



**JAYOTI VIDYAPEETH WOMEN'S UNIVERSITY,
JAIPUR**

**Faculty of Education & Methodology
Department of Education & Methodology**

SYLLABUS

**INTEGRATED BACHELOR OF SCIENCE-
BACHELOR OF EDUCATION
B.Sc. B.Ed.(PCM)**

SESSION – 2022-23

DURATION – 4 YEARS/8 SEMESTER

**SYLLABUS FOR:
I -IV YEARS**

PROGRAM DETAIL

Name of Program	-	B.Sc.B.Ed.(PCM)Integrated
Program Code	-	B.Sc. B.Ed.(PCM)
Mode of Program	-	Yearly /Semester
Duration of Program	-	4 yrs/ 8 Semester
Total Credits of Program	-	492
Curriculum Type and Medium Choice	-	English

B.Sc .B.Ed. Detailed Syllabus (PCM)**I SEMESTER**

S. No.	Credit	Name of Course
1	9	English Language
2	9	Hindi Language
3	9	Holistic Education
4	7	Differential Calculus & Analytical Geometry
5	7	Number Theory, Theory of Equations & Matrices
6	12	Mechanics
7	12	Inorganic Chemistry
Total	65	

II SEMESTER

S. No.	Credit	Name of Course
1	9	English Language
2	9	Hindi Language
3	6	Environmental Studies
4	5	Theatre Arts Heritage & Craft Traditions
5	6	Understanding Education & Its Perspectives
6	10	Partial Differentiations
7	10	Elasticity, Waves, Heat & Thermodynamics
8	10	Physical Chemistry
Total	65	

III SEMESTER

S. No.	Credit	Name of Course
1	9	English Language
2	9	Hindi Language
3	4	Psychology of Learner & Learning
4	5	ICT in Education I
5	14	Real Analysis
6	12	Electricity and Electromagnetism
	12	Organic chemistry
Total	65	

IV SEMESTER

S. No.	Credit	Name of Course
1	9	English Language
2	9	Hindi Language
3	9	Assessment Learning
4	14	Differential Equation
5	12	Optics
6	12	Inorganic Chemistry
7	9	Internship Methodology (2 Week)
Total	74	

V SEMESTER

S. No.	Credit	Name of Course
1	9	Teaching Approaches And Strategies
2	9	Pedagogy Of Physical Science
3	9	Pedagogy Of Biological Science
4	14	MULTIVARIATE CALCULUS & VECTOR CALCULUS
5	12	Basic Electronics
6	12	Physical Chemistry
Total	65	

VI SEMESTER

S. No.	Credit	Name of Course
1	4	Peace Oriented Value Education
2	10	Pedagogy Of Physical Science
3	10	Pedagogy Of Biological Science
4	12	Group Theory
5	12	Relativity And Quantum Mechanics
6	12	Organic Chemistry
7	9	Internship Methodology (2 Week)
Total	69	

VII SEMESTER

S. No.	Credit	Name of Course
1	6	Secondary Education In India: Status, Issues And Concerns
2	6	Inclusive Education , Guidance And Counseling In School
3	30	Internship Methodology (14+2 Week)
Total	42	

VIII SEMESTER

S. No.	Credit	Name of Course
1	5	Indian Constitution & Human Rights
2	6	Curriculum And School
3	12	Atomic, Molecular, Nuclear And Solid State Physics
4	6	Linear Algebra And Rings And Fields
5	6	Complex And Numerical Analysis
	12	Advanced Chemistry
Total	47	

I Semester

Nature of Course	Name of subjects	C	T	D	P	P.S.
Language	English Language	9	9	0	0	0
	Hindi Language	9	9	0	0	0
Education	Holistic Education	9	5	1.5	2	0.5
Mathematics	Differential Calculus & Analytical Geometry	7	6	0	0	1
	Number Theory, Theory of Equations & Matrices	7	6	0	0	1
Physics	Mechanics	12	8	0.5	3	0.5
Chemistry	Atomic Structure & Bonding	12	8	0.5	3	0.5
University Compulsory Course	Extra-Curricular Activities	1	-	-	1	-
	Community Development Activities	1	-	-	1	-
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65+2	51	2.5	8	3.5

Note:

- C represents number of credit per course
- T represents number of theory credit per course
- P represents number of practical and per course
- D represents Demonstration/Tutorial in the lecture hall
- PS represents practice session in the lecture hall

II Semester

Nature of Course	Name of subjects	C	T	D	P	P.S.
Language	English language	9	9	0	0	0
	Hindi Language	9	9	0	0	0
Education	Environmental Studies	6	4	1	1	0
	Theatre Arts Heritage & Craft Traditions	5	3	1.25	0.75	0
	Understanding Education & its Perspectives	6	6	0	0	0
Mathematics	Partial Differentiations	10	8	0	0	2
Physics	Elasticity, Waves, Heat & Thermodynammaics	10	7	0.5	2	0.5
Chemistry	State of Matter & Nuclear Chemistry	10	7	0.5	2	0.5
University Compulsory Course	Extra-Curricular Activities	1	-	-	1	-
	Community Development Activities	1	-	-	1	-
	FUNDAMENTAL OF COMPUTERS	1*	0.5	0	0.5	0
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65+2	53	3.25	5.75	3

Note:

- C represents number of credit per course
- T represents number of theory credit per course
- P represents number of practical and per course
- D represents Demonstration/Tutorial in the lecture hall
PS represents practice session in the lecture hall

**B.Sc .B.Ed (PCM)
III Semester**

Nature of Course	Name of subjects	C	T	D	P	P.S.
Compulsory language	English Language	9	9	0	0	0
	Hindi language	9	9	0	0	0
Education	Psychology of Learner & Learning	4	3	0.5	0.5	0
	ICT in Education I	5	3	0.5	1	0.5
Mathematics	Real Analysis	14	12	0	0	2
Physics	Electricity and Electromagnetism	12	8	1	2	1
Chemistry	Organic chemistry	12	8	1	2	1
University Compulsory Course	Extra-Curricular Activities	1	-	-	1	-
	Community Development Activities	1	-	-	1	-
University Mission course	Women's Rights and Law	1*	0	0	0	-
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65+2	52	3	5.5	4.5

Note:

- **C** represents number of credit per course
- **T** represents number of theory credit per course
- **P** represents number of practical and per course
- **D** represents Demonstration/Tutorial in the lecture hall
- **PS** represents practice session in the lecture hall

B.Sc. B.Ed (PCM) IV Semester

Nature of Course	Name of subjects	C	T	D	P	P.S.
Language	English Language	9	9	0	0	0
	Hindi Language	9	9	0	0	0
Education	Assessment Learning	9	9	0	0	0
Mathematics	DIFFERENTIAL EQUATION	14	12	0	0	2
Physics	OPTICS	12	8	1	2	1
Chemistry	THERMODYNAMICS, EQUILIBRIUM AND SOLUTIONS	12	8	1	3	0
University Compulsory Course	Environmental Science & Disaster Management	1	1	-	-	-
	Extra-Curricular Activities	1	-	-	1	-
	Community Development Activities	1	-	-	1	-
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65 +3	55	2	5	3

Note:

- C represents number of credit per course
- T represents number of theory credit per course
- P represents number of practical and per course
- D represents Demonstration/Tutorial in the lecture hall
- PS represents practice session in the lecture hall

B.Sc B.Ed PCM
V Semester

Nature of Course	Name of subjects	C	T	D	P	P.S.
Education	TEACHING APPROACHES AND STRATEGIES	9	9	0	0	0
	PEDAGOGY OF PHYSICAL SCIENCE	9	9	0	0	0
	PEDAGOGY OF MATHEMATICS	9	9	0	0	0
Mathematics	MULTIVARIATE CALCULUS & VECTOR CALCULUS	14	12	0	0	2
Physics	BASIC ELECTRONICS	12	8	1	2	1
Chemistry	TRANSITION ELEMENTS, COORDINATION COMPOUNDS AND CHEMICAL KINETICS	12	8	1	2	1
University Compulsory Course	Extra-Curricular Activities	1	-	-	1	-
	Community Development Activities	1	-	-	1	-
	Help aid	1*	0	0	0	0
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65+2	55	2	4	4

Note:

- **C** represents number of credit per course
- **T** represents number of theory credit per course
- **P** represents number of practical and per course
- **D** represents Demonstration/Tutorial in the lecture hall
- **PS** represents practice session in the lecture hall

**BSc B.Ed PCM
VI Semester**

Nature of Course	Name of subjects	C	T	D	P	P.S.
Education	Pedagogy of Physical Science	10	10	0	0	0
	Pedagogy of Mathematics	10	10	0	0	0
Core Mathematics	Group Theory	12	12	0	0	0
Core Physics	Relativity And Quantum Mechanics	12	8	1	2	1
Core Chemistry	Organic chemistry	12	8	1	2	1
Education	Internship Methodology (4 Week)	9	0	0	9	0
University Compulsory Courses	Extra-Curricular Activities	1	-	-	1	-
	Community Development Activities	1	-	-	1	-
	Gender Sensitization	1*	-	-	-	-
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65+2	48	2	13	2

Note:

- **C** represents number of credit per course
- **T** represents number of theory credit per course
- **P** represents number of practical and per course
- **D** represents Demonstration/Tutorial in the lecture hall
- **PS** represents practice session in the lecture hall

**B.Sc. B.Ed (PCM)
VII Semester**

Nature of Course	Name of subjects	C	T	D	P	P.S.
Education	Secondary Education In India: Status, Issues And Concerns	6	6	0	0	0
	Inclusive Education , Guidance And Counseling In School	6	6	0	0	0
Education	Internship Methodology (14 Week)	30	0	0	0	9
University Compulsory Course	Extra-Curricular Activities	1	-		1	-
	Community Development Activities	1	-		1	-
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		44	12	0	2	9

Note:

- **C represents number of credit per course**
- **T represents number of theory credit per course**
- **P represents number of practical per course**
- **D & T represents Demonstration/Tutorial in the lecture hall**
- **P.S. represents Practice Session**

B.Sc. B.Ed (PCM)**VIII Semester**

Nature of Course	Name of subjects	C	T	D	P	P.S.
Education	Indian Constitution & Human Rights	5	5	0	0	0
	Curriculum and School	6	6	0	0	0
Physics	Atomic, Molecular, Nuclear And Solid State Physics	12	8	1	2	1
Mathematics	Linear Algebra And RINGS AND FIELDS	6	6	0	0	0
	Complex And Numerical Analysis	6	6	0	0	0
Chemistry	Electrochemistry, Photochemistry, Spectroscopy And Macromolecules	12	8	1	2	1
University Compulsory Course	Extra-Curricular Activities	1	-		1	-
	Community Development Activities	1	-		1	-
University Optional Course	Professional activities	-	-	-	-	-
Total Credits		65+2	41	3	18	3

Note:

- **C** represents number of credit per course
- **T** represents number of theory credit per course
- **P** represents number of practical per course
- **D & T** represents Demonstration/Tutorial in the lecture hall
- **P.S.** represents Practice Session

Course Objectives

The basic structure of the 4-Years Integrated B.Sc. B.Ed. Programme in Education is designed keeping in mind the following facts:

1. The learning outcomes of each paper are designed in such a manner that these may help student teachers to clearly understand the main objectives of studying the course and to motivate them to enter teaching profession with full confidence and competencies required.
2. The Courses from Education comprising important areas like foundations of education; pedagogy of school subject (s) mathematics, physical science, biological science; and engagement with the field/practicums and school based experiences through school internship are well organised among eight (8) semesters keeping in view the credit load in each semester as well as some psychological principles.
3. The main objective is to prepare the quality teachers in science, and mathematics for secondary stage of education by imbibing appropriate professional values.
4. Students will be capable of oral and written scientific communication and will prove that they can think critically and work independently.

I SEMESTER

ENGLISH LANGUAGE

Credits-9(9+0+0+0)

Objective:-

The curriculum seeks to introduce a wide range of English. Students are also exposed in connection with Modern English to broader level in depth. To enhance the language ability of pupils through academic and practical usage of language in and out of the classroom.

Unit I: Descriptive Grammar

(Credit-3)

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

(Credit-2)

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

(Credit-2)

Note making; Note- taking; Summary writing.

Comprehension Skills

Extracts from literary, scientific and educational journals.

Unit IV: Skills of Communication

(Credit-2)

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

References:

- 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

Course outcomes:

1. Students will demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation.
2. Students will develop the ability to read works of literary, rhetorical, and cultural criticism,

HINDI LANGUAGE

Credits-9(9+0+0+0)

Course 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.

Unit I :History of Language and Literature-1

(Credit-3)

Hindi Bhasha aur Sahitya ka Itihas [Aarmbha se Lekar 1857 Tak]

Unit II: Short Story-1 [Pre-Independence Literature

(Credit-2)

Swatantratapurva Hindi Kahani Ka Vikas

1. Chandradhar Sharma Guleri- Usne Kaha Tha
2. Jayshankar Prasad- Puraskar
3. Premchand- Panch Parmeshwar
4. Jainendra- Ek Raat

Unit III: Short Story-2 [Post-Independence Literature]

(Credit-2)

Swatantrayottar Hindi Kahani Ka Vikas

1. Mohan Rakesh- Uski Roti
2. Kamleshwar- Dilli Mein ek Maut
3. Phanishwar Nath Renu- Teesari Kasam
4. Bhism Sahani- Cheef ki Dawat

Unit IV : Communication skills

(Credit-2)

Group Discussion [Samooch Charcha]

Introduction – Definition – Characteristics – Types of Discussion –Round table, Symposium, Lecture forum etc. – Relevance of Group Discussion – Exercises.

Suggested Activities:

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 .

Reference:

1. Hindi Sahitya Ka Itihas: Ramchandra Shukla Rajkamal Prakashan, Delhi
2. Hindi Sahitya Ka Itihas: Dr Nagendra, Mayoor Paperbacks, Delhi
3. Hindi Sahitya Ki Bhoomika: Hajari Prasad Divedi Rajkamal Prakashan, Delhi
4. Hindi Sahitya Ka Adikaal: Hajari Prasad Divedi Rajkamal Prakashan, Delhi
5. Hindi Sahitya Ka Udbhav Aur Vikas: Hajari Prasad Divedi Rajkamal Prakashan, Delhi
6. Hindi Sahitya Ka Ateet: Viswanath Prasad Mishra, Rajkamal Prakashan, Delhi
7. Bhakti Aandolan Aur Bhaktikavya: Shivkumar Mishra, Lokbharti Prakashan, Delhi
8. Bhakti Aandolan aur Surdaska Kavya: Maneger Panday, Vani Prakashan, Delhi
9. Bhakti Ke Aayam: Dr P Jayraaman, Vani Prakashan, Delhi
10. Bhartiya Bhakti Sahitya: Dr Rajmal Bora, Vani Prakashan, Delhi
11. Bhaktikavya ka Samajdarshan: Dr Premshankar, Vani Prakashan, Delhi
12. Hindi Sahitya Ka Sanchhipt Itihas: Nanddulare Bajpayee, Swaraj Prakashan, Delhi
13. Hindi Sahitya ka Sanchhipt Itivritt: Shivkumar Mishra, Vani Prakashan, Delhi
14. Hindi Kahani- Antarang Pahchan: Dr Ramdars Mishra, Vani Prakashan, Delhi
15. Hindi Kahani- Sanrachana aur Samvedana: Dr Rachna Saah, Vani Prakashan, Delhi
16. Galp Ka Yatharth- Kathaloochan ke Aayam: Suvas Kumar, Vani Prakashan, Delhi
17. Hindi Ka Gadyaparva: Namvar Singh, Rajkamal Prakashan, Delhi
18. Sahitya ki Pahchan: Namvar Singh, Rajkamal Prakashan, Delhi
19. Katha Vivechan aur Gadyashilp: Ramvilas Sharma, Vani Prakashan, Delhi
20. Kahani Anubhav aur Abhivyakti: Rajendra Yadav, Vani Prakashan, Delhi

Course outcomes: The students...

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

HOLISTIC EDUCATION

Credits-9(5+1.5+2+0.5)

Course objectives:-

1. To develop the understanding the concept of health.
2. Understand the roll of health education and its importance in education.
3. To provide a broad spectrum of avenues for maximum potential.
4. To prepares for life long learning.
5. To understand basic and practical health programmes.

UNIT I: Health Education

(Credit-2)

Meaning and definition of health- Dimensions of health- physical, mental, social and emotional and their inter relatedness Factors that promote and affect health- Biological, environmental and sociocultural Concept of Health Education- School Health Programmes- Promoting Health Instruction, Healthful School Living and Health Services Programmes.

PRACTICALS(Credit-0.5+1+0.25)(D-0.5)(P-1)(PS-0.25)

(1) 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) .

(2) 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) .

Unit2: Physical Education

(Credit-1)

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

Unit3: Physical fitness

(Credit-1)

Physical Fitness- Components of Physical Fitness, Training methods for developing Physicalfitness.Physical education programme at high schools- selection of activities in games and athletics based on physiological, psychological and sociological characteristics of students

PRACTICALS(Credit-0.5+0.5+0.25)(D-0.5)(P-0.5)(PS-0.25)

1)Marking of playfields/ track. Organising Intramural competitions, Officiating matches, Drawing fixtures for different type of tournaments, and maintaining of records.

2) Health Appraisal of School Students.

Unit4: Yoga Education

(Credit-1)

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

PRACTICALS(Credit-0.5+0.5)(D-0.5)(P-0.5)

- 1) Practice of Yogic Exercises and Yogasanas- Mudras, Suryanamasakara and a minimum of 25 simple asanas.
- 2) 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.

Suggested Readings:

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. Edward F. Voltmer and Arthur A. Esslinger (1964). The Organisation and Administration of Physical Education, Bombay, The Times of India Press.

Course outcomes:-

After the transaction of the course student teacher :-

1. develop and understanding the concept of health.
2. Understand the roll of health education and its importance in education.
3. get a broad spectrum of avenues for maximum potential.
4. prepares for life long learning.
5. understand basic and practical health programmes.

Differential Calculus & Analytical Geometry

Credits-7(6+0+0+1)

Objectives: At the end of the course students will be able to:

- (i) Understand concepts, principles and techniques of Continuity and Differentiation.
- (ii) Understand the concept of Differentiation.
- (iii) Understand the concepts of Coordinate geometry

Unit I: Continuity and Differentiation (Credit-2+0.25)(T-2)(PS-0.25)

Definition of limit, existence of limit, Undeterminate forms, 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 (Credit-2+0.25)(T-2)(PS-0.25)

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 (Credit-1+0.25)(T-1)(PS-0.25)

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 (Credit-1+0.25)(T-2)(PS-0.25)

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.

Course outcomes: At the end of the course students:

- (i) Understand concepts, principles and techniques of Continuity and Differentiation.
- (ii) Understand the concept of Differentiation.
- (iii) Understand the concepts of Coordinate geometry

Suggested Readings:

1. Differential Calculus by Gokhroo and Saini
2. Calculus and Analytical Geometry by S.Chand
3. Calculus by Anton, Addison-Wiley.
4. Calculus with Analytical Geometry by S K Stein, McGraw Hill.
5. 3. Calculus and Analytical Geometry, Thomas and Finney, S.Chand and Co. Ltd.
6. Analytical solid geometry, JPH
7. Calculus Person Prentice Hall

NUMBER THEORY, THEORY OF EQUATIONS, MATRICES

Credits-7(6+0+0+1)

Objectives: The course objective is to make student:

- (i) Understand concepts, principles and techniques of GCD and LCM
- (ii) Understand the concept of Theory of Equations.
- (iii) Understand the concepts of Matrices and its Applications.

Unit I: Theory of Numbers (Credit-2+0.25)(T-2)(PS-0.25)

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 (Credit-2+0.25)(T-2)(PS-0.25)

Relation between roots and coefficients, Symmetric functions, Transformations, Reciprocal equations, Descartes’s rule of signs, Multiple roots, Solving cubic equations by Cardon’s method, Solving quartic equations by Descartes’s method and Ferrari’s method.

Unit III: Matrices (Credit-1+0.25)(T-1)(PS-0.25)

Definition of Matrix, order of matrices, Algebra of matrix, Adjoint of a square matrix Determinants, Inverse of matrices, Singular and non-singular matrices Symmetric and Skew Symmetric, Hermitian and Skew Hermitian matrices and their standard properties, 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 (Credit-1+0.25)(T-1)(PS-0.25)

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.

Suggested Readings:

1. Algebra by Swapn kumar sarkar.
2. Theory of Numbers by John E. Cloury
3. Elementary Number Theory by David M. Burton.
4. Algebra by Natarajan, Manicavachagon Pillay and Ganapathy, S. Vishwanath Pvt. Ltd.
5. Theory of Equations by Uspensky, McGraw Hill Book Co. Ltd.
6. Macmillian higher algebra, Macmillan
7. Linear Algebra, Tata McGraw Hill
8. Linear Algebra, Tata McGraw Hill

Course Outcomes: At the end of the course students:

- I. Understand concepts, principles and techniques of GCD and LCM
- II. Understand the concept of Theory of Equations.
- III. Understand the concepts of Matrices and its Applications

MECHANICS

Credits-12(8+1+2+1)

Course objectives-

1. To understand the motion of objects in different frame of references.
2. To understand laws of motion, reference frames, and its applications i.e. projectile motion, simple harmonic oscillator, Rocket motion, elastic and inelastic collisions.
3. To understand the idea of conservation of angular momentum, central forces and the effective potential.
4. non-inertial frames: pseudo forces, examples involving the centrifugal force and coriolis force.

Unit I: Particle Dynamics

(Credit-2)

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, Application of Newton's law, Frames of reference, inertial and non inertial, Galilean transformations, velocity and acceleration, pseudo forces, Force laws, weight and mass, static procedure for measuring forces.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

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

Unit II: Conservation Laws and Collisions

(Credit-2)

Conservation Laws: Introduction, conservative forces, potential energy, complete solution for one, two and three dimensional systems, non-conservative forces, conservation of energy, mass and energy. Conservation of Linear Momentum: Centre of mass, laboratory and C.M. frame. motion of the center of mass, linear momentum of a particle, linear momentum of a system of particles, 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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

1. Study of the motion of a freely falling body.
2. Study of the dependence of the period of oscillation of a spring-mass system on mass.
3. Study of the acceleration of a body subjected to different unbalanced forces

Unit III: Gravitation and Central Force

(Credit-2)

Gravitation : Introduction, Newton's law of Universal Gravitation, Universal Gravitation constant, 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.

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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

1. Study of accelerations of different masses under a constant unbalanced force.
2. Study of conservation of energy and momentum in head-on-collision between two spheres of equal mass.
3. Study of conservation of momentum and energy of a collision in a plane.

Unit IV: Rotational Kinematics**(Credit-2)**

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, work, power and work – kinetic energy theorem.

Suggested Readings:

1. Fundamentals of Physics (English) 1st Edition , Author: Ivanov, B.N. Publisher: CBS Publisher.
2. Fundamental physics (class XI) , Gomber, K. L.,
3. University Physics, Revised Edition, Harris Benson, John Wiley and Sons, Inc.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

1. Conservation of momentum in an explosion.
2. Study of the relation between pressure and volume of a gas at constant temperature.

Suggested Readings:

1. PSSC Physics Laboratory Guide.
2. Practical Physics, E Armitage, John

Course outcome-

1. The students understand the application of central force to the stability of circular orbits, Kepler's laws of planetary motion, Orbital Precession and Rutherford scattering.
2. The students understand the dynamics of rotating objects i.e. rigid bodies, angular velocity, the moment of inertia, parallel axis theorem, the inertia tensor, the motion of rigid bodies. non-inertial frames: pseudo forces, examples involving the centrifugal force and coriolis force.

Inorganic Chemistry

Credits-12(8+1+2+1)

Objectives:

- To provide a broad foundation in chemistry that stresses scientific reasoning and analytical problem solving with a molecular perspective.
- To acquire basic knowledge to students teachers about atomic structure, periodic properties, Chemical Bonding and Ionic solids, Understanding the chemistry of s-and p-block elements, the fundamentals of the chemistry of the main group elements, and important real world applications of many of these species and Acids and Bases and solvent system.
- Students will be able to describe the fundamentals of acid/base chemistry, including pH calculations, buffer behaviours.

Unit I: Atomic Structure and Periodic trends

(Credit-2)

Atomic Structure: Idea of de-Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrödinger wave equation, significance of Ψ and Ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d and f orbitals. Aufbau and Pauli exclusion principles, Hund's multiplicity rule, effective nuclear charge.

Periodic Properties

Atomic and Ionic radii, Ionization energy, electron affinity and electronegativity-methods of determination or evaluation, trends in periodic table and applications in predicting and expecting the chemical behavior.

Unit II: Chemical Bonding and Ionic solids

(Credit-2)

Structure and Bonding: 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 with special reference to NH_3 , H_3O^+ , SF_4 , ClF_3 , ICl_2^- and H_2O , MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, multicenter bonding in electron deficient molecules such as Boranes, bond strength and bond energy, percentage ionic character from dipole moment and electro-negativity difference.

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.

Unit III: Chemistry of sand p block elements

(Credit-2)

s-Block Elements: Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in bio-systems, an introduction to alkyls and aryls.

p-Block Elements: Comparative study (including diagonal relationship) of groups 13-17 elements, compounds like hydrides, oxides, oxy acids and halides of group 13-16, hydrides of boron-diborane and higher boranes, borazine, borohydrides, fullerenes, carbides, fluorocarbons, silicates (structural principle), tetrasulphur tetra nitride, basic properties of halogens, interhalogens and polyhalides.

Chemistry of Noble Gases: Chemical properties of the noble gases, chemistry of xenon, structure and bonding in xenon compounds.

Unit IV: Acids and Bases and solvent system

(Credit-2)

Theories of Acids and Bases: Arrhenius, Bronsted-Lowry, Lux-Flood, solvent system and Lewis concept of acids and bases. Solvent system of acids and bases with special reference to liquid Ammonia, liquid BrF_3

Concept of 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, electro negativity.

Solvent Systems: 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 .

Suggested Readings:

1. Lee, J.D. Concise Inorganic Chemistry, ELBS.
2. Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry
3. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications.
4. Shriver and Atkins Inorganic Chemistry, W. H. Freeman and Company
5. James Huheey, Inorganic chemistry: Principles of Structure and Reactivity, Pearson Education India
6. B.N. Figgis, J.E Huheey, P.W. Atkins Inorganic Chemistry, Pearson Education
7. Duward Shriver, Inorganic Chemistry, W. H. Freeman
8. Gary Wulfsberg, Inorganic Chemistry, University Science Books
9. A. R. West, Solid State Chemistry and its Applications, Wiley

CHEMISTRY PRACTICALS

(Credit-2)

1. Inorganic Chemistry:

Semi micro analysis: Detection of the presence of three cations and three anions (including interfering) in a given mixture qualitatively.

2. Quantitative Analysis: Volumetric Analysis

- Determination of acetic acid in commercial vinegar using NaOH.
- Determination of alkali content – antacid tablet using HCl.
- Estimation of calcium content in chalk as calcium oxalate by permanganometry.
- Estimation of ferrous and ferric by dichromate method.
- Estimation of copper using thiosulphate.

Course outcomes:

After completion of this course students will be-

1- Able to know the concepts of atomic structure and the use of the periodic table in predicting an element's physical and chemical properties.

2- Perform quantitative calculations based on the relationship between wavelength, energy, and the speed of light.

3- Able to know types of bonds, formation of bonds, hybridization and molecular orbital theory and chemistry of borazine, diborane.

II Semester

ENGLISH

Credit-9(9+0+0+0)

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.

Unit I: Descriptive Grammar

(Credit-3)

Function of Auxiliaries; Modals; Question form

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

Unit II: Development of Language Competence

(Credit-2)

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 & Creative Skills in Writing

(Credit-2)

Letter-writing (Professional / Personal), Writing dialogues, poems and essays

Unit IV: Basic Phonetics

(Credit-2)

Sounds of English language, intonation and transcription using IPA.

References:

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

Course outcomes:

After completion of this course students will be able to-

- 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.

HINDI LANGUAGE

Credit-9(9+0+0+0)

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.

Unit I: History of Language and Literature-2

(Credit-3)

Aadhunik Hindi Sahitya ka Itihas [1857 Se Lekar Ab Tak]

Unit II : Modern Poetry-1 [Pre-Independence Literature]

(Credit-2)

Swatantratapurva Hindi Kavita Ka Vikas

1. Maithilisanan Gupt- Nar Ho Na Nirash Karo Man ko
2. Jayshankar Prasad- Himadri Tung Sring Se Prabudh Sudhha Bharti
3. Suryakant Tripathi Nirala- Joohi ki Kali
4. Sumitranandan Pant- Drut Jharo Jagat Ke Jirn Patra
5. Mahadevi Verma-MaiNeer Bhari Dhukh Ki Badli.

Unit III : Modern Poetry-2 [Post-Independence Literature]

(Credit-2)

Swatantrayottar Hindi Kavita Ka Vikas

1. Gajanan Madhav Muktibodh- Bhool Galti,
2. Kedarnath Agrawal- Chandra Gahna Se Lautati Ber
3. Raghveer Sahay- Aapki Hansi
4. Nagarjun- Aakal Aur Uske Bad
5. Kedarnath Singh- Aakal Me Saras

Unit IV : Communication skills Conversation [Varta]:**(Credit-2)**

Characteristics – Definition – Styles of conversation – Higher order skills-Telephonic conversation, Role Play, – Models, etc. – Exercises.

References:

1. Hindi Sahitya Ka Itihas: Ramchandra Sukla, Vani Prakashan, Delhi
2. Hindi Sahitya ka Aadikal: Hajari Prasad Divedi, Vani Prakashan, Delhi
3. Hindi Sahitya Ka Itihas: Dr Nagendra , Mayoor Paperbacks, Delhi
4. Hindi Sahitya Ka Sanchhipt Itihas: Nanddulare Bajpayee, Swaraj Prakashan, Delhi
5. Hindi Sahitya Ka Dusara Itihas: Bacchan Singh, Vani Prakashan, Delhi
6. Aadhunik Hindi Sahitya ka Itihas: Bacchan Singh, Lokbharti Prakashan, Delhi
7. Hindi Sahitya ka Sanchhipt Itivritt: Shivkumar Mishra, Vani Prakashan, Delhi
8. Hindi Sahitya ka Sanchhipt Itihas:Viswanath Tirpathi, Orient Longman, Delhi
9. Sawtantrayotar Hindi Sahitya Ka Itihas: Dr Laxmisagar Vasney, Delhi
- 10.Hindi Sahitya Aur Samvedana Ka Vikas: Ramswaroop Chaturvedi, Lokbharti Prakashan
- 11.Bhasha, Yugbodh aur Kavita: Dr Ramvilas Sharma, Vani Prakashan, Delhi
- 12.Kavita ka Vartmaan: Dr P Ravi, Vani Prakashan, Delhi
- 13.Hindi Kvaya ka Itihas: Ramswaroop Chaturvedi, Lokbharti Prakashan, Delhi
- 14.Kavita ki Zameen aur Zameen ki Kavita: Namvar Singh, Rajkamal Prakashan, Delhi
- 15.Nayee Kavita aur Astitvawad: Ramvilas Sharma, Rajkamal Prakashan,Delhi
- 16.Chhayavad: Namvar Singh, Rajkamal Prakashan, Delhi
- 17.Kavita ke Naye Pratiman: Namvar Singh Raajkamal Prakashan, Delhi
- 18.Hindi Kavita ka Atit aur Vartmaan: Maneger Panday, Vani Prakashan, Delhi
- 19.Hindi Kavita Ki Tisari Dhara: Mukesh Manas, Swaraj Prakashan, Delhi
- 20.Effective Communication Skills, by Omkar N Kour
- 21.Prayojanmoolak Hindi- Madhav Sontakke, Rajkamal Prakashan Samooh, Delhi
- 22.Prayojanmoolak Hindi ki Nayee Bhoomika- Kailash Nath Panday, Rajkamal Prakashan Samooh, Delhi
- 23.<http://www.hindisamay.com>

Suggested Activities:

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 .

Course outcomes:

After completion of this course students will be able to-

- 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.

ENVIRONMENTAL STUDIES

Credit-6(4+1+1+0)

Objectives:

- To familiarize the students to develop a comprehensive understanding of various facets of life forms, ecological processes .
- To get a basic idea about the Critical thinking Capability to identify relevant environmental issues, analyse the various underlying causes, evaluate the practices.
- Moral and ethical awareness/reasoning Develop empathy for various life forms and appreciate the various ecological linkages within the web of life.
- To make students realize the importance and their role in the protection and maintenance of a healthy environment for sustainable development.

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

Environment: Studies, concept, Scope and Importance.

Natural Resources - Renewable and Non-renewable (Forest, water, mineral, food, energy and land resources).

Associated problems and strategies for Conservation and Sustainable Development.

Ecosystem – concept, components, Ecosystems –Concept, structure and function; Pond ecosystem, Forest ecosystem; Food chains, Food webs; Concept of ecological succession energy flow, types of ecosystem.

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;

Conservation of biodiversity - In-situ and Ex-situ; Endangered and endemic species – Concept; Afforestation – Social forestry, Agroforestry, Green belt.

PRACTICALS

- a. Visit to document environmental assets - river / forest / grassland/ hill/national parks.
- b. Visit to a local polluted site : Urban / Rural / Industrial / Agricultural.
- c. Study of common plants, insects, birds.

Unit II: Environmental Concerns

Disaster management– Definition and types (Natural and Man-made); Self-protection during disasters (Fire, Floods, Earthquakes, landslides)

Environment Protection Act; Biodiversity Act (2002); National Environmental Policy, 2006 – Provisions and importance; Environmental Impact Assessment – Concept; Swachh Bharat Mission– Objectives; International agreements – Montreal and Kyoto protocols

PRACTICALS

- a. Study of simple ecosystems – pond, river, hill slopes, etc.
- b. Project on environmental pollution in the nearby sites Preparation of exhibits on environmental themes and organize an exhibition.
- c. Conduct a survey of environmental problems of the community

Unit III: Natural resources and management

- 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, Wasteland reclamation. and Solid waste management.
- d. Population growth, variation among nations; Population explosion – Family Welfare Programme; HIV/ AIDS; Environment and human health
- e. Impact of plastic on human and animal health

Unit IV: Environmental Pollution

Environmental pollution- Air, water, soil, marine, noise and thermal pollution, nuclear hazards; solid waste management and conservation, preventive measures of pollution.

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).

Suggested Readings:

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. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p
4. Rao M N. & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.

Course Outcomes:

The student will be able to

- Gain in-depth knowledge on natural processes that sustain life.
- Predict the consequences of human actions on the web of life, global economy and quality of human life.
- Develop critical thinking for shaping strategies (scientific, social, economic and legal) for environmental protection and conservation of biodiversity, social equity and sustainable development.
- Acquire values and attitudes towards understanding complex environmental - economic social challenges, and participating actively in solving current environmental problems and preventing the future ones.
- Adopt sustainability as a practice in life, society and industry.
- Understand the importance and dimension of a healthy environment, become environmentally conscious, skilled and responsible in all their actions with a concern for sustainable development.
- Apply the knowledge on ecological and environmental significance of microbes for the benefit of the society.

THEATRE, ART AND HERITAGE CRAFT TRADITIONS

Credit-5(3+1.25+0.75+0)

Objectives:

- To understand the critical role of the crafts community and its integral relationship to the Indian society.
- To enable students to understand the relationship between economics, culture and aesthetics
- To introduce Indian culture through the crafts, so that school students appreciate the variety of skills and expressions of the Indian artist
- To provide students a creative aesthetic experience of the unique visual and Material culture of India and develop values of conservation, protection of the Environment, resources and heritage of the country
- To enable students to understand the relationship between tradition and contemporary trends, form and function, creator and consumer.

Unit I: Unit: I: Concept & forms of Theatre & Arts

(Credit-1)

Eastern and Western, Natyashashtra, Doctrine of Rasa, Tragedy, Catharsis, Folk and Classical art forms. Drama, Stage Plays. Skits, Mime, Street Plays

Introduction to the History of Word Art, Forms of Art: music, dance, theater and visual arts

- appreciate different art forms
- integration of art forms in classroom process
- analyse text books for integration of different art forms.

Unit II: Expression through art forms

(Credit-1)

Expressing ideas about different aspects of life

- Expressing various emotions
- Enhancing communication and presentation skills, developing imagination, creativity and aesthetic sensibility among the student teachers
- Utilizing different art expressions in teaching learning situation

Unit III: Cultural heritage of India

(Credit-1)

Exposure to the cultural heritage of Locality, state/region, Nation Reflection and incorporation of the rich cultural heritage during the celebrations of festivals, functions and special days document processes of an art or craft form from the pedagogical point of view; such as weaving or printing of textiles, making of musical instruments, folk performances in the community Acquaintance with the life and work of artists and their contribution to teaching and learning.

Suggested Readings

Position Paper- National Focus Group on Arts, Music, Dance and Theater NCERT, 2006, New Delhi

Position Paper- National Focus Group on Heritage Crafts, NCERT, New Delhi, 2006 NCF 2005
NROER- National Repository of Open Educational Resource, Department of School Education & Literacy, MHRD.

PRACTICALS (Credit-0.25+0.25)(D-0.25)(P-0.25)

- 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

Course Outcomes:

After studying the subject student would be able to understand about the origin of art forms in world. They would be capable to analyse the various forms of arts and its relevance in education and social phenomenon.

UNDERSTANDING EDUCATION AND ITS PERSPECTIVES

Credit-6(6+0+0+0)

Objectives:-

After completed the course the student-teacher will be able to:-

- To develop basic understanding and concept of education.
- Learn about the education and its implementation.
- Explain in detail the role of education in social and cultural change.
- Understand the roll of education and instrument of social change
- To develop the Socio-cultural influences on the aims and organization of education;

Unit I: Basic Concepts of Education

(Credit-1.5)

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

(Credit-1.5)

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

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

Unit III: Education and Socio-Cultural Context

(Credit-1.5)

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

(Credit-1.5)

) 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

Suggested Readings:

1. Pathak, Avijit (2002) social Implications of Schooling, Delhi Rainbow Publishers.
2. Krishnamurthi J Education and the Significance of life, KFI Publications.
3. Anand, C L and et al (1993) Teacher and Education in the Emerging Indian Society, NCERT, New Delhi.
4. Mahatma Gandhis Philosophy of Education and its Relevance/Agarwal, Ruchi
5. Govt. of India, MHRD (1986, Revised 1992) National Policy of Education, New Delhi.

Course Outcomes:

Education serves several functions for society. These include (a) socialization, (b) social integration, (c) social placement, and (d) social and cultural innovation. Education promotes social inequality through the use of tracking and standardized testing and the impact of its "hidden curriculum." Schools differ widely in their funding and learning conditions, and this type of inequality leads to learning disparities that reinforce social inequality. This perspective focuses on social interaction in the classroom, on the playground, and in other school venues. Specific research finds that social interaction in schools affects the development of gender roles and that teachers' expectations of pupils' intellectual abilities affect how much pupils learn. Certain educational problems have their basis in social interaction and expectations. Schools ideally perform many important functions in modern society. These include socialization, social integration, social placement, and social and cultural innovation.

PARTIAL DIFFERENTIATIONS AND INTEGRAL CALCULUS

Credit-10(8+0+0+2)

Objectives: At the end of the course students will be able to:

1. Understand concepts, principles and techniques of Partial Differentiation.
2. Understand the concept of Curves and Surfaces.
3. Understand the concepts of Integration and its Applications.

Unit I: Partial Derivatives – I(Credit-2+0.5)(T-2)(PS-0.5)

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

Unit II: Partial Derivatives – II(Credit-2+0.5)(T-2)(PS-0.5)

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 (Credit-2+0.5)(T-2)(PS-0.5)

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

Unit IV: Integration (Credit-2+0.5)(T-2)(PS-0.5)

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.

Suggested Readings:

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. Introduction to Calculus and Analytical Geometry by Courant and John, Narosa Publishing House.
5. Integral Calculus by Shanthinarayan, S.Chand and Co. Ltd

Course outcomes: At the end of the course students will be able to:

1. Understand concepts, principles and techniques of Partial Differentiation.
2. Understand the concept of Curves and Surfaces.
3. Understand the concepts of Integration and its Applications.

ELASTICITY, WAVES, HEAT AND THERMODYNAMICS**Credit-10(7+0.5+2+0.5)****Course objectives-**

1. To recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems, point out the limitations and be able to refer to very different solutions of identical oscillator equations due to different initial and boundary conditions.
2. To understand how several waves or parts of waves interact, and be able to calculate and analyze diffraction and interference phenomena, and explain the conditions required for such phenomena to appear.

Unit I: Elasticity and Waves (Credit-1.5)

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

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

Waves: General differential equation of one dimensional wave motion and its solution, plane progressive harmonic wave, differential calculus methods for speed of transverse waves on a uniform string and for that of longitudinal waves in a fluid, energy density and energy transmission in waves, group and phase velocity of waves.

PRACTICALS (Credit-0.25+1+0.25)(D-0.5)(P-1)(PS-0.25)

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

Unit II: Kinetic Theory of Gases (Credit-1.5)

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

PRACTICALS (Credit-0.25+1+0.25)(D-0.5)(P-1)(PS-0.25)

1. Study of Newton's law of cooling.
2. Melde's experiment – determination of frequency.
3. Determination of solar constant.
4. Study of variation of pressure and temperature of a gas at constant volume.
5. J by Joules Calorimeter.
6. Lees and Charlton disc – Thermal conductivity of a bad conductor.
7. Specific heat of a solid by the method of mixtures.

Unit III : Heat and Thermodynamics**(Credit-2)**

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**(Credit-2)**

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.

Suggested Readings:

1. Fundamental physics (class XI), Gomber, K. L..
2. Heat thermodynamics and statistical physics, Lal, Brij.
3. Heat and Thermodynamics, Zeemansky, McGraw Hill.
4. The physics of waves and Oscillations, Bajaj NK,
5. PSSC Physics Laboratory Guide.
6. Practical Physics, E. Armitage, John Murray.

Course outcome-

1. The students understand the efficiency of Carnot's engine and the significance of first law and second of thermodynamics and implications of the second law of thermodynamics and limitations placed by the second law on the performance of thermodynamic systems.
2. The students understand the interrelationship between thermodynamic functions and ability to use such relationships to solve practical problems.

PHYSICAL CHEMISTRY

Credit-10(7+0.5+2+0.5)

Objectives:

- To acquire basic knowledge to students teachers about Mathematical concepts and learn the basic concepts of nuclear radioactivity and Nuclear reactions.
- To enhance the understanding of students in concepts related to Liquid, Colloidal states & Structure of Ionic solids, Behaviour of Gases, concepts in thermodynamics, different thermodynamic quantities such as heat and work and how are they measured, related or transformed.

Unit I: Mathematical concepts and Nuclear Chemistry

(Credit-1.5)

Mathematical Concepts: Logarithmic relations, curve sketching, linear graphs and calculation of slopes, differentiation of functions like k_x , e^x, x^n , $\sin x$, $\log x$; maxima and minima, partial differentiation and reciprocity relations, Integration of some useful/relevant functions; permutations and combinations, Factorials, Probability.

Nuclear Chemistry: Radioactive decay – decay law, disintegration constant, half-life and average life, alpha and beta disintegration reactions, group displacement law, nuclear reactions fission, fusion, artificial radioactivity, applications of radioactivity, nuclear power, carbon dating, biological effects of various types of radiations, nuclear chemistry for peace, Nuclear chemistry in Medicine and diagnostic techniques.

Unit II : Liquid, Colloidal states & Structure of Ionic solids

(Credit-1.5)

Liquid State: 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 cells.

Colloidal States: 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 application of colloids, colloidal electrolytes.

Structure of Ionic solids: 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's equation, Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

Unit III : Behaviour of Gases

(Credit-2)

Gaseous States: Postulates of kinetic theory of gases, deviation from ideal behaviour, Vander Waals' equation of state;

Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, 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, Liquification of gases (based on Joule – Thomson effect).

Unit IV : Thermodynamics

(Credit-2)

First Law of Thermodynamics: Statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule's law- Joule-Thomson coefficient and inversion temperature. Calculation of w , q , dU , & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, temperature dependence of enthalpy, Kirchhoff's equation.

Second law of thermodynamics: Need for the law, 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 change, Clausius inequality, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.

Third law of thermodynamics: Nernst heat theorem, statement and concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G with A with P , V and T .

Suggested Readings:

1. Engel, Physical Chemistry, Pearson Publications.
2. Mary Anne White, Physical Properties of Materials, Taylor & Francis second edition.
3. D N Bajpai, Advanced Physical Chemistry, S. Chand Publishing
4. S Lewis and D Gladstone, Elements of Physical Chemistry, Macmillan.
5. Peter Atkins Julio de Paula, The elements of Physical Chemistry, Oxford University Press.

PRACTICALS

(Credit-2)

1. Colloids

- To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi- and trivalent anions.

2. Viscosity

- To determine the percentage composition of a given mixture (non interacting systems) by viscosity method.
- To determine the percentage composition of a given binary mixture by viscosity method (acetone & ethyl methyl ketone)

3. Surface Tension

- To determine the surface tension of amyl alcohol in water at different concentrations and calculate the excess of these solutions.
- To determine the percentage composition of a given surface tension binary mixture by surface tension method (acetone & ethyl methyl ketone).

Course Outcomes:

The students will acquire basic knowledge about Mathematical concepts and learn the basic concepts of nuclear radioactivity and Nuclear reactions.

She/he will understand the concepts related to Liquid, Colloidal states & Structure of Ionic solids, Behaviour of Gases, concepts in thermodynamics, different thermodynamic quantities such as heat and work and how are they measured, related or transformed.

III Semester

English Language

Credit-9(9+0+0+0)

Objective: - Students are exposed in connection with Modern English and English literature to broader level. Students will be able to exchange their thoughts on sociocultural and political theme. After completing this course, there are many career options. Such as- media, journalism, publishing, public relations, content writing, blogging, creative writing, teaching and academic research.

Unit I: Language Work (Credit-3)

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

Unit II: Comprehension Skills (Credit-2)

Extracts from literary, scientific and educational journals.

Unit III: Advanced Writing Skills (Credit-2)

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

Unit IV: Skills of Communication (Tutorials) (Credit-2)

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. The Practical Course For Developing Writing Skills In English : JK Ganggal
2. A Practical Course For Developing Writing Skills In English : Jk Ganggal
3. Communication skills 4th edition : Peter Simon.
4. Aarts, Bas(2011). Oxford Modern English Grammar. OUP
5. David K. Dunaway.(1995) Aldoux Huxley Recollected: An Oral History .
6. Rowman Altamira Publication
7. Warner R Anthony(1993). English Auxiliaries : Structure And History. CUP

Course outcomes: The students develop the knowledge of grammar, to develop writing and comprehension skill of students

HINDI LANGUAGE

Credit-9(9+0+0+0)

Objectives:-

- 1.Mahadevi Verma v Kanhyalal Sethiya ka parichy bata sakenge.
- 2.Skills of writing ke bare me jan sakenge.
3. Hindi Sahitya khand pramukh sahitykar ke bare me jan sakenge.
- 4.Nibandh- agarchand nahata –Rajasthan ki Saanskritk dharohar ke bare me jan sakenge.

Unit I Sahitya khand

(Credit-3)

- 1-Kahani –Premchand –Bade bhaishab -Vijaydandetha- sikandar or kauwao
- 2-Sansmaran- Kanhyalal Mishra “Prabhkar- bayalisa ke jewar ki un leharo mai”
- 3-Rekhachitra-Ramvraksha Benipuree-rajiya
- 4-Vighyan –Ghunakarmule-shani sabse sunder gharha
- 5-Nibandh- Agarchand Nahata –Rajasthan ki Saanskritk dharohar
- 6-Vayanga—Sharad Joshi -jeep par sawar eliliya
- 7- Prayawaran-Anupam Mishra –Aaj bhi khere hai taalaab

Unit II: General Biography of Following Writers

(Credit-3)

Mahadevi Verma
Kanhyalal Sethiya
Suryakant Tripathi Nirala

Unit III: Skills of writing

(Credit-3)

Novel Writing
Short Story Writing
Dialogue Writing

Suggtsted Activities:

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.

Reference:

1. A Handbook of Writing Activities, Prasaranga, University of Bangalore.
2. 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.
3. Vyakaran Pradeep by Ramdev. Publisher : Hindi Bhavan, 36,Tagore Town Allahabad – 211 002

Information and Communication Technology in Education- I

Credit-5(3+0.5+1+0.5)

Objectives of the course:

- To Appreciate the historical development of various educational media.
- To Identify and demonstrate an understanding of the main components of the computer hardware in use.
- To Differentiate various operating system and explain main functions of the system and application software environment.
- To Use a word processor, spread sheet, drawing and presentation software to produce various teaching learning resources for educational use.
- To Use internet technologies efficiently to access remote information, communicate and collaborate with others.
- To Understand the social, economic, security and ethical issues associated with the use of ICT.

Unit I: Basics in ICT and Computer Applications(I)

(Credit-1)

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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

Hands on experience in setting up a desktop PC and working with various input devices, output devices, storage devices, and display devices Practice in installing various system and application software Using word processor, spread sheet, and presentation software to produce various teaching learning resources.

Unit II: Basics in ICT and Computer Applications(II)

(Credit-1)

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 III: Basic Computer Software Applications(I)

(Credit-0.5)

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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

Locating internet resource- navigating, searching, selecting, saving and evaluating (use standard internet evaluation criteria) Social bookmarking of internet resources using any social bookmarking tools (diigo, delicious, stumbleupon).

Unit IV: Basic Computer Software Applications (II)

(Credit-0.5)

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.

PRACTICALS (Credit-0.5+0+0)

Comparative study of ICT syllabus of school education and teacher education of various organizations
Evaluating multimedia CD ROMs using standard criteria and study the multimedia
Developing multimedia e-content for a topic using eXe Learning

Suggested Reading

1. [FUNDAMENTALS OF INFORMATION TECHNOLOGY - 2ND EDN 2nd Edition](#), Leon, Alexis
2. Evant, M: The International Encyclopedia of Educational Technology.
3. Jain Amit; Sharma Samart; & Banerji Saurab (2002). MicrosoftWord forBeginners. NISCOM, CSIR: New delhi
4. How Best To Use Internet And Email (English) 01 Edition, [Jayant Neogy](#), Unicorn Books
5. Step by Step Microsoft Excel 2010 (English), [FRYE](#)
6. BEYOND BULLET POINTS: USING MS POWER POINT 3/E (English) 3rd Edition, [ATKINSON](#), PHI LEARNING PVT. LTD-NEW DELHI

Course outcomes:

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

- Appreciate the historical development of various educational media.
- Identify and demonstrate an understanding of the main components of the computer hardware in use.
- Differentiate various operating system and explain main functions of the system and application software environment.
- Use a word processor, spread sheet, drawing and presentation software to produce various teaching learning resources for educational use.
- Use internet technologies efficiently to access remote information, communicate and collaborate with others.
- Model collaborative knowledge construction using various web 2.0 tools and technologies.
- Understand the social, economic, security and ethical issues associated with the use of ICT.

PSYCHOLOGY OF LEARNER & LEARNING

Credit-4(2+2+0+0)

Objective: The objective of the course is to teach how people learn in a variety of settings to identify approaches and strategies to make learning more effective.

Unit I: Nature of the Learner

(Credit-0.5)

Concept of growth, development-principles, characteristics of the child & adolescent, maturation and learning; Factors contributing to development such as heredity, nutrition, childrearing 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, Socialization and learning: understanding influences and factors that shape learner's identity. Learners in Context: Situating learner in the socio-political and cultural context. Social, economic and cultural differences in socialization: implications for education.

Unit II: Individual differences & Assessment of Differences between Learners (Credit-0.5)

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

(Credit-0.5)

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 - Constructivism: Introduction to the concept; Piaget's theory: what is learning, structures and processes of cognitive development, cognitive conflict, characteristics of thought in different stages, implications for teaching-learning. Vygotsky's Theory: Introduction, the general genetic law, concept of ZPD, tools and symbols in development, implications for teaching.

Unit IV: Factors affecting Learning & Management of Learning

(Credit-0.5)

Concept of Motivation; types, techniques of enhancing motivation, Health, sleep, difficulty of task, content and study habits as factor 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, Co-operative Learning strategies. Collaborative Learning and role of ICT

Practical/Sessional Work:**(Credit-2)**

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, and attitudinal learning)

Suggested Readings:

1. Essentials of Educational Psychology (English) 1st Edition, [S. K. Mangal](#), Phi Learning.
2. Aggarwal, Essentials of Educational Psychology, 9th Ed. 2003, Vikas Publishing.
3. Personality Development and Soft Skills (English) by BARUN K MITRA

Course outcomes: The psychology of teaching and learning helps us understand the social, emotional and cognitive processes that constitute learning throughout the lifespan settings as diverse as government research centers, schools, community organizations.

ELECTRICITY AND ELECTROMAGNETISM

Credit-12(8+1+2+1)

Course objectives-To

1. Understand the basic concepts of electric and magnetic fields.
2. Understand the concept of conductors, dielectrics, inductance and capacitance.
3. Gain knowledge on the nature of magnetic materials.
4. Understand the concept of static and time varying fields.
5. Gain knowledge on electromagnetic induction and its applications.
6. Gain knowledge on EM waves, propagation and their properties.
7. Ability to use Maxwell's equations in calculations featuring: both free and stationary electromagnetic waves.

Unit I : Electrostatics & Electric Currents

(Credit-2)

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 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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Resistance measurements. B. Capacitance measurements. C. EMF measurements.

Unit II: Electric Fields in Matter

(Credit-2)

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). Polarizability and susceptibility – Frequency dependence of polarizability, Clausius-Mossotti equation.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- RC circuits.

Unit III : Magnetostatics and ac circuits

(Credit-2)

Review of Ampere's law, near a long wire, Magnetic lines of induction, force between two parallel conductors, definition of ampere, 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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- Magnetic Induction measurements

Unit IV : Electromagnetic Induction

(Credit-2)

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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- Ampere's Law

Suggested Readings:

1. Physics (Class XII), NCERT.
2. Fundamental physics (class XII), Gomber, K.L.
3. Fundamental of physics electricity and magnetism, S.K Chatterjee,

Course outcomes-

1. The students understand the basic concepts of electric and magnetic fields.
2. The students understand the concept of conductors, dielectrics, inductance and capacitance.
8. The students gain knowledge on the nature of magnetic materials.
9. The students understand the concept of static and time varying fields.

Real Analysis

Credit-14(12+0+0+2)

Course objectives: At the end of the course students will be able to:

1. Understand concepts, principles and techniques of Real Numbers, Neighborhoods and Limit Points.
2. Understand the concept of Sequences.
3. Understand the concepts of Convergence of Infinite Series

Unit I: Real Numbers (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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

Unit II: Neighborhoods and Limit Points (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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

Unit III: Sequences (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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 ((Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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.

Suggested Readings:

- Real Analysis by J.M.Howie, Springer 2007.
- Real Analysis by Malik, Wiley Eastern.
- Mathematical Analysis by Malik and Savita Arora, New Age International Pvt. Ltd.
- Mathematical Analysis by Shanthinarayan, S. Chand and Co. Ltd.
- Real Analysis by Rudin Walter
- Real analysis by Apostol
- Real analysis by A R Vasishtha, J.N Sharma, Krishna Prakashan Mandir.

Course outcomes- At the end of the course students:

- I. Understand concepts, principles and techniques of Real Numbers, Neighborhoods and Limit Points.
- II. Understand the concept of Sequences

ORGANIC CHEMISTRY

Credit-12(8+1+2+1)

Course objectives:

- To acquire basic knowledge to students teachers about the concept of hybridization and geometry of atoms and the three-dimensional structure of organic molecules, Stereochemistry and Reaction Mechanism, General aspects of Organic Reactions; an understanding of nucleophiles, electrophiles, electronegativity and resonance.
- To acquire basic knowledge to students teachers about understanding of Cyclo alkanes, Cyclo Alkenes and Alkadienes, how to use their understanding of organic mechanisms to predict the outcome of reactions, the fundamentals of electronic structure and bonding in aromatic systems, reactivity patterns of aromatic molecules, chemical properties of Alkyl and Aryl Halides and general periodicity patterns of (organic/inorganic) molecules and the ability to design synthetic approaches to such species.

Unit I: Stereochemistry of Organic Compounds

(Credit-2)

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: Chemistry of Cyclo alkanes, Cyclo Alkenes and Alkadienes

(Credit-2)

1. Cycloalkanes: Nomenclature, methods of formation, chemical reactions, 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, Stereochemistry of cyclo alkanes.

2. Cycloalkenes: Methods of formation, conformation and chemical reactions of cycloalkenes.

3. Alkadienes: Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes, Structure of allenes and butadiene, methods of formation, polymerization, chemical reaction - 1, 2 and 1, 4 additions, Diels-Alder reaction.

Unit III: Aromatic Hydrocarbons**(Credit-2)**

- A. Arenes and Aromaticity: Nomenclature of benzene derivatives, the aryl group, Aromatic nucleus and side chain, Structure of benzene; molecular formula and Kekule structure, stability and carbon-carbon bond lengths of benzene, resonance structure, MO picture. Aromaticity: The Huckle rule, aromatic ions.
- B. 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, naphthalene and Anthracene.

Unit IV: Alkyl and Aryl Halides**(Credit-2)**

Nomenclature and classification of alkyl halides, methods of formation, chemical reactions, Mechanisms of nucleophilic substitution reactions of alkyl halides, SN^2 and SN^1 reactions with energy profile diagrams, Polyhalogen compounds: Chloroform, carbon tetrachloride. Methods of formation of aryl halides, nuclear and side chain reactions, 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.

Suggested Readings:

1. Morrison, R. N. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Eliel, E. L. & Wilen, S. H. Stereochemistry of Organic Compounds; Wiley: London, 1994.
5. Jerry March, Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, Sixth Edition
6. Peter Sykes, A Guidebook to Mechanism in Organic Chemistry Paperback – 2003.
7. Harkishan Singh and V. K. Kapoor. Medicinal and Pharmaceutical Chemistry. VallabhPrakashan Publishers, Delhi. 1996.

PRACTICALS (Credit-2)

Laboratory Techniques:

1. Organic Chemistry: Laboratory techniques

- Calibration of Thermometer

Naphthalene (80-82°C), Acetanilide (113.5-114°C), Urea (132.5-133°C), Distilled Water (100°C)

- Distillation

Simple distillation of ethanol-water mixture using water condenser

Distillation of nitrobenzene and aniline using air condenser

- Crystallization

Concept of induction of crystallization, Phthalic acid from hot water (using fluted filter paper and stem less funnel), Acetanilide from boiling water, Naphthalene from ethanol, Benzoic acid from water

- Decolourisation and crystallization using charcoal

Decolourisation of brown sugar (sucrose) with animal charcoal using gravity filtration.

Crystallization and decolorization of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorizing carbon) using ethanol.

- Sublimation (simple and Vacuum)

Camphor, Naphthalene, Ophthalmic acid and Succinic acid.

- Determination of melting point/ boiling points

Determination of melting point: Naphthalene, Benzoic acid, Urea, Succinic acid, Cinnamic acid, Salicylic acid, Acetanilide, m-Dinitrobenzene p-Dichlorobenzene, Aspirin.

Determination of boiling points: Ethanol, Cyclohexane, Toluene, Aniline and Nitrobenzene.

2. Functional Group Analysis

- a. Detection of extra elements (N, S and halogens), solubility behavior and functional groups (Alcoholic, phenolic, carboxylic, carbonyl, esters, carbohydrates, amines, amides, nitro and anilide) in simple organic compounds.
- b. Identification of an organic compound through the functional group analysis and preparation of suitable derivatives.

Course Outcomes: After studying this course the students will be able to :

- 1- Know the fundamentals of organic chemistry
- 2- Know stereoisomerism
- 3- Know Aliphatic and Aromatic compounds"

IV SEMESTER

ENGLISH

Credit-9(9+0+0+0)

Objectives: - The objective of teaching English has two main aspects:

1. Language aspect: Words, sentences, pronunciation, spelling and grammar.
2. Literature aspect: Words, sentences, expressing ideas, feelings and experiences.

These two objectives differ from each other as far as the class and age of students is concerned.

The Other four fold objectives are-

1. Semantic-related to understanding.
2. Phonetic- deals with the sound spelling and pronunciation.
3. Graphic- related to writing.
4. Phonetic-cum-graphic- dealing with reading.

Unit I: Creative Skills in Writing (Credit-(3)

Writing dialogues

Writing poems

Writing essays

Unit II: Phonetics (Credit-(2)

Speech Organs

Syntactic, Semantic, Pragmatic

Unit III: Literature – Novel & Drama (Credit-(2)

E M Forster: A Passage to India

Joseph Conrad: Heart of Darkness

Unit IV: Literature – Drama (Credit-(2)

Girish Karnad – Tuglaq

Samuel Beckett's waiting for Godot

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. Second Language Acquisition : Rod Ellis
2. Stone Douglas (1999). Difficult conversations: How to discuss what Matters Most, New York.: Penguin Books.
3. Gabor Don (2001). How to start a Conversation and Make Friends, New York:
4. Introducing Second Language Acquisition : Saville Trocke M, CUP

Course outcomes:

1. Students will demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation.
2. Students will develop the ability to read works of literary, rhetorical, and cultural criticism,

HINDI LANGUAGE

Credit-9(9+0+0+0)

Objectives:-

- Hindi Vayakranika ka samany adhyayan v paribhasha ko samajh sakenge.
- Sabada niraman padati-upsarg,partayaya,sandhi,samasa ki pahachan kar sakenge.
- Hindi ki Parmookh Boliyan ka adhyayan kar sakenge.
- Rajbhasha or Rashtra Bhasha mein antar kar payenge.

Unit I: Grammer -1

(Credit-(3))

Vayakranika hindi:

1-Nibandh lekhan-sabad seema 300

2-karyalaye lekhen – shashkeeya –ardha shashkeeya patra'karyalaya ghyapan,vighyapati evam karyalaya aadesha,Adhisuchana,prasthankan

3-Sankshepan-

4-Pallawan

5-Sabada niraman padati-upsarg,partayaya,sandhi,samasa

6 Sabad sudhi and vakaya sudhai

7—Muhaware and locoktiyan

8-Paribhasika sabdawali

9-Sabad ke prakar –sanghya ,sarvanam ,visheshan,evam kirya visheshan

Unit II Grammer –II

(Credit-(3))

Sabad Shakti

Samasa

Alankara

Unit III: Hindi ki Parmookh Boliyan

(Credit-(3))

Rajbhasha or Rashtra Bhasha mein antar

Suggested Activities:

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.

References:

1. A Handbook of Writing Activities, Prasaranga, University of Bangalore.
2. Hindi Bhasha Vighyan by Dr. Bholanath Tiwari

Course outcomes:

1. Students will demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation.
2. Students will develop the ability to read works of literary, rhetorical, and cultural criticism.

ASSESSMENT OF LEARNING

Credit-9(9+0+0+0)

Objectives:- The course will enable the student teachers to –

- 1.Understand the process of evaluation
- 2.develop the skill in preparing, administering and interpreting the achievement test.
- 3.understand and use different techniques and tools of evaluation for learning
- 4.comprehend the process of assessment for learning
- 5.develop skills necessary to compute basic statistical measures to assess the learning.

Unit I: Introduction to Assessment & Evaluation (Credit-3)

(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 (Credit-2)

(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 (Credit-2)

(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(Credit-2)

(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)

Suggested Readings:

1. Linn; Measurement and Assessment in Teaching 9th Edition by Pearson
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. [Sinclair](#) , [Sheila Anne \(Editor\)](#) , [Barry](#) : Assessment as Learning : Using Classroom Assessment to Maximize Student Learning , Corwin Publishers
4. Dix; The Essential Guide to Classroom Assessment: Practical Skills for Teachers, Pearson India.
5. [Thorndike Robert M.](#) , [Thorndike-Christ Tracy](#) ;Measurement And Evaluation In Psychology And Education (English) 8th Edition, Prentice-Hall

Course outcomes:

- Students will be able to understand the concept of measurement, evaluation and assessment and know the process of evaluation
- They can able to learn about the concept of CCE, rating and grade.

DIFFERENTIAL EQUATIONS

Credit-14(12+0+0+2)

Objectives: At the end of the course students will be able to:

- (i) Understand the concepts and techniques of Differential Equations.
- (ii) Understand the concept of Formation and Solution of different order Differential Equations.

Unit I: Definition and Formation of Differential Equation (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

Definition, Order and Degree of Differential equation. Formation of a differential equation, Solution of a differential equation, Equations of the first order and first degree, Variables separable, Homogeneous form – Reducible to homogeneous form, Linear Differential equations, Integrating factors, Bernoulli's equation, Exact Differential equations, Equations reducible to exact Differential equations.

Unit II: Equation of First Order and Higher Degree (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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: Dependent and Independent Variables (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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 of Differential Equation (Credit-3+0+0.5+0.5)(T-3)(P.S-0.5)

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.

Suggested Readings:

- An Introduction to Partial Differential Equations by Stephenson, ELBS.
- Introductory Course in Differential Equations by Murray, Orient Longman.
- Ordinary and Partial Differential Equations by M .D Raisinghania, S. Chand and Co.
- Differential Equations by Vasishta and Sharma, Krishna Prakashan Mandir.

Course outcomes: At the end of the course students will able to:

- Understand the concepts and techniques of Differential Equations.
- Understand the concept of Formation and Solution of different order

OPTICS

Credit-12(8+1+2+1)

Objectives-

1. To understand the event like reflection, refraction, interference, diffraction etc.
2. To understand the applications of diffraction and polarization.
3. To understand the applications of interference in design and working of interferometers.

Unit I: Wave Nature of Light and Interference

(Credit-2)

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, interference in thin film, colours of thin film, interference at an air wedge film, Newton's ring and its applications, Michelson's interferometer and its applications

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Refraction at Spherical Surfaces
- B. Spectrometer experiments using prism

Unit II: Diffraction of Light

(Credit-2)

Fraunhoffer and Fresnel : Diffraction, Diffraction at a single slit and intensity distribution, double slit and intensity distribution, Diffraction by N- slits, Plane Transmission Grating: Theory and formation of spectra, width of principal maxima, absent spectra, overlapping of spectral lines, number of spectra, 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).

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Experiments on Interference
- B. Experiments on Diffraction

Unit III: Polarisation of Light

(Credit-2)

Double refraction, production of plane polarized light by double refraction, Nicol Prism, Double refraction in uniaxial crystals, Huygen's explanation of Double Refraction, Plane, circular and elliptically polarized light, Half-wave and quarter-wave plates, production and detection of plane, circularly and elliptically polarized light by Nicol Prism and Quarter-wave plate. Rotatory Polarization, Fresnel's explanation, specific rotation, half shade and Biquartz Polarimeter, determination of specific rotation and strength of sugar solution.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A.Experiments on Polarisation

Unit IV: Scattering of Light and Lasers

(Credit-2)

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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Experiments on resistance/capacitance using ballistic galvanometer

Suggested Readings:

1. Textbook of Optics, Brijlal and Subramaniam
2. Optics, A K Ghatak.
3. Fundamentals of Optics, Jenkins and White.
4. Engineering physics, Rawat, S. S.

Course outcomes-

1. The students understand phenomenon based on light and related theories.
2. The students get skills to identify and apply formulas of optics and wave physics.
3. The students understand the resolving power of different optical instruments.
4. The students understand working of optical fiber and their applications in communication

Inorganic Chemistry

Credit-12(8+1+3+0)

Objectives:

To gain an understanding of the chemistry of transition and inner transition metals, coordination compounds, organometallic compounds, metal carbonyls of Transition Elements, Coordination chemistry and magnetic behaviour of complexes, Chemistry of Lanthanide and Actinides, concepts of Oxidation and Reduction and Principles involved in the extraction of the elements.

Unit I:

Transition Elements

(Credit-2)

General group trends with special reference to electronic configuration, variable valency, magnetic and catalytic properties, colour and spectral behaviour, ability to form complexes, stability of various oxidation states and e.m.f. comparative studies of Chemistry of the first, second and third transition series.

Inorganic Reaction Mechanism

Thermodynamic and Kinetic stability. Introduction to inorganic reaction mechanisms. Substitution reactions in square planar Complexes, Trans-effect, theories of trans effect. Determination of binary formation constant by pHmetry and spectrophotometry

Unit II:

Chemistry of Lanthanide and Actinides

(Credit-2)

Chemistry of Lanthanide: Occurrence and separation, electronic structure, oxidation states and ionic radii and lanthanide contraction, spectral and magnetic properties, complex formation and applications.

Chemistry of Actinides: Electronic configuration, oxidation states, actinide contraction, complex formation, spectral and magnetic properties, applications. Chemistry of separation of Np, Pu and Am from Uranium, similarities between the later actinides and later lanthanides.

Unit III:

Coordination Compounds

(Credit-2)

Werner's coordination theory and its experimental verification, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes. Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-field parameters.

Oxidation and Reduction

Use of redox potential data- analysis of redox cycle, redox stability in water-Frost, Latimer and Pourbaix diagrams. Principles involved in the extraction of the elements.

Unit IV:

Organometallic Compounds, Metal Carbonyls & Nitrosyls

(Credit-2)

A. Organometallic compounds

Definition, nomenclature and classification of organometallic compounds, preparation, properties, bonding and applications of alkyls and aryls of Li, Al, Hg, Sn and Ti, a brief account of metal-ethylene complexes and homogenous hydrogenation.

B. Carbonyls and Nitrosyls

- a) **Metallic Carbonyls:** Metallic carbonyls General methods of Preparation, general properties, structure and nature of Metal carbonyls, bonding in carbonyls, Effective atomic number (EAN) rules as applied to metallic carbonyls. 18-electron rules applied to metallic carbonyls. Preparation, properties and structure of nickel tetracarbonyl, iron penta carbonyls, chromium hexa carbonyls, dimanganesedeca carbonyl, dicobaltocta carbonyl.
- b) **Metallic Nitrosyls:** Some metallic Nitrosyls: Metal nitrosyl carbonyls, metal nitrosyl halides, sodium nitroprusside (Preparation properties, structures and uses) structure and nature of M-N bonding in nitrosyl. Effective atomic number (EAN) rules as applied to metallic nitrosyls.

Suggested Readings:

1. R. C. Mehrotra and A. Singh Organometallic Chemistry :A Unified Approach, Wiley
2. A. G. Sharpe: Inorganic Chemistry, Pearson
3. Bell and Lott: Modern approach to Inorganic chemistry, Van Nostrand
4. Emelns and Anderson Principles of Inorganic Chemistry
5. G. L. Miessler and D. A. Tarr: Inorganic Chemistry, Prentice Hall
6. Cotton and Wilkinson, Advanced Inorganic Chemistry, 6th Edition, Wiley
7. Lee, J.D. Concise Inorganic Chemistry, ELBS.
8. Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry
9. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications
10. Shriver and Atkins Inorganic Chemistry, W. H. Freeman and Company
11. James Huheey, Inorganic chemistry: Principles of Structure and Reactivity, Pearson Education India
12. Shriver and Atkins' Inorganic Chemistry, Oxford Press
13. Green wood, Chemistry of The Elements, Elsevier

Practicals:

(Credit-2)

Synthesis and analysis

- a. Preparation of sodium trioxalatoferrate (III), $\text{Na}_3 [\text{Fe} (\text{C}_2\text{O}_4)_3]$ and determination of its composition by permanganometry.
- b. Preparation of copper tetraammine complex. $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$.
- c. Preparation of Ni-DMG complex, $[\text{Ni}(\text{DMG})_2]$.
- d. Preparation of *cis*- and *trans* - bisoxalatodiaqua chromate (III) ion.

Gravimetric Analysis

- a. Cu as Copper thiocyanate.
- b. Ni as Nickel dimethylgloxime

pH metry

- To determine normality of xN HCl by pH metry.
- To determine normality and dissociation constant of weak acid (xN CH_3COOH) by pH metry.
- To determine normality and dissociation constant of dibasic acid (xN oxalic acid/malonic acid/maleic acid) using 0.1N NaOH solution.
- A comparative study on methods of finding pH using universal indicator, pH paper strips (both wide and narrow range), pH meter.
- Determination of solubility product constant (K_{sp}) of a sparingly soluble salt.

- Determination of dissociation constant of phenol phthalin/methyl orange by colorimeter.
- Determination of molecular weight of a given liquid by steam distillation.
- Determination of percentage composition of NaCl by critical solution temperature method (phenol-water system).
- Determination of distribution coefficient of benzoic acid between water and toluene or acetic acid between water and 1-butanol.
- Determination of transition temperature of a given salt hydrate.
- Determination of molecular weight of the given substance by Rast's method.

Course outcomes-

The student gain an understanding of the chemistry of transition and inner transition metals, coordination compounds, organometallic compounds, metal carbonyls of Transition Elements, Coordination chemistry and magnetic behaviour of complexes, Chemistry of Lanthanide and Actinides, concepts of Oxidation and Reduction and Principles involved in the extraction of the elements.

V SEMESTER

TEACHING APPROACHES AND STRATEGIES

Credit-9(9+0+0+0)

Objectives:-

The course provides an opportunity for students to apply what they learn in the classroom to real-life experiences has proven to be an effective way of both disseminating and integrating knowledge. Discussion, active learning, cooperative learning, integrating technology, distance learning. The interaction between teacher and learners is the most important feature of the classroom.

Unit I: Understanding Teacher and Teaching

(Credit-3)

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: Preactive 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

(Credit-2)

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

(Credit-2)

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

(Credit-2)

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.

Suggested Readings:

1. R. C. Mishra; Classroom Management (English) 01 Edition.APH Publisher.
2. Patricia & Devis; Cognition and Learning. Sil International, Global Publishing.
3. Dewey, J. (1916). Democracy and Education. New York : The MacMillan Company.
4. Lindfors, J. (1984). How children learn or how teachers teach? A Profound confusion: Language Arts, 61 (6), 600-606.
5. Smith, K. (1993). Becoming the “guide” on the side: Educational Leadership, 51(2), 35-37.
6. Savery, J. and Duffy, Thomas M. (1995). Problem based learning: An instructional model and its constructivist framework. Educational Technology, 35, 31-38.

Course Outcomes:

Teaching Strategies and. Approaches for Pupils with Special. Educational Needs A Scoping. Study. Every teacher develops a particular way of going about the complex task of teaching. the method of teaching in very important , but explaining the most successful results depend on many factors. Perceptions of the Extent of Use of the Selected Teaching Strategies and teaching approach are one of the most important processes to have teaching success.

PEDAGOGY OF PHYSICAL SCIENCE

Credit-9(9+0+0+0)

Objectives:

- To Gain insight about the nature of science and its curriculum.
- To Comprehend the approaches and strategies of learning science at secondary level.
- To Apply pedagogic aspects in teaching-learning of science effectively by adopting appropriate teaching strategy.
- To Discuss a topic in science; construct test items to measure objectives belonging to various cognitive levels.
- To Use teaching aids effectively in teaching science.
- To Gain the knowledge and comprehend the principles of curriculum and analyse the organization of science content at secondary level.
- To Select and use the relevant methods, strategies and approaches in science class and laboratory.
- To Develop skills in organizing, using and maintaining the available resources in teaching science.
- To Transfer the fundamental experimental skills to the pupils and organize different activities related with science processes/skills to the pupils.

Unit I: The Nature of Science and its Curriculum

(Credit-3)

Nature of Science: History, Philosophy and nature of science, its role and importance in daily life, Science as interdisciplinary area of learning, development of science and technology, their interdependence and impact on society, development of scientific attitude and values through science education.

Curriculum Development: need and salient features of curriculum, strategy and principles of curriculum construction, trends in science curriculum, development of science curriculum in India, basic criteria of validity of a science curriculum in the light of NCF – 2005, curriculum for the secondary level. Objectives of teaching science at Upper Primary level and Secondary level. Analysis of syllabus and textbooks of science at Upper Primary and Secondary level.

Unit II : Approaches and Strategies of Learning Science

(Credit-2)

Lesson Planning: Instructional objectives, identification of teaching points, organising the content, designing learning experiences, Pedagogical shift from science as fixed body of knowledge to process of constructing knowledge.

Scientific Method: Observation, enquiry, hypothesis, experimentation, data collection, generalization.

Unit and Lesson Planning: Using constructivist approach, taking examples from specific contents of science such as electric circuit, magnetic effects of current, physical and chemical changes, animal and plant kingdom.

Strategies of Learning: Inquiry approach, experimentation, problem solving, concept mapping, collaborating learning and experiential learning in science, facilitating learners for self-study in science.

Learning Resources and strengthening Science

Learning Resources: Identification and use of learning resources in science from immediate environment such as natural pH indicators, common salts, fruits, lenses and mirrors, inter-conversion of one form of energy to other, exploring alternative sources of energy, audio-visual materials; multimedia–selection and designing; use of ICT in learning science.

Instructional resources: Multimedia, computer, charts, models, improvised apparatus and their role and functions.

Strengthening of Learning Science: Organisation of practicals in laboratory, use of science kits, investigatory project, field trips, science clubs, science fairs, use of worksheets.

Unit III : Planning and Pedagogic Aspects in Teaching - Learning of Science (Credit-2)

Lesson Planning and learning concepts of science such as Newton's laws of motion, universal law of gravitation, heat as energy, temperature, transfer of heat, reflection, refraction and total internal reflection of light.

Mole concept and Avogadro's number, structure of atom, periodicity of elements, acid, base & salt and pH scale, carbon and its compounds.

Nutrition in amoeba and hopper, digestive and respiratory system in animals, control and coordination in animals, reproduction in animals.

Photosynthesis, factors affecting the process of photosynthesis, respiration in plants, transportation in plants, asexual and sexual reproduction, pollination, fertilization and partheno-genesis in plants. Heredity and variations, structure of chromosome, RNA & DNA.

Unit IV : Exploring Learning of Science (Credit-2)

Exploring learning of science concepts such as electric circuits, series and parallel combination of circuits, electric current, measurement of current and potential difference, ohm's law, resistance, factors effecting resistance, electrical energy, elementary ideas about A.C. and D.C. motors, characteristics of metals, metallurgical operations-dressing of the ore, calcinations, roasting, smelting and refining, concept of electrode potential and electrochemical series, reactivity of metals and non-metals, extraction of metals like iron, copper and aluminium.

Evaluation in Science

Modes of evaluation: oral, observation and written, objective and essay type questions, Types of objective test items: short answer type, multiple choice type, fill-in-blank type, true-false, matching type, construction of test items: achievement test, diagnostic test and their construction, Preparation of blue print: taking examples of concepts of science mentioned in unit III and IV, continuous and comprehensive evaluation for overall development of child.

Tools and Techniques of Assessment: learning indicators, performance-based assessment, learners' records of observations, field diary, oral presentation of learner's work, portfolio, assessment of project work, assessment of learning based on content mentioned in unit III and IV.

Modes of Learning Engagement:

Constructivist Approach: Activity based learning experimentation, Interactive learning, Group work, demonstration method, Peer learning, Project work, Assignments followed by presentation, Discussion, Inquiry approach, Concept mapping etc.

Practicum:

Activities based on Science syllabus of Classes IX and X:

- Preparation of teaching aids: charts, models, Preparation of one working model.
- Preparation of a model lesson plan followed by seminar/ presentation before the whole group.
- Preparation of kit for teaching learning of a topic along with write up (name of unit, name of the theme/topic, material used, procedure, learning outcomes).
- Preparation of blue print and construction of an achievement test, its administration on one section of a class and analysis of results.

Practicals:

- Study of laws of reflection and refraction.
- Verification of Ohm's law.

- Demonstration of Magnetic effect of current.
- Determination of given resistance and specific resistance of a material using wheat stone bridge and post office box.
- Preparation of crystals of copper sulphate.
- Study of exothermic and endothermic, combination and decomposition reactions.
- Preparations of gases (H₂, O₂ & CO₂) and study of their properties.
- Study nature of soft and hard water from a given water sample and its removal.
- Preparation of blood film/blood group testing.
- Study of diffusion and osmosis.
- Study of evolution of CO₂ and heat in respiration.
- Study of evolution of O₂ in photosynthesis.
- Check adulteration in food items.
- Demonstration of interaction between a magnet and current.
- Examine bacteria from curds and milk under microscope.

Suggested Readings:

1. Lewis, J. 1972 Teaching of School Physics, Penguin Book, UNESCO.
2. Anderson, Hans O and Koutnik, Paul G, 1972. Towards More effective science Instruction in secondary education. The MacMillan Co., New York and Courier MacMillan, London,.
3. Das, RC. 1984 Curriculum and Evaluation. National Council of Educational Research and Training, New Delhi,.
4. Driver, R. The pupil as scientist, Open University Press, Buckingham, 1983.
5. Saxena A.B. 1988. Vigyan Shikshan Ka Ayonjan Har Prasad Bhargava & Sons, Agra,
6. Science for Class IX and X, NCERT Publication.
7. National Curriculum Framework 2005, NCERT Publication. 2006
8. NCERT (2005) National Curriculum Framework. New Delhi. NCERT
9. Science Teachers and Educators 1985. UNESCO Bangkok
10. NCERT: Teacher Education Curriculum Framework 1978 NCERT, New Delhi.
11. Teaching Life Sciences, J.K. Sood, Kohli Publication.
12. Science Teaching In Schools by Du RC (1985) Sterling Publication.
13. Science for Class IX and X, NCERT Publication New Delhi
14. R.C. Sharma Modern Science Teaching, Dhanpat Rai & Sons, Delhi.
15. Teaching Technology for College Teachers, Sterling Publishers. New Delhi
16. Food and Nutrition by E.P.G Arya Book Depot. New Delhi.

Outcomes:- On completion of the course, the student teacher will be able to:

- Gain insight about the nature of science and its curriculum.
- Comprehend the approaches and strategies of learning science at secondary level.
- Apply pedagogic aspects in teaching-learning of science effectively by adopting appropriate teaching strategy.
- Discuss a topic in science; construct test items to measure objectives belonging to various cognitive levels.
- Use teaching aids effectively in teaching science.
- Gain the knowledge and comprehend the principles of curriculum and analyse the organization of science content at secondary level.
- Select and use the relevant methods, strategies and approaches in science class and laboratory.
- Develop skills in organizing, using and maintaining the available resources in teaching science.
- Transfer the fundamental experimental skills to the pupils and organize different activities related with science processes/skills to the pupils.

PEDAGOGY OF MATHEMATICS

Credit-9(9+0+0+0+0)

Objectives:- The student teachers will be able to:

- Acquire a clear perspective of the nature of mathematics
- Gain insight on the meaning, nature, scope and objective of mathematics education
- Appreciate the changes in curriculum and evolve new approaches to teaching
- Understand the principles, processes relationships and to design appropriate strategies for teaching.
- Design appropriate activities for developing a concept.
- Design mathematics laboratory.
- Develop competencies in designing appropriate diagnostic and remedial tests.
- Construct appropriate assessment tools for evaluating mathematics learning.
- Appreciate the importance of mathematics lab in learning mathematics.
- Develop the competencies in preparation of appropriate teacher aids unit plan lesson plan and test items.
- Construct appropriate assessment tools for evaluating mathematics learning.
- Understand and develop Technology Integrated Mathematics Module (TIMM) using on different subject specific open source software on various concepts of Geometry at secondary stage and
- Understand and develop dynamical digital applets with emphasis on process involved in teaching and learning of mathematics at secondary stage.
- Explain the meaning of evaluation
- Infer the effect of evaluation on students

Unit I: Nature and Scope of Mathematics (Credit-3+0+0+0.50)(T-3)(D-0.50)

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 - oneway 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 (Credit-3+0+0+0.50)(T-3)(D-0.50)

Need for establishing general objectives for teaching mathematics, Study of the aims and general objectives of teaching mathematics vis-a-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 (Credit-1.5+0+0+0.50)(T-3)(D-0.50)

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 Generalization(Credit-1.5+0+0+0.50)(T-3)(D-0.50)

By exposition: Teaching by exposition, Moves in teaching 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.

Suggested Readings:

Butler and Wren (1965). , The Teaching of Secondary Mathematics, London: McGraw Hill Book Company.

NCERT, A textbook of Content-cum-Methodology of Teaching Mathematics, New Delhi: NCERT.

Gill bottle ;Teaching Mathematics in the primary School (English),
Continuum Special Priced Titles

Course outcomes: At the end of the course students:

- Design appropriate activities for developing a concept.
- Design mathematics laboratory.
- Develop competencies in designing appropriate diagnostic and remedial tests.
- Construct appropriate assessment tools for evaluating mathematics learning.
- Appreciate the importance of mathematics lab in learning mathematics.
- Develop the competencies in preparation of appropriate teacher aids unit plan lesson plan and test items.

MULTIVARIATE CALCULUS & VECTOR CALCULUS

Credit-14(12+0+0+2)

Objectives: At the end of the course students will be able to:

- (i) Understand concepts, principles and techniques of Line, Double Integrals and Triple Integrals.
- (ii) Understand the concept of Improper Integrals.
- (iii) Understand the concepts of Vector Calculus.

Unit I: Line and Double Integrals (Credit-3+0.5)(T-3)(PS-0.5)

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 (Credit-3+0.5)(T-3)(PS-0.5)

Definition of a triple integral, Evaluation, Definition of a triple integral, Evaluation, Calculation of Volume by using Triple integral. Volumes of some classic shapes.

Unit III: Improper Integrals (Credit-3+0.5)(T-3)(PS-0.5)

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 (Credit-3+0.5)(T-3)(PS-0.5)

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.

Suggested Readings:

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.

Course Outcomes: At the end of the course students:

- Understand concepts, principles and techniques of Line, Double Integrals and Triple Integrals.
- Understand the concept of Improper Integrals.
- Understand the concepts of Vector Calculus

BASIC ELECTRONICS

Credit-12(8+1+2+1)

Course objectives-

1. To understand the OP-AMP based applications like inverter, summer, integrator and differentiator.
2. To understand the measurement of h-parameters.

Unit I : Semiconductor Characteristics and Applications

(Credit-2)

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'-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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Junction diode characteristics
- B. Zener diode characteristics
- C. Junction Transistor characteristics

Unit II : Transistors and Applications

(Credit-2)

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, hparameters 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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Rectifier circuits
- B. Transistor amplifier CE configuration
- C. Transistor amplifier Emitter follower

Unit III : Digital and Communication Electronics

(Credit-2)

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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Logic gates
- B. Experiments on OP-AMP
- C. Lissajous figures

Unit IV : Communication Electronics

(Credit-2)

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.

PRACTICALS (Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. FET characteristics
- B. Transistor Oscillator

Suggested Readings:

1. Physics of semiconductor Devices, Sze, SM.
2. Introduction to solid state physics, Kittel Charles.
3. Digital electronics, Salivahanan.
4. Principles of Communication Systems, Taub and Schilling.
5. Solid state physics, Pillai, S. O.

Course outcomes-

1. The students understand complementary symmetry type push-pull amplifier.
2. The student's phase-shift oscillator.

Physical Chemistry

Credit-12(8+1+2+1)

Objectives:

To learn the basic principles of phase equilibrium, Electrochemistry and phase equilibrium, chemical equilibrium and its relationship with thermodynamic quantities, basic concepts of electrochemistry and its applications, chemical bonding from the valence bond model and molecular orbital theory, the limitations of classical mechanics at molecular length scales, the differences between classical and quantum mechanics, the connection of quantum mechanical operators to observables, probabilities, amplitudes, averages, expectation values, and observables. The connection between common approximation methods and standard chemical frameworks (Born-Oppenheimer approximation, molecular orbitals).

Unit I: Electrochemistry

(Credit-2)

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 and 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 solubility product of a sparingly soluble salt, conductometric titrations.

Types of reversible electrodes-gas-metal ion, metal-insoluble salt anion 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, 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), polarization, over potential and hydrogen overvoltage. application of concentration cells, solubility product and activity coefficient, potentiometric titrations. Definition of pH and pK_a determination of pH using hydrogen, Hydrolysis of salts. Corrosion-types, theories and methods of combating it.

Unit II: Chemical Equilibrium

(Credit-2)

Chemical Equilibrium: Equilibrium constant and free energy. Thermodynamic derivation of law of mass action. Le Chatelier's principle. Reaction isotherm and reaction isochore – Clapeyron equation and Clausius – Clapeyron equation, applications.

Phase Equilibrium: 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. Solid solutions – compound formation with congruent melting point (Mg-Zn) and incongruent melting point, ($NaCl-H_2O$), ($FeCl_3-H_2O$) system. Freezing mixtures, acetone-dry ice. Liquid-liquid mixtures- Ideal liquid mixtures, Raoult's and Henry's law. Non-ideal system-azeotropes- HCl- 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.

Unit III: Chemical Kinetics

(Credit-2)

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.

Experimental methods of chemical kinetics: conductometric, potentiometric, optical methods, polarimetry and spectrophotometer. Theories of chemical kinetics: 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.

Characteristics of catalyzed reactions, classification of catalysis homogeneous and heterogeneous catalysis, enzyme catalysis, miscellaneous examples.

Unit IV: Elementary Quantum Mechanics

(Credit-2)

De Broglie hypothesis, the Heisenberg's uncertainty principle, Sinusoidal wave equation, Hamiltonian operator, Schrodinger wave equation and its importance, physical interpretation of the wave function, postulates of quantum mechanics, particle in a one dimensional box. Schrodinger wave equation for H-atom, separation into three equations (without derivation), quantum numbers and their importance, hydrogen like wave functions, radial wave functions, angular wave functions.

Suggested Readings:

1. S Lewis and D Gladstone, Elements of Physical Chemistry, Macmillan.
2. Moudgil, H. K. Textbook of physical chemistry second edition, PHI
3. B S Bahl, G D Tuli & Arun Bahl, Guide to Essentials of Physical Chemistry S. Chand Publishing.
4. Alberty & Bawendi Silbey, Physical Chemistry 4th Economy Edition, Wiley.
5. Christopher M. A. Brett, Ana Maria Oliveira Brett, Electrochemistry: Principles, Methods, and Applications, Oxford science publications
6. Keith J. Laidler, Chemical Kinetics, 3rd Edition, Prentice Hall
7. Michael J. Pilling and Paul W. Seakins, Reaction Kinetics 2nd Edition, Oxford Science Publications.
8. Puri, Sharma & Pathania, Principles of Physical Chemistry.
9. Ira N Levine, Physical Chemistry 6 edition McGraw-Hill Higher Education.
10. A K Chandra, Introductory Quantum Chemistry, Tata McGraw-Hill Education.
11. Ira N Levine 7 edition Quantum Chemistry Pearson.

PRACTICALS(Credit-2)

Chemical Kinetics

1. Electrochemistry

- a. pH metric: Acid-Base Titration.
- b. To determine the strength of the given acid conduct metrically using standard alkali solution.
- c. To determine the solubility and solubility product of a sparingly solubility product of a sparingly soluble electrolyte conduct metrically.
- d. To determine the ionization constant of a weak acid conduct metrically.
- e. To titrate potentiometrically the given ferrous ammonium sulphate solution using KMnO_4 / $\text{K}_2\text{Cr}_2\text{O}_7$ as titrant and calculate the redox potential of $\text{Fe}^{2+}/\text{Fe}^{3+}$ system on the hydrogen scale.

2. Chemical Kinetics

- a. To study the saponification of ethyl acetate kinetically.
- b. To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.
- c. To study the effect of acid strength on the hydrolysis of an ester.
- d. To compare the strength of HCl and H_2SO_4 by studying the kinetics of hydrolysis of ethyl acetate.
- e. To study kinetically the reaction rate of decomposition of iodide by H_2O_2

Outcomes:

The students learn the basic principles of phase equilibrium, Electrochemistry and phase equilibrium, chemical equilibrium and its relationship with thermodynamic quantities, basic concepts of electrochemistry and its applications, chemical bonding from the valence bond model and molecular orbital theory, the limitations of classical mechanics at molecular length scales, the differences between classical and quantum mechanics, the connection of quantum mechanical operators to observables, probabilities, amplitudes, averages, expectation values, and observables. The connection between common approximation methods and standard chemical frameworks (Born-Oppenheimer approximation, molecular orbitals).

VI SEMESTER
PEACE ORIENTED VALUE EDUCATION

Credit-4(4+0+0+0)

Objectives:

- To Understand the importance of peace education.
- To Analyse the factors responsible for disturbing peace.
- To appreciate the role of peace in life.
- To Develop insight of understanding of concept of Indian values according to time, space and situation.
- To scientifically analyse values in Indian culture and tradition.
- To Develop positive attitude about Indian human values
- To Understand the Indian values according to Shradhhaand logic.
- To understand the co-ordination with Indian values and life style.
- To Analyse the ethical, artistic and pleasant values.
- To Analyse absolute evalues in globalization and universlization.
- To develop the teaching learning method for adaptation and assimilation in life value.
- To explain fundamental aims and values that provides the intellectual basis of contemporary education policy and practice.
- To engage with issues in a manner that makes them sensitive to promote certain educational values while marginalizing others.
- To explore the meaning of Ethics and values.
- To understand the process of value education.

Unit I: Importance of Peace

(Credit-1)

- Aims, objectives and importance of Peace Education.
- Barriers- Psychological, Cultural, Political
- Factors responsible for disturbing Peace: Unemployment, terrorism, Exploitation, Suppression of individuality, complexes.
- Characteristics of good textbook, evaluation of textbook, analysis of text book from peace education perspective.

Unit II: Nature and sources of values, Classification of values

(Credit-1)

- Meaning, concept need and importance of values and ethics.
- Personal and Social values
- Intrinsic and extrinsic values on the basis of personal interest and social good.
- Social, moral, spiritual and democratic values on the basis of expectation of society and one's self inspiration.
- Identification of Analysis of emerging issues involving value conflicts
- Design and development of instructional material for nurturing values.

UNIT III: Values in religious scriptures

(Credit-1)

- Bhagwad gita-Nishkam Karma, Swadharma, Laksagrah and Stithpragya.
- Bible – Concept of truth, compassion, forgiveness
- Dhamnipada- Astangmarg, Aryastyaand Madhyamarg
- Gurugranth Sahib- Concept of Kirath, Sungat, Pangat & Jivanmukti
- Quran–Concept of spiritual and moral values (adah, raham & theory of justice) & social responsibilities.

UNIT IV: Methods and Evaluation of Value Education

(Credit-1)

- Traditional Methods: Story Telling, Ramleela, Tamasha, street play and folk songs.
- Practical Methods: Survey, role play, value clarification, Intellectual discussions.
- Causes of value crisis: material, social, economic, religious evils and their peaceful solution.
- Role of school- Every teacher's teacher of values, School curriculum as value laden.
- Moral Dilemma (Dharmsankat) and one's duty to wards self and society

Practicum/Field Work (Any two of the following):

- Preparation of a report on school programmes for promotion of peace.
- Observation of classroom situation and identification of factors promoting peace.
- Analyse morning assembly programme of a school from the point of view of value education.
- Analysis of a text book of a school subject from the point of view of values hidden.
- Practice of role-play in two situations and preparation of report.
- Report on value conflict resolution in a situation.

Suggested Readings:

1. Acharya Mahapriya : Towards Inner Harmony, New Delhi, B. Jain Publishers, 1999
2. Dutt, N.K. and Ruhela S.P.: Human Values and Education, Sterling Publishers Pvt. Ltd., New Delhi,
3. Gandhi K.L.: Value Education, Gyan Publishing House, New Delhi, 1993
4. Gupta, Nathu Lal: Value Education: Theory and Practice: Jaikrishan Agarwal, Mahatma Gandhi Road, Ajmer – 2000
5. I.A. Lolla: Value Certification: An advanced Handbook for trainers and Teachers, Calif, University Associate Press, Krischan Boum, Howard 1977
6. Prem Kripal: Value in Education, NCERT, New Delhi 1981
7. Rajput, J.S. (2001). Values in Education, New Delhi, Sterling Publishers, 2005
8. Rokeach M.: The Nature of Human Values, The Free Press, New York 1973
9. Sharma R.S.: The Monk who sold his Ferrari, Mumbai, Jaico Publishing House, 2003
10. Swami Ragnanath Anand: Eternal Values for a Changing Society, BVB Bombay 1971.
11. Gupta, K. M. (1989). Moral Development of School Children Gurgaon: Academic Press.
12. Krishnamurthy, J. (2000). Education and the Significance of Life. Pune: KFI.
13. Dhokalia, R. P. (2001). External Human Values and World Religious. New Delhi: NCERT.
14. Sheshadri, C., Khadere, M. A., & Adhya, G. L. (ed.) (1992). Education in Value. New Delhi: NCERT, London, Allen and Unwin.
15. Singh, R. N. (ed.) (2003). Analytical study of Sikh Philosophy, Commonwealth Publishers: New Delhi- 02.
16. Khan Masood Alia (ed.) (2006). Islamic Thought and its Philosophy. Commonwealth Publishers: New Delhi- 02.
17. Khan, Intakhab Alam (2007). Peace, Philosophy and Islam, Academic Excellence. Delhi- 31.

Outcomes: After completion of the course, student-

- Understand the importance of peace education.
- Analyze the factors responsible for disturbing peace.
- Appreciate the role of peace in life.
- Develop insight of understanding of concept of Indian values according to time, space and situation.
- Scientifically analyse values in Indian culture and tradition.
- Develop positive attitude about Indian human values
- Understand the Indian values according to Shradhha and logic.
- Understand the co-ordination with Indian values and life style.
- Analyse the ethical, artistic and pleasant values.
- Analyse absolute values in globalization and universalization.
- Develop the teaching learning method for adoption and assimilation in life value.
- Explain fundamental aims and values that provide the intellectual basis of contemporary education policy and practice.
- Engage with issues in a manner that makes them sensitive to promote certain educational values while marginalizing others.
- Explore the meaning of Ethics and values.
- Understand the process of value education.

PEDAGOGY OF PHYSICAL SCIENCE

Credit-10(10+0+0+0)

Objectives:

- To Gain insight about the nature of science and its curriculum.
- To comprehend the approaches and strategies of learning physical science at secondary level.
- To apply pedagogic aspects in teaching-learning of physical science effectively by adopting appropriate teaching strategy.
- To discuss a topic in Science, construct test items to measure objectives belonging to various cognitive levels.
- To Use teaching aids effectively in teaching science.
- To Gain insight the salient features of curriculum, strategy and principles of curriculum and science curriculum for the secondary level.
- To comprehend the objectives of teaching science at secondary level.
- To apply the principles of learning processes in the teaching of science.
- Teach a topic in science effectively by adopting appropriate teaching strategy.
- To construct test items to measure objectives belonging to various cognitive levels.
- To Use effectively the teaching aids in teaching science.

Unit I : Nature of science and its Curriculum

(Credit-3)

Nature of Science: History, Philosophy and nature of science, its role and importance in daily life, Science as interdisciplinary area of learning, development of science and technology, their interdependence and impact on society.

Curriculum Development: need and salient features of curriculum, strategy and principles of curriculum construction, trends in science curriculum, development of science curriculum in India, basic criteria of validity of a science curriculum in the light of NCF – 2005, curriculum for the secondary level. Objectives of teaching science at upper primary level and secondary level. Analysis of syllabus and textbooks of science at upper primary and secondary level.

Unit II : Approaches and Strategies of Learning Physical Science

(Credit-3)

Lesson Planning: Pedagogical shift from science as fixed body of knowledge to process of constructing knowledge, scientific method: observation, enquiry, hypothesis, experimentation, data collection, generalization, unit and lesson planning: using constructivist approach taking examples from specific contents of science such as electric circuit, magnetic effects of current, physical and chemical changes.

Strategies of Learning: inquiry approach, experimentation, problem solving, concept mapping, collaborating learning and experiential learning in science, Facilitating learners for self-study in science.

Learning Resources: identification and use of learning resources in science from immediate environment such as natural pH indicators, common salts, fruits, lenses and mirrors, inter-conversion of one form of energy to other, exploring alternative sources of energy, improvisation of apparatus, audio-visual materials; multimedia–selection and designing; use of ICT in learning science.

Strengthening of Learning Science: organisation of practicals in laboratory, use of science kits, investigatory project, field trips, science clubs, science fairs, relationship between science and other subjects, scientific attitude, development of values through science education, concept mapping and its use, co-operative learning.

Unit III : Pedagogic Aspects in Teaching - Learning of Physical Science (Credit-2)

Pedagogic aspects in teaching-learning of science concepts such as nature of matter: classification of matter based on chemical constitution elements, compounds and mixtures, types of mixtures- homogenous and heterogeneous solution, atoms and molecules, atomic theory of matter, atomic and molecular masses, concept of mole, chemical reactions, types of chemical reactions: combination, decomposition displacement reactions, electronic concept of oxidation reduction, oxidation number of redox reactions, elementary idea of electrochemical cell and dry cell.

Planning and Pedagogic Aspects for Teaching - Learning of Physical Science

Planning and pedagogic aspects- lesson planning and learning of science concepts such as Charge, electrostatic force, quantization of charge, capacitance, potential and potential difference, Ohm's law, series and parallel connections of resistances and capacitances, electric power, magnetic effect, heating effect of current, Faraday's law of induction, Lenz Law, motor and generators, oscillations and waves, periodic and non-periodic motion, sound as wave motion, longitudinal and transverse waves.

Unit IV : Exploration of learning of Physical Science (Credit-2)

Exploration of learning of science concepts such as displacement, motion and its types, speed, velocity and acceleration, angular velocity and acceleration, force: magnitude and direction, addition and subtraction, resultant, balanced and unbalanced force, momentum, work: work done by force, dependence of work on relative orientation of force and displacement, energy (kinetic and potential) work - energy equivalence, power, conversion of K.E. into P.E. and vice-versa, law of conservation of energy and momentum, gravitation: Newton's laws of gravitation, acceleration due to gravity, factors affecting 'g'. Chemical reactions, type of chemical reactions-combination, decomposition, displacement reactions, endothermic and exothermic reactions, concept of oxidation, reduction, redox reactions, rate of reaction, factors affecting the rate like concentration, temperature, pressure and catalyst.

Evaluation in Science

Concept of CCE, modes of evaluation: oral, observation and written, objective and essay type questions, types of objective test items: short answer type, multiple choice type, fill-in-blank type, true-false, matching type, making of test items, achievement test, diagnostic test and their construction, preparation of blue print taking examples of concepts of science mentioned in unit III and IV, continuous and comprehensive evaluation for overall development of child.

Tools and Techniques of Assessment: development of learning indicators, Performance-based assessment, learners' records of observations, field diary, oral presentation of learners work, portfolio, assessment of project work, construction of test items and administration of tests, exploring content and assessments of learning based on content mentioned in unit III and IV.

Modes of Learning Engagement:

Constructivist approach: Activity based learning experimentation, Interactive learning, Group work, Peer learning, Project work, Assignments followed by presentation, Discussion, Inquiry approach, Concept mapping etc.

Practicum:

Activities based on Science syllabus of classes IX and X

- Preparation of one working model.
- Preparation of a model lesson plan followed by seminar /presentation before the whole group.
- Preparation of kit for teaching learning of a topic along with write up (name of unit, name of the theme/topic, material used, procedure, learning outcomes).
- Construction of an achievement test, its administration on one section of a class and analysis of results.

Practicals:

- Preparation of designs of ideal Laboratory/Herbarium/Aquarium/terrarium.
- Measuring the rates of water absorption and loss in plants and animals.
- To design and perform experiment to demonstrate that by product of Respiration in plants and animals is heat.
- To demonstrate oxygen consumption during respiration in plants and animals.
- Perform experiments to detect the presence of carbohydrates, lipids and proteins in food by qualitative chemical tests.
- Measurement of length, mass, time, temperature, current, voltage.
- Graphic manipulation like (a) distance-time graph (b) velocity – time graph (c) voltage – current graph (d) temperature – time graph.
- Study of motion under force (design and demonstration).
- Methods of preparation of common laboratory reagents.
- Separation of substances of a given mixture like (i) NaCl, NH₄Cl and sand and (ii) Sulphur, NaCl and Iron scrap.
- Demonstration of laws of electromagnetic induction.
- Study heating effect of current.
- Qualitative chemical test for some common food stuffs.
- Preparation of Chlorine (Cl₂) and Ammonia (NH₃) and Study of their properties.
- Study nature of soft and hard water.

Suggested Readings:

1. P.K.G.Nair, 1985 Principle of Environmental Biology, UNESCO training of science teachers and educators Bangkok UNESCO.
2. NCERT: 1978 Teacher Education curriculum framework, NCERT, New Delhi
3. Science Teaching in Schools by Das. R.C.(1985), Sterling publication.
4. Modern Science teaching by Heiss, E.d. Obourn, E.S. Hoffman, C.W (1961) MacMillian Publication, New York.
5. NCERT (2006) Science for Class IX & X. New Delhi. NCERT.
6. Lewis, 1. 1972 Teaching of school physic, Penguin Book, UNESCO,.
7. Anderson, Hans 0 and Koutnik Paul G. 1912 Towards More effective science instruction in secondary education. The Macmillan Co., New York and Courier Macmillan, London,;
8. Das; 'RC. 1984 Et a. Curriculum and Evaluation National Council of Educational research And Training New Delhi,.
9. Driver, R 1983 The pupil as scientist? Open University Press, Buckingham.
10. Saxena, A.B. 1988 Vigyan Shikshan KaAyonjan Har Prasad Bhargava& Sons, Agra.
11. NCERT (2006) Science for class IX and X, New Delhi. NCERT
12. NCERT (2005) National Curriculum Framework. New Delhi. NCERT.

Outcomes: On completion of the course, the student teacher will be able to:

- Gain insight about the nature of science and its curriculum.
- Comprehend the approaches and strategies of learning physical science at secondary level.
- Apply pedagogic aspects in teaching-learning of physical science effectively by adopting appropriate teaching strategy.
- Discuss a topic in Science, construct test items to measure objectives belonging to various cognitive levels.
- Use teaching aids effectively in teaching science.
- Gain insight the salient features of curriculum, strategy and principles of curriculum and science curriculum for the secondary level.
- Comprehend the objectives of teaching science at secondary level.
- Apply the principles of learning processes in the teaching of science.
- Teach a topic in science effectively by adopting appropriate teaching strategy.
- Construct test items to measure objectives belonging to various cognitive levels.
- Use effectively the teaching aids in teaching science.

PEDAGOGY OF MATHEMATICS

Credit-10(10+0+0+0)

Objectives: On completion of the course, the student teachers will be able to:

- Formulate instructional objectives for different topics of mathematics.
- Appreciate mathematics to strengthen the student's resource.
- Design the process of developing a concept.
- Appreciate the role of mathematics in day-to-day life.
- Channelize, explain, reconstruct and evaluate their thinking.
- Pose and solve meaningful problems.

Unit I : Teaching of Proof

(Credit-3)

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

(Credit-3)

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

(Credit-2)

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

(Credit-2)

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 problemsolving
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.

Suggested Readings:

Butler and Wren (1965). , The Teaching of Secondary Mathematics, London: McGraw Hill Book Company.

NCERT, A textbook of Content-cum-Methodology of Teaching Mathematics, New Delhi: NCERT.

Gill bottle ;Teaching Mathematics in the primary School (English), Continnum Special Priced Titles

State text books in Mathematics of Southern Region from Class VI to X.

Outcomes: On completion of the course, the student will be able to:

- Appreciate the historical perspective and contribution of Indian mathematicians in development of the subject.
- Appreciate and explore Technology Integrated Mathematics Module (TIMM) based on different subject specific open source software on various concepts of Geometry at secondary stage; and
- Appreciate and develop dynamical digital applets with emphasis on process involved in teaching and learning of mathematics at secondary stage.
- Be conversant with the nature, values, structure and scope of Mathematics.
- Interpret the principles of child development for planning lessons;
- Understand the principles of learning

GROUP THEORY

Credit-12(12+0+0+0)

Objectives: At the end of the course students will be able to:

- (i) Understand concepts, principles of group theory
- (ii) Understand the concept of Homomorphism
- (iii) Understand the concepts of Isomorphism

Unit I: Group Theory - I

(Credit-3)

Definitions Simple properties of Group, Types of Group, subgroup, permutation group, Cyclic Permutation, order of elements, Order of group

Unit II: Group Theory - II

(Credit-3)

Cyclic groups, Coset decomposition of a Group, Index of a subgroup, Lagrange's theorem, Consequences, Caley's Theorem.

Unit III: Group Theory - III

(Credit-3)

Cayley's Theorem, Structure of finite and infinite cyclic groups, Normal subgroups, Quotient groups, Groups of Transformations.

Unit IV: Group Theory - IV

(Credit-3)

Homomorphism and Isomorphism of groups, Kernel of a Homomorphism, Dihedral groups, Fundamental theorem of Homomorphism.

Suggested Readings:

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. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.
5. Contemporary Abstract Algebra by Joseph A. Gallian, Narosa Publishing House.

Outcomes: At the end of the course students:

- I. Understand concepts, principles of group theory
- II. Understand the concept of Homomorphism
- III. Understand the concepts of Isomorphism

RELATIVITY AND QUANTUM MECHANICS

Credit-13(8+1+2+1)

Course objective-

1. To develop understanding of special theory of relativity and its applications to understand length contraction, time dilation, relativistic addition of velocities, conservation of momentum and variation of mass, relativistic momentum, relativistic energy, and mass-energy relation.
2. To understand the origins of quantum mechanics.
3. To understand and explain the differences between classical and quantum mechanics

Unit I : Theory of Relativity

(Credit-2)

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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Electromagnetic induction
- B. A.C. and D.C. Bridges

Unit II : Origin of Quantum Theory

(Credit-2)

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 - raymicroscope.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Laser diffraction
- B. Ballistic galvanometer

Unit III : Development and Application of Schroedinger Equation

(Credit-2)

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).

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

A. Elasticity

Unit IV : Quantum Statistics(Credit-2)

Limitations of classical statistics, phase space, phase cells, postulates of quantum statistics; in distinguish ability, 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.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

A. Galvanometers

Suggested Readings:

1. Perspectives of Modern Physics, Beiser.
2. Introduction to Quantum Mechanics, David J. Griffiths
3. Quantum mechanics, Satyaprakash, pragati prkashan.,
4. Atomic and nuclear physics, sharma|Pearson publication

Course outcomes-

1. The students understand the idea of wave function.
2. The students understand the uncertainty relations.
3. The students understand the Schroedinger wave mechanics and operator formalism.

ORGANIC CHEMISTRY - II

Credit-12(8+1+2+1)

Objectives:

- Students will gain an understanding of the fundamental electronic structure and bonding in carbonyl compounds, substituent effects on pKa (in the case of carboxylic acids), the reactivity of carbonyl compounds with both hard and soft nucleophiles (carboxylic acids, aldehydes and ketones), the ability of synthetic organic chemistry to prepare specific molecular targets in a selective manner through a series of simple bond-forming processes.
- To know about important functional group transformations and bond-forming methods in organic synthesis
- To introduce students to the chemistry of carbonyl compounds including structure and reactivity, 1,2- and 1,4-addition and enols and enolates. Chemistry of Nitrogen Compounds, Synthetic transformation of aryl diazonium salts, azo coupling. Chemistry of Heterocyclic compounds.

Unit I: Chemistry of Hydroxy Compounds and ether

Chemistry of hydroxy compounds

(Credit-2)

Alcohols: classification and nomenclature. Monohydric alcohols-nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols-nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$\text{Pb}(\text{OAc})_4$ and HIO_4] and pinacol-pinacolone rearrangement. Trihydric alcohols- nomenclature and methods of formation, chemical reactions of glycerol.

Phenols: Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols-electrophilic aromatic substitution, acylation and carboxylation. Mechanism of Fries rearrangement, Claisen rearrangement, Gatterman synthesis, Hauben-Hoesch reaction, Lederer-Manasse reaction and Reimer-Tiemann reaction.

Ethers and Epoxides: Nomenclature of ethers and methods of their formation, physical properties, Chemical reactions – cleavage and auto oxidation, Ziesel's method. Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and Organolithium reagents with epoxides.

Unit II: Chemistry of Carbonyl Compounds including Enolates

(Credit-2)

Aldehydes and Ketones: Nomenclature and structure of 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 acid. Physical properties,

Mechanism of nucleophilic additions to carbonyl group with particular emphasis on Benzoin, Aldol, Perkin and Knoevenagel condensations, Condensation with ammonia and its derivatives, Wittig reaction, Mannich reaction. Use of acetals as protecting group, Oxidation of aldehydes, Baeyer-villiger oxidation of ketones, Cannizzaro reaction, MPV, Clemmensen, Wolff-kishner, LiAlH_4 and NaBH_4 reductions, Halogenation of enolizable ketones.

Introduction to α , β unsaturated aldehydes and ketones.

Organic Synthesis via Enolates: Acidity of α -hydrogens. Synthesis of ethyl acetoacetate by Claisen condensation and Synthesis of diethylmalonate. Keto-enol tautomerism in ethyl acetoacetate. Synthetic applications of ethyl acetoacetate and diethylmalonate. Alkylation of 1,3-dithianes.

Unit III: Chemistry of Nitrogen Compounds

(Credit-2)

Nitroalkanes and Nitroarenes: Preparation of nitroalkanes and nitroarenes. Chemical reactions of nitroalkanes. Mechanisms of nucleophilic substitution in nitroarenes and their reductions in acidic, neutral and alkaline media. Picric acid. Halonitroarenes: Reactivity.

Amines: Structure and nomenclature of amines, physical properties. Stereochemistry of amines, Separation of a mixture of primary, secondary and tertiary amines, Structural features effecting basicity of amines, Amines salts as phase-transfer catalysts, Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles), reductive amination of aldehydic and ketonic compounds, Gabriel-phthalimide reaction, Hofmann bromamide reaction. Reactions of amines: Electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid. Synthetic transformation of aryl diazonium salts, azo coupling.

Unit IV: Chemistry of Heterocyclic compounds

(Credit-2)

Heterocyclic Chemistry: Introduction: Molecular orbital picture and aromatic characteristic of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.

Suggested Readings:

1. Bruckner, R. Advanced organic chemistry: Reaction Mechanisms Academic Press
2. Lowry, Thomas H. Mechanism and theory in organic chemistry Addison-Wesley
3. Kalsi P S Reaction Mechanism 6th Edition
4. Singh Mukherjee, Reaction Mechanism
5. Francis A Carey Organic Chemistry fourth edition.
6. Bahl, Arun A textbook of organic chemistry S. Chand and Co. Ltd.
7. Gupta R, Kumar M, Gupta V, Heterocyclic Chemistry, Springer
8. Francis A. Carey, Richard A. Sundberg, Advanced Organic Chemistry
9. David E. Lewis Advance Organic Chemistry Oxford University Press.

PRACTICALS

Synthesis of Organic Compounds

- a. Acetylating of salicylic acid, aniline, glucose and hydroquinone.
- b. Benzoylation of aniline and phenol.
- c. Aliphatic electrophilic substitution: Preparation of iodoform from ethanol/ acetone.
- d. Aromatic electrophilic substitution:
 - i. Nitration: Preparation of m-dinitrobenzene and p-nitroacetanilide
 - ii. Halogenation: Preparation of p-bromoacetanilide and 2,4,6-tribromophenol
- e. Diazotization/coupling: Preparation of methyl orange and methyl red
- f. Oxidation: Preparation of benzoic acid from toluene
- g. Reduction: Preparation of aniline from nitrobenzene and m-nitroaniline from m-dinitrobenzene.

Outcomes:

- Students gain an understanding of the fundamental electronic structure and bonding in carbonyl compounds, substituent effects on pKa (in the case of carboxylic acids), the reactivity of carbonyl compounds with both hard and soft nucleophiles (carboxylic acids, aldehydes and ketones), the ability of synthetic organic chemistry to prepare specific molecular targets in a selective manner through a series of simple bond-forming processes.
- Students know about important functional group transformations and bond-forming methods in organic synthesis
- Students know about the chemistry of carbonyl compounds including structure and reactivity, 1,2- and 1,4-addition and enols and enolates. Chemistry of Nitrogen Compounds, Synthetic transformation of aryl diazonium salts, azo coupling. Chemistry of Heterocyclic compounds.

INTERNSHIP PROGRAMME METHODOLOGY 1 (Credit-9)

Phase 1: Pre-internship

Phase 2: Internship

Phase 3: Post-Internship and Critical Reflection of Internship Experience

VII Semester

SECONDARY EDUCATION IN INDIA: STATUS, ISSUES AND CONCERNS

Credit-6(6+0+0+0)

Objectives:-

The Curriculum aims to:

1. achieve cognitive, affective and psychomotor excellence;
2. enhance self-awareness and explore innate potential;
3. attain mastery over laid down competencies;
4. imbibe 21st century learning, literacy and life skills;
5. promote goal setting, and lifelong learning;
6. inculcate values and foster cultural.

Unit I: Concept, Nature and Purpose of Secondary Education

(Credit-2)

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.

Unit II: Status of Secondary Education

(Credit-2)

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

(Credit-1)

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

(Credit-1)

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.

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.

Suggested Readings:

1. Chopra, R.K. (1993) Status of Teachers in India, NCERT, New Delhi.
2. Cardinal Principles of Secondary Education. a Report of the Commission on the Reorganization of Seco (English) Isha Books.
3. Govt. of India (1966) Abstract and Analysis of the Report of the Indian Education Commission, with Notes, and "The Recommendations" in Full
4. [Shyam Lal Arya](#); National Policy of Education, 1992, Modification and their POA's MHRD, Deptt. of Education. Signature Books International.
5. [Neelam Ed Sood](#); Management of School Education in India 2012, pp. 230 (Crown Size) (English) 01 Edition. Aph Publishing Corporations

Outcomes- After completion of this course, the student will-

- acquire the ability to utilize technology and information for the betterment of humankind;
- strengthen knowledge and attitude related to livelihood skills;
- develop the ability to appreciate art and show case talents;
- Promote physical fitness, health and well-being.
- Promote arts integrated learning.

INCLUSIVE EDUCATION , GUIDANCE AND COUNSELLING IN SCHOOL

Credit-6(6+0+0+0)

Objectives:-

- To get the knowledge of the concept, need and principles of guidance.
- To explains the role of school in organizing different guidance programmes
- To narrates the process, tools and techniques of counselling.
- To explains the qualities and role of a school counsellor

Unit I: Introduction of Inclusive Education, Educational Strategies and Management

(Credit-2)

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 Importance and need for adaptation Guidelines for adapting teaching science, social studies, mathematics and languages at the secondary level Educational measures for effective implementation of inclusive education.

Unit II Nature, needs and Evaluation of SWDN

(Credit-2)

Definition, types and classification of SWDN Characteristics and educational needs of SWDN based on research evidence Supportive resources and services for children with SWDN in inclusive Education 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 CCE

UNIT-III Guidance & Counselling

(Credit-1)

Guidance and Counselling- Meaning, Definitions, Aims, Nature, Principles and Needs. Counselling- Meaning, Definitions, Elements-Characteristics – Objectives – Need – Type and relationship between guidance and Counselling - Benefits- Limitations, History of guidance movement in India – Problems of guidance movement in India – Ways to improve guidance movement in India.

UNIT-IV Guidance Services in Schools

(Credit-1)

Non-testing devices in guidance: Observation, Cumulative record, Anecdotal record, Case study, Autobiography, Rating Scale, Sociometry etc. Testing devices in guidance--Meaning, Definition, Measurement, Uses of psychological tests. Guidance services at different school levels- Organisation of Guidance services in schools – Role of guidance personnel – Career and Occupational Information – sources, gathering, filing, dissemination

Sessional work

1. Tutorial - Readings on PWD Act, RTE Act, IEDSS, SSA, RMSA and their implications for inclusive education
2. Tutorial – visit to special schools for observing the behaviours of students with VI, HI, MR, LH.
3. Chauhan, S. S. (2008). Principles and techniques of guidance. UP: Vikas Publishing House Pvt Ltd.
4. Sharma, R. N. (2008). Vocational guidance & counseling. Delhi: Surjeet Publications.

Suggested Readings:

1. Sophia Dimitriadi ;Diversity, Special Needs and Inclusion in Early Years Education (English) 1st Edition, SAGE Publications India Pvt Ltd
2. Internet Source, MHRD (2005b). 'Action Plan for Inclusive Education of Students and Youth with Disabilities',
3. Internet Source, SSA (2002). 'Basic features of SSA', Inclusive education in SSA, Retrieved from www.ssa.nic.in / inclusive_education /ssa_plan_manual
4. [Neena Dash](#) ;Inclusive Education for Children With Special Needs.

Outcomes-

After going through the course the student will be able:

- To orient the student with tools and techniques of measurement and evaluation.
- To develop skills and competencies in constructing and standardizing a test.
- To enable the student to tabulate and find out some standard meaning from the raw scores by using statistical procedures
- To make the students understand how various requirements of education are measured evaluated interpreted and their results are recorded to help learners.

VIII SEMESTER

INDIAN CONSTITUTION AND HUMAN RIGHTS

Credit-5(5+0+0+0)

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.

Unit I: Meaning and Importance of the Constitution

(Credit-3)

- (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

(Credit-2)

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.

Suggested Readings:

1. Madhav Khosla, THE INDIAN CONSTITUTION (English) Oxford University Press
2. Ghosh, Indian Government and Politics. PHI LEARNING PVT. LTD-NEW DELHI
3. Naseem Ahmad, Indian Public Administration, Anmol Publications Pvt.Ltd.
4. Jagdish chand, Education In India After Independence : Anshah Publishing House (shipra Pub.), H4-03 Mayurdhwaj, 60 Ip. Extn. Delhi-92.

Outcomes- After going through the course the student will be able to:

- 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.

CURRICULUM AND SCHOOL

Credit-6(6+0+0+0)

Objectives:-It aims at understanding and learning- the developmental stages of children, nature of the knowledge in general and curricular subject areas in particular, and the child's socio-political contexts. Further the objectives also have to be specific enough to be used as guidelines for content selection and organisation.

Unit I: Concept and determinants of curriculum (Credit-2)

Meaning of Curriculum; the dynamics of hidden curriculum and its effects; Core curriculum;Spiral curriculum;Determinants of school curriculum;National goals and priorities: Trends in the curriculum of school education at national and state levels (with reference to National Curriculum frameworks); Difference between curriculum Curriculum and syllabus.

Unit II: Curriculum implementation in schools (Credit-2)

Planning and converting curriculum into syllabus and learning activities. Role of teacher in operationalising curriculum (Concept mapping, Longrange planning, daily lesson Planning, creating learning situations, selecting learning experiences, choice of resources, planning Assessments. Time management, Text book as a tool for curriculum transaction, other learning resources such as 'on learning' and ICT, interactive videos, other technological resources. Planning and use of curricular materials – teachers hand book, sourcebook, work book, manuals, and Other learning materials.

Unit III: School as a system for curriculum implementation (Credit-2)

Concept of a school; its components; school climate and environment. School as an organization- mission, vision and core values. Factors influencing school environment. School plant, Physical and academic infrastructural facilities. Planning: Types of planning-short term, annual plan; Strategic planning and goal setting;.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 School Time table.

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.

Suggested Readings:

1. Alka Kalra (1977) Efficient School Management and Role of Principals, APH Publishing, New Delhi.
2. Buch M B Planning Education, Implementation and Development, NCERT, New Delhi. .
3. Curriculum Planning for better teaching and learning by J.G. Saylor and W Alexander (Holt, Rinehart and Winston).
4. Dewey, John (1959): The child and the Curriculum, Chicago, The University of Chicago Press.
5. Eugenia Hepworth Berger (1987), Parents as partners in Education: The school and home Working together.
5. Howson, Geoffrey (1978): Developing a New Curriculum, London: Heinmann.

Outcomes- After going through the course the student will:

- Understand and construct their own knowledge
- Understand importance of Experiences in Learning
- Understand the socio-economic context and identity of the learner.

Linear Algebra And Rings And Fields

Credit-6(6+0+0+0)

Objectives: At the end of the course students will be able to:

- (i) Understand concepts, principles of linear algebra.
- (ii) Understand the concept of Ring and Field.
- (iii) Understand the concepts of Vector space

Unit I: Rings and Fields.

(Credit-1.5)

Definition and structure of Ring Properties of Ring ,Sub Rings ,Properties of subrings, Definition of Field , Integral Domain Example of Integral Domain and Field , Quotient Ring Binomial ring Prime Ideals

Unit II: Ideals

(Credit-1.5)

Ideals, Maximal Ideals and Prime Ideals, Principal ideals, Principal ideal ring, Zero divisor. Cancellation law of Ring ,Some result on Ring, Integral domain and field . Homomorphism of a ring, Kernel of a ring homomorphism, Fundamental theorem of Homomorphism, Eisenstein's Criterion of irreducibility,

Unit III; Vector Spaces

(Credit-1.5)

Vector spaces, Subspaces, Linear Combinations, Linear span, Linear dependence And Linear independence of vectors, Basis and Dimension, Quotient spaces, Homomorphisms of vector spaces, Isomorphism of vector spaces, Direct sums, Inner product spaces, , Orthogonal vectors

Unit IV Linear Transforms

(Credit-1.5)

Linear maps as matrices, Change of basis and the effect of associated matrices, Kernel and Image of a linear transformation, Rank and Nullity theorems. 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.

Suggested Readings:

1. Topics in Algebra by I. N 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. Basic Abstract Algebra, 2nd Edition by P B Bhattacharya, S K Jain and S R Nagpal, Cambridge University Press.

Outcomes: At the end of the course students:

- I. Understand concepts, principles of linear algebra.
- II. Understand the concept of Ring and Field.
- III. Understand the concepts of Vector space

COMPLEX AND NUMERICAL ANALYSIS

Credit-6(6+0+0+0)

Objectives: At the end of the course students will be able to:

- Understand concepts, principles and techniques of Interpolation.
- Understand the concept of numerical methods.
- Understand the concepts of complex variables.

Unit I: Interpolation,

(Credit-1.5)

Definition of 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. General quadrature formula, Newton-Cotes quadrature formula, Trapezoidal Rule, Simpson's 1/3 rule, Simpson's 3/8 rule, Weddle's rule, Gauss quadrature.

Unit II: Numerical Methods

(Credit-1.5)

Solution of system of linear equations – Iterative methods – Jacobi & Gauss Seidel 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 III: Analytic Functions.

(Credit-1.5)

Introduction, Functions of a Complex Variable, Limits, Theorems on Limit, Continuous Functions, Differentiability, Analytic function The Cauchy-Riemann Equations, Sufficient condition for analytic function Harmonic Functions Polar form of C-R equation, construction of analytic function Power series.

Unit IV: Transformations.

(Credit-1.5)

Introduction Conformal Mappings Bilinear Transformations, Cross ratio, Fixed Points of Bilinear Transformations, Some Special Bilinear Transformations, Discussion of mapping of $w=z$. Determine the mobious transformation,

Suggested Readings:

1. Theory and Problems of Linear Algebra, Seymour Lipschitz, Schaum Outline Series.
2. Modern Algebra, Vol. II, by Narayanan and Manicavachagam Pillay, S. Vishwanathan and Co.
3. Brief Survey of Modern Algebra, Birkhoff and MacLane, IBH
4. Vector Algebra, Shantinathan and P K Mittal, S Chand and Co. Ltd.
5. Modern Algebra by Vasishta, Krishna Prakashan Media Ltd.

Outcomes:

At the end of the course students will be able to:

- I. Understand concepts, principles and techniques of Interpolation.
- II. Understand the concept of numerical methods.
- III. Understand the concepts of complex variables

ATOMIC, MOLECULAR, NUCLEAR AND SOLID STATE PHYSICS

Credit-13(9+1+2+1)

Objectives-The student will be able to -

1. Understand basic elements of practical spectroscopy i.e. signal-to-noise ratio, resolving power, width and intensity of spectral transitions.
2. Understand many electron atoms and interaction of spins i.e. LS and JJ coupling.
3. Understand effect of external fields to spectra like, Normal and Anomalous Zeeman effect.
4. Understand rotational, vibrational, electronic and Raman spectra of molecules and their applications.

Unit I: X-Rays and Atomic spectra

(Credit-3)

Continuous X-ray spectra. Duane and Hunt limit. Characteristic X ray spectra, Moseley's law and its significance, X-ray energy levels. Bragg's law. Compton Effect, Determination of e/m of an electron by Thomson method, Excitation and Ionisation potentials, Franck-Hertz experiment, Bohr-Sommerfeld Model of atom, vector model of an atom, Stern-Gerlach experiment and its theory. Spin-orbit interaction and Fine structure of spectral lines. Quantum numbers and selection rules, L-S and J-J coupling. Zeeman effect Paschen - Back effect.

Unit II: (Credit-2): Molecular Spectra And Crystal lattices:

Rotation, vibration and electronic spectra of molecules, Raman and IR spectra, Crystal lattices: Bravais and primitive vectors, simple body centered, and face centered cubic lattices, primitive unit cell, Wigner-Seitz cell and conventional cell, crystal structures and lattices with bases, hexagonal close packed and diamond structures, reciprocal lattice, definition and example, first Brillouin zone, lattice planes and Miller indices

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Biprism
- B. Spectrometer
- C. Series and Parallel Resonance

Unit III : Atomic Nucleus and particle physics

(Credit-2)

proton-electron hypothesis, Proton-neutron hypothesis, Yukawa's Theory (Qualitative), Binding energy, Nuclear stability, Segre chart. Nuclear Models - Liquid drop model, semi-empirical mass formula, Shell model and magic numbers (qualitative). Radioactive displacement laws. Theory of decay (qualitative). Geiger-Nuttall law. Beta decay, Gamma decay, pair production, successive disintegration, radioactive dating, energy production in stars, Nuclear reactors. Particle Physics: Classification of particles, Particle Accelerators and Detectors: LINAC, Cyclotron, Betatron, GM counter.

Unit IV :Thermal Properties and magnetic properties of Solids

(Credit-2)

Thermal Properties: Specific heat of solids, Einstein and Debye theories, Vibrational modes of one-dimensional monatomic system, lattice dispersion, Fermi energy, Hall effect, Magnetic Properties: Langevin's theory of dia and para magnetism, Curie-Weiss Law of Superconductivity, critical temperature and Meissner Effect, High temperature superconductors.

PRACTICALS(Credit-0.25+0.5+0.25)(D-0.25)(P-0.5)(PS-0.25)

- A. Current balance-magnetic induction
- B. Coupled oscillations
- C. e/m of electrons
- D. Energy gap of a semiconductor
- E. Magnetic susceptibility

Suggested Readings:

1. Electricity and Magnetism, Edward m purcel
2. Concept of Modern Physics Beiser.
3. Electricity and Magnetism, A. A. Rangwala
4. Atomic and Nuclear Physics: Laser, Rajkumar.

Outcomes-

1. The students understand many electron atoms and interaction of spins i.e. LS and JJ coupling.
2. The students understand effect of external fields to spectra like, Normal and Anomalous Zeeman effect.
3. The students understand rotational, vibrational, electronic and Raman spectra of molecules and their applications.

Advanced Chemistry

Credit-12(8+1+2+1)

Objectives: Students Teachers will be able to

- Understand the Spectroscopic methods that are used to study the molecules.
- Predict the appearance of a molecule's vibrational spectra as a function of symmetry and uses in detailed organic structure analysis
- Determine the vibrations for a triatomic molecule and identify whether they are infrared-active.
- Determine whether the molecular vibrations of a tri-atomic molecule are Raman active.
- Explain the difference between Stokes and anti-Stokes lines in a Raman spectrum.
- Understand Chemistry of Biomolecules.

Unit I: Spectroscopy-I (Theoretical Principle)

(Credit-2)

Introduction: electromagnetic radiation, regions of the spectrum, basic features of different spectrometers, statement of the Born-Oppenheimer approximation, degrees of freedom.

- **Rotational Spectrum:** Diatomic molecules, Energy levels of a rigid rotor (semi-classical principles), selection rules, spectral intensity, distribution using population distribution (Maxwell-Boltzmann distribution) determination of bond length, qualitative description of non-rigid rotor, isotope effect.
- **Vibrational Spectrum:** Infrared spectrum: energy levels of simple harmonic oscillator, selection rules, pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effect of anharmonic motion and isotope on the spectrum, idea of vibrational frequencies of different functional groups.
- **Raman Spectrum:** Concept of polarisability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, σ , π - and n M.O., their energy levels and the respective transitions.
- **Nuclear magnetic resonance (NMR) spectroscopy:** Proton magnetic resonance (^1H NMR) spectroscopy, nuclear shielding and deshielding, chemical shift and molecular structure, area of signals and proton counting, splitting of signals, spin-spin coupling and coupling constant, interpretation of NMR spectra of simple organic molecules such as ethyl bromide, ethanol, acetaldehyde, 1, 1, 2-tribromoethane, ethyl acetate, toluene and acetophenone.

Unit II: Electronic Spectrum & Photochemistry

(Credit-2)

Electronic Spectrum: Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Frank-Condon principles. Qualitative description of σ , π - and n M.O., their energy levels and the respective transitions.

Photochemistry

Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grothus-Draper law, Stark-Einstein law, Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions – energy transfer processes (simple examples).

Unit III: Spectral & Magnetic properties of Transition Metal complexes (Credit-2)

Electronic spectra of Transition Metal Complexes: Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, petrochemical series, Orgel-energy level diagram for d^1 to d^9 states, discussion of the electronic spectrum of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex ion.

Magnetic Properties of Transition Metal Complexes: Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula, L-S coupling, correlation of μ_s and μ_{eff} values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.

Unit IV: Bioinorganic Chemistry (Credit-2)

Metal ions present in biological systems, classification of elements according to their action in biological system. Geochemical effect on the distribution of metals. Sodium / Potassium pump,

carbonic anhydrase and carboxypeptidase. Excess and deficiency of some trace metals. Toxicity of metal ions (Hg, Pb, Cd and As), reasons for toxicity, Use of chelating agents in medicine, Cisplatin as an anti-cancer drug. Iron and its application in bio-systems, Haemoglobin, Myoglobin; Storage and transfer of iron.

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.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides and proteins. Primary and secondary structures of proteins. Protein denaturation/renaturation.

Nucleic acids: introduction, Constitution of nucleic acids, Ribonucleosides and ribonucleotides. The double helical structure of DNA.

Suggested Readings:

1. Sharma Y. R. elementary organic spectroscopy: principles and chemical applications paperback.
2. Mehta and Mehta, Organic chemistry, PHI
3. Donald L. Pavia Gary M. Lampman George S. Kriz James A. Vyvyan, Introduction to Spectroscopy, 5th Edition.
4. Bahl B. S. & Bahl Arun 5000 Solved Problems In Organic Chemistry, S. Chand Publishing.
5. Madan R. L., Chemistry for Degree Students B.Sc. 3rd Year S. Chand Publishing.
6. Nafis Haider S, Fundamental of Organic Chemistry, S. Chand Publishing.
7. Pradeep. T. Nano: The Essentials; Understanding Nanoscience and Nanotechnology. Tata McGraw-Hill Education Pvt. Ltd., New Delhi.
8. Kenneth J. Klabunde and Gleb B. Sergeev Nanochemistry (Second Edition)
9. Bandyopadhyay, A. K. Nano Materials. New Age International Publishers, New Delhi
10. P.T. Anastas and J.C. Warner, Green Chemistry: Theory and Practice. Oxford University Press.
11. Lancaster M. Green Chemistry: Introductory Text. Royal Society of Chemistry (London).
12. Ryan M.A. and Tinnesand M. Introduction to Green Chemistry. American Chemical Society (Washington).
13. Cann M. C. and Connelly M. E. Real world cases in Green Chemistry, American Chemical Society (Washington).
14. Cann M. C. and Umile T. P. Real world cases in Green Chemistry (Vol 2) American Chemical Society (Washington)
15. Ahluwalia, V.K., Kidwai, M. New Trends in Green Chemistry, 2004
16. Inorganic Polymers by Stone and Graham.

Practicals

Organic Chemistry

- a. Two stage preparation: p-nitroacetanilide from Aniline and p-Bromoacetanilide from Aniline.
- b. Determination of Iodine value of an oil/fat.
- c. Separation of two component mixture using water or NaHCO_3 solution & identification of the two components. Preparation of one derivative.
- d. Green synthesis:

Physical Chemistry

Colorimetry

- Determination of formula of complex by Job's method.
- Verification of Beer - Lambert law for $\text{KMnO}_4/\text{K}_2\text{Cr}_2\text{O}_7$ and determine the concentration of the given solution of the substance.

Polarimetry

Determination of the specific rotation of a given optically active compound and determination of the concentration of given solution of an optically active substance

Ion Exchange Method

Separation and estimation of Mg (II) and Zn (II)

Chromatography

To determine R_f value of individual and mixture of amino acid by thin layer chromatography (TLC).

Separation, Isolation and Analysis of the Different Components in a Mixture.

Method of separation of green leaf pigment, mixture of inorganic, vitamins, colors of flowers etc. separation of α , β , γ carotene from carrot.

Refractometry and Polarimetry

To verify law of refraction of mixture (e.g of glycerol and water) using Abbe's refractometer. To determine the specific rotation of a given optically active compound.

UV spectrophotometer

Record the UV spectrum of p-nitro phenol (in 1:4 ethanol: water mixture). Repeat after adding a small crystal of NaOH. Comment on the difference, if any.

Record the U.V. spectrum of a given compound (acetone) in cyclohexane (a) Plot transmittance versus wavelength. (b) Plot absorbance versus wavelength.

Outcomes: At the end of the course students will be able to:

- The knowledge about Spectral & Magnetic properties of Transition Metal complexes.
- Understand the Bioinorganic Chemistry, Geochemical effect on the distribution of metals.
- Learn chemistry of Amino Acids, Peptides, Proteins and Nucleic Acids