	**25**	**25**	**50**	**-**	**50**	**100**
	V # PG P.5	Physics: Basic Electronics	**25**	**25**	**50**	**50**	**50**	**100**
	V # PG C.5	Chemistry: Transition Elements, Coordination Compounds and Chemical Kinetics	**25**	**25**	**50**	**50**	**50**	**100**
				Total				**600**
VI								
	VI# PG POPS.2	Pedagogy of Physical Science	**25**	**25**	**50**	**-**	**50**	**100**
	VI # PG POM.2	Pedagogy of Mathematics	**25**	**25**	**50**	**-**	**50**	**100**
	VI # PG M.7	Mathematics: Group Theory	**25**	**25**	**50**	**-**	**50**	**100**
	VI # PG P.6	Physics: Relativity and Quantum Mechanics	**25**	**25**	**50**	**50**	**50**	**100**
	VI # PG C.6	Chemistry: Organic Chemistry - II	**25**	**25**	**50**	**50**	**50**	**100**
				Total				**500**
VII	**VII#PG ICT.2**	**ICT in Education**	**25**	**25**	-	**50**	**50**	**100**
	VII # PG M.8	Mathematics: Rings and Fields	**25**	**25**	**50**	**-**	**50**	**100**
	VII # PG M.9	Mathematics: Linear Algebra	**25**	**25**	**50**	**-**	**50**	**100**
	VII # PG P.7	Physics: Atomic and Molecular Physics	**25**	**25**	**50**	**50**	**50**	**100**
	VII # PG C.7	Chemistry: Electrochemistry and Photochemistry	**25**	**25**	**50**	**50**	**50**	**100**
	VII # PG IP.1	**Internship Methodology I**	**25**	**25** **25**	-- -	**50**	**50**	**100**
	VII # PG IP.1I	**Internship Methodology II**	**25**	**25**		**50**	**50**	**100**
				Total				**600**
VIII								

	VIII # PG IC.1	Indian Constitution And Human Rights	**25**	**25**	**50**	**-**	**50**	**100**
	VIII # PG Edu.5	Secondary Education: Status, Issues and Concerns	**25**	**25**	**50**	**-**	**50**	**100**
	VIII # PG Edu.6	**Inclusive Education/ Guidance and Counselling/curriculum & school**	**25**	**25**	**50**	**-**	**50**	**100**
	VIII # PG M.10	Mathematics: Complex Analysis (Paper I)	**25**	**25**	**50**	**-**	**50**	**100**
	VIII # PG M.11	Mathematics: Paper II Numerical Analysis / Graph theory (Optional)	**25**	**25**	**50**	**-**	**50**	**100**
	VIII # PG P.8	Physics: Nuclear and Solid State Physics	**25**	**25**	**50**	**50**	**50**	**100**
	VIII # PG C.8	Chemistry: Spectroscopy, Natural Products and Heterocyclics	**25**	**25**	**50**	**50**	**50**	**100**
		Total						**800**
IX	IX # PG-Edu.8	Foundations of Higher Secondary Education	25	25	50	-	50	100
	IX # PG-C.9.1	Foundations of Chemistry – I	25	25	50	-	50	100
	IX # PG-C.9.2	Methods of Chemical Analysis	25	25	50	-	50	100
	IX # PG-C.9.3	Concepts, Models and Structural Methods of Inorganic Chemistry	25	25	50	-	50	100
	IX # PG-C.9.4	Stereochemistry and Organic Reaction Mechanism	25	25	50	-	50	100
	IX # PG-C.Pr.9.5	Chemical Thermodynamics & Statistical Mechanics	25	25	50	-	50	100
	IX # PG-C.Pr.9.6	Inorganic Chemistry Practical - I	25	25	-	50	50	100
	IX # PG-C.Pr.9.7	Physical Chemistry Practical – I	25	25	-	50	50	100
		Total						**800**
X	X # PG-C.10.1	Foundations of Chemistry	25	25	50	-	50	100
	X # PG-10.2	Teaching of Chemistry	25	25	50	-	50	100
	X # PG-C.10..3	Titrimetric Analysis & Separation Techniques	25	25	50	-	50	100
	X # PG-C.10.4	Advanced Inorganic chemistry	25	25	50	-	50	100
	X # PG-C.10.5	Synthetic Organic Chemistry & Chemistry of Natural Products	25	25	50	-	50	100
	X # PG-C.10.6	Quantum, Nuclear & Radiation Chemistry	25	25	50	-	50	100
	X # PG-C.Pr.10.7	Organic Practical - I	25	25	-	50	50	100
	X # PG-C.Pr.10.8	Analytical Practical – I	25	25	-	50	50	100
		Total						**800**
XI	XI # PG-11.1	Applied Analysis	25	25	50	-	50	100
	XI # PG-C.11.2	Organometallics, Catalysis and industrial Inorganic Chemistry	25	25	50	-	50	100
	XI # PG-C.11.3	Spectroscopy	25	25	50	-	50	100
	XI # PG-C.11.4	Electrochemitry and Surface Chemistry	25	25	50	-	50	100
	XI# PG-C.11.5	Organic Practical – II	25	25	-	50	50	100

	XI # PG-C.11.6	Analytical Practical – II	25	25	-	50	50	100
	XI # PG-C.11.7	Internship	25	25	-	50	50	100
	XI/PG-C.11.7	Communication Skills/ Inclusive Education -II	25	25	50	-	50	100
		Total						**800**
XII	C.12.1	Research in Chemistry Education	25	25	50	-	50	100
	XII # PG-C.12.2	Instrumental Methods of Chemical Analysis	25	25	50	-	50	100
	XII # PG-C.12.3	Bio-Inorganic Chemistry	25	25	50	-	50	100
	XII # PG-C.12.4	Heterocyclics Molecular Rearrangements Green Chemistry, Synthetic Drugs and Antibiotics	25	25	50	-	50	100
	XII # PG-C.12.5	Chemical Kinetics	25	25	50	-	50	100
	XII # PG-C.12.6	Inorganic Practical – II	25	25	-	50	50	100
	XII # PG-C.Pr.12.7	Physical Chemistry Practical – II	25	25	-	50	50	100
		Total						**700**
		Grand Total						

***Among these only two electives will be offered.**

9.3 ***Duration of semester end examination for all theory courses will be of 2 hours duration and for practical examination, it is of 3 hours duration from I Semester to VIII Semester and 4 hours from IX Semester to XII Semester***

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

10 Question paper setting, valuation etc.,

10.1 Question paper setting for C_3.

(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.

10.2 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.

10.3 Valuation and Classification of Successful Candidates

All papers 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 8th 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 16th week of the semester. In general $C_1$and C_2 should be evaluated through test / seminar/ dissertation / presentations / assignment.

Between the 18th and 20th 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 :

	Distribution	*Formula*
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 = ΣGP / Total number of credits and the class is declared as follows :

	FGP	
CGPA	*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 of 24 credits for the entire programme of M.Sc.Ed. of 6 years. The candidate 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_3:

a. scores $\geq 30\%$ in $C_1 + C_2$ and $M < 30\%$

b. scores $\geq 30\%$ in $C_1 + C_2$; $M \geq 30\%$ 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 the make up also, then he 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 :

- ***fails to put in 75% attendance in the course,***
- ***decides to discontinue/ withdraw to study the course,***
- ***scores less than 30% in $C_1 + C_2$ together,***
- ***scores in***
  - ***i) $C_1 + C_2$ is $\geq$30% and M < 30% or***
  - ***ii) $C_1 + C_2$ is $\geq$30%, M $\geq$30% and Grade G = 4 and exercises option to drop the paper within 10 days from the date of notification of final results,***
- ***is unsuccessful in the MAKE-UP examination and also in one more appearance in the subsequent semester.***

A candidate who has dropped a paper has to re-register for the course when the course is offered again by the Department or Section.

10.4 If a candidate fulfils all the requirements to write C_3 examination but due to exigencies if he/she is unable to write C_3 , then he/she can opt to appear for C_3 of the course as and when the institute conducts the same.

10.5 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.

10.6 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.

10.7 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.

11.0 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.

12.0 Marks Cards:

12.1 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.

13.0 Barring of Simultaneous Study

13.1 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.

13.2 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.

14.0 Miscellaneous:

14.1 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.

14.2 Other regulations not specifically mentioned above are as per the Regulations of the University as applicable from time to time.

14.3 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#PG-E.1 ENGLISH

Credits : 3 (2L + 1T+0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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*, 2nd Ed. Allyn and Bacon

Mckay. et al. (1995). *The Communication Skills Book*, 2nd 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 # PG-RL.1.1 HINDI

Credits : 3 (2L + 1T +0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 conversa6ion, 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 # PG-RL.2.1 KANNADA

Credits : 3 (2L + 1T +0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-RL.3.1 MALAYALAM

Credits : 3 (2L + 1T +0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 pittennu
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 # PG-RL.4.1 TAMIL

Credits : 3 (2L + 1T +0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-RL.5.1 TELUGU

Credits : 3 (2L + 1T +0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-HE.1 HOLISTIC EDUCATION

Credits : 1(0L + 0T +1P) **Marks : 100**
Contact hrs per week: 2 **$C_1 + C_2$: 50**
C_3 : 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 dont'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 Dhyan Yogic Kriyayen, Ladnun, Tulsio Adhyatma Nigam.
8. Seetharam A.R. (1996) Yoga for Healthy Living. Mysore , Paramahamsa 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# PG-M.1 MATHEMATICS
Paper – I
DIFFERENTIAL CALCULUS AND ANALYTICAL GEOMETRY

Credits : 3 (2L + 1T +0P) **Marks: 100**
Contact hrs per week: 4 **C_1+ C_2: 50**
Exam Duration : 2 hrs **C_3 : 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^{th} 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# PG-M.2 MATHEMATICS
Paper 2
NUMBER THEORY, THEORY OF EQUATIONS AND MATRICES

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 mXn, 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# PG-P.1 PHYSICS THEORY
MECHANICS - I

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 λ 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, 6th 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_3: 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 # PG-C.1 CHEMISTRY
THEORY - ATOMIC STRUCTURE AND BONDING

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Ψ and Ψ^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 NH_3, H_3O^+, SF_4, CIF_3, ICl_2, and H_2O.

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 – H_2^+ ion, calculation of energy levels from wave functions, physical picture of bonding and antibonding wave functions, concept of σ, σ^*, π, π^* 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 H_2, comparison of M.O. and V.B. Models.

Discussion about homonuclear (He_2, N_2, O_2, F_2, C_2) and heteronuclear (CO and 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_3 : 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

II SEMESTER

II# PG-E.2 ENGLISH

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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*, 2nd Ed. Allyn and Bacon
4. Mckay. et al. (1995). *The Communication Skills Book*, 2nd Ed. New Harbinger Publications.

REGIONAL LANGUAGES

II # PG-RL.1.2 HINDI

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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:
a) Sahitya ki mahatta
b) Pahla safed bal
c) Gehun banam gulab
d) Devdary
e) Sahitya aur Jeevan

II # PG-RL.2.2 KANNADA

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, Prasaranga 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 Hennu Noada - 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 # PG-RL.2.3 MALAYALAM

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 50**

Unit I. Descriptive Grammar
Samasa and Alamkara
(Ref : Bhashaa bhushanam and Kerala Paanineeyam , 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# PG-RL.4.2 TAMIL

Credits : 3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 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# PG-RL.5.2 TELUGU

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Sanghikaachaaralu
Tirupati Venkata kavula Avadhana vidya

II # PG-EE.1 ENVIRONMENTAL STUDIES

Credits : 1(0L + 0T + 1P) **Total : 100**
Contact hrs per week: 2 **$C_1 + C_2$: 50**
C_3 : 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

c. Multidisciplinary Nature of Environment: Studies, concept, Scope and Importance.
d. Natural Resources - renewable and non-renewable (Forest, water, mineral, food, energy and land resources); Associated problems and strategies for Conservation and Sustainable Development.
e. Ecosystem – concept, components, energy flow, types of ecosystem
f. 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.
g. 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

b. Visit to document environmental assets - river / forest / grassland/ hill/national parks.
c. Visit to a local polluted site : Urban / Rural / Industrial / Agricultural
d. Study of common plants, insects, birds
e. Study of simple ecosystems – pond, river, hill slopes, etc.
f. Project on environmental pollution in the nearby sites
g. Preparation of exhibits on environmental themes and organize an exhibition
h. 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, Clanderson 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 & Waston, 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 # PG-TAHCT.1 THEATRE, ART AND HERITAGE CRAFT TRADITIONS

Credits : 1(0L + 0T + 1P) **Total : 100**
Contact hrs per week: 2 **$C_1 + C_2$: 50**
C_3 : 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, Natyashasthra, 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# PG-EDU.1 UNDERSTANDING EDUCATION AND ITS PERSPECTIVES

Credits : 2(1L + 1T +0P) **Marks: 100**
Contact hrs per week: 3 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Krishramurthy
b) Western: Plato, Rousseau, John Dewey, Montessori and Paulo Frieri

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/ 3rd 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 # PG-M.3 MATHEMATICS
PARTIAL DIFFERENTIATIONS AND INTEGRAL CALCULUS

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, Hyperbloid, Parabloid, 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# PG-P.2 PHYSICS

THEORY - ELASTICITY, WAVES, HEAT AND THERMODYNAMICS

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, Modulii 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, 6th 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, Zeemansky, McGraw Hill.
4. Physics of Vibration and Waves, H J Pain.

PHYSICS PRACTICALS

Exam Duration : 3 hrs **C_3 : 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 O^o 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# PG-C.2 CHEMISTRY
THEORY
STATES OF MATTER AND NUCLEAR CHEMISTRY

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 NH_3 and liquid 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_3 : 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 stalagnometer.
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

III SEMESTER

III# PG-E.3 ENGLISH

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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*, 2nd Ed. Allyn and Bacon
5. Mckay. et al. (1995). *The Communication Skills Book*, 2nd Ed. New Harbinger Publications**.**

REGIONAL LANGUAGES

III # PG-RL.1.3 HINDI

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-RL.2.3 KANNADA

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, 3rd 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 # PG-RL.3.3 MALAYALAM

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 ponniyam 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# PG-RL.4.3 TAMIL

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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# PG-RL.5.3 TELUGU

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Rachamallu 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) **Marks : 100**
Contact hrs per week: 2 **$C_1 + C_2$: 50**
C_3 : 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

1. Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices
2. Practice in installing various system and application software
3. Using word processor, spread sheet, and presentation software to produce various teaching learning resources.
4. Locating internet resources - navigating, searching, selecting, saving and evaluating (use standard internet evaluation criteria)
5. Social bookmarking of internet resources using any social bookmarking tools (diigo,delicious,stumbleupon)
6. Comparative study of ICT syllabus of school education and teacher education of various organizations
7. Evaluating multimedia CD ROMs using standard criteria and study the multimedia evaluation reports available at http://www.teem.org.uk/
8. 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
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 # PG- Edu.2 PSYCHOLOGY OF LEARNER & LEARNING

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 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 & adolesent, 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. Modem Research, Second Ed. Reason Education & Pvt. Ltd.

III# PG-M.4 MATHEMATICS
Real Analysis

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Apostal, Addison Wesley, Narosa, New Delhi, 2nd Edition.
7. Principles of Mathematical Analysis by Walter Rudin, 2nd 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# PG-P.3 PHYSICS
THEORY

ELECTRICITY AND ELECTROMAGNETISM

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 – Kirchhoff'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, 6th 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_3: 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# PG-C.3 CHEMISTRY

THEORY

ORGANIC CHEMISTRY – I

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 $KMnO_4$. 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 σ- and π- complexes. Mechanism of nitration, halogenation, sulphonation, mercuration 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_3: 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

IV SEMESTER

IV# PG-E.4 ENGLISH

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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. Merrriam, 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 # PG- RL.1.4 HINDI

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-RL.2.4 KANNADA

Credits : 3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 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 # PG-RL.3.4 MALAYALAM

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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# PG-RL.4.4 TAMIL

Credits : 3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 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# PG-RL.5.4 TELUGU

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-Edu.3 ASSESSMENT OF LEARNING

Credits: 2 (1L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 3	**$C_1 + C_2$: 50**
Exam Duration: 2 hrs	**C_3 : 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, 8th 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 (8th 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 # PG-M.5 MATHEMATICS
DIFFERENTIAL EQUATIONS

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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# PG-P.4 PHYSICS
THEORY
OPTICS

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, Polariods, 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_3 : 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# PG-C.4 CHEMISTRY
THEORY

THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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_2 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_2O), ($FeCl_3$ – H_2O) and ($CuSO_4$ – H_2O) system. Freezing mixtures, acetone dry ice.

Liquid – liquid mixtures: Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system – Azeotropes – HC – H_2O 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_3: 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 (Ksp) 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 toulene 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

V SEMESTER

V # PG-Edu. 4 TEACHING APPROACHES AND STRATEGIES

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 50**

Objectives:
On completion of the coursed, 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 earning, 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*, 2nd 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 21st 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.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://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://online.sfsu.edu/~foreman/itec800/finalprojects/eitankaplan/pages/classroom.htm

V# PG-POPS.1 PEDAGOGY OF PHYSICAL SCIENCE

Credits : 4(2L+2T +0P) **Marks: 100**
Contact hrs per week : 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 21st 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 20th 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# PG-POM.1 PEDAGOGY OF MATHEMATICS

Credits : 4(2L+2T +0P) **Marks: 100**
Contact hrs per week : 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-POBS.1 PEDAGOGY OF BIOLOGICAL SCIENCE

Credits : 4(2L+2T +0P)	**Marks: 100**
Contact hrs per week : 6	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 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 (8th 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 -2nd 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 # PG-M.6 MATHEMATICS

MULTIVARIATE CALCULUS & VECTOR CALCULUS

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 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# PG-P.5 PHYSICS
THEORY

BASIC ELECTRONICS

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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_3 : 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# PG-C.5 CHEMISTRY
THEORY

TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 lanthanaides 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 $Ni(CO)_4$, $Fe(CO)_5$ and $V(CO)_6$, 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_3 :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.

VI SEMESTER

VI# PG-POPS.2 PEDAGOGY OF PHYSICAL SCIENCE

Credits : 4(2L+2T +0P) **Marks: 100**
Contact hrs per week : 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 : Pedagogic 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 start, 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# PG-POM.2 PEDAGOGY OF MATHEMATICS

Credits : 4(2L+2T +0P) **Marks: 100**
Contact hrs per week : 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Miffilin.
3. Iglewiez, Boris and Stoyle, 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 # PG-POBS.2 PEDAGOGY OF BIOLOGICAL SCIENCE

Credits : 4(2L+2T +0P) **Marks: 100**
Contact hrs per week : 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 5th 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^{th} 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^{nd} 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# PG-M.7 MATHEMATICS

GROUP THEORY

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Vasishtha, 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, 2nd 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, 5th 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# PG-P.6 PHYSICS
THEORY

RELATIVITY AND QUANTUM MECHANICS

Credits : 4 (3L + 0T +1P)	**Marks: 100**
Contact hrs per week: 6	**$C_1 + C_2$: 50**
Exam Duration : 2 hrs	**C_3 : 50**

Objectives : To enable students to understand the essentials of relativity and quantum mechanics, the two theories of 20^{th} 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 - γ-ray microscope.

Unit III : Development and Application of Schroedinger 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_3 : 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# PG-C.6 CHEMISTRY
THEORY
ORGANIC CHEMISTRY – II

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 [$Pb(OA_c)_4$ and 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-Villager oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions. Halogenation of enolizable ketones. An introduction to α, β 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 α – hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthetic applications of malonic ester: dicarboxylic acids – succinic acid and adipic acid; α,β – unsaturated acids – crotonic acid and cinnamic acid; barbituric acid.

Synthetic applications of acetoacetic ester: dicarboxylic acids – succinic acid and adipic acid; α, β – 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_3 : 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 , $NaHCO_3$, 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_f 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_f 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

VII SEMESTER

VII # PG-ICT.2 Information and Communication Technology in Education- II

Credits : 1(0L + 0T + 1P) **Marks : 100**
Contact hrs per week: 2 **$C_1 + C_2$: 50**
C_3 : 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, www.wordpress.com, or 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

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
- 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&futf8=1&gp=1&gp=1&text=ict+in+education&text_p=inc

VII# PG-M.8 MATHEMATICS

RINGS AND FIELDS

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, Kernal 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, 2nd 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, 5th 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 # PG-M.9 MATHEMATICS

LINEAR ALGEBRA

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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, Saymour 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, Brikhoff 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, Spinger 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# PG-P.7 PHYSICS
THEORY

ATOMIC AND MOLECULAR PHYSICS

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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. Duanne 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_3: 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# PG-C.7 CHEMISTRY
THEORY

ELECTROCHEMISTRY AND PHOTOCHEMISTRY

Credits : 4 (3L + 0T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 (ΔG, ΔH 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_3: 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 # PG- IP.1 INTERNSHIP PROGRAMME METHODOLOGY 1

Credits: 4 (0L+ 0T+4P) **Marks : 100**
$C_1 + C_2 = 50$
$C_3 = 50$

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_1)

Phase 2 : Internship (C_3)

Phase 3 : Post-Internship and Critical Reflection of Internship Experience(C_2)

VII # PG-IP.1 INTERNSHIP PROGRAMME

METHODOLOGY 2

Credits: 4 (0L+ 0T+4P) **Marks : 100**

$C_1 + C_2 = 50$

$C_3 = 50$

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_1)

Phase 2 : Internship (C_3)

Phase 3 : Post-Internship and Critical Reflection of Internship Experience(C_2)

VIII SEMESTER

VIII # PG- IC.1 INDIAN CONSTITUTION AND HUMAN RIGHTS

Credits : 1(0L + 1T + 0P) **Marks :100**
Contact hrs per week: 2 **$C_1 + C_2$: 50**
C_3 : 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. Granveille 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 Aministration 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. Granveille 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 # PG- EDU.5 SECONDARY EDUCATION IN INDIA: STATUS, ISSUES AND CONCERNS

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 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:

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7. Malhotra, P.L. (1986) School Education in India : Present status and Future Needs, NCERT, New Delhi.
8. NCERT (1997) Code of Professional Ethics for Teachers.
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10. NCTE (1998) Policy Perspectives in Teacher Education, New Delhi Peters, R.S. (1971) Ethics and Education, George Allen Unwin Ltd. London.
11. Singh, R.P. (Ed) Teacher Training in India-Looking Ahead Federation of Management & Educational Institutions, New Delhi.

VIII # PG-Edu.6(a) : INCLUSIVE EDUCATION
(Optional)

Credits: 3 (2L + 1T + 0P)	**Marks: 100**
Contact hrs per week: 4	**$C_1 + C_2$: 50**
Exam Duration: 2 hrs	**C_3 : 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 calssroom 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 emotioanal (barrier free environment)
- Facts and myths of inclusve 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: Educationl 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 mesasures 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 assessement 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

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34. Sabatino D. A. and Mauser A. J. (1978) Intervention strategies for specialized secondary education. Allyn and Bacon, Inc.
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VIII# PG-Edu.6(b) GUIDANCE AND COUNSELLING IN SCHOOLS (Optional)

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 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 couselling.

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

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3. Bhatnagar, Asha and Gupta, Nirmala (Eds.) (1999). Guidance and Counselling: A theoretical Perspective; Volume-II, New Delhi: Vikas Publishing House Pvt. Ltd.
4. Gibson R L and Mitchell, M H (2003). Introduction to Counselling and Guidance. New Delhi: Prentice-Hall.
5. Gysbers and N C and Hendrerson E (2006). Developing and Managing Your School Guidance and Counselling Programme (4th Edn.). Alexandria, VA: American Psychological Corporation.
6. Saraswat, R K and Gaur J S (1994). Manual for Guidance Counsellors. New Delhi: NCERT.

7. Mohan, S (1998). Career Development in India: Theory, Research and Development; New Delhi: Vikas Publishing House.
8. Joneja G K (1997). Occupational Information in Guidance. Newq delhi: NCERT
9. Mohan, S and sibia, A (1998). Handbook of Personality Measurements in India. New Dehli: NCERT
10. Srivastava A K. (2003). Principles of Guidance and Counselling; New Delhi: Kaniksha Publishers and Distributors.

VIII # PG-Edu.6(c) CURRICULUM AND SCHOOL

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 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 curriculam 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 :

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2. Bhagley Classroom Management, McMillan Co., New York.
3. Bhatnagar R P and Vearma (1978) Educational Supervision, Loyal Book Department, Meerut.
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16. Olivia, P (2004): Developing the curriculum (6th 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.
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VIII# PG-M.10 MATHEMATICS

Paper I
COMPLEX ANALYSIS

Credits : 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 Transformatiions, 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# PG-M.11(a) MATHEMATICS
Paper II (Optional)
NUMERICAL ANALYSIS*

Credits : 2 (1L + 1T + 0P) **Marks: 100**
Contact hrs per week: 3 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 # PG-M.11(b) MATHEMATICS
Paper II (Optional)
GRAPH THEORY*

Credits : 2 (1L + 1T + 0P) **Marks: 100**
Contact hrs per week: 3 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 20th 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, 4th 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 Freank 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, 2nd Edition.

*** Any one of the above two papers of VIII Semester will be selected.**

VIII# PG-P.8 PHYSICS

THEORY

NUCLEAR AND SOLID STATE PHYSICS

Credits : 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 α 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 Schroedinger 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_3 : 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# PG-C.8 CHEMISTRY
THEORY

SPECTROSCOPY, NATURAL PRODUCTS AND HETEROCYCLICS

Credits : 3 (1L + 1T +1P) **Marks: 100**
Contact hrs per week: 6 **$C_1 + C_2$: 50**
Exam Duration : 2 hrs **C_3 : 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 α,β-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

Terpinoids : 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 α - 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, sulphathiozole, 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_3: 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 Vij'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

IX SEMESTER

IX PG C. Edu 10 FOUNDATIONS OF HIGHER SECONDARY EDUCATION

Credits : 3(2L + 1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Objectives:
- Understand the concept of Education and its Epistemological premises
- Analyses the Discipline categories and their Logical distinctions
- Understands Education as a Discipline and its contribution to curriculum courses
- Analyses the societal problems and the necessity for Peace Education in schools

- Explores the possible sources of value conflicts , crisis among Higher secondary learners and teacher's role in helping to resolve value conflicts
- Analyses various perspectives and thoughts on Peace and Peace Education
- Analyses the role of Education in a Pluralistic society like India and a need for culture-specific pedagogy in School Education
- Reflects on the social discriminations , inequalities and the oppressed groups ,as a teacher , as well as a member of the society and develops responsible attitude and commitment
- Understands the school as a sub system of society and its responsibilities in reflecting the cultural and social ethos in its aims and functions
- Examines the concerns and issues of contemporary Indian Society and their bearing upon Education

Transaction Mode:
Lectures followed by Discussions; Group Discussions; Seminars; Collaborative Presentations; Assignments

COURSE CONTENT:

Unit I :
Education as a critical concept and criteria of educative process; Knowledge and disciplines; Logical distinction between Scientific and Mathematical Knowledge; Education as a discipline; Multidisciplinary nature of education; Concept and nature of value and value education; Factors contributing to value development; Value shifts; Need for education for peace; Value crises in adolescent learners; Methods of resolving value conflicts; Human rights; Role of education in promoting peace; Use of curricular and co-curricular areas in promoting peace as a value; Rationality as a value to be developed in learners.

Unit II :

a) Styles of learning and thinking – implications for understanding the adolescent learner; Sociocultural factors influencing learning.

b) The process of adult learning – cognitive changes (Praget and Elkind); role of feedback and incentives; learner's experience in the construction of knowledge.

c) Personality and development of self; The intra and interpersonal realm – self perception, self-defeating behaviour, self presentation, impression and management, self-monitoring; search for identity (Erikson), time of turmoil.

d) Mental health and management – Issues and concerns; adjustment and adjustment mechanisms; role of teacher in management.

Unit III :

a) Characteristic of Indian society : Multicultural, Multilinguistic and Multireligion system and role of senior Secondary Teacher

b) Socialization and acculturation, etc. influence on personality development in education.

c) Modernisation, its attributes and effect on present system of education.

d) Democratic values, equality and social justice, its importance in classroom teaching at higher secondary level.

Unit IV : Issues and Concerns of Senior Secondary Education

Gender equality, Inclusive Education for Children with Diverse Needs. Environmental Concerns, Sustainable Education, Quality Teacher Education, Globalization and its Effect over Education System.

References:

1. Dewey,John(1956): The School and the Society, The University of Chicago,ptd in USA,1990.
2. Carnoy, Martin (1974): education as Cultural Imperialism, Longman Inc. London
3. Bruner,S,J(1972): the Relevance of Education,Pub by Redwood press Ltd, ptd in Great Britain.
4. Gross,R,B(1970): Analytical Philosophy- An Historical Introduction, Western Publishing company, Inc. USA
5. O'Connor.D.J(1956): Philosophy Of Education
6. Dewey, J(1916): Democracy and Education: An Introduction to Education, New York
7. Peters, R.S: The concept of Education
8. Peters, R.S: Education and Education of Teachers
9. Pathak, Avijit (2002), Social Implications of Schooling, Rainbow Publishers, Delhi
10. Introduction: Life at School, need for critical enquiry Ch. 2 Sociology of School Knowledge Ch 3. Looking Beyond Texts, culture of school and formation of consciousness
11. Kumar Krishna (2004), What is Worth Teaching? 3rd edition, Orient Longman Ch 3. Implications of a Divisive School System Ch. 6 Growing Up Male

12. Saraswathi, T.S. (1999), Culture, Socialization and Human Development, Sage Publications
13. Bhattacharjee, Nandini, Through the Looking Glass: Gender Socialization in a Primary School (Ch14)
14. Krishnamurti, J., Education and the Significance of Life, KFI Publications (Ch. 6)
15. Readings from 'The Social Character of Learning' by Krishna Kumar and from 'Inner World' by Sudhir Kakar could also be considered
16. Krishnamurthi.J (2002): Why are you being educated? Talks at Indian Universities Krishnamurthy Foundations of India, Ptd by Chennai
17. Banks, James A. and C. A. McGee Banks, eds(1989): Multicultural Education: Issues and Perspectives. Needham Heights, Mass.: Allyn & Bacon
18. Boocock, S. S(1980): Sociology of Education: An Introduction. Lanham, MD: University Press of America
19. Chesler, Mark A. and W. M. Cave(1981): A Sociology of Education. New York: Macmillan
20. Dreeben, Robert(1968): On What is Learned in School. Reading, Mass.: Addison-Wesley
21. Durkheim, Emile(1956): Education and Sociology. Tr. Sherwood D. Fox. New York: Free Press
22. Eggleston, John(1977): The Sociology of the School Curriculum. Boston: Routledge & K. Paul
23. Jackson, P.W.(1968):Life in Classrooms. New York: Holt.
24. Rayner Steve (2007): Managing Special and Inclusive Education. New Delhi : Sage Publications.
25. Woodfolk Anitha (2004) : Educational Psychology. Boston : Pearson.
26. Snowman, S and Bidher, R. (2004): Psychology Applied to Teaching. California : Wadsworth.
27. NCERT (2005) : Education of Children with Special Needs – Position Paper by National Focus Group. New Delhi: NCERT.
28. NCERT (2005): Education for Peace- Position Paper by National Focus Group. New Delhi : NCERT.
29. Byrne, D. and Baron, R. (2008): Social Psychology. Boston : Allyn and Bacon.
30. Palmer, Joy, A. (2003) : Environmental Education in the 21st Century – Theory, Practice, Progress and Promise. New York : Routledge.

IX/PG-C.9.1 FOUNDATIONS OF CHEMISTRY - I

Credits : 2 (1L+1T+0P) **Max. Marks: 50**
Contact hours per week: 3 **$C_1 + C_2$: 50**
Exam duration: 2 hrs **C_3 : 50**

Course Objectives:

The student teacher will be able to:

1. understand the historical evolution of concepts and Principles of Chemistry.
2. understand the scope and Philosophy of Science.
3. analyze the various types of explanations in Science.

Unit I : History and Nature of Chemistry as a branch of Science

Early Science in East and West- a comparison; Alchemy; Early Greek and Indian thinkers; Scientific revolution;Cause-effect and teleological reasoning; classical and Quantum theories;Modern Science and Progress-hope and Fear
Nature of Science; Scientific Knowledge-Facts, Concepts, Principles, Theories and Laws – Discussion with subject specific illustrations

Unit II: Philosophy Of Science

Science and Pseudo science; Philosophy of Science and Science; Empirical evidences in science; Satisfactory and Unsatisfactory Explanations; Theories and their modifications; Competing theories Models and Analogies; Observation –reliability in observations and measurements; Illusions, Role of language in Science

Reference:

1. *A source book of Atomic Energy* by Samuel Glasstone
2. Ray.P.C,1909, *History of Hindu Chemistry*. Vol.I and II, London: Williams and Norgate
3. Subbarayappa.B.V,1999, Indian Alchemy: Its origin and Ramifications
4. John Kemeny, *A Philosopher looks at Science*
5. Fetzer.J,(1993) *Philosophy of Science*, NY, Paragon House
6. Lambert K & Brittain G C(1987) *An Introduction to the Philosophy of Science*, Ridgeview: Atescadero, 3rd Edition
7. Aiekenhead,G.S.(2003) STS Education: A rose by any other name. In *A vision for Science Education: Responding to the world of Peter J. Fensham*(ed.) Cross,R:Routledge Press
8. Aiekenhead,G.S.(1994)What is STS Teaching? In Solomon J & G. Aiekenhead (eds.): *STS Education International perspectives in Reform*. NY:Teacher's college press.
9. Alsop,S.& Hicks K(eds.)(2001) *Teaching Science* , London , Kogan page

IX # PG-C.9.2 Methods of Chemical Analysis

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT - I

Analytical chemistry-meaning and analytical prospective, scope and function: Analytical problems and their solutions, trends in analytical methods and procedures.

Language of analytical chemistry - analysis, determination and measurement. Techniques, methods, procedures and protocols. Classifying analytical techniques. Selecting an analytical method-accuracy, precision, sensitivity, selectivity, robustness and ruggedness. Scale of operation, equipment, time and cost. Making the final choice.

Errors and treatment of analytical data: Limitations of analytical methods-Error-determinate and indeterminate errors, minimization of errors. Accuracy and precision. Distribution of random errors, the normal error curve. Statistical treatment of finite samples-measures of central tendency and variability-mean, median, range, standard deviation and variance. Student's t-test. Confidence interval of mean. Testing for significance-comparison of two means and two standard deviations. Comparison of an experimental mean and a true mean. Criteria for the rejection of an observation-Q-test. Propagation of errors-determinate errors and indeterminate errors.

UNIT-II

Standardization and calibration: Comparison with standards-direct comparison and titrations. External standard calibration-the least squares method, regression equation, regression coefficient. Internal standard methods and standard-addition methods. Figures of merit of analytical methods-sensitivity and detection limit, linear dynamic range.

Obtaining and preparing samples for analysis: Importance of sampling, designing a sample plan-random, judgement, systematic-judgement, stratified and convenience sampling. Type of sample to collect-grab and composite samples. Insitu sampling. Size of sample and number of samples. Implementing the sampling plan-solutions, gases and solids. Bringing solid samples into solution-digestion and decomposing.

UNIT-III

Titrimetric analysis: An overview of titrimetry. Principles of titrimetric analysis. Titration

curves. Titrations based on acid-base reactions-titration curves for strong acid - strong base, weak acid – strong base and weak base – strong acid titrations. Selecting and evaluating the end point. Finding the end point with visual indicators, end point by monitoring pH and temperature.

Quantitative applications – selecting and standardizing a titrant, inorganic analysis-alkalinity, acidity and free CO_2 in water and waste waters, nitrogen, sulphur,

ammonium salts, nitrates and nitrites, carbonates and bicarbonates. Organic analysis-functional groups like carboxylic acid, sulphonic acid, amine, ester, hydroxyl and carbonyl. Air pollutants like SO_2. Quantitative calculations. Characterization applications-equivalent weights and equilibrium constants.

Acid-base titrations in non-aqueous media: Role of solvent in acid-base titrations, solvent systems, differentiating ability of a solvent, some selected solvents, titrants and standards, titration curves, effect of water, determining the equivalence point, typical applications determination of carboxylic acids, phenols and amines.

Unit IV

Flame photometry and Atomic absorption spectrometry: Energy level diagrams-atomic absorption spectra. Flame characteristics. Flame atomizers and electrothermal atomization. Comparison of spectral interferences, chemical and physical interferences in flame photometry (FP) and atomic absorption spectrophotometry (AAS). Use of organic solvents. Quantitative techniques-calibration curve procedure and the standard addition technique. Typical commercial instruments for FP and AAS. Applications. Qualitative analysis and quantitative evaluations. Relative detectabilities of atomic absorption and flame emission spectrometry.

Molecular luminescence spectrometry: Theoretical basis for fluorescence and phosphorescence. Singlet and triplet excited states. Variables affecting luminescence-quantum efficiency, transition types, structure and structural rigidity, temperature and solvent effects, effect of pH, dissolved oxygen and concentration effect. Excitation spectra *vs* emission spectra. Fluorescence instrumentation-fluorometers and spectrofluorometers. Sensitivity and selectivity. Modification necessary to measure phosphorescence. General scope of applications of luminescence.

Nephelometry and turbidometry: Principles, instrumentation and applications.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Principles and Practicals of Analytical Chemistry, F. W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
7. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
8. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th Edition, CBS Publishers, New Delhi, 1988.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.

10. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., New Delhi, 2002.

IX # PG-C.9.3 CONCEPTS, MODELS & STRUCTURAL METHODS IN INORGANIC CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT I

Structures and energetics of ionic crystals: Introduction, MX (NaCl, CsCl, ZnS) and MX_2 (fluorite, β-crystobalite and cadmium iodide) types. The perovskite and spinel structures. Thermodynamics of ionic crystal formation. Lattice energy, Born-Haber cycle, Born-Lande equation. Applications of lattice energetics. Ionic radii, factors, affecting the ionic radii, radius ratio rules.

Structures and energetics of inorganic molecules: Introduction, Energetics of hybridization.VSEPR model for explaining structure of AB, AB_2E, AB_3E, AB_2E_2, ABE_3, AB_2E_3, AB_4E_2, AB_5E and AB_6, molecules. M.O. treatment for homonuclear and heteronuclear diatomic molecules. M.O. treatment involving delocalized π-bonding (CO_3^{2-}, NO_3^-, NO_2^-, CO_2 and N_3^-). M.O. correlation diagrams (Walsh) for triatomic molecules.

UNIT-II

Electron deficient compounds: Diborane and its reactions, higher boranes, ploy hedral boranes (preparations, properties, structure and bonding). Wade's rules, carboranes and metallocarboranes.

Lanthanides: Review of important properties (spectral, magnetic etc). Abundance and extraction, General principles- conventional, solvent extraction and ion exchange methods.

Separation from monazite. Chemistry of principal oxidation states (II, III and IV) Uses: lanthanides as shift reagents, high temperature super conductors.

Actinides: Occurrence and preparation of elements, Isolation of the elements: thorium and uranium, enrichment of uranium for nuclear fuel, uranium hydrides, oxides and chlorides. Chemical reactivity and trend. Chemistry of trans-uranium elements.

UNIT-III

NMR Spectroscopy: Basic principles, Chemical shift and factors affecting it, coupling constants. ^{19}F, ^{31}P -NMR and NMR of paramagnetic complexes. Double resonance technique, The nuclear overhauser effect, Magnetic susceptibility measurements by Evan's method. NMR to solids.

ESR Spectroscopy: Theory, presentation of the spectrum, hyperfine coupling, the 'g' values and factors affecting the magnitude of the 'g' values. Zero-field splitting and Kramers' degeneracy. Application to simple inorganic and organic free radicals and to metal complexes.
NQR Spectroscopy: Theory, Energies of the quadrupole transitions, Instrumentation, effect of magnetic field on the spectra, relationship between electric field gradient and molecular structures. Applications - interpreation of e^2Qq data, structural information from NQR data.

UNIT-IV
Vibrational spectroscopy: Introduction, Theory of infrared absorption, theoretical group frequencies, correlation chart. Applications to coordination compounds- Aquo, ammine, urea, DMSO, cis and trans metal complexes. Change in spectra accompanying change in symmetry upon coordination (nitrite, sulphate, nitrate, perchlorate and carbonate)
Mossbauer Spectroscopy: Theoretical basis, Interpretation of Mossbauer spectra- Isomer shift, Quadrupole splittings and magnetic hyperfine structures, Application: $Fe_3(CO)_{12}$. Prussian blue, hexacyanoferrate.
Photoelectron spectroscopy: Introduction, principles, chemical shifts, photoelectron spectra of simple molecules, X-ray photoelectron and Auger electron spectroscopy. Applications.
Mass spectrometry: Theory, experimental techniques, molecular ions, fragmentation and ion reaction, Applications to coordination compounds.

References:

1. Basic Inorganic Chemistry – 3rd edn. F.A. Cotton, G. Wilkinson and P.L. Gaus, John Wiley and Sons (2002).
2. Inorganic Chemistry, 3rd edn. James E. Huheey, Harper and Row Publishers (1983).
3. Inorganic Chemistry, 2nd edn. D.F. Shriver, P.W. Atkins and C.H. Langford, Oxford University Press (1994).
4. Introduction to Modern Inorganic Chemistry, K.M. Mackay and R.A. Mackay, Blackie Publication (1989).
5. Concepts and Models of Inorganic Chemistry 3rd edn. B.E. Douglas, D.H. McDaniel and Alexander, Wiley (2001).
6. Electronic absorption spectroscopy and related techniques – D.N. Sathyanarayana, Universities press (2001).
7. Structural Methods in Inorganic Chemistry – E.A.V. Ebsworth, D.W.H. Ranklin and Cradock, Blackwell Scientific Publications (1988).
8. Physical methods in Inorganic chemistry – R.S. Drago, Saunders Publishers (1966).

IX # PG-C.9.4 STEREOCHEMISTRY AND ORGANIC REACTION MECHANISM

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Stereoisomerism: Projection formulae [Fly wedge, Fischer, Newman and Saw hourse], enantiomers, diasteroisomers, racemic mixture and their resolution, configurational notations of simple moleculesx, DL and RS configurational notations.

Stereoselectivity: Sterioselective reactions, diasteroselective reactions, stereospecific reactions, regioselective & regiospecific reactions.

Opotical Isomerism: Conditions for optical isomerism, optical isomerism due to chiral centres and molecular dissymmetry, allenes and biphenyls, criteria for optical purity.

Geometrical isomerism: Due to C=C, C=N and N=N bonds, E,Z conventions, determination of configuration by chemical methods.

Conformational Isomerism: Elementary account of conformational equillibria of ethane, butane and cyclohexane.

Conformational analysis: Conformation of cyclic compounds such as cyclopentane, cyclohexane and decalins. Conformational analysis of 1,2-; 1,3-, 1,4-disubstituted cyclohexanes. Effect of conformation on the course of rate of reactions.

UNIT-II

Structure and reactivity: Acids and Bases, Structural effect on acidity and basicity, hydrogen bonding Resonance, inductive and hyperconjugation effects.

Reaction Intermediates: Formation, structure, stability, detection and reactions of carbocations (classical and non-classical), carbanions, free radicals, carbenes, nitrenes, nitrile ylides and arynes.

Substitution reactions: Mechanism of nucleophilic substitution reactions-Kinetics, Mechanism and stereochemical factor affecting the rate of S_{N1}, S_{N2}, S_N^i reactions, Neighbouring group participation.

Aromatic nucleophilic substitution: SN1, SN2 and benzyne mechanism, Bucherer reaction.

Aromatic electrophilic substitution: Mechanism of nitration, halogenation, sulphonation, Friedel- Crafts alkylation and acylation, Mannich reaction, chloromethylation, Vilsmeier-Haack reaction.

UNIT-III

Reaction Mechanism I: Classification of reactions, meaning and importance of reaction mechanism.

Determination of reaction mechanism by kinetic and non-kinetic-methods:

Kinetic Method: Mechanistic implications from rate laws, the transition state theory, ambiguities in interpreting kinetic data, solvent effect, ionic effect, isotopic effect,

solvent isotopic effect, substituent effect, steric effect, linear free energy relationships – Hammett equation and Taft treatment.

Non-kinetic methods; Energy profile diagram, identification of products, testing possible intermediates, trapping of intermediates, cross over experiments, isotopic labeling, sterochemical studies, limitations.

Aromaticity: Concept of aromaticity, Huckel's rule, Polygon rule, annulenes.

UNIT – IV

Reaction Mechanism II: Mechanism of Addition reactions: Addition to C-C multiple bonds involving electrophiles, nucleophiles and free radicals. Markownikoff's rule and anti-Markownikoff's rule, Hydroboration and its application.

Typical additions to carbonyl compounds: Addition of hydride, water, alcohol, thioalcohol, bisulphate, HCN, Grignard reagents and amino compounds.

Mechanism of reactions of carboxylic acids and their derivatives: Mechanism of ester hydrolysis, formation and hydrolysis of amides, decarboxylation mechanisms.

Mechanism of electrophilic substitution reactions-Kinetics, mechanism and stereochemical factor affecting the rate of S_E1 & S_E2.

Elimination reactions: Mechanism and stereochemistry of eliminations-E1, E2, E1cb mechanism, cis elimination, Hofmann and saytzeff eliminations, competition between elimination and substitution, Chugaev reaction.

References:

1. E. L. Eliel and S. H. Wilen, Stereochemistry of Organic Compounds, Jhon Willey and Sons, New York. 1994.
2. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow Hill, New York, 1987.
3. Organic Chemistry-Morrison & Boyd
4. Finar, Organic Chemistry, ELBS Longmann, Vol. I & II 1984.
5. Basic Principles of Organic Chemistry-Robert & Casereo
6. N. S. Issacs, Reactive intermediates in Organic Chemistry, Jhon Willey and Sons, New York. 1974.
7. R. K. Bansal, Organic Reaction Mechanism, Wiley Eastern Limited, New Delhi, 1993.
8. J. March, Advanced Organic chemistry, Willey Interscience, 194.
9. E. S. Gould, Mechanism and structure in Organic Chemistry, Halt, Rinehart & Winston, New York, 964.
10. A Guide book to mechanism in Organic Chemistry-Petersykes
11. F. A. Carey and Sundberg, Advanced Organic Chemistry-Part A & B, 3rd edition, Plenum Press, New York, 1990.
12. P. S. Kalsi, Stereo Chemistry of Organic compounds and solved problems.

IX # PG-C.9.5 CHEMICAL THERMODYNAMICS & STATISTICAL MECHANICS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT I

Concepts of entropy and free energy: Entropy as a measure of unavailable energy. Entropy change during spontaneous process. Helmholtz and Gibbs free energies. Thermodynamic criteria of equilibrium and spontaneity. Variation of free energy with temperature and pressure. Third law of thermodynamics-calculation of absolute entropies.

Partial molar properties: Partial molar volumes and their determination by intercept method and from density measurements. Chemical potential and its significance. Variation of chemical potential with temperature and pressure. Formulation of the Gibbs Duhem equation. Derivation of Duhem-Margules equation.

UNIT II

Fugacity: Determination of fugacity of gases. Variation of fugacity with temperature and pressure. Activity and activity coefficients. Variation of activity with temperature and pressure. Determination of activity coefficients by vapour pressure, depression in freezing point, solubility measurements and by electrical methods.

Thermodynamics of dilute solutions: Raoult's law, Henry's law. Ideal and non-ideal solutions. Discussion and derivation of the laws of osmotic pressure, cryoscopy and ebullioscopy. Determination of molecular weights. Donnan membrane equilibrium: Thermodynamic treatment using the concept of chemical potentials. Heat capacity of solids, Einstein and Debye heat capacity equations, characteristic temperature and its significance.

UNIT III

Phase Rule Studies: Thermodynamic derivation of phase rule, application of phase rule to the two component systems, simple eutectic type, compound formation with congruent melting point and incongruent melting points, systems involving the formation of a continuous series of solid solutions, Roozeboom's classification. Application of phase rule to three component systems. Systems of three liquids, systems of two salts and water. .

UNIT IV

Statistical Mechanics: Introduction, thermodynamic probability relation between entropy and thermodynamic probability, principle of equipartition of energy, Maxwell-Boltzmann distribution equation, partition function, translational, rotational and vibrational partition functions, evaluation of molar entropies, entropy of monatomic gas (Sackur-Tetrode equation). Evaluation of internal energy, enthalpy,

Helmholtz and Gibbs free energies, equilibrium constant, partition functions of atoms and diatomic molecules**.**

References:

1. Thermodynamics for Chemists by S. Glasstone, Affiliated East-west press, New Delhi, (1965).
2. Chemical Thermodynamics by I.M. Klotz, W.A. Benzamin Inc. New York, Amsterdam (1964).
3. Basic Physical Chemistry by W.J. Moore, Prentice Hall of India Pvt. Ltd., New Delhi (1986).
4. Text book of Physical Chemistry by Samuel Glasstone, MacMillan Indian Ltd., 2nd edition (1974).
5. Theoretical Chemistry by S. Glasstone.
6. Elementary statistical thermodynamics by N.D. Smith Plenum Press, NY (1982).
7. Elements of Physical Chemistry –Lewis and Glasstone.
8. Physical Chemistry by P.W. Atkins, ELBS, 4th Edition, Oxford University Press (1990)
9. Statistical themodynamics by B.C. Meclelland, Chapman and Hall, London (1973).
10. Elements of classical and statistical thermodynamics by L.K. Nash, Addison-Wesley (1970).
11. Statistical thermodynamics by I.M. Klotz.
12. Introduction to Statistical Thermodynamics by M. Dole, Prantice-Hall, (1962).

IX # PG-C.PR.9.6 INORGANIC PRACTICAL – I

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

Quantitative Analysis: (Any ten of the following experiments)

1. Determination of iron in haematite using cerium(IV) solution (0.02M) as the titrant, and gravimetric estimation of insoluble residue.
2. Estimation of calcium and magnesium carbonates in dolomite using EDTA titration, and gravimetric analysis of insoluble residue.
3. Determination of manganese dioxide in pyrolusite using permanganate titration.
4. Quantitative analysis of copper-nickel in alloy/mixture:

i. Copper volumetrically using KIO_3.
ii. Nickel gravimetrically using DMG

5. Determination of lead and tin in a mixture: analysis of solder using EDTA titration.
6. Complexometric determination of calcium and lead in a mixture.
7. Quantitative analysis of chloride and iodide in a mixture:

i. Iodide volumetrically using KIO_3

ii. Total halide gravimetrically.

8. Determination of chlorate in commercial samples by iodometric method.
9. Determination of borax by neutralization titration.
10. Gravimetric analysis of molybdenum with 8- hydroxyqunoline.
11. Spectrophotometric determinations of :

a. Titanium using hydrogen peroxide.

b. Vanadium using eriochrome cyanine R in micellar medium.

c. Iron using thiocyanate/1,10-phenanthroline method in commercial samples.

d. Nickel using dimethylglyoxime in steel solution.

12. Circular paper chromatographic separation of (Demonstration):

a. Iron and nickel

b. Copper and nickel

REFERENCES

1. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 3rd edition.
2. Vogel's Text Book of Quantitative Chemical Analysis – 5th edn, J. Basset, R.C. Denney, G.H. Jeffery and J. Mendhom.
3. Spectrophotometric determination of elements – Z. Marczenko.
4. Quantitative Chemical Analysis – Daniel C. Harris, 7th edition, (2006)

IX # PG-C.PR.9.7 PHYSICAL CHEMISTRY PRACTICAL – I

(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

1. Study of kinetics of hydrolysis of an ester using HCl/H_2SO_4 at two different temperatures, determination of rate constants and energy of activation.
2. Study of kinetics of reaction between $K_2S_2O_8$ and KI, first order, determination of rate constants at two different temperatures and E_a.
3. Conductometric titration of a mixture of HCl and CH_3COOH against NaOH.
4. Conductometric titration of a mixture of HCl, CH_3COOH and $CuSO_4$ against NaOH.
5. Potentiometric titration of KI vs $KMnO_4$ solution.
6. Determination of dissociation constant of a weak acid by potentiometric method.

7. Potentiometric titration of $AgNO_3$ vs KCl.
8. To obtain the absorption spectra of coloured complexes, verification of Beer's law and estimation of metal ions in solution using a spectrophotometer.
9. Spectrophotometric titration of $FeSO_4$ against $KMnO_4$.
10. Determination of heat of solution of benzoic acid by variable temperature method (graphical method).
11. Thermometric titration of hydrochloric acid with a NaOH.
12. Determination of molecular weight of a compound using Bekmann's cryoscopic method using benzene or/and water as solvent.
13. Potentiometric titrations of (a) Fe(II) vs V(V).
14. Kinetics of photodegradation of indigocarmine (IC) using TiO_2 as photocatalyst and study the effect of [TiO_2] and [IC] on the rate of photo degradation.
15. Conductometry –To determine the degree of hydrolysis and hydrolysis constant of aniline hydrochloride.
16. Conductometric titration of potassium iodide with mercuric perchlorate.
17. Determination of the molecular weight of a polymer material by viscosity measurements (cellulose acetate/methyl acrylate).

References

1. Practical Physical Chemistry – A.J. Findlay.
2. Experimental Physical Chemistry –F. Daniels et al.
3. Selected Experiments in Physical Chemistry – Latham.
4. Experiments in Physical Chemistry – James and Prichard.
5. Experiments in Physical Chemistry – Shoemaker.
6. Advanced Physico-Chemical Experiments –J. Rose.
7. Practical Physical Chemistry –S.R. Palit.
8. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
9. Experiments in Physical Chemistry – Palmer.
10. Experiments in Chemistry –D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
11. Experimental Physical Chemistry –Das. R.C. and Behera B, Tata Mc Graw Hill.

X SEMESTER

X/PG-C.10.1 FOUNDATIONS OF CHEMISTRY - II

Credits: 2 (1L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 3 **$C_1 + C_2$: 50**
Exam. Duration: 2 hrs **C_3 : 50**

Course Objectives:

The student teacher will be able to:

1. critically examine the mutual influence of Science, Society and Technology.
2. study the impact of changing priorities on science Education in Schools
3. analyze the emerging issues like Right to Education and Inclusive Education in learning Chemistry at secondary level.

Unit I: Science, Technology and Society

Science and Technology, National Science policy, Science and Progress; Science in Everyday life; Technology influencing society and vice versa; Values in Science; Gender Issues; STS projects in school curriculum; Critical pedagogy and its integration in science education; Scientific temper as a value.

Unit II: Contemporary Issues in Chemistry and Chemistry Education

Environmental issues; Green house gases and climatic changes; Green Chemistry; Alternate Energy sources; Nano technology; Pollution control boards and the standards; Waste Management and communication technology as an aid in science education;
Status of Chemistry Education at Tertiary level-problems and Issues

Reference:

1. *A source book of Atomic Energy* by Samuel Glasstone
2. Ray.P.C,1909, *History of Hindu Chemistry*. Vol.I and II, London: Williams and Norgate
3. Subbarayappa.B.V,1999, Indian Alchemy: Its origin and Ramifications
4. John Kemeny, *A Philosopher looks at Science*
5. Fetzer.J,(1993) *Philosophy of Science*, NY, Paragon House
6. Lambert K & Brittain G C(1987) *An Introduction to the Philosophy of Science*, Ridgeview: Atescadero, 3rd Edition
7. Aiekenhead,G.S.(2003) STS Education: A rose by any other name. In *A vision for Science Education: Responding to the world of Peter J. Fensham*(ed.) Cross,R:Routledge Press

8. Aiekenhead,G.S.(1994)What is STS Teaching? In Solomon J & G. Aiekenhead (eds.): *STS Education International perspectives in Reform*. NY:Teacher's college press.
9. Alsop,S.& Hicks K(eds.)(2001) *Teaching Science* , London , Kogan page

X /PG-C.10.2 TEACHING OF CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Course Objectives
The student teacher will be able to

- Understand the nature and scope of Chemistry
- Understand the different pedagogical approaches to teaching of Chemistry
- Plan learning designs based on problem situations, inquiry and projects
- Explore the use and relevance of different learning resources and materials in teaching of Chemistry
- Study the facilities and materials available in chemistry labs for teaching chemistry at higher secondary level
- Familiarize with different types of curricular projects in Chemistry, their purpose and themes
- Analyse the text books and other instructional materials with reference to the content, its organization, learning experiences and other characteristics
- Prepare tools for assessing learning of chemistry

Unit I
Aims, Objectives and Approaches to Teaching/Learning Chemistry
Chemistry as a pure and experimental science; processes of scientific method; applied disciplines of chemistry; objectives of teaching chemistry at +2 level based on the aims of education as reflected in NCF-2005;Criteria of selecting learning objectives-integration of process skills and learning attainments, promoting scientific temper and creativity as the other aims of teaching/learning chemistry;

- Approaches to teaching/learning chemistry: Investigatory approach, Inquiry method, Problem solving, Problem Based Learning, Projects, Demonstration Cum Discussion, Discovery and Guided Discovery learning, Inductive and deductive methods, and concept attainment approaches, Cooperative and collaborative learning, Self learning methods, ICT integrated approaches for teaching/learning Chemistry. (The above listed approaches will be illustrated drawing specific examples from content at +2 level followed by group work), Identification of teacher qualities to enhance scientific temper and creativity and suitable approaches to develop these in learners.

Unit II

Planning for Teaching/Learning of Chemistry

Pedagogical Analysis: Meaning and importance, identification of content categories- facts, concepts, principles, generalizations, laws and theories, pedagogical analysis of content reflecting STS links and social concerns and issues if any, writing learning objectives, identification of learning experiences for teaching different content categories; Preparation of lessons for teaching/ learning of chemistry: Components- Learning objectives, learning concepts, connecting to prior knowledge, learning resources, sequential learning experiences: Designing learning episodes and activities, grouping of learners, designing of group tasks, teachers' questions, scaffolding with the present knowledge, black board work, use of ICT and other learning resources, review and assignments.

Suggested topics for pedagogic analysis

1. Laws of Chemical Combinations
2. Mole Concept and Molar Masses
3. Electronic Configuration of Elements and their Periodic Properties
4. Laws of Chemical Equilibrium and Factors affecting equilibrium
5. Acids, bases and salts
6. Electrical & Magnetic properties of Solids
7. Types of Solutions and Colligative properties
8. Galvanic cells, Electrolytic cells and Electrolysis
9. Rate of Chemical reaction and Factors influencing rate of reaction
10. Isomerism in Co-ordination compounds
11. **Redox reactions in terms of electron transfer**
12. Nomenclature of Organic compounds
13. Concepts in Organic Reaction Mechanism
14. Chemical reactions of Alcohols / Phenols / Carbonyl compounds

Unit III

Instructional and Curricular Resources

Chemistry Text books, lab manuals, journals on Chemistry Education, Teacher manuals, work sheets, Teaching Learning Aids, Laboratory work, multimedia and web based resources

Lab as a resource: Evolution of practical work in Chemistry and its purpose; Demonstration of content specific experiments on topics related to +2 content, Set of experiments in the lab to illustrate process skills related to learning of chemistry; Planning, designing and demonstrations of experiments, Recent trends and issues in practical work

Curricular Resources: Study of curricular projects at the State/ National/Inter National Levels in Chemistry; Critical analysis of CBSE syllabus and text books in Chemistry

based on the validities enumerated in NCF-2005.

UNIT IV

Assessment in Learning Chemistry

Tools and techniques of assessment in chemistry learning: Open ended questions, short answers and objective type questions.

Assessment of Practical Work**:** Criteria for observing the practical work, skills in observation and recording the observations; interpreting the results of practical work, ability to plan practical procedures and techniques of solving problems and manipulative skills.Assessment of attitude towards practical work: Set of exercises, course work, oral questioning. Assessment of project work; Self assessment; Peer assessment; Planning for Portfolio assessment in chemistry.

X/PG-C.10.3 TITRIMETRIC ANALYSIS AND SEPARATION TECHNIQUES

Credits: 3 (2L+1T+0P) **Max.Marks :100**

Contact Hrs per week : 4 **$C_1 + C_2$: 50**

Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Precipitation titrations: Titration curves, feasibility of precipitation titrations, factors affecting shape-titrant and analyte concentration, completeness of the reaction, titrants and standards, indicators for precipitation titrations involving silver nitrate, the Volhard, the Mohr and the Fajan's methods, typical applications.

Complexometric titrations: Complex formation reactions, stability of complexes, stepwise formation constants, chelating agents, EDTA-acidic properties, complexes with metal ions, equilibrium calculations involving EDTA, conditional formation constants, derivation of EDTA titration curves, effect of other complexing agents, factors affecting the shape of titration curves completeness of reaction, indicators for EDTA titrations-theory of common indicators, titration methods employing EDTA-direct, back and displacement titrations, indirect determinations, titration of mixtures.

Redox titrations: Balancing redox equations, calculation of the equilibrium constant of redox reactions, constructing titration curves, detection of end point, visual indicators and potentiometric end point detection.

Quantitative applications-adjusting the analytes oxidation state, selecting and standardizing a titrant. Inorganic analysis-chlorine residuals, dissolved oxygen in water, water in non-aqueous solvents. Organic analysis-chemical oxygen demand (COD) in natural and waste waters, titrations of mercaptans and ascorbic acid with I_3^- and titration of organic compounds using periodate.

UNIT-II

Chromatography: Definition, principles and mechanism of separation, classification of chromatographic techniques. General descriptions of column chromatography-frontal analysis, displacement analysis and elution analysis. General theory of column chromatography: characterizing a chromatogram-retention time, retention volume and baseline width. Chromatographic resolution, capacity factor, column selectivity. Column efficiency-band broadening-rate theory and plate theory. Peak capacity, non ideal behavior. Optimizing chromatographic separations using capacity factor, column selectivity and column efficiency- Van Deemter equation, and its modern versions, Golay equation and Huber-Knox equations.

Gas chromatography (GC): Principles, instrumentation-mobile phase, chromatographic columns, stationary phases, sample introduction, temperature control, and detectors for gas chromatography. Quantitative and qualitative applications.

UNIT III

High performance liquid chromatography (HPLC): Principles, instrumentation-columns (analytical and guard columns), stationary phases, mobile phases, choosing a mobile phase, isocratic *Vs* gradient elution, HPLC plumbing, sample introduction. Detectors for HPLC spectroscopic, electrochemical and others, quantitative applications.

Ion exchange chromatography (IEC): Definitions, requirements for ion-exchange resin, synthesis and types of ion-exchange resins, principle, basic features of ion-exchange reactions, resin-properties-ion-exchange capacity, resin selectivity and factors affecting the selectivity, applications of IEC in preparative, purification and recovery processes. Separation of chemically similar elements, determination of total cation concentration of a water sample.

Size-exclusion chromatography: Theory and principle of size-exclusion chromatography, experimental techniques of gel-filtration chromatography (GFC) and gel-permeation chromatography (GPC), materials for packing-factors governing column efficiency, methodology and applications.

Thin layer chromatography: Principle, apparatus and methodology, applications. HPTLC.

UNIT-IV

Affinity chromatography: Definitions, separation-mechanism-matrices, matrix activation, role of spacer arms and applications.

Supercritical fluid chromatography (SFC): Properties of supercritical fluids, instrumentation and operating variables, comparison of SFC with other types of chromatography, applications.

Supercritical fluid extraction: Advantages of supercritical fluid extraction, instrumentation,

supercritical fluid choice, off-line and on-line extractions, typical applications of supercritical fluid extraction.

Electrophoretic methods: Electrophoresis & Capillary Electrophoresis**:** Theory-**e**lectrophoretic mobility, electroosmotic mobility, electroosmotic flow velocity, total mobility, migration time, efficiency, selectivity and resolution. Instrumentation-

capillary tubes, hydrodynamic and electrokinetic methods of sample injection, applying electric field and detectors. Capillary electrophoresis methods-capillary zone electrophoresis, micellar electrokinetic capillary chromatography, capillary gel electrophoresis and capillary electrochromatography.

Solvent extraction: Theory-Nernst partition law, efficiency and selectivity of extraction. Extraction systems**:** Extraction of covalent neutral molecules, extraction of uncharged metal chelates and synergic extraction, extraction of ion-association complexes-non chelated complexes, chelated complexes and oxonium systems. Use of salting out agents. Methods of extraction-batch and continuous extractions. Applications.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Introduction to Instrumental Analysis, Robert. D. Braun, Pharm. Med. Prem. India, 1987.
7. Instrumental Method of Analysis, W. M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
8. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., 2002.
9. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.

X # PG-C.10.4 ADVANCED INORGANIC CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Symmetry and structure: Symmetry elements and symmetry operations, concept of a group, definition of a point group, classification of molecules into point groups. Mulliken symbols. Geometries of metal complexes of higher coordination numbers.

Stability of coordination compounds: Introduction, trends in stepwise stability constants, factors influencing the stability of metal complexes with reference to the nature of metal ion and ligands, the Irving-William series, chelate effect.

Determination of stability constants: Theoretical aspects of determination of stability constants of metal complexes by spectrophotometric, pH metric and polarographic methods.

Crystal field theory: Salient features of CFT, d-orbital splitting in octahedral, tetrahedral, square planar and tetragonal complexes, Jahn-Teller distortions, measurement of 10 Dq and factors affecting it. Evidences for metal-ligand covalency.

UNIT II

Molecular Orbital Theory: MOT to octahedral, tetrahedral and square planar complexes without and with pi-bonding. MO energy diagrams for octahedral complexes with sigma ligands having pi-systems.

Electronic spectra: Introduction, selection rules and intensities, electronic spectra of octahedral and tetrahedral complexes, Term symbols for d^n ions, Orgel and Tanabe-Sugano diagrams, charge-transfer spectra. Ligand-field transition, Optical rotatory dispersion and Circular dichroism.

Magnetic properities: Introduction, Magnetic susceptibility and its measurements, Spin and orbital contributions to the magnetic moment, the effects of temperature on μ_{eff}, Spin-cross over, ferromagnetism, antiferromagnetism and ferrimagnetism.

UNIT-III

Reactions and Mechanisms: Introduction Substitution reactions- Inert and labile compounds, mechanisms of substitution.Kinetic consequences of Reaction pathways-Dissociation, interchange and association.Experimental evidence in octahedral substitution- Dissociation, Associative mechanisms, the conjugate base mechanism, the kinetic chelate effect. Stereochemistry of reactions Substitution in trans and its complexes, isomerization of chelate rings. Substitution reactions of square-planar complexes- Kinetics and stereochemistry of square-planar substitutions, evidence for associative reactions, explanations of the trans effect.

UNIT IV

Electron-transfer processes: Inner-sphere mechanism and outer-sphere mechanism, conditions for high and low oxidation numbers.

Photochemical reactions: Prompt and delayed reactions, d-d and charge transfer reactions, transitions in metal-metal bonded systems.
Metal-metal bonding: Evidences and factors favoring of M-M bonding, Wade's-Mingo's- Lauher rules, bi, tri, tetra, penta and hexa nuclear metal clusters.

References:

1. Chemical Applications of Group Theory, 3rd edn, F.A. Cotton, John Wiley and Sons (2006).
2. Molecular Symmetry and Group Theory – Robert L Carter, John Wiley and Sons (2005).
3 Physical Inorganic Chemistry- A Coordination Chemistry Approach- S. F. A. Kettle, Spektrum, Oxford, (1996).
4 Inorganic Chemistry- 2nd edn, C. E. Housecroft and A. G. Sharpe, Pearson Education Ltd, (2005).
5 Inorganic Chemistry- 3rd edn, G. L. Miessler and D. A. Tarr, Pearson Education, (2004).
6 Inorganic Chemistry- 2nd edn, D. F. Shriver, P. W. Atkins and C. H. Langford, Oxford University Press, (1994).
7 Inorganic Chemistry- 3rd edn, James E. Huheey, Harper and Row Publishers, (1983).
8 Basic Inorganic Chemistry- 3rd edn, F. A. Cotton, G. Wilkinson and P. L. Gaus, John Wiley and Sons, (2002).

X # PG-C.10.5 SYNTHETIC ORGANIC CHEMISTRY AND CHEMISTRY OF NATURAL PRODUCTS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Reductions: Catalytic hydrogenations (homogeneous and heterogeneous)-catalysts, solvent, reduction of functional groups, catalytic hydrogen transfer reactions. Wilkinson catalyst. Bakers yeast, $LiAlH_4$, $NaBH_4$, metal dissolving reactions (Birch reduction). Leukert reaction (reductive amination), diborane, Meerwein-Pondorf-Varley reduction, Wolf-Kishner reduction. Clemensen reduction.
Oxidations: Oxidation with chromium and manganese compounds (CrO_3, $K_2Cr_2O_7$, PCC, PDC, Sarret reagent, Jones reagent, MnO_2, $KMnO_4$), ozone, peroxides and peracids, lead tetra acetate, periodic acid, OsO_4, SeO_2, NBS, chloramines-T, Sommelet oxidation, Oppenauer oxidation

UNIT-II

Reactions and Reagents in Organic synthesis: Use of following reagents in organic synthesis and functional group transformations: Lithium diisopropylamide (LDA), Gilmann reagent, dicyclohexyl carbodiimide (DCC), dichloro dicyano quinine (DDQ), trialkyl silyl halides, phase transfer catalyst, crown ethers, Fenton's reagent, Ziegler-Natta catalyst, diazomethane, Lawesson reagent, epoxidation, Woodward and Prevost hydroxylation, Stark enamine reaction, Phosphorus ylides – Wittig and related reactions, 1, 3- dithiane anions-Umpolung reaction, sulphur ylides – reactions with aldehydes and ketones, Peterson reactions-synthesis of alkenes.

UNIT-III

Protecting groups: Protection of hydroxyl, carboxyl, carbonyl, thiol and amino groups. Illustration of protection and deprotection in synthesis.

Aldol and related reactions: Keto-enol tautomerism, mechanism and synthetic applications of aldol condensations, Claisen reaction, Schmidt reaction, perkin raction, Knovenogel, benzoin. Stobbe condensation, Darzens Glysidic ester condenasation, Cannizaro reaction, Tschenko reaction. Michael addition.

Introduction to disconnection approach: Basic principles and terminologies used in disconnection approach. One group C-X and two group C-X disconnections.

UNIT IV

Chemistry of Natural Products

Alkaloids: Introduction, classification, isolation and general methods of structural elucidation, biological importance. Structural elucidation and synthesis of Atropine, Papaverine and Quinine.

Terpenoids: Introduction, classification and general methods of structural elucidation, biological importance. Structural elucidation and synthesis of alpha-terpineol, alpha- Pinene and Camphor.

Steroids: Introduction, Structural elucidation and synthesis of Cholesterol and Ergosterol. Biological importance of bile acids, estrone, progesterone, testosterone, androsterone and corticosterones.

References

1. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow Hill, New York, 1987.
2. Organic Chemistry-Morrison & Boyd
3. I. Finar, Organic Chemistry,m ELBS LOongmann, Vol 1 & II, 1984.
4. J. March, Advanced Organic Chemistry, Willey Interscience, 1994.
5. E. S. Gould, Mechanism Mechanism and structure in Organic Chemistry, Halt, Rinhart & Winston, New York, 1964.
6. F. A. Carey and Sundberg. Advanced Organci Chemistry – part A & B, 3rd edition, Plenum Press, New York. 1990.
7. Comprehensive Organic Synthesis – B. M. Trost and 1. Fleming series, Pergamon Press, New York, 1991.
8. A Guide book to mechanism in organic chemistry-Petersyke.
9. S. K. Ghosh, Advanced General organic chemistry, Book and Alleied (P) Ltd. 1998.

10. K.Albert, l.Lehninger, D.L.Nelson, M.M.Cox, Principles of Biochemistry, CBZ Publishers, New Delhi, 1993
11. Harper's Biochemistry, Ed. R.Harpere, Prentice Hall Press, New York, 1990
12. Steroids, L.Fiescher and M.Fiescher

X # PG-C.10.6 QUANTUM , NUCLEAR AND RADIATION CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT I

Wave-particle duality of material particles, deBroglie equation, Heisenberg Uncertainty principle, Concept of operators (operator–operand), Algebra of operators, commutative and noncommutative operators, linear operator, Laplacian operator, Hamiltonian operator, eigen value, eigen function, class Q function, Hermitian operator, turn over rule, atomic units. Wave equation for stretched strings, Schrodinger wave equation for particles, Eigen values and Eigen functions, postulates of quantum mechanics. Application of Schrodinger equation to a free particle and to a particle trapped in a potential field (one dimension and three dimensions). Degeneracy, Wave equation for H-atom, Separation and solution of R, Φ and Θ equations. Application of Schrodinger equation to rigid rotator and harmonic oscillator. Approximate methods –Necessity of approximate methods, perturbation method, the theory of perturbation method –first order and second order correction, application to He-atom (first order correction only) – calculation of first ionization potential and binding energy.

UNIT II

Nuclear chemistry: Radioactive decay – General characteristics, decay kinetics, parent –daughter decay growth relationships, determination of half-lives, Nuclear stability – packing fraction, binding energy, Brief survey of alpha, beta and gamma decays. Nuclear reactions – Bethe's notation, types of nuclear reactions – specific nuclear reactions, photonuclear reactions, Oppenheimer –Phillips process, spallation reactions. Definition of Curie and related calculations.. Szilard-Chalmers process. Geiger-Muller counters – G.M. Plateau, dead time, coincidence loss, determination of dead time,.

UNIT III

Photochemistry: Introduction to photochemistry, quantum yield and its determination, factors affecting quantum yield, Actinometry -Uranyloxalate and potassium ferrioxalate actinometers, acetone and diethylketone actinometers. Term symbols and significance. Photosensitization: by mercury, dissociation of H_2. Photochemical kinetics of: Decomposition of CH_3CHO, formation of HCl. Photodegradation: Photocatalyst – ZnO, TiO_2, principle, application of ZnO/TiO_2 in the photo degradation of dyes (IC), pesticides (DDT) and in industrial effluents. Effect of photo degradation on COD value.

Unit IV

Radiation chemistry: Introduction, units, interaction of electromagnetic radiation with matter, G-value, LET of radiation, dosimetry, Fricke and cericsulfate dosimeters. Radiolysis - cysteine, and biphenyl. Radioisotopes as tracers, use of isotopic tracers in the elucidation of reaction mechanism, structure determination and solubility of sparingly soluble substances. ^{14}C dating, isotope dilution, neutron activation analysis, radiometric titrations and medicinal applications of isotopic tracers. Hazards in radiochemical work and radiation protection.

References

1. Quantum Chemistry – A.K. Chandra. Second Edition, Tata McGraw Hill Publishing Co. Ltd., (1983).
2. Quantum Chemistry – Eyring, Walter and Kimball. John Wiley and Sons, Inc., New York.
3. Quantum Chemistry –I.N. Levine. Pearson Education, New Delhi, (2000).
4. Theoretical Chemistry – S. Glasstone. East West Press, New Delhi, (1973).
5. Quantum Chemistry – R.K. Prasad, New Age International Publishers, (1996).
6. Valence Theory – Tedder, Murel and Kettle.
7. Quantum Chemistry – D.A. McQuarrie.
8. Theoretical Inorganic Chemistry – Day and Selbin.
9. Nuclear Chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
10. Nuclear Physics and Chemistry by G. Harvey.
11. Essentials of Nuclear Chemistry by H.J. Arnikar, Eastern Wiley (1990).
12. Nuclear Chemistry by U.N. Dash, Sultan Chand and Sons (1991).
13. Source book on atomic energy by S. Glasstone, 3rd edition Van Nonstrand (1967).
14. Nuclear chemistry by Friedlander and Kennedy, John Wiley and Sons (1987).
15. Essentials of nuclear chemistry by H.J. Arnikar, Eastern Wiley (1990).
16. Nuclear radiation detection by Price. Nuclear radiation detectors by S.S. Kapoor and Ramamoorthy, Wiley Eastern (1986).
17. Fundamentals of radiochemistry by D.D. Sood, A.V.R. Reddy and N. Ramamoorthy
18. Photochemistry-Calvert & pitts, Wiley, New York, (1996)
19. Advances in Photochemistry-Rohatgi Mukherjee.
20. Principle and applications of Photochemistry-R. P. Wayne, Elsevier, New York.(1970)

21. Photochemistry, Paul Suppan, RSC. London, (1994)
22. Dupey and Chapmann, Molecular reactions and Photochemistry, Prenctic Hall-International, Tokyo, 1972.

X # PG-C.10.7 ORGANIC PRACTICAL I

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **C_1 + C_2:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

1. Preparation of parabromoaniline from acetanilide or Preparation of p-nitro aniline from acetanilide.
2. Preparation of p-nitroiodobenzene from paranitroaniline.
3. Preparation of aniline from nitrobenzene.
4. Preparation of ß-D-Glucose penta acetate or Preparation of Glucosazone.
5. Preparation of anthroquinone.
6. Preparation of phenoxy acetic acid or Preparation of cinnamic acid.
7. Preparation of benzophenone
8. Preparation of S-Benzylthiuronium chloride.
9. Condensation of anthracene and maleic anhydride (Diels-Alder reaction).
10. Preparation of m-nitrobenzoic acid from methyl benzoate.

References

1. A Text book of practical organic Chemistry – A. I. Vogel Vol.I
2. Practical Organic Chemistry-Mann & Saunders.
3. Manual of Organic Chemistry –Dey and Seetharaman.
4. An introduction to practical organic Chemistry-Robert, Wingrove etc.
5. Semimicro qualitative organic Analysis by Cheronis, Entrikin and Hodnet.
6. J. N. Guthru & R. Kapoor, Advance experimental Chemistry, S. Chand Company, New Delhi-1991.
7. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PGE International (P) LTd. London, 3rd edition. 1996.
8. N. K. Visno, Practical Organic Chemistry, New PGE International (P) Ltd. London, 3rd edition, 1996.

X # PG-C.10.8 ANALYTICAL PRACTICAL – I

(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$:50**
Exam. Duration: 4 Hrs **C_3: 50**

COURSE CONTENT:

1. Determination of purity of a commercial sample of mercuric oxide by acid-base titration.
2. Determination of formaldehyde content in a pesticide and sodium benzoate content in a Food product by acid-base titration.
3. Determination of potassium hydrogen phthalate in an impure sample by titration with $HClO_4$ in acetic acid medium.
4. Titrations of amino acids with $HClO_4$ in CH_3COOH medium.
5. Determination of benzoic acid in food products by titration with methanolic KOH in chloroform medium using thymol blue as indicator.
6. Spectrophotometric determination of pKa of an acid-base indicator.
7. Spectrophotometric determination of lead on leaves using solvent extraction.
8. Solvent extraction of zinc.
9. Anion exchange chromatographic separation of zinc and magnesium followed by EDTA titration of the metals.
10. Separation and determination of chloride and bromide on an anion exchanger.
11. Thin layer chromatographic separation of amino acids.
12. Thin-layer chromatographic separation of nitro anilines on fluorescent sheets.
13. Determination of chloride concentration in water by capillary electrophoresis.
14. Analysis of artificial sweetners and additives in beverages by HPLC.
15. Determination of caffeine in beverages by HPLC.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India. 35
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993 Prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
7. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
8. Practical Clinical biochemistry methods and interpretations, R.Chawla, J.P. Bothers Medical Publishers (P) ltd., 1995.
9. Laboratory manual in biochemistry, J. Jayaraman, New Age International Publishers, New Delhi, 1981.
10. Practical clinical Biochemistry-Harold Varley and Arnold.Hein mann, 4th edn.

XI SEMESTER

XI/PG-C.11.1 APPLIED ANALYSIS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Food analysis: Objectives of food analysis. Sampling procedures. Detection and determination of sugars and starch. Methods for protein determination. Oils and fats and their analysis-iodine value, saponification value and acid value. Rancidity-detection and determination (peroxide number). Tests for common edible oils. Analysis of foods for minerals-phosphorus, sodium, potassium and calcium. General methods for the determination of moisture, crude fibre and ash contents of food. Analysis of milk for fat and added water. Non-alcoholic beveragesdetermination of chicory and caffeine in coffee; caffeine and tannin in tea. Alcoholic beveragesmethanol in alcoholic drinks and chloral hydrate in toddy. Food additives-chemical preservatives. Inorganic preservatives-sulphur dioxide and sulphites, their detection and determination. Organic preservatives-benzoic acid and benzoates, their detection and determination. Flavouring agents-detection and determination of vanilla and vanillin. Coloring matters in foods-classification, certified colors, detection of water soluble dyes, color in citrus fruits, beet dye in tomato products, mineral color. Pesticide residues in foods-determination of chlorinated organic pesticides. Control food quality-codex alimentaries, Indianstandards.

UNIT-II

Drugs and pharmaceutical analysis: Importance of quality control; drugs and pharmaceuticals. Sources of impurities in pharmaceutical chemicals. Analytical quality control in finished/final products. Common methods of assay. Analysis of common drugs; Analgesics-aspirin, paracetamol; Anthelmentics-mebendazole; Antiallergics-chlorpheneramine maleate; Antibioticspenicillin chloromycetin; Anti-inflammatory agents-Oxyphenbutazone; Antimalarialsprimaquine phosphate; Antituberculosists-INH; Narcotics-nicotine, morphine; Expectorants- Benadryl; Sedative-diazepam; Vitamins-A. C, B1, B2, B6, niacin and folic acid. Estimation of drug residues in biological samples.

UNIT-III

Air pollution: Types and sources of air pollutants; natural background concentrations of air pollutants; Principles and methods of sampling; a survey of reactions and methods involved in the determination of carbon monoxide, sulphur oxides, nitrogen oxides, hydrocarbons and particulates; Consequences of air pollution.

Water pollution: Origin of waste water; types of water pollutants and their effects; Sources of water pollution; domestic, industrial and agricultural soil as sources of

pollution. Objectives of analysis. Parameters of analysis: color, turbidity, total solids, conductivity, acidity, alkalinity, hardness, chloride, sulphate, fluoride, silica, phosphates and different forms of nitrogen; Heavy metal pollution: public health significance of cadmium, chromium, copper, lead, zinc, manganese, mercury and arsenic, general survey of instrumental techniques for the analysis of heavy metals in aquatic systems; Pesticides as water pollutants and their analysis; Water pollution laws and standards. **Radioactive pollution:** Sources of pollutants; effects on vegetation and health. Detection and monitoring of radioactive
pollutants. Methods of safe disposal of radioactive waste.

UNIT-IV

Biomedical and forensic analysis: Composition of body fluids and detection of abnormal levels of certain constituents leading to diagnosis of disease. Sample collection and preservation of physiological fluids. Analytical methods for the constituents of physiological fluids (blood,serum, urine). Blood-estimation of glucose, cholesterol, urea, haemoglobin and bilirubin. Urine-urea, uric acid, creatinine, calcium phosphate, sodium, potassium and chloride. Biological significance, analysis and assay of enzymes (pepsin, monoaminoxidase, tyrosinase); and hormones (progesterone, oxytocin, insulin). Chemical, instrumental and biological assays to be discussed wherever necessary.

Forensic analysis: General discussion of poisons with special reference to mode of action of cyanide, organophosphates and snake venom. Estimation of poisonous materials such as lead, mercury and arsenic in biological materials.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th Edition, CBS Publishers, New Delhi, 1988.
7. Principles and Practice of Analytical Chemistry, F. W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., New Delhi, 2002.
11. Standard Methods of Chemical Analysis, A. J. Welcher (Part B), Robert E. Kriegor Publishing Co. Usa, 1975.

12. Environmental Chemistry, S. E. Manahan, Willard Grant Press, London, 1983.
13. Environmental Chemistry Analysis, Lain L. Marr, Malcolm S. Cresser, Blackie and Son Ltd, London, 1983.
14. The Air Pollution HandBook, Richard Habey, Penguin, 1978.
15. Environmental Engineers Handbook, Part I and II, B. G. Liptak.
16. Hawk's Physiological Chemistry, Ed. B. L. Oser, 14th Edn, Tata McGraw Hill, 1976.
17. Analytical Biochemistry, Holmes and Peck, Longmans, 1983.
18. Practical Clinical Biochemistry, H. Varley, Arnold Heinmann.
19. A Biologist's Guide to Principles and Techniques of Practical Biochemistry, Wilson and Goulding, 1981.
20. Essentials of Forensic Medicine and Toxicology, K. S. Narayana Reddy, 2002.

XI # PG-C.11.2 ORGANOMETALLICS, CATALYSIS & INDUSTRIAL INORGANIC CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Fundmental concepts: Introduction, Classification of organmetallic compounds by bond type, Nomenclature, the Effective atomic number rule, complexes that disobey the EAN rule, common reactions used in complex formation.

Organometallics of transition metals: Preparation, bonding and structures of nickel, cobalt, iron and manganese carbonyls. Preparation and structures of metal nitrosyls in organometallics. Ferrocene and ruthenocene: Preparation, structure and bonding. Complexes containing alkene, alkyne, arene and allyl ligands: preparation, structure and bonding. The isolobal principles.

UNIT-II

Homogenous Catalysis: General acid and base catalysis. Oxidation of amino acids and carbohydrates in pressence of acid and base
catalysis. Acidity functions - Bronstead, Hückel, Hammett and Bunnett hypothesis.

Industrial Applications: Alkene hydrogenation, hydroformylation, The Wacker process, Monsanto acetic acid process and L-DOPA synthesis, alkene oligomerizations, Water-gas shift reactions.

Heterogeneous catalysis - Commercial Applications: Alkene polymerization: Ziegler-Natta catalysis, Fischer-Tropsch carbon chain growth. Zeolites as catalysts for organic transformation**:** Uses of ZSM -5 Alkene metathesis, hydroboration, Arylation or vinylation of olefins (Heck reaction).

UNIT – III

Nitrogen and nitrogen compounds: Industrial production and uses of ammonia and hydrazine.

Nitrides of sulphur: $(SN)_2$ and $(SN)_4$ – Preparation, properties, structure and applications. Phosphonitrile polymers and phosphazenes.

Mineral fertilizers: Phosphorous containing fertilizers - Economic importance, importance of superphosphate, ammonium phosphates and their synthesis.

Nitrogen containing fertilizers - Importance and synthesis of ammonium sulfate, ammonium nitrate and urea.

Potassium containing fertilizers - Economic importance and manufacture of potassium sulfate.

Silicon and its inorganic compounds: General information and manufacture of ferrosilicon, electronic grade silicon and metallurgical grade silicon. Applications.

Silicones: General methods of preparation (silicone oils and rubbers) and properties of silicones.

Applications.

UNIT –IV

Zeolites: Introduction, types of zeolites, manufacture of synthetic zeolites and applications.

Inorganic fibers: Introduction, properties, classification, asbestos fibers, optical fibers, carbon fibers,

Applications.

Ceramics: General information, classification of ceramic products, composition and raw materials,

Applications of clay ceramic products.

Inorganic pigments: General information and economic importance,

White pigments – titanium dioxide pigments, zinc oxide pigments.

Colored pigments – Iron oxide, chromium oxide, mixed-metal oxide pigments and ceramic colorants.

Corrosion protection pigments, luster pigments, luminescent pigments, magnetic pigments.

References:

1. Organometallic Chemistry, 2 edn, R.C. Mehrothra and A. Singh, New Age International Publications (2006).
2. Fundamental Ttransition Metal Organometallic Chemistry- Charles M. Lukehart, Brooks/Cole Publishing Company (1985).
3. The Organometallic Chemistry of the Transition Metals, 4 edn, Robert H. Crabtree, Wiley Interscience, (2005).
4. Organometallics- A Concise Introdution, 2 edn, Chistoph Elschenbroich and Albert salzer VCH, (1992).
5. Inorganic Chemistry, 2 end- C. E. Housecroft and A. G. Sharpe, Pearson Education Ltd., (2005).
6. Inorganic Chemistry- 3rd edn, G. L. Miessler and D. A. Tarr, Pearson Education, (2004).

7. Basic Organometalic Chemistry-B.D. Gupta and A. J. Elias, Universities Press (2010).
8. Chemistry of the Elements – N.N. Greenwood and A. Earnshaw, Pergamon Press (1985).
9. Industrial Inorganic Chemistry – 2nd edn. K.H. Buchel, H.H. Moretto and P. Woditsh, Wiley- VCH (2000).
10. Inorganic polymers – G.R. Chatwal, HPH (1996).

XI # PG-C.11.3 SPECTROSCOPY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

UV-VIS Spectroscopy: Quantitative aspects of Absorption-Beer's law. Terminology associated with absorption measurements. Limitation of the law: Real, chemical, instrumental and personal. Theory of molecular absorption. Vibration rotation fine structure of electronic spectra. Types of absorption bands C-T & ligand field. Empherical rules for predicting the wavelength of maximum absorption: Olefins, conjugated dienes, cyclic trienes and polyenes- unsaturated aldehydes and ketones-benzene and substituted benzene rings. Basic components of instrumentation, single and double beam designs. Applications: Qualitative and quantitative analysis of binary mixtures, measurement of dissociation constants of acids and bases, determination of molecular weight, photometric titrations, determination of stoichiometry and stability of the complexes and kinetic studies.

UNIT-II

IR Spectrosocpy: Introduction, Instrumentation, samples handling, Modes of vibrations, Hooks Law, Characteristic group frequencies and skeletal frequencies. Finger print region, Identification of functional groups- Alkenes, Aromatics, Cabonyl compounds (aldehydes and ketones, esters and lactones), halogen compounds, sulphur and phosphorus compounds, amides, lactums amino acids and amines. Factors affecting group frequencies and band shapes, conjugation, resonance and inductance, hydrogen bonding and ring strain. Tautomerism, Cis-trans isomerism. Applications of IR spectra.

UNIT-III

NMR Spectroscopy: Magnetic properties of nuclei (magnetic moment, g factor, nuclear spin), effect of external magnetic field on spinning nuclei, Larmor precession frequency, resonance conditions, population of nuclear magnetic energy levels, relaxation processes, relaxation time, line width and other factors affecting line width.
Chemical Shift: Standards employed in NMR, factors influencing chemical shift: electronegativity, shielding and deshielding, vander Walls deshielding magnetic

anisotropy, H-bonding, diamagnetic and paramagnetic anisotropies, spin-spin coupling, chemical shift values and correlation for protons bonded to carbon and other nuclei, Instrumentation.
Chemical shift equivalence and magnetic equivalence, proton exreactions, effects of chiral centre, stereochemistry-hindered rotation, karplus curve-variation of coupling constants with dihedral angle.
Composite Problems. Problems involving the application of the above spectroscopic techniques (UVVisible, IR, NMR and Mass) for structural elucidation of organic molecules.

UNIT IV

Mass spectrometry: Principles, instrumentation, different methods of ionization. El, Cl, FD and FAB, lon separators-single focusing separator with magnetic diffraction, double focusing analyzer, time-of-fight separator and quadrupole analyzer, Mass spectra – nmolecular ion, base peak, metastable peak. General rules for gragmentation pattern. Nitrogen rule, Hydrogen, transfer rearrangement and McLafferty rearrangement. Mass spectral fragmentation of Organic compounds (acids, ester, hydrocarbons, halogenated hydrocarbons, alcohols, carbonyl compounds, amines, ethers and heterocyclic compounds).

References

1. Spectroscopy, B. P. Straughan and S. Salker, John Wiley and Sons Inc., New Yourk, Vol.2, 1976.
2. Organic Spectroscopy, William kemp, English Language Book society, Macmillm, 1987.
3. Application of Absorption Spectroscopy of Organic Compounds, John R. Dyer, Prentice/Hall of India Private Limited, New Delhi, 1974.
4. Spectrometric Identification of Organic Compounds, Fourth Edition, Robert M. Silverstein, G. Clayton Bassler and Terence C. Morrill, John Wiley & Sons, New York, 1981.
5. Organic Spectroscopy, V. R. Dani, Tata MeGraw-Hall Publishing Company Limited, New Delhi. 1995.
6. Spectroscopy, B. P. Straughan, S. Walker, Chapman and Hall John Wiley and Sons Inc., New York, Vol.I 1976.
7. Interpretation of Carbon-13 NMR Spectra, F.W. Wehrli and T. Wirthin, Heyden, London, 1976.
8. NMR spectroscopy-Powai

XI # PG-C.11.4 ELECTRO CHEMISTRY AND SURFACE CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

Unit I
Electro Chemistry
Arrhenius theory of strong and weak electrolytes and its limitations, Debye-Huckel theory of strong electrolytes, Debye Huckel-Onsager equation, Debye-Huckel limiting equation for activity coefficients, Debye-Huckel equation for appreciable concentrations. A brief survey of Helmholtz- Perrin, Gouy-Chapman and Stern electrical double layer(No Derivation). Liquid junction potential and its determination. Transport Number**:** Determination of transport number by Hittorf method and e.m.f method. True and apparent transport numbers. Abnormal transport numbers, effect of temperature and concentration on transport number.

Unit II
Irrversible electrode process: Introduction, reversible and irreversible electrodes reversible and irreversible cells. Polarization, over voltage-ohmic over voltage, concentration overvoltage activation overvoltage, experimental determination of over voltage. Equations for concentration over potential, diffusion current – stationary current, potential curves, thickness of diffusion layer, diffusion controlled current – potential curves at a dropping mercury electrode, polarography, half wave potential, application in qualitative and quantitative analysis. Energy barrier and electrode kinetics, Butler- Volmer equation, Tafel equation. Hydrogen over voltage and Oxygen over voltage.Effect of temperature, current density and pH on over voltage.

UNIT III
Surface Chemistry

Different types of surfaces. Examination of surfaces using ESCA, Auger, SEM and STM. Properties of surface phase. Thermodynamics of surface. Surface tension of solutions. Gibbs' adsorption equation and its verification. Surfactants and miscelles. Surface films: Different types. Surface pressure and surface potential, and their measurements and interpretation.

The gas-solid inter phase: Types of adsorption. Hear of adosrption. The Langmuir theory-kinetic and statistical derivation. Multilayer adsorption- the BET theory and Harkins-Jura theory. Adsorption from solutions on solids. Langmuir and classical isotherms. Chemisorption-differences with physical adsorption. Adsorption isotherms. Adsorption with dissociation. Adsorption with interaction between adsorbate molecules. Measurement of surface area of solids: Harkins-Jura absolute method, entropy method, and the point B method. Use of Langmuir, BET and Harkins-Jura isotherms for surface area determination.

UNIT IV

Electrokinetic Phenomena: Electrophoresis - principles of free electrophoresis, zone electrophoresis, gel electrophoresis and its applications in qualitative and quantitative study of proteins. Determination of isoelectric point of a protein. Electro osmosis and streaming potential and its biological significance. Biological significance of Donnan membrane phenomenon. Micelles and its involvement during digestion and absorption of dietary lipids. Diffusion of solutes across biomembranes and its application in the mechanism of respiratory exchange. "Salting In" and "Salting out" of proteins. Osmotic behaviour of cells and osmo-regulation and its application in the evolution of excretory systems of organisms. Effect of temperature and pH on the viscosity of biomolecules (albumin solution). Significance of viscosity in biological systems - mechanism of muscle contraction, detection of intrastrand disulfide bonds in proteins, polymerization of DNA and nature of blood flow through different vessels. Effect of temperature, solute concentration (amino acids) on surface tension. Biological significance of surface tension - stability of Alveoli in lungs, interfacial tension in living cells (Danielli and Davson model). Application of sedimentation velocity and sedimentation equilibrium method for molecular weight determination of proteins.

References

1. Elements of Physical Chemistry –Lewis and Glasstone.
2. Physical Chemistry by P.W. Atkins, ELBS, 4th Edition, Oxford University Press(1990).
3. Basic Physical Chemistry by W.J. Moore, Prentice Hall, New Delhi, (1986).
4. Physical Chemistry –G.M. Barrow, McGraw Hill International service (1988).
5. Introduction to electrochemistry by S. Glasstone.
6. Modern electrochemistry Vol. I and II, by J.O.M. Bockris and A.K.N. Reddy, Pentium Press, New York (1970).
7. Electrochemistry –Principles and applications by E.G. Potter.
8. Electrochemistry by Reiger, Prentice Hall (1987).
9. Treatise on Electrochemistry, G. Kortum 2nd Edition, Elsevier, London (1965).

XI # PG-C.11.5 ORGANIC PRACTICAL – II

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **C_1 + C_2:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

A. Qualitative analysis:

Separation of binary mixtures, identification of functional groups and Preparation of suitable solid derivatives.

B. Quantitative Analysis: *(Any four of the following)*

1. Determination of equivalent weight of acid
2. Estimation of amino or hydroxyl group by acetylation method.
3. Estimation of keto group by haloform or oxime method.
4. Estimation of nitro group.
5. Estimation of sugars by Fehling's method.
6. Determination of saponification value of oils.
7. Determination of iodine value of oils.
8. Estimation of nitrogen by Kjaldhal's method.
9. Determination of N-Acetyl groups.

References

1. Manual of Organic Chemistry-Dey and Seetharaman.
2. Modern experimental Organic Chemistry by John H. Miller and E. F. Neugil, p 289.
3. An introduction to practical Organic Chemistry-Robert, Wingrove etc.
4. A Text book of practical Organic Chemistry – A I. Vogel Vol.III
5. Practical Organic Chemistry-Mann & Saunders
6. An Introduction to Practical Organic Chemistry-Robert, Wingrove etc.
7. Semimicro qualitative Organic Analysis by Cheronis, Entrikin and Hodnet .
8. R. K. Bansal, Laboratory Manual of Organic Chemistry, New PAGE International (P) Ltd. London, 3rd edition, 1996.
9. N. K. Vishnoi, Practical Organic Chemistry, New PAGE International(P) Ltd. London, 3rd edition, 1996.

XI # PG-C.11.6 ANALYTICAL PRACTICAL – II

(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **C_1 + C_2:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

1. Determination of calcium in limestone by redox, acid-base and complexation titrations.
2. Determination of vitamin C in orange juice by titration with cerium (IV) and with 2, 6-dichlorophenol indophenol.
3. Determination of aluminium and magnesium in antacids by EDTA titration.
4. Analysis of a copper-nickel alloy sample for copper and nickel by EDTA titration using masking and selective demasking reactions.
5. Determination of saccharin in tablets by precipitation titration.
6. Determination of iodine value and saponification value of edible oils.
7. Determination of ascorbic acid in goose berry/bitter gourd by titrimetry / spectrophotometry using N-bromosuccinimide (NBS).

8. Determination of sulpha drugs by potentiometry using $NaNO_2$ and iodometric assay of penicillin.
9. Polarographic determination of copper and zinc in brass.
10. Determination of iron in mustard seeds and phosphorus in peas by spectrophotometry.
11. Analysis of waste water for anionic detergents and phenol by spectrophotometry.
12. Analysis of sulphonamides by uv-spectrophotometry.
13. Colorimetric analysis of procaine by diazotization and coupling reaction.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8^{th} edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition, 1993, prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Pharmaceutical Drug Analysis by Ashutoshkar, New Age International Publishers, New Delhi, 2005.
7. Practical Pharmaceutical Chemistry, Ed. A. H. Geckett, J. B. Stenlake, 4_{th} Ed. Part I and II, CBS Publishers, New Delhi.
8. Quantitative Analysis of Drugs in Pharmaceutical Formulations, P. D. Sethi, 3_{rd} Ed. CBS Publishers & Distributors, New Delhi, 1997.

XI # PG.IP.2 INTERNSHIP PROGRAMME 2 (Senior Secondary Level)

Duration: 4 Weeks **Max. Marks: 100**
$C_1 + C_2$: 50
C_3 : 50

Objectives:
To provide field experience to the students to develop competencies and skills required for effective classroom teaching at the senior secondary level; class management; evaluation of student learning; organization of cocurricular activities; 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 two phases.

Phase 1 : Internship

Phase 2 : Post-Internship and Critical Reflection of Internship Experience

XI # PG-C.11.7 COMMUNICATION SKILLS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Objectives:

- Introduce students to the process of communication in terms of its concept, importance and components.
- Make sure that the student acquires the necessary skills of the effective communication with himself/herself and others in social and formal settings.
- Provide students with the necessary skills that will help them to present themselves and their ideas in a more effective way.
- Help them to understand the barriers in communication.
- Acquire, develop and improve the skills of dialogue and persuasion as a senior secondary student teacher.

COURSE CONTENT

Unit I : Introduction
Concept, Meaning and Importance of Communication – Factors influencing Communication, Types of Communication – Importance for language teaching at different levels of education

Unit II : Language Skills
Language Skills – Listening, Speaking, Reading and Writing – Types, techniques for fostering the skills – Assessment. Theories of communication

Unit III : Factors Affecting Communication
Communication Cycle, Barriers of Communication, Understanding the variations in communication pattern – distortion, omission, substitution etc., - Accommodation of these barriers in classroom, Effectiveness of communication – Assessment

Unit IV : Practice in Communication Skills
Practice in Communication skills – Oral & Written Communication, Manner and place of articulation, Assertiveness, functionality and aesthetics of communication, Use of Technology in Communication , Research trends in Communication

Sessional Activities
Oral practice in language lab
Simulation & Role-play in classroom
Case studies on communication
Visit to AIISH and CIIL

References:

1. Barnard, M 1996 Fashion as Communication, London : Routledge.
2. Schrum, L. 1999. Technology and Professional Development of Teachers Educational Technology Research and Development, 47(4), pp.83-90.
3. Austin, F M (1961) Art of Questioning in the Classroom, University of London Press Ltd., London.
4. Brown, J.S., Collins, A. & Duguid, S. (1989). Situated cognition and the culture of learning. Educational Researcher, 18(1), 32-42.
5. Vygotsky, L. (1978). Mind in Society: The Development of Higher Psychological Processes MA: Harvard University Press.
6. Langer, J. & Applebee, A. N. (1987). How writing shapes thinking: A study of teaching and learning. National Council of Teachers of English.
7. Smith, K. (1993). Becoming the "guide" on the side. Educational Leadership. 51(2), 35-37.
8. Vygotsky, L. S. Thought and Language. Cambridge, MA: MIT Press, 1962.

XI # PG-C.11.7 INCLUSIVE EDUCATION - II

Credits: 3 (2L + 1T + 0P) **Marks: 100**
Contact hrs per week: 4 **$C_1 + C_2$: 50**
Exam Duration: 2 hrs **C_3 : 50**

Objectives

On completion of this course the students will be able to

- Understand concept, meaning and significance of inclusive education
- Appreciate the need for promoting inclusive practice and the roles and responsibilities of the teachers
- Preparation of teachers for inclusive schools,
- Analyze special education, integrated education, mainstream and inclusive education practices,
- Identify and utilize existing resources for promoting inclusive practice.

COURSE CONTENT:

Unit I : Introduction

- Definition, concept and importance of inclusive education.
- Historical perspectives of inclusive education for children with diverse needs.
- Difference between special education, integrated education and inclusive education.
- Advantages of inclusive education in the context of Education For All and Right to Education Act.

Unit II: Current Issues in Inclusive Education

- Inclusion of all children with diverse needs in existing schools
- Early identifications and placement in inclusion,
- Development of Compensatory Skills(Plus Curriculum)

- Coordination and utility of resources
- N.C.F and adaptation of teaching learning materials
- Research priority in inclusive education

Unit III : Teacher Preparation and Inclusive Education

- Teaching skills and competencies
- Professional ethics
- Institution training teachers for inclusive education
- Professional growth of teachers and teacher educators

Unit IV : Education Strategies

Education Strategies used in Inclusive education (peer tutoring co-operative learning critical pedagogy – multi level, multi-cultural, multi-ability grouping Adaptation of content & methodology in Science – Guidelines for adaptation ICT in Inclusive Education – Research Trends in Inclusive education.

Sessional Activities:

- Visit to Inclusive Schools
- Case study of children with diverse needs
- Observation of Inclusive classrooms
- Development of Ex material on adaptation

References

- Ainscow, M., Booth. T (2003): The Index for Inclusion: Developing Learning and Participation in Schools. Bristol: Center for Studies in Inclusive Education
- Jha. M. (2002) Inclusive Education for All: Schools Without Walls, Heinemann Educational Publishers, Multivista Global Ltd, Chennai, 600042, India.
- Sharma, P.L. (2003) Planning Inclusive Education Small Schools, R.I.E. Mysore.
- Sharma, P.L. (1990) Teachers handbook on IED-Helping children with special needs N.C.E.R.T. Publication.
- Sharma, P.L. (1988) Teacher Handbook-Helping children with special needs, Unicef assisted publication, N.C.E.R.T New Delhi.

XII SEMESTER

XII/PG.C.12.1 RESEARCH IN CHEMISTRY EDUCATION

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

Course Objectives:

The present research in Chemistry Education is concentrated around Using new methodologies, technology, learning tools and assessment techniques**.** The goal of this course is to present the contemporary perspectives in Research in Chemical Education and to find solutions to problems in class rooms from the reform initiative.

The student teacher will be able to:

1. understand the current reform movements in Chemistry Education
2. critically Examine the areas of research in Chemistry Education
3. familiarize the Student teachers with the concept and methods in Action Research.
4. encourage teachers to take up research as a measure of Professional Development

Unit 1:Trends in Research in Chemical Education.

Diversity in Research; Areas of research; Transition from behaviorist to constructivist model; Developmental, experimental and correlation studies with examples; A comparison of Studies in India and other countries; Implications to classrooms; vision of Science Education Research- Policy Perspectives in India.

Unit 2: Action Research and Investigatory Projects in Chemistry

Meaning, scope, some typical Action Research Studies; Steps involved and role of the teacher; as an indicator of professional growth. Planning Investigatory projects and studying its effectiveness in learning. Teacher as a reflective practitioner.

Unit 3: Professional Development in Chemistry Education

Chemical Abstracts and Current Contents; Chemical Education Journals relating to school Education(School Science Review, Journal of Chemical Education, Journal of Research in Science Teaching, Chemistry Education, NCERT journals); Format of reporting in different journals; Online surfing and Internet browsing-Web resources in Chemical Education; Online journals, Virtual laboratories, Wikipedia, Patenting and copy right rule; Acknowledging the source.

Unit 4: Supporting Agencies for Researching Teachers

Role of National and state agencies in NCERT, RIEs, SCERT, ERIC, IASE in conducting In-service programmes,conferences, monitoring capacity building and evaluating the functions of them.; financing agencies for research in Chemistry Education; Seminars, conferences and paper presentations through in NSTA, Indian Chemical society, Indian Science Congress, NSTC, NCERT and other organizations; Teacher autonomy as a researcher

Reference

1. N.Costa, L.Marques and R Kempa (2000), Science teachers' awareness of findings from education research. *Research in Science and Technology Education*,**18**,37-44
2. M.Stolk, A Bulte, O.De Jong, and A. Pilot (2005). Teaching concepts in contexts, designing a chemistry teacher course in a curriculum innovation. In Boersma, K. et.all... (Eds). Research and the quality of science education (in pres). Dordrech / Boston: Kluwer Academic publishers.
3. J.Gilbert, O.DeJong, R.Justi, D.Treagust, and J.Van Driel (2002). Research and development for the future of chemical education. In Gilbert. J...et.all. (Eds). Chemical Education: Towards Research-based practice (PP.391-408). Dordrech / Boston: Kluwer Academic Publishers.
4. Journal of Research in Science Teaching
5. School Science Review
6. Journal of Chemical Education
7. Chemistry Education
8. Home Pages on Web: NCERT, NCTS, ERIC, NSTA

XII # PG-C.12.2 INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:
UNIT-I
Classification of electrochemical methods: Controlling and measuring current and potential, potentiometers, galvanostats and potentiostats. Potentiometric methods of analysis. Potentiometric electrochemical cells. Potential and concentration. The Nernst equation. Liquid junction potentials. Reference electrodes-SHE, calomel electrode and silver/silver chloride electrode. Metallic indicator electrodes-electrodes of first kind and second kind. Redox electrodes. Membrane electodes –membrane potential, selectivity of memebranes. Glass ion selective electrodes. Crystalline solid state ion selective electrodes. Liquid-based ion selective electrodes. Gas sensing electrodes. Potentiometric biosensors. Quantitative applications. Activity *Vs*

concentration. Quantitative analysis using external standards and the method of standard additions. Measurement of pH. Clinical and environmental applications.

Electrogravimetric analysis: Theory, apparatus, cell processes, deposition and separation,
electrolytic separation of metals, applications.

Coulometric methods of analysis: General discussion, coulometry at controlled potential,
apparatus and general technique. Applications - coulometric titrations (amperometric coulometric)-principles, apparatus, comparison of coulometric titrations with conventional
titrations, automatic coulometric titrations, applications.

Voltammetry: Fundamentals of voltammetry. Cyclic voltammetry**:** Principles and applications.

Stripping analysis: Stripping voltammetry-basic principles, electrodes used for stripping analysis, apparatus for stripping analysis, applications, determination of lead in water. Voltammetry with micro electrodes.

UNIT II

Thermal method of analysis: Introduction, thermogravimetric analysis (TGA)-types of thermogravimetric analysis, principles. Factors affecting the results-heating rate, furnace,
instrument control/data handling. Applications-purity and thermal stability, evaluation of correct drying temperature, analysis of complex mixture and determination of kinetic parameters of thermal degradation.

Differential thermal analysis (DTA): Theory-variables affecting the DTA curves. Differences between TGA and DTA. General principles. Instrumentation. Applications-analysis of the physical mixtures and thermal behaviour study. Determination of melting point, boiling point and decomposition point.

Differential scanning calorimetry (DSC): Basic principle. Differences between DTA and DSC. Instrumentation-power compensated DSC, heat flux DSC. Applications-Studies of thermal transitions and isothermal crystallization. Pharmaceutical industry for testing the purity of the samples. Thermomechanical analysis. Dynamic mechanical analysis**.**

Enthalpimetric analysis: Thermometric titrimetry and direct injection enthalpimetry-principle, instrumentation, applications.

UNIT-III

Kinetic methods of analysis: Introduction, basis of kinetic methods, rate law extressions.

Classifying chemical kinetic methods-direct computation integral methods, direct-computation rate methods, curve-fitting methods. Instrumentation. Quantitative applications-enzyme catalyzed reactions, non-enzyme catalyzed reactions, non-catalytic reactions. Determining V_{max}, K_m for enzyme catalyzed reactions. Elucidating mechanism for the inhibition of enzyme catalysis. Determination of enzymes, LDH, GOT and GPT. Determination of substrates –urea, uric acid, blood glucose and blood

alcohol. Analysis of closely related compounds-neglect of reaction of slow reacting component method and logarithmic extrapolation method.

UNIT IV

Automated methods of analysis: An overview. Principles of automation. Automated instruments: process control. Continuous analyzers. Discrete autoanalyzers. Instruments used in automated process control. Automatic instruments-discrete and continuous flow sampling instruments. Flow injection analysis-principles-dispersion coefficient. Factors affecting peak height, sample volume, channel length and flow rate, and channel geometry. Limited dispersion applications, medium dispersion applications, stopped flow methods and flow injection titrations. Discrete automatic systems-centrifugal fast scan analyzer, automatic organic elemental analyzers. Analysis based on multilayer films-general principles, film structures, instrumentation, performance and applications –blood urea nitrogen, blood glucose and potassium.

References

1. Fundamental of Analytical Chemistry, D.A. Skoog, D.M. West, Holler and Crouch 8th edition, 2005, Saunders College Publishing, New York.
2. Analytical Chemistry, G.D. Christian, 5th ed., 2001 John Wiley & Sons, Inc, India.
3. Quantitative Analysis, R.A. Day and A.L. Underwood, 6th edition,1993 prentice Hall, Inc. New Delhi.
4. Vogel's Textbook of Quantitative Chemical Analysis, J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, 6th edition, Third Indian Reprint.2003 Pearson Education Pvt. Ltd., New Delhi.
5. Analytical Chemistry Principles, John H. Kennedy, 2nd edition, Saunders College Publishing, California, 1990.
6. Instrumental Methods of Analysis by H.H. Willard, L.L. Merritt and J.A. Dean, 7th Edition, (1988).
7. Principles and Practice of Analytical Chemistry, F. W. Fifield and Kealey, 3rd edition, 2000, Blackwell Sci., Ltd. Malden, USA.
8. Modern Analytical Chemistry, David Harvey, McGraw Hill, New Delhi, 2000.
9. Introduction to Instrumental Analysis, Braun, Pharm. Med. Press. India.
10. Instrumental Method of Analysis, W. M. Dean and Settle, 7th edition, 1986, CBS Publishers, New Delhi.
11. Instant Notes of Analytical Chemistry, Kealey and Haines, Viva books Pvt. Ltd., 2002.

XII # PG-C.12.3 BIO-INORGANIC CHEMISTRY

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT- I

Structural and molecular biology: Introduction, The structural building blocks of proteins, the structural building block of nucleic acids. Metal ion interactions with nucleosides and nucleotides. General features of DNA- metal complex interaction.
A brief overview of molecular biology- Replication and Transcription, Translation.

Bioenergetics: Introduction, Redox reactions in metabolism, the central role of ATP in metabolism. Kinetic stability of ATP, Mitochondrial flow of electrons from NADH to O_2. Oxidative phosphorylation and respiratory chain.

Sodium and potassium-Channels and Pumps: Introduction, Transport across membranes. Potassium and sodium channels, The sodium-potassium ATPase, Macro cyclic crown ether compounds, cryptands and ionophores.

Biochemistry of calcium: Introduction-comparison of Ca^{2+} and Mg^{2+}. Biological roles of calcium, binding sites of calcium and proteins, storage of calcium, calcium in muscle contraction, calcium in blood cloting process.

Cobalt-Evolutionary Relics:

Vitamin B_{12} and Coenzymes: Structural feature, names of different forms, chemistry of cobalamin, biochemical functions of cobalamins, model compounds. Special characteristics of B_{12} Coenzyme.

UNIT-II

Metal ion transport and storage:

Iron storage and transport: Transferrin, ferritin, phosvitin and gastroferrin. Iron transport in microbes: siderophores, *in vivo* microbial transport of iron

Oxygen transport and oxygen uptake proteins: Properties of dioxygen(O_2): Thermodynamic and kinetic aspects of dioxygen as an oxidant, activation of dioxygen through complexation with metal ions. Haemoglobin (Hb) and Myoglobin (Mb) in oxygen transport mechanism: Introduction to porphyrin system, substituent effects on porphyrin rings, functions of Hb and Mb. Characteristics of O_2-binding interaction with Hb and Mb. Model compounds for oxygen carriers (Vaska's complex and cobalt(III) –Schiff base complexes). Hemerythrin and emocyanin.

UNIT III

Electron transport proteins and redox enzymes: Iron – sulfur proteins (rubredoxins and ferredoxins) and cytochromes including cytochrome P450. Catalase and peroxidase: Structure and reactivity . Superoxide dismutase: Structure and reactivity.Molybdenum containing enzymes: Aspects of molybdenum chemistry, Xanthine oxidase, aldehyde oxidase, sulfite oxidase, nitrogenase and nitrite reductase.

Non-redox metalloenzymes - Structure and reactivity : Carboxypeptidase-A, Alcohol dehydrogenase, Leucine aminopeptidase and carbonic anhydrase.

UNIT- IV

Therapeutic uses of Metals - Metals in Medicine: Introduction, Metals and human biochemistry, general requirements.

Disease due to metal deficiency and treatment: Iron, zinc, copper, sodium, potassium, magnesium, calcium and selenium.

Metal complexes as drugs and therapeutic agents; Introduction, antibacterial agents, antiviral agents, metal complexes in cancer therapy, Metal complexes for the treatment of rheumatoid arthritis, vanadium diabetes , Metal complexes as radio diagnostic agents.

Treatment of toxicity due to inorganics: General aspects of mechanism of metal ion toxicity, (i)-Mechanism of antidote complex with poison, rendering it inert: arsenic, lead, mercury, iron, copper

(ii) Antidote accelerated metabolic conversion of poison to non-toxic product: cyanide and carbon monoxide

References:

1. The Inorganic Chemistry of Biological Process- 2nd edition , M. N. Hughes, John Wiley and Sons, (1988).
2. Bioinorganic Chemistry- R. W. Hay, Ellis Horwood Ltd, (1984).
3. Biological Inorganic Chemistry –An Introduction, R. R. Crichton, Elsevier, (2008).
4. Bioinorganic Chemistry- A. K. Das, Books and Allied(P) Ltd, (2007).
5. Bioinorganic Chemistry- K. Hussain Reddy, New Age International Ltd. (2003).
6. Bioinorganic Chemistry: A Survey- Eiichiro Ochiai ,Academic Press, (2008).
7. Bioinorganic Chemistry: A Short Course-2nd edition, R. M. Roat-Malone, Wilely Interscience,(2007).
8. Medicinal Applications of Coodination Chemistry- Chris Jones and John Thornback, RSC Publishing, (2007).
9. Transition Metal Complexes as Drugs and Chemotherapeutic Agents- N.Farrell, Kluwer Academic Publishers (1989).
10. The Biological Chemistry of the Elements: The Inorganic Chemistry of Life- 2nd edition , J.J. R. Frausto da Silva and R. J. P. Williams, Oxford University Press,(2001).

XII # PG-C.12.4 HETEROCYCLICS, MOLECULAR REARRANGEMENTS, GREEN CHEMISTRY, SYNTHETIC DRUGS AND ANTIBIOTICS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT – I

Chemistry of heterocyclic compounds: Nomenclature of heterocyclic systems, structure, synthesis and important reactions of benzofran, benzothiophene, thiazole, pyrazole, pyrone, coumarin, chromones, pyrimidine, purine, imidazole, oxazole. Synthesis and synthetic applications of Pyrazine, pyridazine, azirines, diazines, azepines benzodiazepines.

UNIT-II

Molecular rearrangements: Introduction. Carbon-to carbon migrations: Pinacol-pinacolone, Wagner-Meerwein, Benzidine, Demjanov, Benzilic acid, Favorskii, Fries, Cope, Claisen rearrangement.

Carbon-to nitrogen Migrations: Hofmann, Curtius, Lossen, Schmidt and Beckmann rearrangement.

Miscellaneous rearrangement: Sommelet-Hauser, Witting, Japp-Klingermann rearrangement, Baeyer-Villeget rearrangement.

UNIT III: Green Chemistry

Introduction, Green Chemistry Principles, Presidential Green Chemistry Challenge Awards (PGCCA), designing green synthesis – choice of starting matrials,choice of reagents, choice of catalysts including phase transfer catalysts, choice of solvent. atom economy, green oxidizing agents, microwave induced synthesis, ultrasound assisted synthesis, synthesis using bio-catalysts, synthesis in aqueous phase, synthesis in soild state, applications of green chemistry in daily life and Environmental pollution and health hazards.

UNIT IV

Drugs & Antibiotics:

Synthetic Drugs: Synthesis of antipyretics: antipyrine, aminopyrine, novalgin and phenacetin. Synthesis of anticoagulants: dicoumarol, tromexan, warfarin and phenindione. Synthesis of anaesthetics: α-eucaine, benzocaine, procaine and xylocaine.

Antibiotics: Structural elucidation and synthesis of Chloromycetin and Penicillin, Structure of streptomycin and terramycin (without elucidation) and their pharmaceutical importance.

References

1. Photochemistry-Calvert & pitts, Wiley, New York, (1996)
2. Advances in Photochemistry-Rohatgi Mukherjee.
3. Principle and applications of Photochemistry-R. P. Wayne, Elsevier, New York.(1970)
4. Photochemistry, Paul Suppan, RSC. London, (1994)
5. Dupey and Chapmann, Molecular reactions and Photochemistry, Prenctic Hall-International, Tokyo, 1972.
6. H. Pine, Hendrickson, Cram and Hammond, Organic Chemistry, Mac Grow hill, New YTork 1987.
7. Organic Chemistry-Marrison & Boyd
8. I. Finar, Organic chemistry, ELBS Longmann, Vol. I & II, 1984.
9. J. March, Advanced Organic Chemistry, Willey Interscience, 1994
10. E. S. Gould, Mechanism and Structure in Organic chemistry, Halt, Rinhart & Winston, New York. 1964.
11. F. A. Carey and Sundberg, Advanced Organic Chemistry-Part A & B. 3rd edition, Plenum press, New York. 1990.
12. Heterocyclic chemistry – Joule & Smith.
13. Heterocyclic Chemistry – Acheson.
14. Green Chemistry; Theory and Practice, Anastas, P.T. and Warner, J.C., Oxford University Press, NY, 1998.
15. New Trends in Green Chemistry, Ahluwalia, V.K. and Kidwai, M., Anamaya Publishers, New Delhi, 2007.

XII # PG-C.12.5 CHEMICAL KINETICS

Credits: 3 (2L+1T+0P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$: 50**
Exam. Duration: 2 Hrs **C_3 : 50**

COURSE CONTENT:

UNIT-I

Kinetics of complex reactions: Parallel, consecutive and reversible reactions. Determination of orderof reaction. Arrhenius equation, energy of activation and its experimental determination. Simple collision theory-mechanism of bimolecular reaction. Lindemann's theory, Hinshelwood's theory for unimolecular reaction. Activated complex theory of reaction rate, classical thermodynamic treatment, partition function, statistical thermodynamic treatment.

Unit II

Kinetics of reactions in solution-Salt effects,effect of dielectric constant (single sphere and double sphere model), effect of pressure, volume and entropy change on reaction rates. Cage effect with an example. Kinetics of heterogeneous reactions - Langmuir's theory, unimolecular and bimolecular surface reactions.

UNIT-III

Fast Reactions: Study of kinetics by flow techniques, equation for contact time, stopped flow and continuous flow methods. Relaxation method, equation for relaxation time, temperature jump and pressure jump methods, flash photolysis, pulse radiolysis and shock tube method.

Potential energy surface, theoretical calculation of energy of activation.

Chain reactions: Rice-Herzfeld mechanism for the thermal decomposition of acetaldehyde, Kinetics of explosive reactions, explosion limits (H_2 and O_2 reaction). Kinetics of autocatalytic and oscillatory chemical reactions, oscillatory chemical reaction of oxidation of malic acid by bromate ion catalyzed by Ce (III). Catalyzed and uncatalyzed reaction: Ru(III) catalyzed oxidation reaction of primaryamines by chloramine –T in HCl medium.

UNIT-IV

Kinetic methods of analysis: Analytical uses of reaction rates relative, basis of reaction rate methods, rate laws-first and second order reactions relative rates of reactions, analytical utility of first or pseudo first order reactions, determination of reaction rates, types of kinetic methods–differential methods, integral methods, multicomponent analysis-neglect of reaction of slow-reacting component,logarithmic extrapolation method, reaction rate method, applications-catalyzed reactions,measurement methods for catalyzed reactions, micro determination of inorganic species like iodide, selenium, cobalt & mercury in complex materials, determination of organic species, non-catalytic reactions. Applications of enzyme-catalysed reactions for the analysis of substrates-stoichiometric and rate methods, determination of urea, uric acid, blood glucose, galactose and blood alcohol, determination of enzymes-LDH, GOT and GPT.

A brief outline of IR, UV, NMR, Mass spectroscopy as tools for kinetic study.

References

1. Chemical Kinetics by K.J. Laidler.
2. Chemical Kinetics –Frost and Pearson.
3. Kinetics and Mechanism of Chemical Transformation by J. Rajaram and J.C. Kuriacose.
4. Chemical Kinetics –L.K. Jain.
5. Chemical Kinetics –Benson.
6. Elements of Physical Chemistry –Lewis and Glasstone.
7. Physical Chemistry by P.W. Atkins, ELBS, 4th Edition, Oxford University Press (1990)
8. Kinetics in Analytical Chemistry – H. B. Mark and G. A. rechnitz, Interscience Publishers, John Willey and Sons, New York.

XII # PG-C.PR.12.6 INORGANIC PRACTICAL – II

(Any ten of the following suggested experiments)

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **$C_1 + C_2$:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

A. Qualitative Analysis:

Qualitative analysis of mixtures of inorganic compounds containing six cations and anions including a rare element and insoluble and involving interfering ions and similar ions requiring special treatment.

B. Inorganic Synthesis: (Any five of the following experiments)

1. Preparation of Chloropentammine cobalt(III) chloride and Estimation of chloride in a complex by potentiometric or ion-exchange method
2. Synthesis and characterization of tris-triphenyl phosphine copper(II)nitrate. Estimate copper.
3. Preparation of *cis*- and *trans*- dichlorobis(ethylenediammine) cobalt(III)chloride. Record the UV-Vis spectra and compare it with *cis*-form.
4. Preparation of hexamine cobalt(III) chloride and estimate cobalt ion.
5. Synthesis of bis-dichlrotriphenyl phosphine nickel(II).
6. Determination of magnetic susceptibility of any two compounds/complexes by Gouy method.
7. Determination of the composition of iron-phenanthroline complex by:
   (a) Job's method and
   (b) mole-ratio method and
8. Determine the stability constant of iron-tiron/iron-phenanthroline by Turner-Anderson method.
9. Preparation and Kinetics of the acid hydrolysis of potassium trisoxalato cobaltate(III) trihydrate.
10. Preparation of tris(oxalate)ferrate(III) and estimate the metal ion.
11. Preparation of hexamine nickel(II) chloride.
12. Preparation of the EDTA complex of Mn(II).
13. Estimate the chloride ion in a given complex by silver nitrate titration after ion-exchange separation.

References

1. Advanced physico-chemical experiments – J. Rose.
2. Instrumental analysis manual - Modern Experiments for Laboratory – G.G. Guilbault and L.G. Hargis.
3. A Text Book of Quantitative Inorganic Analysis – A.I. Vogel, 5th edition.
4. Experimental Inorganic Chemistry – G. Palmer.
5. Inorganic Synthesis – O. Glemser.
6. Experimental Inorganic/Physical Chemistry- Mounir A. Malati.
7. Quantitative Chemical Analysis – Daniel C. Harris, (2006) 7th edition.
8. Spectrophotometric determination of elements – Z. Marczenko
9. A Text Book of Qualitative Inorganic Analysis – A.I. Vogel

XII # PG-C.PR.12.7 PHYSICAL CHEMISTRY PRACTICAL – II

(Any ten out of the following suggested experiments)

Credits : 2(0L+0T + 2P) **Max.Marks :100**
Contact Hrs per week : 4 **C_1 + C_2:50**
Exam. Duration: 4 Hrs **C_3:50**

COURSE CONTENT:

1. Determination of thermodynamic parameters for the kinetics of decomposition of diacetone alcohol by NaOH.
2. Spectrophotometric kinetics of oxidation of indigocarmine by chloramine-T (CAT) (a) Determination of order of reaction w.r.t. [CAT] (b) Effect of pH and determination of order of reaction w.r.t. $[H^+]$.
3. Kinetic study on Ru(III) –catalysed reaction between primary amine and CAT (a) Determination of order of reaction w.r.t. [Ru(III)], (b) Determination of order of reaction w.r.t. $[H^+]$, (c) Determination of E_a and thermodynamic parameters.
4. Kinetics of saponification of ethyl acetate by conductivity method and study the effect of dielectric constant of the medium (using CH_3OH).
5. Study of photolysis of uranyl oxalate: (a) determination of intensity of light source (b) study of photocatalysis of oxalic acid.
6. Determination of rate for the photolysis of CAB solution.
7. Determination of half-life of ^{40}K.
8. Study of salt effect on solubility and determination of activity coefficient.
9. Determination of pK value of an indicator (bromophenol blue).
10. Spectrophotometric analysis of a mixture of (a) $CuSO_4$ and K_2CrO_4.
11. Study of complex formation between ferric salt and salicylic acid.
12. Determination of half wave potential of metal ions in a mixture (Mn^{2+}, Pb^{2+} and Cu^{2+}).
13. Estimation of a metal ion in solution by polarographic method.

14. Amperometric titration of lead nitrate against potassium chromate/potassium dichromate.
15. Coulometric titrations - NaOH vs HCl.

References

1. Practical Physical Chemistry – A.J. Findlay.
3. Experimental Physical Chemistry –F. Daniels et al.
4. Selected Experiments in Physical Chemistry – Latham.
5. Experiments in Physical Chemistry – James and Prichard.
6. Experiments in Physical Chemistry – Shoemaker.
7. Advanced Physico-Chemical Experiments –J. Rose.
8. Practical Physical Chemistry –S.R. Palit.
9. Experiments in Physical Chemistry – Yadav, Geol Publishing House.
10. Experiments in Physical Chemistry – Palmer.
11. Experiments in Chemistry –D.V. Jahagirdar, Himalaya Publishing House, Bombay, (1994).
12. Experimental Physical Chemistry –Das. R.C. and Behera B, Tata Mc Graw Hill.

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