Curriculum Framework
M.A./M.Sc.-M.Ed.(3 Year)
Academic Year 2023-24

Based on NEP 2020

॥ न हि ज्ञानेन सदृशं पवित्रमिह विद्यते ॥

भारतीय शिक्षक प्रशिक्षण संस्थान, गांधीनगर

Indian Institute of Teacher Education, Gandhinagar

(A State Public University Established by Government of Gujarat)

Curriculum Framework M.A./M.Sc.-M.Ed. 2023

Published by

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Registrar

Indian Institute of Teacher Education

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From the Desk of Vice-Chancellor….

Dear All,

National Education Policy-2020 (NEP-2020) has been a policy to place Indian Education System on the global platform. It has been guiding us to reframe educational ethos in global context intervening Indian Knowledge System. India has been regarded as one of the ancient educational system and world was attracted towards the system our forefathers invaded for centuries. It has been our hard luck that the Centres of Knowledge, and Teaching and Learning like; Takshshila, Nalanda, Vallabhi, etc. were attacked and vanished the places were the Knowledge was practiced. But the spirit and zeal, which we have inherited still exists in hearts of Indians from ages. It is the right time to explore our culture, traditions, ethos, values, rituals to the world and it will bring solace to millions and millions of individuals all over the Globe; because we believe in **"वसुधैव कुटुम्बकम्"** and it can be proved with how Indus Valley Culture has possessed the real essence of these words. Indian Subcontinent has been found under tremendous disturbance and so is the world. If we wish, as Global Citizen, peace and harmony among all, we need to have paradigm shift in Educational System. This shift will place India as "विश्वगुरु" and that is the mission envisaged in NEP-2020.

Indian Institute of Teacher Education, Gandhinagar is an institute with difference because it has been instituted for the noble cause of uplifting the standards of School Education through Teacher Education, because the Teacher can reestablish the Indian Ethos in global context. The teacher is pivot in bringing out dynamism into young learners and there may be different society in future. This global community has power to establish peace and harmony into the world.

So, looking at need of futuristic societies and recommendations of NEP-2020, IITE has revised its curriculum on guiding principles of NCFTE-2009 and NEP-2020. The revised curricula is within recommendation of NEP-2020 of Integrated Teacher Education Programme (ITEP) and all guiding principles and recommendations of NCTE's Curriculum Committee have been incorporated. It is certain that these curricula will help prospective teachers and prospective teacher educators to develop holistically.

On publishing the curriculum framework for all courses offered by IITE, I thank faculties and Members of BoS and Academic Council for wholehearted efforts in bringing out these curricula in very short notice. It is also a request to all stakeholders to review and let us know what the best can be added to these curricula for making it more comprehensive and updated.

Wishing all of you all the best.

5th September, 2023

Gandhinagar

Dr. Harshad A. Patel

Contents:

Curriculum Framework M.A./M.Sc.-M.Ed. (3 Year) in force from Academic Year 2023-24

M.Sc.-M.Ed. 3 Year integrated Programme													
Sr. No.	Subject	No.	Course	Type	Credit Per Sem						Total Credit	Total per Subject	
					S1	S2	S3	S4	S5	S6			
1	Education	1	Psychological Foundations of Education	Theory	4						4	60	
		2	Methods of Research in Education I	Theory	4						4		
		3	Philosophical and Sociological Foundations in Education	Theory		4					4		
		4	Methods of Research in Education II	Theory		4					4		
		5	Policy, Politics and Economics of Education	Theory			2				2		
		6	Preparation and Presentation of Theme Paper	Theory			2				2		
		7	Technology in Education	Theory			4				4		
		8	Management and Administration	Theory				4			4		
		9	1. Foundational and Prepratory Stage in Education 2. Middle and Secondary Stage in Education 3. Higher Education 4. Teacher Education	Theory				4			4		
		10	Internship M.Ed. I	Practical				2			2		
		11	Dissertation I : Research Proposal	Practical				2			2		
		12	Inclusion: Concept and Policy Framework	Theory					4		4		
		13	1. Educational Statistics I 2. Guidance & Counselling Services 3. Measurement and Evaluation 4. Indian Knowledge System	Theory					4		4		
		14	Internship M.Ed. II	Practical					2		2		
		15	Dissertation II : Tool Development	Practical					2		2		
		16	Curriculum Planning, Evaluation and Research	Theory						4	4		
		17	1. Psychological Testing 2. Academic Writing 3. Educational Statistics II 4. Environment Education	Theory						4	4		
		18	Dissertation 3 : Report Submission	Practical						4	4		
		Total			8	8	8	12	12	12	60		
2	Chemistry	1	Organic Chemistry - I	Theory	4						4	60	1
		2	1. Physical Chemistry-I 2. Inorganic Chemistry-I	Theory	4						4		
		3	Laboratory Experiments in Chemistry-I	Practical	2						2		
		4	IPR in Chemical Sciences	Theory (Submission)	2						2		
		5	Organic Chemistry-II	Theory		4					4		
		6	1. Analytical Chemistry 2. Inorganic Chemistry-II	Theory		4					4		
		7	Laboratory Experiments in Chemistry-II	Practical		2					2		
		8	Dissertation in Chemical Sciences I	Practical (Submission)		2					2		
		9	Molecular Spectroscopy	Theory			4				4		
		10	1. Polymer Chemistry 2. Advanced Inorganic Chemistry	Theory			4				4		
		11	Laboratory Experiments in Chemistry-III	Practical			2				2		
		12	Dissertation in Chemical Sciences II	Practical (Submission)			2				2		
		13	Heterocyclic Chemistry	Theory				4			4		
		14	1. Natural Products 2. Physical Chemistry-II	Theory				2			2		
		15	Laboratory Experiments in Chemistry-IV	Practical				2			2		
		16	Medicinal Chemistry	Theory					4		4		
		17	1. Dyes 2. Environmental Chemistry	Theory					2		2		
		18	Laboratory Experiments in Chemistry-V	Practical					2		2		
		19	Drugs	Theory						4	4		
		20	1. Disconnection Approach 2. Advanced Physical Chemistry	Theory						2	2		
		21	Laboratory Experiments in Chemistry-VI	Practical						2	2		
		Total			12	12	12	8	8	8	60		
3	Mathematics	1	Advanced Complex Analysis	Theory	4						4	60	2
		2	1. Abstract Algebra 2. Differential Geometry	Theory	4						4		
		3	Practical: Advanced Complex Analysis	Practical	2						2		
		4	Proofs in Mathematics	Theory (Submission)	2						2		
		5	Combinatorics and Graph Theory	Theory		4					4		
		6	1. Advanced Linear Algebra 2. Functional Analysis	Theory		4					4		
		7	Practical: Combinatorics and Graph Theory	Practical		2					2		
		8	Dissertation in Mathematics: Preliminary	Practical (Submission)		2					2		
		9	Number Theory	Theory			4				4		
		10	1. Mathematical Modelling 2. Mathematical Methods	Theory			4				4		
		11	Practical: Number Theory	Practical			2				2		
		12	Dissertation in Mathematics: Completion	Practical (Submission)			2				2		
		13	Measure Theory	Theory				4			4		
		14	1. Operation Research 2. Discrete Mathematics	Theory				2			2		
		15	Practical: Measure Theory	Practical				2			2		
		16	Topology	Theory					4		4		
		17	1. Classical Mechanics 2. Cryptography	Theory					2		2		
		18	Computer Programming in "C"	Practical					2		2		
		19	Ordinary Differential Equations	Theory						4	4		
		20	1. Fuzzy Set Theory 2. Special Functions	Theory						2	2		
		21	Introduction to Sci Lab	Practical						2	2		
		Total			12	12	12	8	8	8	60		

M.Sc.-M.Ed. 3 Year integrated Programme													
Sr. No.	Subject	No.	Course	Type	Credit Per Sem						Total Credit	Total per Subject
					S1	S2	S3	S4	S5	S6		
4	Physics	1	Classical and Quantum Mechanics	Theory	4						4	60
		2	1. Numerical Analysis and Computer Programming 2. Instrumentation and Sensors	Theory	4						4	
		3	Laboratory Experiments in Physical Sciences -I	Practical	2						2	
		4	IPR in Physical Sciences	Theory (Submission)	2						2	
		5	Solid State Physics-II	Theory		4					4	
		6	1. Laser and Non-Linear Optics 2. Condensed Matter Physics	Theory		4					4	
		7	Laboratory Experiments in Physical Sciences -II	Practical		2					2	
		8	Dissertation in Physical Sciences I	Practical (Submission)		2					2	
		9	Thermodynamics and Statistical Mechanics	Theory			4				4	
		10	1. Nanotechnology and Thin film Physics 2. Astrophysics and Cosmology	Theory			4				4	
		11	Laboratory Experiments in Physical Sciences -III	Practical			2				2	
		12	Dissertation in Physical Sciences II	Practical (Submission)			2				2	
		13	Electrodynamics and Mathematical Physics	Theory				4			4	
		14	1. Spectroscopic Techniques 2. Crystallography and Material Science	Theory				2			2	
		15	Laboratory Experiments in Physical Sciences – IV	Practical				2			2	
		16	Advanced Electronics	Theory					4		4	
		17	1. Space Physics and Technology 2. Experimental Methods and Techniques	Theory					2		2	
		18	Laboratory Experiments in Physical Sciences -V	Practical					2		2	
		19	Nuclear and Particle Physics	Theory						4	4	
		20	1. Remote Sensing and Applications 2. Plasma Physics	Theory						2	2	
		21	Laboratory Experiments in Physical Sciences -VI	Practical						2	2	
		Total			12	12	12	8	8	8	60	
5	Botany	1	Anatomy of Higher Plants	Theory	4						4	60
		2	1. Phyto Resources - Utilization and Management 2. Ecology & Evolution	Theory	4						4	
		3	Laboratory Experiments in Plant Sciences-I	Practical	2						2	
		4	IPR in Life Sciences	Theory (Submission)	2						2	
		5	Plant Taxonomy	Theory		4					4	
		6	1. Fundamentals of Microbiology 2. Ethnobotany & Medicinal Plants	Theory		4					4	
		7	Laboratory Experiments in Plant Sciences-II	Practical		2					2	
		8	Dissertation in Plant Sciences I	Practical (Submission)		2					2	
		9	Cell Biology	Theory			4				4	
		10	1. Environmental Biology & Climate Change 2. Biochemistry & Enzymology	Theory			4				4	
		11	Laboratory Experiments in Plant Sciences-III	Practical			2				2	
		12	Dissertation in Plant Sciences II	Practical (Submission)			2				2	
		13	Advanced Plant Physiology	Theory				4			4	
		14	1. Analytical and Separation Techniques 2. Embryology of Higher Plants	Theory				2			2	
		15	Laboratory Experiments in Plant Sciences-IV	Practical				2			2	
		16	Genetics & Molecular Biology	Theory					4		4	
		17	1. Principles of Horticulture 2. Bioinformatics & Computational Biology	Theory					2		2	
		18	Laboratory Experiments in Plant Sciences-VI	Practical					2		2	
		19	Plant Biotechnology: Scope and Principles	Theory						4	4	
		20	1. Genetic Engineering & Genomics 2. Forestry	Theory						2	2	
		21	Laboratory Experiments in Plant Sciences-VI	Practical						2	2	
		Total			12	12	12	8	8	8	60	

M.A.-M.Ed. 3 Year Integrated Programme													
Sr. No.	Subject	No.	Course	Type	Credit Per Sem						Total Credit	Total per Subject
					S1	S2	S3	S4	S5	S6		
1	Education	1	Psychological Foundations of Education	Theory	4						4	60
		2	Methods of Research in Education 1	Theory	4						4	
		3	Philosophical and Sociological Foundations in Education	Theory		4					4	
		4	Methods of Research in Education 2	Theory		4					4	
		5	Policy, Politics and Economics of Education	Theory			2				2	
		6	Preparation and Presentation of Theme Paper	Theory			2				2	
		7	Technology in Education	Theory			4				4	
		8	Management and Administration	Theory				4			4	
		9	1. Foundational and Prepratory Stage in Education 2. Middle and Secondary Stage in Education 3. Higher Education 4. Teacher Education	Theory				4			4	
		10	Internship M.Ed. 1	Practical				2			2	
		11	Dissertation 1 : Research Proposal	Practical				2			2	
		12	Inclusion: Concept and Policy Framework	Theory					4		4	
		13	1. Educational Statistics 1 2. Guidance & Counselling Services 3. Measurement and Evaluation 4. Indian Knowledge System	Theory					4		4	
		14	Internship M.Ed. 2	Practical					2		2	
		15	Dissertation 2 : Tool Development	Practical					2		2	
		16	Curriculum Planning, Evaluation and Research	Theory						4	4	
		17	1. Psychological Testing 2. Academic Writing 3. Educational Statistics 2 4. Environment Education	Theory						4	4	
		18	Dissertation 3 : Report Submission	Practical						4	4	
		Total			8	8	8	12	12	12	60	
2	English	1	New Literatures	Theory	4						4	60
		2	Translation Studies in India	Theory	4						4	
		3	Literary and Cultural Theory	Theory	4						4	
		4	Shakespearean Studies	Theory		4					4	
		5	Comparative Mythology in Indian English Literature	Theory		4					4	
		6	Literary Research Methodology 1 (Preparing Research Proposal)	Practical (Submission)		4					4	
		7	Renaissance Drama : Marlowe and Jonson	Theory			4				4	
		8	American Literature	Theory			4				4	
		9	Literary Research Methodology 2 (Dissertation)	Practical (Submission)			4				4	
		10	Neoclassical Literature	Theory				4			4	
		11	1. Indian English Literature 2. Autobiographical Writing and Memoirs	Theory				4			4	
		12	Romantic Poetry	Theory					4		4	
		13	1. Australian Literature 2. Contemporary World Literature: Voices of Globalization	Theory					4		4	
		14	Modernist Literature: From Eliot to Woolf	Theory						4	4	
		15	1. Canadian Literature 2. Magical Realism in World Literature	Theory						4	4	
		Total			12	12	12	8	8	8	60	

SEMESTER I

Semester - I

Semester-1 M.A. M.Ed							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
M.A.	Theory	3	180	12	90	210	300
	Total	5	**300**	**20**	**150**	**350**	**500**

Semester-1 M.Sc. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
M.Sc.	Theory	2	120	8	60	140	200
	Practical	1	60	2	15	35	50
	Theory (Submission)	1	30	2	50	0	50
	Total	**6**	**330**	**20**	**185**	**315**	**500**

No.	Subject	Title	Type	Hours	Credit	Internal	External	Total
1	Education	Psychological Foundations of Education	Theory	60	4	30	70	100
2	Education	Methods of Research in Education I	Theory	60	4	30	70	100
3	English	New Literatures	Theory	60	4	30	70	100
4	English	Translation Studies in India	Theory	60	4	30	70	100
5	English	Literary and Cultural Theory	Theory	60	4	30	70	100
6	Chemistry	Organic Chemistry - I	Theory	60	4	30	70	100
7	Chemistry	1. Physical Chemistry-I / 2. Inorganic Chemistry-I	Theory	60	4	30	70	100
8	Chemistry	Laboratory Experiments in Chemistry-I	Practical	60	2	15	35	50
9	Chemistry	IPR in Chemical Sciences	Theory (Submission)	30	2	50	0	50
10	Mathematics	Advanced Complex Analysis	Theory	60	4	30	70	100
11	Mathematics	1. Abstract Algebra / 2. Differential Geometry	Theory	60	4	30	70	100
12	Mathematics	Practical: Advanced Complex Analysis	Practical	60	2	15	35	50
13	Mathematics	Proofs in Mathematics	Theory (Submission)	30	2	50	0	50
14	Physics	Classical and Quantum Mechanics	Theory	60	4	30	70	100
15	Physics	1. Numerical Analysis and Computer Programming / 2. Instrumentation and Sensors	Theory	60	4	30	70	100
16	Physics	Laboratory Experiments in Physical Sciences -I	Practical	60	2	15	35	50
17	Physics	IPR in Physical Sciences	Theory (Submission)	30	2	50	0	50
18	Botany	Anatomy of Higher Plants	Theory	60	4	30	70	100
19	Botany	1. Phyto Resources - Utilization and Management / 2. Ecology & Evolution	Theory	60	4	30	70	100
20	Botany	Laboratory Experiments in Plant Sciences-I	Practical	60	2	15	35	50
21	Botany	IPR in Life Sciences	Theory (Submission)	30	2	50	0	50

Education

Semester-1

Psychological Foundations of Education

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the nature of human growth and development.
- Understands learning as a process and the factors affecting it.
- Understands the concept and process of learning acceleration.
- Develops their abilities to apply different learning theories according to the demand of the situation.
- Develops the ways of enhancing some mental abilities of the learners.
- Develops a proper perception regarding theories of personality.
- Develops skill of guidance and counselling

Unit 1: Schools of Psychology and Theories of Learning

1.1 Introduction to various Schools of Psychology: Structuralism, Functionalism, Behaviourism, G stalt School, Psychoanalytic School, Humanistic School, and Cognitive School

1.2 Learning Curve, Gagne's Theory of Hierarchy of Learning, Bandura's Theory of Social Learning

1.3 Hull's Theory of Learning, Bruner's Learning Theory

1.4 Insightful Learning, Tolman's Learning Theory

Unit 2: Intelligence and Personality

2.1 Intelligence: Stenberg's Theory of Intelligence, Social Intelligence
Multiple Intelligence: Concept, Gardener Theory of Multiple Intelligence

2.2 Emotional Intelligence: Concept and Daniel Goleman's Theory

2.3 Personality: Freud's Structure of The Human Mind, Freudian Psychoanalytic Theory of Personality, Carl Rogers's Humanistic Theory of Personality,

2.4 Erikson's Theory of Personality, Jung's Theory of Personality and Gordon's Allport's Trait Theory of Personality

Unit 3: Aptitude, Interest, Thinking, Reasoning

3.1 Aptitude: Concept, Nature, Types, Uses, Advantages, Limitations, Measurement
Difference: Aptitude and Intelligence, Aptitude and Achievement , Aptitude and Interest

3.2 Interest : Concept, Development and Identification of Interest

3.3 Attention: Concept, Characteristics, Factors affecting Attention, Types

3.4 Reasoning: Concept, Characteristics, Steps, Types

Unit 4: Guidance and Counselling

4.1 Guidance: Concept, Nature, Principles and Need of guidance
Types: Individual guidance, Educational guidance, and Vocational guidance

4.2 Counselling: Concept, Nature, Principles and Need of counselling
Types: Directive Counselling: Steps, Limitations

Non-Directive Counselling: Steps, Limitations

Eclectic Counselling: Steps, Limitations

4.3 Approaches: CBT, REBT

4.4 Carl Roger's Client centred Theory

Mode of Transaction: Group discussion, Lecture-cum –discussion, Panel discussion, Symposium, Reports, Research Journals, School visits and sharing of experiences

Suggested Activities:

- To organize a seminar on the current topic of educational psychology.
- Visit of Psychological lab and get acquainted with psychological equipment.
- Preparation of any tool on intelligence and its administration on five students
- Conduct a case study on one student who has difficulties in learning in primary years.
- Preparation of learners' profiles based on cognitive and non-cognitive characteristics in order to depict individual differences at the primary or secondary stage.

Semester-1

Methods of Research in Education I

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the basics of educational research.
- Develops the skill of reviewing related literature and previous research.
- Comprehends the meaning of variables, objectives and hypotheses of research.
- Develop understanding of population, sample and sampling technique.

Unit 1: Basics of Educational Research

1.1 Research: Definitions, Meaning and Characteristics

1.2 Types of Research:

-Fundamental Research, Applied Research, Action Research;

- Quantitative Research, Qualitative Research

1.3 Educational Research: Definitions, Meaning and Characteristics

1.4 Areas of Educational Research, Steps of Educational Research Process

Unit 2: Review of Related Literature

2.1 Review of Related Literature: Meaning and Need

Sources: Primary, Secondary and Tertiary

2.2 Types of Review: Traditional or Narrative, Systematic, Meta-analysis, Meta-synthesis

2.3 Conceptual and Theoretical Framework; Operationalisation of terms used

2.4 Criteria for Selecting Research Problem

Unit 3: Objectives , Variables, and Hypotheses of Research

3.1 Research Problem and Research Questions: Characteristics, Points to be kept in mind

3.2 Objectives of Research: Points to be kept in mind and Importance

3.3 Variable: Meaning and Types- Independent, Dependent, Moderator, Controlled and Intervening & Confounding Variable

3.4 Hypothesis: Concept and Characteristics,

Types: Declarative, Directional, Non-directional, Question Form, Null and Research Hypothesis

Unit 4: Population, Sample and Sampling Technique

4.1 Universe and Population: Concept and Characteristics

4.2 Sampling: Meaning, Need and Characteristics

4.3 Types of Sampling

Probability: Random, Stratified, Systematic and Cluster

Non-Probability: Incidental, Purposive, Convenient, Quota and snowball,

Multiphase, Multistage, Double and Match Pair Sampling

4.4 Sample: Concept, Characteristics and Importance

Choice of Sampling Method and determination of sample size

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Classroom discussions on various topics related to research in education
- Panel discussion/debate/seminar presentation on various topics related to research in education

Arts

Semester-1

New Literatures

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Analyses the novel "Kim" by Rudyard Kipling through the lens of postcolonial theory, examining how the text portrays power dynamics, cultural imperialism, and the legacy of colonialism.
- Through the study of "Half of a Yellow Sun" by Chimamanda Ngozi Adichie, critically evaluates the representation of African identity and culture and explore the significance of African literary theory in understanding and interpreting the text.
- By delving into "One Hundred Years of Solitude" by Gabriel Garcia Marquez, grasps the concept of magical realism as a literary movement and its profound impact on shaping Latin American literature's themes and storytelling techniques.
- Examines "The Shadow Lines" by Amitav Ghosh through the perspective of subaltern studies, enabling them to comprehend the marginalization and voices of the subaltern within Asian literature and its socio-political implications.

Unit 1: Postcolonial Literature

- Text Component: "Kim" by Rudyard Kipling
- Theory Component: Postcolonial Theory and its relevance to the study of literature

Unit 2: African Literature

- Text Component: "Half of a Yellow Sun" by Chimamanda Ngozi Adichie
- Theory Component: African Literary Theory and the representation of African identity and culture

Unit 3: Latin American Literature

- Text Component: "One Hundred Years of Solitude" by Gabriel Garcia Marquez
- Theory Component: Magical Realism as a literary movement and its impact on Latin American literature

Unit 4: Asian Literature

- Text Component: "The Shadow Lines" by Amitav Ghosh
- Theory Component: Subaltern Studies and its relevance to the study of Asian literature

Semester-1

Translation Studies in India

Compulsory
Credit: 04
Marks:100

Learning Outcomes::

Prospective teacher educator...

- Understands the fundamental concepts and theories of translation and apply them to analyze and interpret M.K. Gandhi's "Hind Swaraj."
- Examines the role of translation in shaping Indian literature and culture by analyzing selected poems from "The Oxford Anthology of Modern Indian Poetry" translated by Arvind Krishna Mehrotra.
- Explores the impact of cultural translation on the representation of diasporic experiences through the analysis of Chitra Banerjee Divakaruni's "Mistress of Spices."
- Recognises the significance of translation as a means of preserving and promoting vernacular literature in India by studying selections from regional literature translated into English.

Unit 1: Translation: Concepts and Theories

- Text Component: "Hind Swaraj" by M.K.Gandhi
- Theory Component: Theories of Translation and their application in Indian context

Unit 2: History of Translation in India

- Text Component: Selections from "The Oxford Anthology of Modern Indian Poetry" translated by Arvind Krishna Mehrotra (selected poems)
- Theory Component: The role of translation in shaping Indian literature and culture

Unit 3: Cultural Translation

- Text Component: "Mistress of Spices" by Chitra Banerjee Divakaruni
- Theory Component: Cultural Translation and its impact on the representation of diasporic experiences

Unit 4: Translation and Vernacular Literature

- Text Component: Selections from regional literature (e.g., Gujarati, Bengali, or Hindi) translated into English
- Theory Component: Translation as a means of preserving and promoting vernacular literature in India

Semester-1

Literary and Cultural Theory

Compulsory
Credit: 04
Marks:100

Learning Outcomes::

Prospective teacher educator...

- Demonstrates the ability to apply New Criticism's principles of close reading and formal analysis to analyze the structure of poetry in "The Well Wrought Urn" by Cleanth Brooks.
- comprehends the key tenets of Structuralist Theory and employ its methods to explore underlying structures and systems in literary and cultural contexts through the text "Introduction to Structuralism."
- By studying William Wordsworth's "The Prelude" and "The Ecocriticism Reader" edited by Cheryll Glotfelty and Harold Fromm, develops an understanding of Ecocriticism and its application in analyzing literature's ecological perspectives.
- Through the exploration of "The Namesake" by Jhumpa Lahiri and an introduction to feminism in the Indian context, gains insights into feminist literary criticism and its relevance to the Indian cultural landscape.

Unit 1: New Criticism and Formalism

- Text Component: "The Well Wrought Urn: Studies in the Structure of Poetry" by Cleanth Brooks
- Theory Component: New Criticism and its focus on close reading and formal analysis of literary texts

Unit 2: Structuralism

- Text component: Introduction to Structuralism
- Theory Component: Structuralist Theory and its examination of underlying structures and systems in literature and culture

Unit 3: Ecocriticism

- Text Component: William Wordsworth "The Prelude"
- Theory Component: Introduction "The Ecocriticism Reader" edited by Cheryll Glotfelty and Harold Fromm (1996)

Unit 4: Feminism in Indian context

- Text Component: "The Namesake", by Jhumpa Lahiri
- Theory Component: Introduction to feminism in Indian context.

Science

Chemistry

Semester-1

Organic Chemistry I

Compulsory
Credit: 04
Marks:100

Learning outcomes:

Prospective teacher educator...

- Gets basic knowledge of organic reaction mechanism as well as important reactive Intermediates
- Understands the basic and vital concepts of organic chemistry
- Knows the oxidation and reduction processes
- Gets knowledge of Pericyclic reactions

Course Content:

Unit 1: Reaction intermediates

1.1 Introduction
1.2 Fundamental Reactions
1.3 Homolytic and Heterolytic fission
1.4 Electrophiles and Nucleophiles
1.5 Carbocations
1.6 Carbanions
1.7 Free radicals
1.8 Carbenes and Nitrenes
1.9 Benzynes
1.10 Ylides and Enamines

Unit 2: Oxidation

2.1 Introduction of oxidation reactions
2.2 Oxidation of hydrocarbons
2.3 Oxidation of Alcohols
2.4 Oxidation of 1,2-diols
2.5 Oxidation of aldehydes
2.6 Oxidation of ketones
2.7 Oxidation of amines
2.8 Oxidation of hydrazine
2.9 Some microbial oxidations of Progesterone, Oestrone, Diazepam, Oleic acid (only reactions)

Unit 3: Reduction

3.1 Introduction of reduction reactions
3.2 Reduction of hydrocarbons
3.3 Reduction of aldehydes
3.4 Reduction of carboxylic acids
3.5 Reduction of ester
3.6 Reduction of anhydrides
3.7 Reduction of nitriles
3.8 Reduction of epoxides
3.9 Reduction of nitro group and Nitroso group
3.10 Some microbial reduction with Baker's yeast

Unit 4: Pericyclic reactions

4.1 Introduction to pericyclic reactions
4.2 Types of Pericyclic reaction reactions
4.3 Stereochemistry, molecular orbital symmetry
4.4 Frontier Orbitals of Ethelene, 1,3- butadiene, 1,3,5-hexatriene and allyl system
4.5 F.M.O. and P.M.O. approach to cycloaddition and electrocyclic reactions
4.6 Generalization of woodword Hoffmann rule
4.7 Sigmatropic rearrangement- suprafacial & antarafacial shift of H
4.8 Stereoselectivity in sigmatropic rearrangement
4.9 Enantioselectivity in pericyclic reactions

Mode of Transaction: PPTs. Video Lectures, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Tests ,Continuous and comprehensive evaluation (CCE)/Seminar/ Assignment/Preliminary examination

Semester-1

Physical Chemistry I

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Has detailed study of Entropy, Gibbs free energy and Partial molar quantities.
- Gets basic knowledge of Maxwell Boltzmann distribution law and partition function.
- Understands Study of Chemical kinetics of molecular reactions.
- Gets knowledge of Nernst equation and applications of emf.

Course Content:

Unit 1: Thermodynamics

1.1 Introduction
1.2 Importance of thermodynamics
1.3 Enthalpy
1.4 Entropy
1.5 Gibbs free energy
1.6 Gibbs-Helmholtz equation
1.7 Gibbs Duhem equation
1.8 Third law of thermodynamics
1.9 Determination of absolute entropy using Third law of thermodynamics
1.10 Nernst Heat theorem
1.11 Partial molar volume
1.12 Partial molar quantities- Partial molar free energy

Unit 2: Statistical Thermodynamics

2.1 Introduction
2.2 Permutation
2.3 Combination
2.4 Maxwell-Boltzmann Distribution Law
2.5 Partition Function
2.6 Translational Partition Function
2.7 Rotational Partition Function
2.8 Vibrational Partition Function
2.9 Electronic Partition Function
2.10 Nuclear Partition Function
2.11 Numericals

Unit 3: Chemical Kinetics

3.1 Rate expression
3.2 Rate of chemical reactions
3.3 Order of reaction and molecularity of Reaction
3.4 Half lifetime of reaction
3.5 Arrhenius equation
3.6 Activation energy
3.7 Collision theory
3.8 The transition state theory
3.9 Salt effects-Primary salt effect and secondary salt effect
3.10 Chain reaction
3.11 Chain length
3.12 Reaction Mechanism

Unit 4: Electrochemistry

4.1 Conductance
4.2 Conductivity
4.3 Specific Conductance
4.4 Molar conductance
4.5 Electrolytes
4.6 Oxidation- Reduction reaction
4.7 Electrochemical cell
4.8 Electrode potential and electrode Reaction
4.9 Nernst equation
4.10 Applications of emf
4.11 Faraday's laws of electrolysis
4.12. Fuels cell and batteries

Mode of Transaction: PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Experiments and Hands on training on conductometer instrument
Motivate students to perform experiments on chemical kinetics to learn order of reaction

Semester-1

Inorganic Chemistry I

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- understands the periodic elements thoroughly.
- understands s-block elements and their applications efficiently.
- understands p-block elements and their applications efficiently.
- gets idea about molecular symmetry and structural properties with potential applications.

Course Content:

Unit 1: Periodic properties and bonding in chemistry

1.1 Electronegativity and electron affinity
1.2 Ionization potential and ionic radii
1.3 Effective nuclear charge
1.4 Chemical bond
1.5 Ionic bond
1.6 Covalent bond
1.7 Hydrogen bond
1.8 Shape and hybridization of molecules
1.9 Bond order
1.10 MO theory of diatomic molecule
1.11 Huckel theory for conjugated π-electron systems

Unit 2: Chemistry of s-block elements

2.1 Alkali & alkaline earth metals
2.2 Solutions in non-aqueous Media
2.3 Application of crown ethers in extraction of alkali & alkaline earth metals
2.4 Organometallic compounds of Li, Mg, Be, Ca & Na

Unit 3: Chemistry of p-block elements

3.1 Synthesis, Properties, uses & structures
3.2 Boron Hydrides
3.3 Preparation, structure & bonding and interconversion of lower & higher boranes
3.4 Metalloboranes
3.5 Carboranes
3.6 Allotropes of Carbon, C_{60} and compounds (fullerenes)
3.7 Intercalation compounds of Graphite, Carbon nanotubes, silicates, silicones, sulphur and nitrogen

Unit 4: Molecular symmetry

4.1 Introduction
4.2 Symmetry operations and symmetry elements: C_n, σ, S_n, i and E
4.3 Point groups for the molecules (excluding S_{2n} and Ih)
4.4 Multiplication tables of C_{2v}, C_{2h} and C_{3v} point groups
4.5 Application of symmetry to molecular vibrations, interpretation of IR and Raman spectra

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test

Semester-1

Laboratory Experiments in Chemistry I

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Determines type of given ternary organic mixture
- Carries out separation and identification of organic compounds
- Gets training of instruments like pH meter and Conductometer
- Performs experiments on Chemical kinetics with accuracy and required Skills

Course Content:

Paper: Organic Chemistry-I (minimum Four)

To carry out systematic qualitative analysis of ternary organic mixtures (Type: Acid, Phenol, Base ,Neutral) of following states

1. Solid + Solid + Solid (All are water insoluble)
2. Solid + Solid + Solid (At least one compound should be water soluble)
3. Solid + Liquid + Liquid
4. Liquid + Liquid + Liquid

Paper: Physical Chemistry-I (minimum Four)

pH Metry:

1. To determine Normality, Gram/Litre and Molarity of unknown acid by using 0.1N NaOH.
2. To determine Normality, Gram/Litre and Molarity of each acid present in a mixture of Strong acid and weak acid by using 0.1N NaOH.

Conductometry:

1. To determine To determine Normality, Gram/Litre and Molarity of unknown acid by using 0.1N NaOH.
2. To determine Molarity of each acid present in a Mixture of strong acid and weak acid by titrating against 0.1 M NaOH solution conductometrically.

Chemical Kinetics:

1. Chemical kinetics of a reaction between $K_2S_2O_8$ and KI in an aqueous system. (a=b)
2. Chemical kinetics of a reaction between $K_2S_2O_8$ and KI in an aqueous system. (a ≠ b)

Paper: Inorganic Chemistry-I (minimum Four)

To Carry out systematic qualitative analysis of inorganic mixtures containing six radicals as of following:

$CuSO_4$, KBr, KI, Na_2CrO_4, $CaCO_3$, $Zr(NO_3)_3$, $NaNO_3$, ZnS, Na_2SO_4, SeO_2, NaCl, K_2SO_4, $(NH_4)_2SO_4$, $(NH_4)_2MoO_4$, $BaCl_2$, $ZnCO_3$, $Al_2(SO_4)_3$, ZnS, $Ni(NO_3)_2$, KNO_2,KCl, $CdCO_3$, $CuCl_2$, K_2SO_4, $AlPO_4$, H_3BO_3, $(NH_4)_2SO_4$, $CdCl_2$, $NaNO_3$, $ZnCO_3$, $AlPO_4$, $Pb(NO_3)_2$, $NaNO_2$, $MnSO_4$, $NaHSO_3$, K_2CrO_4, $FeSO_4$, $(NH_4)_2SO_4$, Na_3AsO_3, Na_3AsO_4, $(NH_4)_2SO_4$, K_2SO_4, $CeSO_4$, As_2O_3, NH_4Cl, $NiSO_4$, $LiCO_3$, $MgCO_3$, $NaNO_2$, $Mg_3(PO_4)_2$, V_2O_5, H_3BO_3, $SrCO_3$, $Th(NO_3)_3$, Na_3AsO_3, Na_3AsO_4, $BaCO_3$ and $LiCO_3$

Mode of Transaction: Demonstration ,Chalk and Talk Method, Videos

Suggested Activities: Viva, Internal Test

Semester-1

IPR in Chemical Sciences

Theory (Submission)

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Knows the importance of IPR
- Understands meaning of patents and copyright
- Familiarizes with different patent laws
- Gets idea about Various acts for patents in India and abroad

Course Content:

Unit 1: Introduction and Basic concepts of IPR

1.1 Introduction to IPRs
1.2 Basic concepts and need for Intellectual Property
1.3 Meaning and practical aspects of Patents
1.4 Copyrights and Trademarks
1.5 Geographical Indications
1.6 IPR in India and Abroad.
1.7 Nature of Intellectual Property
1.8 Industrial Property
1.9 Technological Research
1.10 Inventions and Innovations: Important examples of IPR

Unit 2: Important acts and treaties

2.1 Patents and the patenting process
2.2 Patent cooperation treaties
2.3 International treaties and conventions on IPRs
2.4 Trade related aspects of Intellectual Property Rights Agreement
2.5 Patent Cooperation Treaty
2.6 Patent Act of India

Mode of Transaction: PPTs. Video Lectures, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Tests

Mathematics

Semester-1

Advanced Complex Analysis

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Complex Numbers, Complex Function & Analytic Function.
- Develops the skills of calculation and construction of graphs of complex function.
- Acquires the knowledge of Complex Analysis.
- Applies the knowledge of Complex Analysis for any real-world problem.

Course Content:

Unit 1: Basics of Complex Numbers

1.1 Basic - complex number, De Moivre's Theorem and its applications
1.2 Limit and continuity of a complex function
1.3 Derivative of a complex function
1.4 Analytic functions

Unit 2: Analytic Functions

2.1 Cauchy-Riemann equations
2.2 Harmonic functions
2.3 Power series, power series as an analytic function
2.4 Elementary functions

Unit 3: Complex Integration

3.1 Complex Integration – Line Integral
3.2 Cauchy's theorem, Cauchy's Integral Formula, Cauchy inequality
3.3 Liouville's theorem, Morera's theorem, Cauchy- Goursat's theorem
3.4 Gauss Mean value theorem

Unit 4: Residue Theory and Mobius Transformation

4.1 Taylor's theorem, Laurent series
4.2 Convergence of power series
4.3 Classification of singularities, Residues, residue theorem, residues at poles,
4.4 Mobius transformation – Properties and it's Canonical Form

Semester-1

Abstract Algebra

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands basics of abstract algebra, including binary operations, groups, subgroups, isomorphism and automorphisms etc.
- Understands the Sylow's Theorem and solve the problems related to it.
- Develops the skills of solving problems on Rings and Fields.
- Acquires knowledge of fundamental theorems of Abstract Algebra.

Course Content:

Unit 1: Types of Group

1.1 Introduction to Groups, Symmetries of a Square
1.2 The Dihedral Groups, Elementary Properties of Groups, Finite Groups
1.3 Subgroups, Subgroup Tests, Cyclic Groups
1.4 Classification of Subgroups of Cyclic Groups

Unit 2: Sylow groups

2.1 The Conjugacy classes, The Class Equation
2.2 Sylow theorems and their applications
2.3 Finite Simple groups, Non-Simplicity Tests
2.4 The simplicity of the group A5

Unit 3: Ring Theory

3.1 Ring, Properties of ring, Subrings, Integral domain, field
3.2 Characteristic of ring, Ideals, Factor Rings, Prime Ideals & Maximal ideals
3.3 Ring Homomorphism, Properties of Ring Homomorphism, The field of quotients
3.4 Polynomial rings, Factorization of Polynomial rings, Divisibility in integral domain

Unit 4: Field Theory

4.1 Vector spaces, subspaces, Linear Independence
4.2 The fundamental Theorem of field theory, Splitting fields, Zeros of an Irreducible polynomial
4.3 Characterization of Extensions, Finite Extensions, Properties of algebraic extension
4.4 Classification of finite fields, Structure of finite fields, Subfields of finite fields.

Semester-1

Differential Geometry

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Increases their capacity to understand geometric aspects of mathematics.
- Understands basic concepts of Differential Geometry with new ideas.
- Develops problem solving ability in the subject of Differential Geometry.
- Develops confidence level to teach the same subject.

Course Content:

Unit 1: Basics

1.1 Various curves and surfaces in the Cartesian coordinates system in R2

1.2 Various curves and surfaces in the Cartesian coordinates system in R3

1.3 Lines, planes and spheres.

1.4 Parameterizations, sum, product and derivatives of vectors.

Unit 2: Curves

2.1 Tangents, curvature.

2.2 Torsion and arc length.

2.3 Frenet - serret apparatus.

2.4 Different types of curves

Unit 3: Global Plane Curves

3.1 Line integrals

3.2 Rotation.

3.3 index convex curves and four vertex theorems (without proof)

3.4 isoperimetric inequality

Unit 4: Surfaces

4.1 Basic definitions

4.2 Tangent planes, fundamental forms (without proof).

4.3 Curvature

4.4 Geodesic.

Semester-1

Practical: Advanced Complex Analysis

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Complex Numbers, Complex Function & Analytic Function.
- Develops the skills of calculation and construction of graphs of complex function.
- Acquires the knowledge of Complex Analysis.
- Appies the knowledge of Complex Analysis for any real-world problem.

Course Content:

Unit 1: Properties & Theorem Verification (Unit 1 & 2)

1.1 Testing Various Properties of Complex Number, Modulus, Argument and Complex Conjugate, logarithmic, Conformal mapping.

1.2 Classify the various types of singularities by definition as well as using expansion of series.

1.3 Verify Various Theorems of Complex Analysis.

1.4 Examples related to Theorems.

Unit 2: Properties & Theorem Verification (Unit 3 & 4)

2.1 Testing Analyticity of Complex function & Verifying the Theorems on analytic function.

2.2 Explain various theorems on complex integration & Rouche's theorem, Open Mapping Theorem & Inverse function theorem.

2.3 Examples on Mobius Transformation.

2.4 Verifying the Theorems of Residues and complex Integration.

Semester-1

Proofs in Mathematics

Theory (Submission)

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Gets knowledge about mathematics terminology used in various literature survey in Mathematical sciences.
- Learns Mathematical proofs in research paper/article in Mathematical Sciences.
- Carries out the research work in Mathematical sciences.
- Studies the of Results and Discussion coming out from Dissertation work in Mathematical Sciences.

Course Content:

Unit 1: Mathematical Grammar & Vocabulary

1.1 Theorem, Corollary, lemma, Proposition

1.2 Axioms, postulates, hypothesis, conjecture, existence.

1.3 uniqueness, boundedness, characteristic & property – meaning & differences.

1.4 Algorithm – basic concepts, sorting & its Complexity.

Unit 2: Various Proof methods

2.1 Direct proof, indirect proof, contrapositive method.

2.2 Contradiction method, proofs by cases, mathematical induction method.

2.3 biconditional proof, vacuous proof, trivial proofs, disproof method by counter example, characterization.

2.4 Generalisation & Simplification Techniques.

Physics

Semester-1

Classical and Quantum Mechanics

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Has a foundation of the concepts of Physics through the theories of classical mechanics and the laws of Physics in the context of the micro world.
- Describes a wide variety of physical phenomena by Rigid Body dynamics and Hamilton Jacobi Theory.
- Generalizes the laws of physics in higher dimensions and apply the formalism of classical mechanics to more advanced frameworks.
- Has the essence of Scattering theory, Partial wave analysis and approximation methods.

Course Content:

Unit 1: Rigid Body Dynamics and Central Force

1.1 Degrees of freedom of a free rigid body, Frames of Reference, Kinetic Energy of a rotating rigid body

1.2 Angular momentum, Moment of Inertia Tensor, Torque and its relation to angular momentum, Euler's equation of motion of a rigid body, Rotation of a free rigid body.

1.3 Reduction of two body problem to one body problem; equation of motion and first integrals; equivalent one-dimensional problem

1.4 Motion in a central force field- General features of the motion; motion in an inverse-square law force, Differential Equation of the orbit, Classification of orbits, Kepler's laws of planetary motion

Unit 2: Hamilton Jacobi Theory

2.1 Hamilton's Jacobi theory and its application to solve central force problem.

2.2 Action–angle variables, application to simple harmonic oscillator, planetary motion, adiabatic invariants

2.3 Equilibrium and small oscillations, normal coordinates, normal modes

2.4 coupled oscillations, diatomic and triatomic molecules

Unit 3: Scattering Theory

3.1 Kinematics of the scattering process, Differential and total cross-sections, Wave mechanical picture of scattering

3.2 The scattering amplitude, Green's function, Formal expression for scattering amplitude, The Born approximation, The Born series

3.3 Asymptotic behavior of partial waves - phase shifts, scattering amplitude in terms of phase shifts, Optical theorem, Phase shifts- relation to the potential

3.4 Partial Waves Analysis, potentials of finite range, Low energy scattering, scattering by a square well potential

Unit 4: Approximation Methods for Stationary States

4.1 Perturbation Theory for Discrete levels**,** Equation in various orders of Perturbation Theory.

4.2 The Non-Degenerate case, The Degenerate case, Removal of Degeneracy

4.3 The WKB Approximation, WKB solution of one-dimensional Schrodinger equation. WKB Solution of Radial Wave Equation

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Classical and Quantum Mechanics
- Using Laboratory Work: Practical laboratory sessions are essential for understanding experimental aspects of Mechanics.
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Classical and Quantum Mechanics.
- Presentations: Students will be asked to give presentations on specific topics related to Classical and Quantum Mechanics enhancing their communication and research skills.
- Computer Simulations: The use of computer simulations or software tools can aid in visualizing and understanding certain phenomena in Classical and Quantum Mechanics.
- Access to Online Resources: Such as e-books, videos, and educational websites, can supplement the learning process.

Suggested Activities:

- Introduce students to computer simulations or software tools that simulate different quantum mechanical phenomenon.
- Organize problem-solving sessions where students can work on complex problems related to Classical and Quantum Mechanics collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of Classical and Quantum Mechanics.

Semester-1

Numerical Analysis and Computer Programming

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Be proficient in programming in the language (C/C++).
- Writes programs for solving various problems in Physics using techniques like Summing up of infinite series, solving differential equations and using numerical integration.
- Develops algorithms based on these numerical methods, which may be implemented using computer programming languages.
- Learns the useful computational techniques to find out solutions to those complicated physical problems where analytic solutions are not obtainable.

Course Content:

Unit 1: Introduction to C Language

1.1 Introduction to C Language, Execution of C Program, History, Structure of C Program, Character Set, Identifier, Variable, Keywords, Identifiers, Constants, Variables

1.2 Data Types, Operators, Expressions, Precedence and Associativity of operators, Type conversions, I/O operations

1.3 Branching, if, simple if, if-else, nesting of if-else, else if ladder, switch, conditional operator

1.4 Looping, while, do while, for, continue and break, goto

Unit 2: Arrays and Computer Strings

2.1 One dimensional arrays, declaration and initialization of arrays, two dimensional and multi-dimensional arrays

2.2 Character strings, Declaration and initialization of string variables, reading and writing of strings

2.3 Arithmetic operations on characters, concatenation, comparing, copying and finding length of strings

2.4 String handling functions, table of strings.

Unit 3: Interpolation and Numerical Integration

3.1 Polynomial interpolation by Lagrange's method, Construction of Newton-Gregory forward difference and backward difference tables.

3.2 least square curve fitting, Fitting a straight line, Fitting a parabola, Fitting an exponential curve

3.3 Numerical integration as quadrature (area under the curve), integration through Lagrange's polynomial interpolation (Trapezoidal and Simpson's rule), simple applications with composite trapezoidal and Simpson's rule, Gaussian quadrature.

Unit 4: Solution of linear and non-linear equations

4.1 Isolations of roots of simple equations, general methods for solving transcendental equations i.e., solution by bisection, Newton-Raphson method and Regula-Falsi method, propagation of errors in each of these methods.

4.2 Solution of Linear System, Gauss elimination and Gauss-Jordan elimination

4.3 Solution of differential equations: Method to solve first order linear differential equations (i.e. initial value problem) by Euler's method and its limitations with a discussion on its accuracy

4.4 Introduction to second order accurate method such as second order Runge-Kutta method and its comparison with Euler's method. 4th order Runge-Kutta Method

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures to lay the foundation of C programming language.
- Using Laboratory Work: Practical laboratory sessions for executing the programs for solving different equations
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems using the C Programming language
- Presentations: Students will be asked to give presentations on specific topics using their programming techniques, enhancing their communication and research skills.
- Access to Online Resources: Such as e-books, videos, and educational websites, can supplement the learning process.

Suggested Activities:

- Organize problem-solving sessions where students can work on complex problems using programming language collaboratively. This fosters teamwork and critical thinking.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.

Semester-1

Instrumentation and Sensors

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands basic of level, flow, temperature & pressure sensors etc.
- Knows the calibration of sensors
- Sets up testing strategies to evaluate performance characteristics of different types of sensors and transducers and
- Selects proper sensor for proposed application.
- Develops professional skills in acquiring and applying the knowledge outside the classroom through design of a real-life instrumentation system.

Course Content:

Unit 1: Fundamentals of Instrumentation and Sensors

1.1 Classification of errors, Error analysis, Static and dynamic characteristics of transducers – Performance measures of sensors

1.2 Classification of sensors – Sensor calibration techniques, Sensor Output Signal Types

1.3 Static and dynamic characteristics of measurement Systems

1.4 Qualitative difference between Transducers and sensors.

Unit 2: Displacement, Force and Torque Measurement

2.1 Liner Displacement:- Resistive Potentiometer, Capacitive Displacement Transducer

2.2 LVDT, Hall Effect Sensor and Fiber Optic Sensor

2.3 Force Measurement Methods- Strain Gauge, Load cell

2.4 Torque Measurement Methods-Inductive Torque Transducer, digital method, dynamometer

Unit 3: Temperature Sensors

3.1 Temperature sensors selection criteria and scale, Classification of Temperature Sensors

3.2 Measurements of Temperature , Electrical and Non Electrical Methods, Electrical Resistance Thermometer

3.3 Pyrometers

3.4 Thermoelectric Sensors, Thermistor, RTD, Thermocouple

Unit 4: Flow Measurement

4.1 Essential properties of Fluids, Fluid Types and Types of flow

4.2 Selection criteria of flow sensor, Mass flow meter

4.3 Head Type flow meter

4.4 Biosensors, Smart Sensors, Basics of MEMS sensors

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Instrumentation and Sensors.
- Using Laboratory Work: Practical laboratory sessions are essential for understanding experimental aspects of Instrumentation and Sensors.
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Instrumentation and Sensors.
- Presentations: Students will be asked to give presentations on specific topics related to Instrumentation and Sensors enhancing their communication and research skills.
- Computer Simulations: The use of computer simulations or software tools can aid in visualizing and understanding certain phenomena in Instrumentation and Sensors.
- Access to Online Resources: Such as e-books, videos, and educational websites, can supplement the learning process.

Suggested Activities:

- Hands-on activity helps them visualize and understand different concepts of Instrumentation and Sensors.
- Introduce students to computer simulations or software tools that simulate different concepts of Instrumentation and Sensors.
- Organize problem-solving sessions where students can work on complex problems related to Instrumentation and Sensors collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of Instrumentation and Sensors.

Semester-1

Laboratory Experiments in Physical Sciences I

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Applies the various procedures and techniques for the experiments.
- Uses different measuring devices and meters to record the data with precision.
- Applies the mathematical concepts/equations to obtain quantitative results.
- Develops basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
- Applies knowledge of mathematics, science, and engineering to the physical problems.

Suggested Experiment :

1. To Study the various logic gates: OR, AND, NOT and NAND
2. To Study the characteristics of transistor as Amplifier
3. Study analogue to digital / digital to analogue conversion.
4. Design and Study clipping and clamping circuits.
5. Measure RC time constant with square wave using CRO
6. Study the various application of op-amp 741
7. Design and study temperature sensor using Arduino
8. Characteristics of Platinum RTD
9. Perform and verify operation & principle of Thermocouple
10. Study Input / Output characteristics of LVDT

Mode of Transaction: Laboratory Experiments, e-resources, ICT and Virtual Lab

Suggested Activities: Performing the experiments and discussing the physical significance and applications, Group discussion, Presentation, Assignment work and Quiz

Semester-1

IPR in Physical Sciences

Theory (Submission)

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Knows the basics of Intellectual Property Rights.
- Knows about the patents and the procedure to file a patent.

Course Content:

Unit 1: Introduction to IPR

1.1 Introduction to IPRs, Basic concepts and need for Intellectual Property – Meaning and practical aspects of Patents

1.2 Copyrights, Geographical Indications

1.3 IPR in India and Abroad. Nature of Intellectual Property

1.4 Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

Unit 2: Patents

2.1 The IPR tool kit, Patents, the patenting process

2.2 Patent cooperation treaties: International Treaties and conventions on IPRs, Trade Related Aspects of Intel lectual Property Rights Agreement

2.3 Patent Act of India

2.4 Rights of an IPR owner, licensing agreements

Mode of Transaction: Classroom teaching using audio visual tools

Suggested Activities: Presentation, Case study

Botany

Semester-1

Anatomy of Higher Plants

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the primary and secondary anatomical structures of different plant parts
- Understands different types of plant tissue systems in angiosperms
- Gains the fundamental knowledge of secondary plant growth and wood types
- May experiences the benefits of team work which will foster their flexibility and responsiveness, especially their ability to respond to change

Course Content:

UNIT 1: INTRODUCTION TO PLANT TISSUES

1.1 Types of Plant Tissues
1.2 Meristematic Tissue: Characteristics, Classification, Theories and Functions
1.3 Simple Permanent Tissues: Parenchyma, Collenchyma, Sclerenchyma
1.4 Complex Permanent Tissues: Xylem and Phloem

UNIT 2: PLANT TISSUE SYSTEMS

2.1 Structure, Orientation and Arrangement of Epidermal Tissue System
2.2 Structure, Types and Classification of Stomata and Epidermal Out Growth
2.3 Ground Tissue System: Definition, Types and Functions
2.4 Vascular Tissue System: Definition, Types and Functions

UNIT 3: SECONDARY GROWTH

3.1 Secondary Growth in Dicots: Vascular Cambium and Cork Cambium
3.2 Secondary Growth in Dicot Stem and Dicot Root
3.3 Dicot Wood Anatomy: Annual Rings, Types of Wood, Tyloses
3.4 Anomalous Secondary Growth with Various Examples

UNIT 4: PLANT ANATOMY IN EVOLUTION

4.1 Phylogeny of Xylem and Phloem Elements
4.2 Nodal Anatomy
4.3 Types of Stele
4.4 Applications and Significance of Plant Anatomy

Mode of Transaction: Lectures; Demonstration and Microscopic Analysis in Life Science Laboratory; Educational Videos

Suggested Activities: Collection of Plant Samples Belonging to Different Families for Anatomy Experiments

Semester-1

Phyto Resources - Utilization and Management

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Provides their contribution towards sustainable utilization of phyto-resources
- Develops green-house technology and harvest technology for improve the income of society
- Develops their better understanding toward the artificial favourable environment for the plants
- Develops their better understanding toward the artificial favourable environment for the plants

Course Content:

UNIT 1: INTRODUCTION OF PHYTORESOURCES

1.1 Concept, natural resources, biological resources, plants as natural resources
1.2 Management practices - need and methods
1.3 Utilization - Bioenergy, food, fodder, fibre, medicine and essences.
1.4 Plant Resources Processed – Jam, jelly, squash, ketchup, raisin, pickle and rubber
1.5 Unprocessed – Honey, timber, wood, tannins and LaTex

UNIT 2: PLANT RESOURCES USED IN COSMETICS, AROMATICS AND PHARMACEUTICS

2.1 Introduction and scope of plants in pharmaceutics
2.2 Herbal preparations Extraction, Separation and Storage Method
2.3 Extraction methods: Oil yielding plants (Sunflower, Peppermint, Neem)
2.4 Extraction method: Dye yielding plants (Heena, Curcuma, Amla)
2.5 Extraction method: Medicinal plants (Ardusi, Satavari, Tulasi)

UNIT 3: HARVEST TECHNOLOGY

3.1 Harvest technology management for fruit
3.2 Artificial ripening
3.3 Methods of picking Post-harvest technology and management for fruits,
3.4 Flowers and medicinal plants – Grading, processing, storage and packing

UNIT 4: ORGANIC FARMING

4.1 Green manuring and organic fertilizers and Biofertilizers,
4.2 Recycling of biodegradable municipal, agricultural and Industrial wastes
4.3 Biocompost making methods, types and method of vermicomposting
4.4 Field Application

Mode of Transaction: Lectures; Demonstration and Microscopic Analysis in Life Science Laboratory; Educational Videos

Suggested Activities: Visit to a medicinal park, visit to a local fruit products industry

Semester-1

Ecology and Evolution

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Develops an appreciation of the natural world through direct experience with local ecosystems
- Learns techniques of data analysis as well as methods of presenting scientific information in figures and tables
- Learns techniques for gathering data in the field
- Develops the understanding of origin of life and evolution

Course Content:

UNIT 1: ECOSYSTEM & ECOLOGICAL FACTORS:

1.1 Concept and Types of Ecosystems
1.2 Overview of Abiotic Factors: i. Climatic ii. Edaphic
1.3 Overview of Biotic Factors: Positive Interactions a. Mutualism b. Commensalism c. Altruism
1.4 Negative Interactions a. Exploitation b. Antibiosis c. Competition

UNIT 2: SUCCESSION & POPULATION ECOLOGY

2.1 Ecological Succession: Types Hydrach & Xerach Succession, Ecesis & Mechanisms;
2.2 Changes involved in succession; Concept of Climax
2.3 Population Ecology: Characteristics of a population; Population growth curves
2.4 Population regulation; Carrying Capacity and Life History strategies (r and k selection)

UNIT 3: PROTOBIOGENESIS, ENDOSYMBIOSIS & EVOLUTION

3.1 Theories of Origin of life, Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers
3.2 Concept of Oparin and Haldane; Experiment of Miller (1953)
3.3 LUCA and Endosymbiosis
3.4 Principles of Evolution, Contribution of Lamarck, Malthus, Darwin and Alfred Russel Wallace

UNIT 4 EVOLUTION & POPULATION GENETICS

4.1 Concepts of variation, adaptation, struggle, fitness and natural selection; Contribution of Hugo de Vries, Neo Darwinism
4.2 Adaptive radiation, Divergent & Convergent evolution; Sexual selection; Co-evolution.
4.3 Population genetics – Populations, Gene pool, Gene frequency; Hardy-Weinberg Law; Genetic Drift
4.4 Isolating mechanisms; Speciation; Allopatricity and Sympatricity

Mode of Transaction: Lectures; Demonstration and Microscopic Analysis in Life Science Laboratory; Educational Videos

Suggested Activities: Understanding ecosystem and succession through videos and field trip.

Semester-1

Laboratory Experiments in Plant Sciences I

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the primary and secondary anatomical structures of different plant parts
- Gains the fundamental knowledge of secondary growth and wood types
- Develops an appreciation of the natural world through direct experience with local ecosystems
- Learns techniques of data analysis as well as methods of presenting scientific information in figures and table

Suggested Experiments

ANATOMY OF HIGHER PLANTS

1. Study of shoot apex and root apex
2. Study of simple tissues in Dicot stem T.S
3. Study of complex tissues in Dicot stem L.S
4. To study the types of vascular bundle from the available plants in campus.
5. To study primary and secondary growth in dicot stem
6. To study anomalous secondary growth due to abnormal behaviour of cambium
7. To study Periderm and Lenticel
8. To study types of nodal anatomy
9. Preparation of permanent slides
10. To study Types of Wood anatomy

ECOLOGY & EVOLUTION

1. To Study the community by Quadrats
2. To study the vegetation using Line Quadrat
3. To study the vegetation using Belt transect method
4. To study the vegetation by Chart Quadrat
5. To estimate IVI of the species using quadrat method
6. To determine present organic carbon and organic matter in the soil of crop lands, grass lands and forest
7. To estimate alkalinity ($CO3^{2-}$, $HCO3^{-}$) from soil sample 8. To estimate hardness (Ca^{2+}, Mg^{2+}) from soil sample.
8. To determine dissolved oxygen content in eutrophic and oligotrophic water samples by Azide modification of Winklers method
9. To determine water holding capacity of soil collected from different Location

PHYTO RESOURCES- UTILIZATION AND MANAGEMENT

1.Study of various food, fodder and forage crops
2.To analyse presence of starch of plants used as food, fodder and forage
3.To study morphology and microscopic structure of whole fibres
4.To study gums, resins and dyes
5.To separate curcuminoid in turmeric by TLC
6.To study various oil yielding plants
7.To perform test for presence of fixed oil/ fats and also to detect the presence of various adulterants
8.To study various Earth, leaf and fruit vegetables
9.To study various medicinal and aromatic plants
10.To detect various chemical constituents in some medicinal plants

Semester-1
IPR in Life Sciences
Theory (Submission)

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Distinguishes and Explain various forms of IPRs.
- Identifies criteria's to fit one's own intellectual work in particular form of IPRs.
- Applies statutory provisions to protect particular form of IPRs.

Course Content:

UNIT 1: INTRODUCTION TO IPR, PATENT & COPY RIGHT

1.1 Meaning of property, Origin, Nature, Meaning of Intellectual Property Rights

1.2 Kinds of Intellectual property rights—Copy Right, Patent, Trade Mark, Trade Secret and trade dress, Design, Layout Design, Geographical Indication, Plant Varieties and Traditional Knowledge, TRIPS

1.3 PATENT - Origin, Meaning of Patent, Types, Inventions which are not patentable, Registration Procedure, Surrender and Revocation of Patents, Infringement, Remedies & Penalties.

1.4 COPY RIGHT—Origin, Definition & Types of Copy Right, Registration procedure, Assignment & licence, Terms of Copy Right, Piracy, Infringement, Remedies

UNIT 2: TRADE MARK, GI TAG AND TRADITIONAL KNOWLEDGE

2.1 TRADE MARKS - Origin, Meaning & Nature of Trade Marks, Types, Registration of Trade Marks

2.2 Infringement & Remedies, Offences relating to Trade Marks, Passing Off, Penalties

2.3 GI - Geographical Indication of Goods: Types, why and how GI need protection and GI laws. Indian Gl act

2.4 Traditional Knowledge: Indigenous, medicinal, bioprospecting knowledge Examples, Need for protection, positive protection, defensive protection, legal aspects.

SEMESTER II

Semester - II

Semester-2 M.A. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
M.A.	Theory	2	120	8	60	140	200
	Practical (Submission)	1	120	4	30	70	70
	Total	5	360	20	150	350	470

Semester-2 M.Sc. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
M.Sc.	Theory	2	120	8	60	140	200
	Practical	1	60	2	15	35	50
	Practical (Submission)	1	60	2	30	70	100
	Total	6	360	20	165	385	550

Sr. No.	Subject	Title	Type	Hours	Credit	Marks Internal	Marks External	Total
1	Education	Philosophical and Sociological Foundations in Education	Theory	60	4	30	70	100
2	Education	Methods of Research in Education II	Theory	60	4	30	70	100
3	English	Shakespearean Studies	Theory	60	4	30	70	100
4	English	Comparative Mythology in Indian English Literature	Theory	60	4	30	70	100
5	English	Literary Research Methodology I (Preparing Research Proposal)	Practical (Submission)	120	4	30	70	100
6	Chemistry	Organic Chemistry-II	Theory	60	4	30	70	100
7	Chemistry	1. Analytical Chemistry / 2. Inorganic Chemistry-II	Theory	60	4	30	70	100
8	Chemistry	LaboratoryExperiments in Chemistry-II	Practical	60	2	15	35	50
9	Chemistry	Dissertation in Chemical Sciences I	Practical (Submission)	60	2	30	70	100

10	Mathemetics	Combinatorics and Graph Theory	Theory	60	4	30	70	100
11	Mathemetics	1. Advanced Linear Algebra /2. Functional Analysis	Theory	60	4	30	70	100
12	Mathemetics	Practical: Combinatorics and Graph Theory	Practical	60	2	15	35	50
13	Mathemetics	Dissertation in Mathematics: Preliminary	Practical (Submission)	60	2	30	70	100
14	Physics	Solid State Physics-II	Theory	60	4	30	70	100
15	Physics	1. Laser and Non-Linear Optics / 2. Condensed Matter Physics	Theory	60	4	30	70	100
16	Physics	Laboratory Experiments in Physical Sciences -II	Practical	60	2	15	35	50
17	Physics	Dissertation in Physical Sciences I	Practical (Submission)	60	2	30	70	100
18	Botany	Plant Taxonomy	Theory	60	4	30	70	100
19	Botany	1. Fundamentals of Microbiology / 2. Ethnobotany & Medicinal Plants	Theory	60	4	30	70	100
20	Botany	Laboratory Experiments in Plant Sciences-II	Practical	60	2	15	35	50
21	Botany	Dissertation in Plant Sciences I	Practical (Submission)	60	2	30	70	100

Education

Semester-2

Philosophical and Sociological Foundations of Education

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends the concepts of philosophy, philosophy of education and its branches.
- Critically analyses and appreciates the schools of philosophy and educational thought of thinkers.
- Examines and reflects on the sociological and sociocultural context of education.
- Critically evaluates and reflects on relation between society and education

Unit 1: Introduction to Philosophy of Education

1.1 Definitions, Concept and Nature of Philosophy from Bhartiya and Western Perspectives

1.2 Branches of Philosophy; Metaphysics, Epistemology and Axiology; their Educational Implications, Inter-Relation between Philosophy and Education

1.3 Concept, Nature Scope and Functions of Philosophy of Education

1.4 Axiological Perspectives of Indian Constitution- Socialism, Secularism, justice, liberty, democracy, equality, freedom

Unit-2: Schools of Philosophy and Educational Thinkers

2.1 Indian Schools of Philosophy - Darshan, Vedanta, Samkhya, and Buddhism with special reference to concept of knowledge, reality, values and educational implications.

2.2 Western Schools of Philosophy - Existentialism, Post-modernism, and their educational implications

2.3 Contribution of Indian Philosophers: Rabindranath Tagore, J. Krishnamurthy, Shri. Aurobindo

2.4 Contribution of Western Philosophers: Rousseau, Plato and John Dewey

Unit-3: Sociological and Socio-cultural Context of Education

3.1 Meaning of sociology, education and sociology of education,
Nature and Branches of Sociology, Inter-Relationship between Education & Sociology

3.2 Culture: Meaning, Nature, Cultural change and Cultural Lag - relation with education

3.3 Social Change: Meaning, Nature, Pattern and Factors; Interrelationship with Education

3.4 Politics, Education and Society: Political influence on education, educational influence on politics, relation between politics education and society.

Unit 4: Society and Education

4.1 Concept and types of social Institutions and their functions: family, school and society

4.2 Concept of Social Movements and social stratification,
Role of Savitribai Phule, M. S. Ghurye and Dayanand Saraswati in Social movements

4.3 Theories of Social Movements: Relative Deprivation, Resource Mobilization, Political Process Theory and New Social Movement Theory

4.4 Approaches to Sociology of Education: Symbolic Interaction and Conflict Theory

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Debate and discussions on philosophical or sociological issue in education.
- Case study analysis using philosophical and sociological theories.
- Field visit to educational institution that embraces a particular philosophy .
- Documentary and Film analysis to study and discuss implications for education.
- Research to investigate the impact of a particular philosophical or sociological foundation in education using interviews, surveys, or literature reviews.

Semester-2

Method of Research in Education II

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands characteristics of tools of research and their types.
- Understands methods of research in education.
- Develops abilities of data handling.
- Develops skill for writing a research report.

Unit 1: Tools And Techniques Of Research

1.1 Tools of Research: Concept and Overview of Types of tools of research
Construction and Standardization of Tool: Steps, Reliability, Validity and Norms

1.2 Interview: Meaning, Advantages, Limitation and Types
Rating Scale: Concept and Types – Likert, Thurston & Q-Sort
Check-List: Points to be kept in Mind while Constructing Check-list

1.3 Questionnaire, Schedule and Inventory: Meaning and Steps of Construction

1.4 Observation: Meaning, Types, Advantages and limitations

Unit 2: Methods Of Research

2.1 Historical Research: Meaning, Purposes, Sources and Steps

2.2 Descriptive Research: Meaning and characteristics
Survey: Meaning and Types
Interrelationship studies: Co-relational Research and Casual Comparative Research, Case Study
Developmental studies: Longitudinal: Cross sectional studies.

2.3 Experimental Research: Meaning; Characteristics -control, manipulation, observation, replication Experimental Designs: Pre, true and quasi experimental designs Validity of experimentation: Internal and External Validity, Factors affecting validity

2.4 Qualitative Research: Meaning and Purpose
Ethnographical, Phenomenological and Grounded Theory Research: Concept

Unit 3: Data Handling

3.1 Scales of Measurement: Meaning; Types –nominal, ordinal, interval, ratio,

3.2 Meaning of treatment of data, editing coding classification tabulation

3.3 Descriptive Statistics: Concept and types- Measures of central tendency, Variability and graphical presentations

3.4 Inferential Statistics: Parametric and Non-Parametric Test: Introduction and Conditions (No Computations),
Level of Significance: Concept, Type – 1 Error, Type – 2 Error, One-tailed and two-tailed test, Computation of t-test (independent sample), chi-square & Pearson Correlation-r

Unit 4: Writing Research Report

4.1 Research Report: meaning and types (thesis, dissertation, journal article, paper)
Parts of Research: Preliminary, content and supplementary

4.2 Format, style, typing, quotations, footnotes, Referencing (APA Latest Edition), pagination, tables, figures, graphs, plates

4.3 Criteria for evaluating research report

4.4 Ethics and Plagiarism in research

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Classroom discussions on various topics related to research in education

Arts

Semester-2

Shakespearean Studies

Compulsory
Credit: 04
Marks:100

Learning Outcomes::

Prospective teacher educator...

- Gains an understanding of Shakespeare's life and historical context, enabling them to appreciate the influences that shaped his work.
- Conducts an in-depth analysis of selected tragedies and historical plays, developing a profound insight into Shakespeare's portrayal of complex characters and themes.
- Explores the comedic elements and romantic themes in Shakespeare's plays, deepening their comprehension of the interplay between love, marriage, and gender roles.
- Analyses Shakespeare's sonnets, allowing them to recognize the exquisite poetic techniques and explore themes of love, beauty, time, and mortality within the sonnets.

Unit 1: Introduction to Shakespeare and His Times

- Overview of Shakespeare's life and historical context
- Exploration of Elizabethan and Jacobean theatre
- Analysis of early modern English language and rhetoric
- Introduction to Shakespeare's major works and genres
- Key themes and motifs in Shakespeare's plays

Unit 2: Tragedies and Histories

- In-depth study of selected tragedies (e.g., Hamlet, Othello, King Lear)
- Analysis of historical plays (e.g., Richard II, Henry IV, Part 1)
- Examination of tragic themes, characters, and tragic flaws
- Comparison of historical accuracy and Shakespeare's portrayal of historical figures
- The role of fate, justice, and morality in Shakespearean tragedies

Unit 3: Comedies and Romances

- Detailed analysis of selected comedies (e.g., A Midsummer Night's Dream, Much Ado About Nothing, Twelfth Night)
- Exploration of romantic elements in Shakespeare's plays
- Examination of comedic devices, wordplay, and mistaken identities
- Themes of love, marriage, and gender roles in Shakespearean comedies
- Study of tragicomedy and late romances (e.g., The Tempest, The Winter's Tale)

Unit 4: Sonnets and Poetic Themes

- Analysis of Shakespeare's sonnets and their structure
- Exploration of themes of love, beauty, time, and mortality in the sonnets
- Comparison of Shakespeare's sonnet form with other poetic traditions
- Study of poetic techniques and imagery in Shakespeare's sonnets
- Connection between Shakespeare's sonnets and his plays

Semester-2

Comparative Mythology in Indian English Literature

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the various definitions, theories, and approaches to mythology in different cultures.
- Identifies and interpret myth and symbolism in the poetry of Tagore, Aurobindo, and R. Parthasarathy.
- Identifies and analyze mythic motifs in novels, specifically Raja Rao's Kanthapura and Mulk Raj Anand's The Private Life of an Indian Prince.
- Explores the relationship between myths, cultural memory, and poetic expression.

Unit 1: Foundations of Comparative Mythology

- Introduction to Mythology: Definitions, theories, and approaches
- Comparative Mythology: The study of common myths across cultures
- Indian Mythological Traditions: Major deities, epics (Ramayana and Mahabharata), and puranas
- Exploring mythological archetypes in Indian literature
- Influence of indigenous beliefs and rituals on Indian English literature

Unit 2: Mythical Motifs in Indian English Poetry

- Myth and Symbolism in Indian English Poetry: Tagore, Aurobindo, and R. Parthasarathy
- The Mythic and Mystical Elements in the poetry of Kamala Das and R. Parthasarathy
- Folklore and Mythical Imagery in the works of Nissim Ezekiel and Keki N. Daruwalla
- Myths and Cultural Memory in the poetry of Arun Kolatkar and Agha Shahid Ali
- Mythological retellings and reinterpretations in contemporary Indian English poetry

Unit 3: Mythical Narratives in Indian English Fiction

- Mythic Motifs in Novels: Raja Rao's Kanthapura and Mulk Raj Anand's The Private Life of an Indian Prince
- Myths and Folktales in Salman Rushdie's Midnight's Children
- The Mahabharata Reimagined: Shashi Tharoor's The Great Indian Novel
- Myth and Modernity in Arundhati Roy's The God of Small Things
- Mythological elements in the works of Amitav Ghosh and Kiran Nagarkar

Unit 4: Mythical Dimensions in Indian English Drama

- Myth and Ritual in Girish Karnad's Plays: Hayavadana and Tughlaq
- Mythological Themes in Vijay Tendulkar's Ghashiram Kotwal
- Contemporary Mythmaking in Mahesh Dattani's Dance Like a Man
- The Mythic and the Political in Nissim Ezekiel's The Song of Deprivation
- Mythological Archetypes in Indian English Theatre: A comparative analysis

Semester-2

Literary Research Methodology-I

Practical (Submission)

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends the step-by-step research process used in literary studies.
- Learns to choose suitable research methods for investigating literary topics.
- Creates well-structured research proposals with clear sections and organization.
- Skillfully develops literature reviews that synthesize and analyze relevant scholarly works.

Unit 1: Introduction to Literary Research Methodology

- Understanding the research process in literature
- Formulating research questions and objectives
- Selecting appropriate research methods
- Reviewing relevant literature and identifying gaps

Unit 2: Writing the Research Proposal

- Structuring the research proposal
- Justifying the research significance and contribution
- Developing a literature review
- Outlining the research methodology and timeline

Note: At the end of the semester, students will require to prepare and submit a research proposal under the guidance of respective faculty.

Science

Chemistry

Semester-2

Organic Chemistry II

Compulsory
Credit: 04
Marks:100

Learning outcomes:
Prospective teacher educator...

- Knows various concepts Stereochemistry
- Understands the role of reagents in the organic synthesis
- Gets knowledge of synthesis and mechanism of organic compounds
- Knows different aspects of Photochemistry

Course Content:

Unit 1: Name Reactions

1.1 Pechmann reaction
1.2 Stork enamine reaction
1.3 Robinson ring annulation
1.4 Wittig reaction and its modifications
1.5 Peterson olefination
1.6 Shapiro reaction
1.7 Michael addition
1.8 Suzuki reaction
1.9 Vilsmeier-Haack reaction
1.10 Fisher Indole synthesis
1.11 Ulmann Reaction

Unit 2: Reagents in organic synthesis

2.1 Pyridinium dichromate(PDC) and PCC
2.2 NBS, HIO_4, $Pb(OAc)_4$, $NaBH_4$, $LIAlH_4$
2.3 1,3-Dicyclohexylcarbodiimide (DCC), Lithium diisopropylamide (LDA)
2.4 Baker's yeast
2.5 umpolung reagent

Unit 3: Stereochemistry

3.1 Concept of Chirality
3.2 Chirality and Symmetry
3.3 Elements of Chirality including Chiral centre, Chiral axis, Chiral plane and Helicity
3.4 CIP Nomenclature
3.5 Molecules with more than one Chiral centre
3.6 Total number of Stereoisomer in such molecules
3.7 Enantiomeric and Diastereomeric Relationship
3.8 Chirogenicity and Stereogenicity
3.9 Pseudochirality, Topicity and Prostereoisomerism
3.10 Determination of Topic relationship between Homomorphic ligands in Intact
3.11 Sawhorse, Newman and Fischer Projections
3.12 Interconversion of Projections
3.13 Optical Purity

Unit 4: Photochemistry

4.1 Introduction
4.2 Basic law of photochemistry, Grothus-Draper Law
4.3 Beer Lambert Law
4.4 Basis of Photochemistry, electronic excitation, excited states
4.5 Jablonskii diagram
4.6 Fluorescence
4.7 Phosphorescence
4.8 Di-π methane rearrangement
4.9 Difference between photochemical and thermal reactions
4.10 Photochemical Reactions of some carbonyl compounds and olefins
4.11 Photochemical cycloaddition reactions

Mode of Transaction: PPTs. Video Lectures, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Tests

Semester-2

Analytical Chemistry

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Gets idea about basic concepts of Analytical Chemistry.
- Understands Separation techniques.
- Gets understanding of Chromatographic techniques.
- Gets knowledge about Thermal analytical methods.
- Understands Centrifuge technique and Data analysis of the results.

Course Content:

Unit 1: Separation techniques

1.1 Solvent extraction
1.2 Principle of liquid – liquid extraction
1.3 Parameter affecting the extraction process
1.4 Aqueous two-phase extraction
1.5 Principle involving two phase aqueous
1.6 Super fluid extraction
1.7 Reversed micelle extraction method
1.8 Ion-exchange separation
1.9 Membrane separation method
1.10 Lyophilization

Unit 2: Chromatographic Techniques

2.1 Introduction to chromatographic technique
2.2 Classification of chromatographic methods
2.3 Application of chromatography
2.4 Definition of retention time, retention volume, relative retention, retention factor and resolution
2.5 Column chromatography
2.6 Principle of column chromatography
2.7 Thin-layer chromatography
2.8 Adsorption chromatography
2.9 Liquid chromatography
2.10 Gas chromatography
2.11 High performance liquid chromatography
2.12 Ion–exchange chromatography

Unit 3: Thermal analytical methods

3.1 Introduction
3.2 Thermal methods of analysis
3.3 Thermogravimetry
3.4 Differential Thermal Analysis and Differential Scanning Calorimetry
3.5 Instrumentation Methodology of TG, DTA and DSC
3.6 Determination of Glass transition, Heat capacity determination

Unit 4: Centrifuge technique and Data analysis

4.1 Introduction
4.2 Centrifuge force
4.3 Principle of Centrifuge
4.4 Introduction of various centrifuge techniques such as differential centrifuge, density gradient, ultracentrifuge
4.5 Mean and standard deviation
4.6 Absolute and relative errors
4.7 Linear regression, covariance and correlation coefficient

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: To visit central instrumental facility for understanding of working principles of chromatographic and thermal analysis techniques

Semester-2

Inorganic Chemistry II

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Develops knowledge for Transition metal chemistry and their role in biological sciences.
- Explains Coordination chemistry
- Knows Theoretical significance of thermodynamic stability
- Gets Introduction and applications of Organometallic Chemistry in inorganic synthetic methodology.

Course Content:

Unit 1: Transition metal chemistry

1.1 Introduction to transition elements
1.2 Physical and Chemical properties of transition metals
1.3 Chemistry of first, second and third transition elements
1.4 Lanthanide and Actinide elements
1.5 Lanthanide and Actinide contractions
1.6 Role of transition metal ions in biological processes

Unit 2: Coordination Chemistry

2.1 Introduction to type of ligands
2.2 Thermodynamic stability of coordination compounds
2.3 Werner theory
2.4 Isomerism in coordination compounds
2.5 Bonding in coordination compounds including VBT, CFT, CFSE
2.6 Factor affecting CFSE, MOT, Electronic spectra of complexes
2.7 Tanabe-Sugano diagrams
2.8 Magnetic properties of complexes

Unit 3: Organometallic Chemistry

3.1 Rules of valance electron (16 and 18)
3.2 Counting electrons in simple metal carbonyl complexes
3.3 Polynuclear carbonyl complexes
3.4 Nitrosyl complexes
3.5 Metal Alkyl
3.6 Carbenes and Carbide alkyl complexes
3.7 Organometallic compound of main group elements

Unit 4: Quantum Chemistry

4.1 Setting up of operators for different observables
4.2 Hermitian operator
4.3 Particle in a one, two ands three-dimensional boxes
4.4 The rigid Rotator
4.5 The Schrodinger equation in spherical polar coordinates for hydrogen atom

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test

Semester-2

Laboratory Experiments in Chemistry II

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Synthesises organic compounds and Inorganic complexes
- Finds out percentage yield of synthesized materials
- Identifies the structural reaction mechanism of organic compounds.
- Learns chemical preparation of inorganic compound.
- Separates different organic mixtures through chromatographic techniques

Course Content
Paper: Organic Chemistry-II (minimum Four)
To carry out organic preparation of followings:

1. Preparation of m-dinitrobenzene from nitrobenzene
2. Preparation of p-nitro acetanilide from acetanilide
3. Preparation of 1-nitro naphthalene from naphthalene
4. Preparation of phthalimide from phthalic anhydride
5. Hydrolysis of methyl meta-dinitro benzoate
6. Preparation of m-nitroaniline from m-dinitrobenzene
7. Preparation of benzil from benzoin
8. Preparation of diazoaminobenzene from benzene diazonium chloride
9. Preparation of m-dinitrobenzene from nitrobenzene

Paper: Analytical chemistry (minimum Four)
Separation of organic mixtures through chromatographic techniques

1. Separation of amino acids by thin layer chromatography.
2. Separation of carbohydrates by thin layer chromatography.
3. Separation of organic acids by thin layer chromatography.
4. Separation of amino acids by paper chromatography.
5. Separation of carbohydrates by paper chromatography.
6. Separation of organic acids by paper chromatography.
7. Liquid-liquid extraction of miscible liquids.
8. Separation of amino acids by Column chromatography.

Paper: Inorganic Chemistry-II (minimum Four)
To carry out preparation of followings Inorganic complexes:

1. Cis/trans potassium di-aquo di-oxalato chromate (III)
2. Chloro penta-ammino cobalt (III) chloride
3. Nitrito penta-amino cobalt (III) Chloride
4. Tris, 2-4 pentanedionato cobalt (III)trihydrate
5. Potassium tri-oxalato aluminate
6. Reinecke's salt
7. Tetrammine cupric sulphate $[Cu(NH_3)_4]SO_4 \cdot H_2O$.
8. Tri (thiourea) cuprous sulphate $[Cu\ (NH_2CSNH_2)_3]_2\ SO_4\ 2H_2O]$.
9. Tri (thiourea) cuprous chloride $[Cu\ (NH_2CSNH_2)_3]\ Cl$
10. Hexa ammine nickel(II) chloride $[Ni\ (NH_3)_6]\ Cl_2$

Mode of Transaction: Demonstration ,Chalk and Talk Method, Videos,crystallization

Suggested Activities/ Internal Assessment: Viva, Internal Test

Semester-2

Dissertation in Chemical Sciences I

Practical (Submission)

Compulsory
Credit: 02
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Gets knowledge about literature survey in chemical sciences.
- Gets understanding of how to write research paper in chemical sciences.
- Carries out the research work in chemical sciences.
- Learns synthesis, purification, characterisation, application of organic compounds.
- Studies of Results and Discussion coming out from Dissertation work in Chemical Sciences.
- Makes summary and conclusion along with references.

Course Content:

- Dissertation work in Chemical Sciences
- Students will prepare a report/synopsis/thesis of dissertation work on the topic of their study comprising of
- An introduction on the topic along with literature survey and justification for the selection of the topic.
- Materials and Methods
- Methodology and Characterization
- Results and discussion
- Summary and conclusion along with the references.
- Each student has to give a midterm presentation of his or her work.

Mode of Transaction: Demonstration ,Chalk and Talk Method,Videos

Suggested Activities: Viva, Internal Test

Mathematics

Semester-2

Combinatorics and Graph Theory

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of Combinatorics and Graph Theory.
- Develops the skills of calculation, Construction & Identifying various graphs, digraphs & its operations.
- Acquires the Knowledge of Combinatorics and Graph Theory
- Applies the knowledge of Combinatorics and Graph Theory for any real-time problem.

Course Content:

Unit 1: Basics of Combinations

1.1 Permutations and Combinations
1.2 Basic Counting techniques
1.3 The pigeonhole principle
1.4 The Inclusion-Exclusion Principle and Applications.

Unit 2: Generating Functions

2.1 Generating Functions
2.2 Recurrence Relations
2.3 Binomial & Multinomial Coefficients
2.4 Polya's Theory of Counting, Guass-Jacobi identity.

Unit 3: Fundamental Graph Theory

3.1 Definitions and examples, Subgraphs, walks, paths and cycles.
3.2 Connectedness, Matrix representation of graphs, Operations on graphs.
3.3 Connectedness Trees and connectivity: Definition and simple properties, Bridge, spanning trees, Caley's theorem.
3.4 Graph colouring- Chromatic Number, Various Graph Parameters.

Unit 4: Directed Graph

4.1 Directed Graph- Definition, Examples, Orientation, tournament, Eulerian digraph.
4.2 Elementary theorems on Directed graph.
4.3 Orientation, tournament, Eulerian digraph.
4.4 Network Flow- Definition, Maximal flow, Problems on Network Flow.

Semester-2

Advanced Linear Algebra

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands important concepts of vector spaces and the concept of Diagonalization.
- Understands the concept of Canonical Forms, Quadratic Form and Linear Transformation.
- Develops the skills of Calculation & obtaining various Canonical Forms, Quadratic Form, Rank and Nulllity of Matrices.
- Acquires Knowledge of Advanced Linear Algebra.

Course Content:

Unit 1: Basics of Linear Algebra

1.1 Vector spaces-subspaces, bases and dimensions.
1.2 Matrix Theory - Rank & Inverse of a Matrix. Basic Concepts-Eigen Value & Eigen Vector of a Square Matrix.
1.3 Characteristic equation of square matrix, Cayley-Hamilton Theorem.
1.4 Relation between matrix and Eigen Values.

Unit 2: Canonical Forms of a Matrix

2.1 Canonical Forms of a Matrix: Basic Concepts- Minimum Polynomial of a Matrix, Block Matrix & Properties.
2.2 Nilpotent Canonical Form (NCF) of a Matrix.
2.3 Jordan Canonical Form (JCF) of a Matrix.
2.4 Rational Canonical Form (RCF) of a Matrix.

Unit 3: Linear Transformation

3.1 Matrix associated with a Linear Map, Linear Map associated with a Matrix.
3.2 Linear operations in $\mu_{m,n}$, Introduction of L (U, V).
3.3 Isomorphism between L (U, V) and $\mu_{m,n}$, Dimension Theorems for $\mu_{m,n}$ and L(U, V)
3.4 Rank – Nullity of Matrices and verification of the Rank-Nullity Theorem for Matrices.

Unit 4: Quadratic Forms

4.1 Bilinear forms and its properties.
4.2 Quadratic forms and its properties.
4.3 Conic Sections for various shapes.
4.4 Reduction of conic equation into standard forms.

Semester-2

Functional Analysis

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the theory of linear space, Banach space.
- Develops the skills of proving various results of the theory.
- Acquires Knowledge of normed linear space, Banach space Hilbert space.
- Applies the knowledge of this theory to various theorems.

Course Content:

Unit 1: Linear Spaces

1.1 Review of linear spaces, quotient linear spaces
1.2 Direct sums of linear subspaces, basis of a linear space - existence using Zorn's lemma
1.3 Linear transformations from a linear space to another
1.4 Projections on a linear space

Unit 2: Normed Linear Spaces

2.1 Normed linear spaces, Banach spaces
2.2 Quotient of a normed linear space by a closed linear subspace
2.3 Continuous linear transformations from a normed linear space to a normed linear space
2.4 Finite dimensional normed linear spaces

Unit 3: Conjugate Spaces

3.1 Conjugate space of a normed linear space, Hahn-Banach theorem with consequences
3.2 The natural imbedding of a normed linear space in its second conjugate space
3.3 Reflexive spaces, open mapping theorem
3.4 Projections on a Banach space, closed graph theorem

Unit 4: Hilbert Spaces

4.1 The uniform boundedness theorem
4.2 Conjugate of an operator on a Banach space
4.3 Hilbert spaces, orthogonal complements
4.4 Complete orthonormal sets in a Hilbert space

Semester-2

Practical: Combinatorics and Graph Theory

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of Combinatorics and Graph Theory.
- Develops the skills of calculation, Construction & Identifying various graphs, digraphs & its operations.
- Acquires the Knowledge of Combinatorics and Graph Theory
- Applies the knowledge of Combinatorics and Graph Theory for any real-time problem.

Course Content:

Unit 1: Mathematical Grammar & Vocabulary

1.1 Applications of Permutations
1.2 Applications of combinations & pigeonhole principle
1.3 Applications of polya's theory, Gauss-Jacobi identity
1.4 Problems on Generating Functions.

Unit 2: Various Proof methods

2.1 Testing Various Properties of different graph structure.
2.2 Verifying the various theorems on graphs and diagraphs.
2.3 Find various graph parameters and graph operations.
2.4 Algorithms: Fusion, Felurry, Prim, Krusal, Breadth First Search, back Tracking. Dijkstra's shortest path algorithm for Weighted graph.

Semester-2

Dissertation in Mathematics: Preliminary

Practical (Submission)

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the particular topic from its basics.
- Acquires the knowledge of the all the subjects studied in the same semester.
- Develops ideas and reading skills for research.
- Studies applications of the same.

Course Content:

Unit 1: Primary Investigation

1.1 Students are expected to collect all references – books, research papers, etc.
1.2 find all the primary results / properties / characteristics of the content of the selected topic.
1.3 Find all examples of counterexamples of the topics. Review the concerned research papers.
1.4 Find the historical background of the topics. Prepare the progress report of primary investigation.

Unit 2: Synopsis

2.1 Students must submit a report/synopsis/thesis of dissertation work on the topic of their study comprising
2.2 An introduction on the topic along with literature survey and justification for the Selection of the topic
2.3 Methodology, Results, Summary and conclusion along with the references.
2.4 Each student has to give a presentation of his or her work

Physics

Semester-2

Solid State Physics II

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Has knowledge of conceptual solid-state physics.
- Learns the concepts of condensed matter in depth with topics from both theoretical and experimental areas.
- Understands the phenomena of new state of materials i.e. superconductivity and its properties in details.

Course Content:

Unit 1: Crystal Structure and Defects in Solids

1.1 Crystalline State, Basic Definitions, Bravais and Non-Bravais Lattices,
1.2 Elements of Symmetry, Crystal Planes and Miller Indices, Examples of Simple Crystal Structures
1.3 Principals of X-Ray, Neutron and Electron Diffraction in Crystalline Solids, Braggs Law, Concept of Reciprocal Lattice, Experimental Techniques of X-Ray Diffraction
1.4 Types of Defects - Point Defects, Line Defects, Plane Defects, Grain Boundaries, Stacking Faults, Diffusion in Solids

Unit 2: Band Theory of Solids

2.1 Electron in Periodic Potential, Bloch Theorem, Kronig-Penney Model
2.2 Effective Mass, Tight Binding Approximation, Brillouin Zones
2.3 Cellular and Pseudo Potential Methods, Fermi Surfaces, De Hass Van Alfon Effect
2.4 Cyclotron Resonance, Classification of Solids, Limit of Band Theory – Metal Insulator Transition

Unit 3: Superconductivity

3.1 Definition, Types of Superconductors, Properties
3.2 Meissner Effect, Isotope Effect, BCS Theory – Qualitative Approach
3.3 Outcomes of BCS Theory, Josephson Effects
3.4 SQUID, Applications of Superconductivity

Unit 4: Magnetism

4.1 Quantum Theory of Diamagnetism and Paramagnetism, Diamagnetic and Paramagnetic Susceptibilities of free electrons,
4.2 Weiss Theory, Temperature Dependence of Saturation Magnetization (MS),
4.3 Heisenberg`s Exchange Model, Slater's Criterion, Concept of Magnons, Ferromagnetic Domains,
4.4 Origin of Domains, Antiferromagnetism and Ferrimagnetism, Ferrites

Mode of Transaction: To Create a comprehensive and effective learning experience for students pursuing Solid State Physics paper. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities: Topic related live demonstration in the classroom, ICT based Teaching – learning, Experiment work in Physics Lab, Outreach program

Semester-2

Laser and Non-linear Optics

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Be conversant with basic operation of lasers and compare the function and properties of a number of common lasers.
- Understands the basics of different non-linear phenomena.
- Acquires the knowledge of the optical fibres and the use of optical fibres in communication systems
- Understands different applications of lasers.

Course Content:

Unit 1: Basics of laser

1.1 Characteristics of laser light, absorption, Spontaneous emission, Stimulated emission, Metastable states, Pumping mechanisms

1.2 Theory of Laser Action, Einstein coefficients, Population inversion and light amplification

1.3 Essential components of the laser, Types of Lasers, Construction and working of Ruby and He-Ne laser with energy level diagram

1.4 Operation of Semiconductor Laser and Nd:YAG laser

Unit 2: Operation and applications of laser

2.1 Resonators – Modes of a resonant cavity: longitudinal & transverse laser modes; stability condition;

2.2 Properties of Gaussian beams; single and multimode oscillations; Q switching; mode locking

2.3 Basic principle of Holography, Difference between a photograph and a Hologram, Formation of a hologram, Reconstruction of the hologram

2.4 Introduction of Optical fibres, Total Internal Reflection, Principle of light propagation through a fibre, The numerical aperture, Attenuation in optical fibre and attenuation limit; Single mode and multimode fibres, Fibre optic sensors
Industrial and medical applications of laser.

Unit 3: Non-linear Optical Phenomena

3.1 Linear Optics In Homogeneous, Isotropic Media, Wave Propagation In Linear, Homogenous Isotropic Media

3.2 Optical Wave In Anisotropic Media, Optical Response of a Harmonic Oscillator

3.3 Nonlinear Susceptibility Tensors, Nonlinear Wave Propagation, second harmonic generation, Three wave mixing

3.4 Phase matching, parametric oscillation, intensity dependent refractive index, phase conjugation

Unit 4: Applications of non-linear optical phenomena

4.1 General Theory Of Four-Wave-Mixing, Nonlinear Refraction And Absorption, Self-Focusing, ,

4.2 Saturation of Absorption, Two-Photon Absorption And Doppler Free Spectroscopy,

4.3 Kerr Lens: An Application of Self Focusing, Optical Phase Conjugation And Degenerate Four-Wave-Mixing

4.4 Optical Pulse Propagation In Nonlinear Medium, Solitons In Optical Fibers

Mode of Transaction:

- To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used
- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Laser and Non-linear Optics
- Using Laboratory Work: Practical laboratory sessions are essential for understanding experimental aspects of Laser and Non-linear Optics.
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Laser and Non-linear Optics.
- Presentations: Students will be asked to give presentations on specific topics related to Laser and Non-linear Optics enhancing their communication and research skills.
- Computer Simulations: The use of computer simulations or software tools can aid in visualizing and understanding certain phenomena in Laser and Non-linear Optics.
- Access to Online Resources: Such as e-books, videos, and educational websites, can supplement the learning process.

Suggested Activities:

Hands-on activity helps them visualize and understand different concepts of laser and non-linear optics.

- Introduce students to computer simulations or software tools that simulate the working of a laser
- Organize problem-solving sessions where students can work on complex problems related to laser and non-linear optics collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of laser and non-linear optics.

Semester-2

Condensed Matter Physics

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands Mossbauer Effect thoroughly.
- Has a solid understanding of the properties and behavior of materials in condensed phases, such as solids and liquids.
- Gains knowledge of different types of phase transitions, such as solid-to-liquid and magnetic phase transitions
- Knows the types of liquid crystals and applications.

Course Content:

Unit 1: Mossbauer effect

1.1 Introduction, Resonant absorption, Recoil energy, Natural broadening, Doppler broadening, Cross-section of resonance processes

1.2 Approach in attempt to observe resonance fluorescence, Mechanism of Mossbauer effect, The experiment of Mossbauer effect, Mossbauer effect as a variable experimental tool

1.3 Debye-Waller factor and its temperature dependence

1.4 General importance of Mossbauer effect, Mossbauer effect and lattice dynamics, Quadruple coupling, Moss bauer effect and magnetism, Isomer shift, Applications of Mossbauer effect

Unit 2: **Optical properties**

2.1 The Complex dielectric function and the complex optical conductivity Propagation of light in conducting media, Drude model,

2.2 Drude Theory–Free Carrier Contribution to the Optical Properties

2.3 Absorption processes, Impurities and excitons and exciton absorption, free carrier absorption, absorption processes involving impurities.

2.4 Photoconductivity –response time and gain factor, p-n junction photovoltaic cells, characteristics and applications

Unit 3: Magnetic properties of solids

3.1 Diamagnetism, Paramagnetism of atoms with permanent magnetic moment

3.2 Magnetic resonance, paramagnetic resonance, resonance with relaxation.

3.3 Nuclear magnetic resonance, line width, hyperfine splitting, Knight Shift, nuclear quadruple resonance

3.4 Ferromagnetic resonance, anti-ferromagnetic resonance, spin wave resonance, electron paramagnetic resonance.

Unit 4: Liquid Crystals

4.1 Ordered phases of matter: translational and orientational order, kinds of liquid crystalline order. Quasi crystals.

4.2 Liquid Crystals. Structural peculiarities and applications, Thermotropic liquid crystals, Classification,

4.3 Phases and phase transitions, anisotropic materials, symmetry aspects, electro-optics of liquid crystal, ferro-, and antiferroelectric liquid crystals

4.4 Examples of LCs in nanoscience, photonics and display devices

Mode of Transaction:

- Classroom lectures will be used to present the fundamental concepts, theories, and principles of condensed matter physics. Instructors explain the theoretical framework, mathematical formalism, and experimental basis of the topics.
- Hands-on laboratory experiments will allow students to observe and measure physical properties of materials, reinforcing theoretical concepts and giving them practical experience with experimental techniques.
- Incorporate online resources, such as video lectures, interactive simulations, and educational websites, to supplement classroom learning and provide additional study materials.

Suggested Activities:

- Divide students into groups and assign them to research and present on specific material properties, such as thermal conductivity, specific heat, or magnetic susceptibility.
- Organize a field trip to a research laboratory or facility where students can observe experimental setups and advanced techniques used in condensed matter physics research.

Semester-2

Laboratory Experiments in Physical Sciences II

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Applies the various procedures and techniques for the experiments.
- Uses different measuring devices and meters to record the data with precision.
- Appliesthes mathematical concepts/equations to obtain quantitative results.
- Develops basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
- Applies knowledge of mathematics, science, and engineering to the physical problems.

Suggested Experiment :

1. Resistivity of Ge at various temperatures by Four Probe method and determination of band gap.
2. To study the thermo emf of a thermocouple
3. Determine Thermal Conductivity using Lee's Disc Apparatus
4. To determine the Hall coefficient and the carrier concentration of semiconductor material using Hall effect.
5. Study of magnetic hysteresis by magnetostriction method.
6. To determine the value of e/m by Thomson's method
7. To determine the Curie temperature of ferromagnetic materials
8. To determine dielectric constant of Ferroelectric materials
9. To determine the magnetic susceptibility of solid / liquid materials
10. To determine the magnetic susceptibility using Quinck's method.

Mode of Transaction: Laboratory Experiments, e-resources, ICT and Virtual Lab

Suggested Activities: Performing the experiments and discussing the physical significance and applications, Group discussion, Presentation, Assignment work and Quiz

Semester-2

Dissertation in Physical Sciences I

Practical (Submission)

Compulsory
Credit: 02
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Does effective literature survey using different sources available online and offline.
- Understands the steps of writing a research paper/article.
- Carries out research work in physical sciences.
- Interprets the results and write summary after completion of the Dissertation work in physical Sciences.

Course Content:

Unit 1: Introduction and Research Methodology

1.1 An introduction on the topic along with literature survey and justification for the Selection of the topic.
1.2 Materials and Methods
1.3 Methodology and Characterization

Unit 2: Analysis Part

2.1 Results and discussion
2.2 Summary and conclusion along with the references.
2.3 Dissertation write – up

Mode of Transaction:- To Create a comprehensive and effective learning experience for students pursuing Dissertation work. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities:- ICT based Research activities, Experiment work in Physics Lab, Field work, Research institute visit

Botany

Semester-2

Plant Taxonomy

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Differentiates between various groups of Bryophytes, Pteridophytes, and Phanerogams
- Practically identifies the various groups of plant kingdom
- Understands the lifecycle of Gymnosperms
- Identifies the angiosperm plants with floral diagrams and identification keys of plant families.

Course Content:

UNIT 1: SYSTEMIC BOTANY

1.1 Taxonomy: Introduction and overview, 5 Kingdom and 8 Kigndom Classification Schemes

1.2 Classification systems - Phenetic and Phylogenetic Systems, Major systems of Plant Classification

1.3 Major characteristics used in taxonomy, International Code of Botanical Nomenclature, Binomial Nomenclature

1.4 Numerical Taxonomy and Chemo Taxonomy

UNIT 2: BRYOPHYTES AND PTERIDOPHYTES

2.1 Study of class Hepaticopsida: Distribution, Habitat, External morphology and reproduction of Pellia

2.2 Study of class Bryopsida: Distribution, Habitat, External morphology and reproduction of Sphagnum

2.3 Life history: Distribution, Occurrence, External morphology and Reproduction (Excluding anatomy) of Equsetum

2.4 Life history: Distribution, Occurrence, External morphology and Reproduction (Excluding anatomy) of Dryopteris

UNIT 3: GYMNOSPERM

3.1 Classification of Gymnosperms

3.2 Life history: Distribution, Occurrence, External morphology and Reproduction (Excluding anatomy: Internal structure) of Cycas

3.3 Life history: Distribution, Occurrence, External morphology and Reproduction (Excluding anatomy: Internal structure) of Gnetum

3.4 Economic Importance of Gymnosperm

UNIT 4: ANGIOSPERM

4.1 Plant families – Polypetalae
Characteristics with representative examples and economic importance of
Family: Rosaceae
Family: Rutaceae

4.2 Plant families – Gamopetalae
Characteristics with representative examples and economic importance of
Family: Compositae
Family: Lamiaceae

4.3 Plant families – Monochlamydae
Characteristics with representative examples and economic importance of
Family: Polygonaceae
Family: Euphorbiacae

4.4 Plant families – Monocotyledonae
Characteristics with representative examples and economic importance of
Family: Commelinaceae

4.4 Plant families – Monocotyledonae
Characteristics with representative examples and economic importance of
Family: Commelinaceae
Family: Graminae

Mode of Transaction: Lectures; Demonstration and Microscopic Analysis in Life Science Laboratory; Educational Videos

Suggested Activities: Collection of Plant Samples Belonging to Different Families for Identification Experiments

Semester-2

Fundamentals of Microbiology

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands about the omnipresence of micro organisms.
- Describes the taxonomic status of micro organisms.
- Learns importance of micro organisms in our world
- Understands of bacterial growth and cultivation
- Understands of extremophilic microorganism
- Learns the diversity and life cycle of Viruses

Course Content:

UNIT 1: SCOPE OF MICROBIOLOGY

1.1 Microbiology as a field of Biology, Place of Microorganisms in Living World
1.2 Groups of Microorganisms Bacteria, Fungi, Algae, Protozoa & Viruses
1.3 Eminent Microbiologists and their contributions
1.4 Applied areas of Microbiology

UNIT 2: GROWTH, REPRODUCTION AND CULTIVATION OF MICROORGANISMS

2.1 Nutritional requirements and nutritional types of Bacteria, Chemical & Physical requirements of Growth, Bacteriological Media
2.2 Modes of Reproduction of Bacteria, Growth of Bacteria: Growth Curve,
2.3 Synchronous Culture and Continuous growth of Bacteria, Chemostat & Turbidostat
2.4 Pure Culture and Cultural Characteristics

UNIT 3: PROTISTS & EXTREMOPHILES

3.1 **Fungi :** General characteristics – Definition, occurrence, Structure, Classification and introduction to major divisions of Fungi, Economic importance, Life cycle
3.2 **Algae :** General Characteristics – Definition, Occurrence, UltraStructure, Economic importance , Life cycle
3.3 **Protozoa :** General Characteristics – Definition, Occurrence, UltraStructure, Economic importance, Life cycle
3.4 **Extremophiles and Unusual Microorganisms** : Thermophiles, Halophiles, Acidophiles, Barophiles, Metha nogens

UNIT 4: DIVERSITY OF AKARYOTES VIRUS

4.1 Introduction and General Characteristics: Definition, Structure, Classification
4.2 Cultivation and Enumeration of Viruses
4.3 Bacterial Viruses: Lytic life cycle (T4 phage), lysogenic life cycle (Lambda phage)
4.4 Plant Viruses, Animal Viruses, Viruses and Cancer, Viroids & Prions

Mode of Transaction: Lectures; Demonstration and Microscopic Analysis in Life Science Laboratory; Educational Videos

Suggested Activities: Understanding microbial world using wet mount method of water sample and educational videos

Semester-2

Ethnobotany & Medicinal Plants

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Knows the importance and usage of plants by the tribes of India
- Proposes new strategies to enhance growth of medicinal herbs considering the practical issues pertinent to India
- Understand sthe importance of traditional knowledge
- Recognises the biopiracy and protection of TK with the help of law
- Associates the natural medicines with their phytochemical in order to check the possibilities ofvalidation of that traditional knowledge scientifically

Course Content:

UNIT 1: ETHNOBOTANY

1.1 Introduction, concept, scope and objectives, Ethnobotany as an interdisciplinary science
1.2 Major and minor ethnic groups or Tribals of India, and their life styles
1.3 Plants Used by the Tribals Food plants, Intoxicants and beverages, Resins and oils and miscellaneous uses, Sacred plants
1.4 Overview of methods of Ethnobotanical Studies Selection of Study area, Field Requirements, Questionnaire Preparation, Voucher specimen

UNIT 2: ROLE OF ETHNOBOTANY IN MODERN MEDICINE

2.1 Medico-ethnobotanical sources in India
2.2 Significance of the following plants in ethno botanical practices (along with their habitat and morphology) *Azadiracta indica*, *Ocimum sanctum*, *Vitex negundo*
2.3 Role of ethnobotany in modern medicine with special example *Rauwolfia sepentina*, *Withania somnifera*, *Asparagus racemosus*
2.4 Biopiracy and IPR of Traditional Knowledge

UNIT 3: DISTRIBUTION AND UTILIZATION OF MEDICINAL PLANTS

3.1 Classification and Distribution of Medicinal plants
3.2 Methods of cultivation, Harvesting, Storage and utilization
3.3 Different systems of Medicine
3.4 Conservation, principles, strategies, in situ – ex situ, protected areas, gene-seed banks

UNIT 4: PLANT DRUG APPLICATION

4.1 Role of Phytochemicals, commercial exploitations (cultivation, in vitro approaches), important medicinal plants with uses and yielding active principles from underground parts/ whole plant/ flowers/ fruits/ seeds.
4.2 Pharmacognosy, morphology (macro – micro), methods, adulterants, quality control.
4.3 Secondary metabolites, types and characteristics
4.4 Plant Extraction strategies, analysis, biosynthetic pathways and inter relationships

Mode of Transaction: Lectures; Demonstration and Microscopic Analysis in Life Science Laboratory; Educational Videos

Suggested Activities: Collection of Plant Samples and visit to Ayurvedik park

Semester-2

Laboratory Experiments in Plant Sciences II

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Identifies the angiosperm plant families on the basis of the morphological characters.
- Understands the meaning of taxonomical terminology
- Learns various forms of plant parts
- Understands diversity of plant parts in the plant kingdom

Suggested Practicals

PLANT TAXONOMY AND MORPHOLOGY

1.Types of Root modification
2.Types of Stem modification
3.Types of Racemose inflorescence
4.Types of Cymose inflorescence
5. Types of special inflorescence
6. Types of Flowers
7. Types of Fruits
8. Types of Seeds
9. Study of dicot family Rosaceae
10. Study of dicot family Rutaceae
11. Study of dicot family Compositae
12. Study of dicot family Lamiaceae
13. Study of dicot family Polygonaceae
14. Study of dicot family Euphorbiaceae
15. Study of monocot family Commelinaceae
16. Study of monocot family Graminae

MICROBIOLOGY

1. To culture bacteria
2. To isolate microorganism from mixed culture and grow a pure culture.
3. Monochrome Staining of given bacterial culture.
4. Negative Staining from tooth tarter.
5. To perform Gram staining of given culture suspension.
6. To carry out standard plate count of given culture.
7. To perform growth curve of *E.coli* and estimate growth rate and generation time.
8. Isolation of bacteriophages from sewage sample based on PFU.

ETHNOBOTANY AND MEDICINAL PLANTS

1.To study the rituals and background of Dabla tribes of India.
2.To prepare questioner for ethnobotanical survey.
3.To study plants used as cosmetics.
4.To study tribal intoxicants.
5. To study *Adhatoda vasica*.
6. To study *Asparagus racemosus*.
7.To study *Cissus quadrangularis*.
8. To study *Vitex negundo*.

Semester-2 | Compulsory

Dissertation in Plant Sciences I

Practical (Submission) | Credit: 04 | Marks:100

Learning Outcomes:

Prospective teacher educator...

- Demonstrates ability to identify a research problem
- Formulates clear objectives for the study
- Designs a feasible methodology to research into the problem
- Increases their capacity to think critically, ability to design and execute an experiment
- Improves confidence and ability in communicating ideas
- This will serve as a lasting and practical basis for a career, for example, in research - whether industry or academia - as well as teaching, media, law, commerce, government or management.

work in Biological Sciences:

Students **will carry out dissertation work** on the topic of their study comprising of

(a) An introduction on the topic along with literature survey and justification for the Selection of the topic.
(b) Materials and Methods
(c) Results and Discussion
(d) Reference
(e) Each student has to give a midterm presentation of their work.

SEMESTER III

Semester - III

Semester-3 M.A. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	90	6	45	105	150
	Practical	1	60	2	50	0	50
M.A.	Theory	2	120	8	60	140	200
	Practical (Submission)	1	120	4	30	70	100
	Total	6	360	20	185	315	500

Semester-3 M.Sc. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	90	6	45	105	150
	Practical	1	60	2	50	0	50
M.Sc.	Theory	2	120	8	60	140	200
	Practical	1	60	2	15	35	50
	Practical (Submission)	1	60	2	30	70	100
	Total	7	360	20	200	350	550

Sr. No.	Subject	Title	Type	Hours	Credit	Internal	External	Total
1	Education	Policy, Politics and Economics of Education	Theory	30	2	15	35	50
2	Education	Preparation and Presentation of Theme Paper	Practical	60	2	50	0	50
3	Education	Technology in Education	Theory	60	4	30	70	100
4	English	Renaissance Drama : Marlowe and Jonson	Theory	60	4	30	70	100
5	English	American Literature	Theory	60	4	30	70	100
6	English	Literary Research Methodology II (Dissertation)	Practical (Submission)	120	4	30	70	100
7	Chemistry	Molecular Spectroscopy	Theory	60	4	30	70	100
8	Chemistry	1. Polymer Chemistry/2. Advanced Inorganic Chemistry	Theory	60	4	30	70	100

9	Chemistry	Laboratory Experiments in Chemistry-III	Practical	60	2	15	35	50
10	Chemistry	Dissertation in Chemical Sciences II	Practical (Submission)	60	2	30	70	100
11	Mathemetics	Number Theory	Theory	60	4	30	70	100
12	Mathemetics	1. Mathematical Modelling 2. Mathematical Methods	Theory	60	4	30	70	100
13	Mathemetics	Practical: Number Theory	Practical	60	2	15	35	50
14	Mathemetics	Dissertation in Mathematics: Completion	Practical (Submission)	60	2	30	70	100
15	Physics	Thermodynamics and Statistical Mechanics	Theory	60	4	30	70	100
16	Physics	1. Nanotechnology and Thin film Physics/ 2. Astrophysics and Cosmology	Theory	60	4	30	70	100
17	Physics	Laboratory Experiments in Physical Sciences -III	Practical	60	2	15	35	50
18	Physics	Dissertation in Physical Sciences II	Practical (Submission)	60	2	30	70	100
19	Botany	Cell Biology	Theory	60	4	30	70	100
20	Botany	1. Environmental Biology & Climate Change/ 2.Biochemistry & Enzymology	Theory	60	4	30	70	100
21	Botany	Laboratory Experiments in Plant Sciences-III	Practical	60	2	15	35	50
22	Botany	Dissertation in Plant Sciences II	Practical (Submission)	60	2	30	70	100

Education

Semester-3

Policy, Politics and Economics of Education

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends the basic concepts of Policies, its formation and impact.
- Critically reflects and reviews the relation and impact of politics on education.
- Acquaints with the basic concept related to Economics of Education
- Critically reviews finances and cost effectiveness of education policies and budget allocations.

Unit 1: Introduction to Policy and Politics

1.1 Meaning of Policy, politics and Economics and their linkage with education

Determinants of Educational Policy

Economic Provisions for education in budgets

1.2 Process of Policy formulation: Analysis of the existing situation, generation of policy options, evaluation of policy, making the policy decision, planning of policy implementation, policy impact assessment and subsequent policy cycles.

Techniques of Policy formulation: Cost Benefit Analysis, Economic Forecasting, Operations Research, Planning-Programming-Budgeting System

1.3 Impact of politics and pressure group on policies, Linkage between Educational Policy and National Development, Agencies involved in development of educational policies and their role in development of education

1.4 Criteria for Policy Evaluation

Methods of Policy Evaluation: Benefit-Cost Analysis, Cost-Effectiveness Analysis, and Research based Analysis,

Unit-2: Economics and Education

2.1 Concept of Educational Finance; Educational finance at Micro and Macro Levels

Economic returns to Higher Education: Signalling Theory Vs Human Capital Theory

2.2 Rate of Returns to Education: Benefits or returns of education, indirect or external benefits, educational expenditure as investment

Determinants of educational costs and its estimation

2.3 Concept of Budgeting and allocation of budget for education

Cost and Cost-effectiveness: Current and capital cost, direct and indirect cost, private cost, social cost and unit cost of education;

Internal and external efficiency of education;

2.4 Overview of Policy Driven Reforms in Higher Education and its impact on Economy

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Policy analysis and their implications on the education system and society.

and aspirations related to education policy, politics, and economics.

- Budget analysis with sample education to identify areas of funding and potential impacts on educational institutions and programs.
- Policy proposal for specific educational issue or problem create comprehensive policy document with recommendations and justifications.
- Data analysis of education-related data, such as enrolment rates, literacy rates, or budget allocations and its relation with policy.

Semester-3

Preparation and Presentation of Theme Paper

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Reviews, appraises and selects the theme for writing Theme Paper.
- Develops and constructs theme in conceptual framework.
- Develops technical and scientific writing skills to frame the theme paper
- Develops presentation, debate and assertive negotiations skills for theme paper presentation.

Course Content: Suggested Framework

The framework suggested here is indicative and suggestive only. The students and facilitator can prepare their own formats and select themes.

- Theme for the Theme Paper is to be selected from any area related to education and its perspective/ impact on philosophy, sociology, psychology, stakeholder, policy, society, economy, etc.
- The format for the theme paper is to be finalized based on the need of the topic.
- Visits to library, online resources and data bases, institutions can be undertaken as per the requirement of the topic for the referencing and conceptualization of theme paper.
- The student has to ensure compliance of the standards of plagiarism and research ethics.
- Submission will be in the form of theme paper duly approved by the facilitator.

Theme Paper presentation will be in the form of seminar/presentations/discussion forums etc. The researcher will be given the 20-25 minutes for the presentation and 20-25 minutes will be given for discussion and feedback.

Mode of Transaction: Face to Face, field visits to institutions, libraries etc.

Suggested Activities:

- Classroom discussions on various themes related to education.
- Discussions and reflections on Methods and techniques for developing and selecting themes.
- Theme paper presentation on various themes related to education.

Semester-3

Technology in Education

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends the basic concepts of educational technology.
- Develops a new perspective on technology use in education
- Critically assess the pedagogical perspective of educational technology.
- Reflects on implications of educational pedagogy and need for professional development of teachers.

Unit 1: Introduction to Technology in Education

1.1 Concept of educational technology and its Historical evolution

1.2 Concept and difference: Technology of Education and Technology in Education

1.3 Current Trends of Technology Use: Learning Analytics. Virtual and augmented reality, Gamification, Artificial intelligence. Internet of Things (IoT), Cloud Computing, Digital and open Badge

1.4 Digital literacy: Concept, Need and types,

Debate on Teaching with technology and teaching for effective use of technology

Unit 2: Perspectives of Technology Use in Education

2.1 Social Perspective: Citizenship for digital society, technology skills for 21st century, impact of technology on society

2.2 Ethical Perspective: Code of ethics, judicious and safe use, Health Perspective: Impact on physiology (eyes, hands, wrist, neck etc.) and psychology (stress, anxiety, depression etc.)

2.3 Legal Perspective: Intellectual property and copyright in digital world, plagiarism, open source and open content

2.4 Policy Perspective: Educational technology in National Policy on Education 1986 & National Education Policy 2020 and relevant guidelines

Unit 3: Pedagogical Perspective and Applications of Technology

3.1 Strategies for integration of educational technology: Substitution, augmentation, modification, redefinition (SAMR Model)

Pedagogical Approaches for effective use of technology: Online, Blended & Flipped Learning

3.2 Strategies for Assessment and feedback mechanism in digital environments

Agencies : National Testing Agency (NTA), Performance, Assessment, Review, and Analysis of Knowledge for Holistic Development (PARAKH)

3.3 Infrastructure for digital content creation, digital repository and dissemination: Role and outreach

Digital Repository: NROER, DIKSHA, SWAYAM and SWAYAMPRABHA

3.4 Challenges and barriers to technology adoption: Equity, equality and access

Miniaturization of educational technology and its impact

Unit 4: Implications and Professional Development

4.1 Implications of behaviourism, cognitivism and constructivism for technology mediated learning

4.2 Implications of socio-cultural theories (Collaborative and situated learning) for technology mediated learning.

4.3 Professional Development of Teachers : Skills for Teacher in digital age and managing the classrooms, Training of teachers for use of technology in Education

4.4 Significance of Research for Technology in Education: Monitoring & Evaluation, Impact and Effectiveness studies in areas related to technology in Education

Mode of Transaction: Face to Face, Seminar, Lecture cum Discussion, Assignment, Project

Suggested Activities:

Classroom discussions on various topics related to technology in education

Arts

Semester-3

Renaissance Drama : Marlowe and Jonson

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends the impact of the Renaissance period on drama and its role in shaping theatrical expressions.
- Demonstrates an understanding of Christopher Marlowe's life and background, and how it influenced his literary contributions during the Renaissance.
- Gains insight into the life and background of Ben Jonson and understand how it influenced the creation of his comedic masterpieces during the Renaissance era.
- Critically evaluates the historical significance and critical reception of Marlowe and Jonson in the context of Renaissance drama, recognizing their lasting impact on the theatrical canon.

Unit 1: Introduction to Renaissance Drama

- Overview of the Renaissance period and its influence on drama
- Key characteristics of Renaissance drama
- Historical and social context of the Elizabethan and Jacobean eras
- Theatres and performance practices of the time

Unit 2: Christopher Marlowe and his Works

- Life and background of Christopher Marlowe
- Analysis of Marlowe's major works: "Tamburlaine the Great," "Doctor Faustus," and "Edward II"
- Themes and motifs in Marlowe's plays
- Exploration of Marlowe's contribution to the development of tragedy and blank verse

Unit 3: Ben Jonson and his Comedies

- Life and background of Ben Jonson
- Analysis of Jonson's major comedies: "Every Man in His Humour," "Volpone," and "The Alchemist"
- Satire and social criticism in Jonson's plays
- Exploration of Jonson's distinctive style, use of language, and comedic techniques

Unit 4: Comparative Study and Critical Analysis

- Comparison of themes, characters, and styles between Marlowe and Jonson
- Influences of classical literature and humanism in their works
- Critical reception and historical significance of Marlowe and Jonson in Renaissance drama
- Modern adaptations and interpretations of their plays in contemporary theatre

Semester-3

American Literature

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- analyses the historical context of colonial America to understand its influence on early American literary expressions.
- investigates literary movements like Romanticism and Transcendentalism to identify their impact on shaping the American literary landscape during the 19th century.
- examines the impact of Modernism on American literature and its influence on the evolving literary forms and techniques.
- engages with contemporary voices and diverse perspectives in literature to understand the complexities of modern American society.

Unit 1: Colonial and Early American Literature

- Historical context of colonial America
- Exploration of Native American oral traditions and creation myths
- Puritan literature and religious writings
- Early American narratives and travelogues
- Key authors: Anne Bradstreet, Jonathan Edwards, and Benjamin Franklin

Unit 2: Nineteenth-Century American Literature

- Literary movements: Romanticism and Transcendentalism
- Examining the theme of individualism and nature
- Slavery and abolitionist literature
- The American Renaissance and its major writers
- Key authors: Edgar Allan Poe, Ralph Waldo Emerson, Emily Dickinson, and Frederick Douglass

Unit 3: Twentieth-Century American Literature

- Modernism and its impact on American literature
- The Harlem Renaissance and African American literature
- Social realism and the Great Depression
- Postmodernism and experimental literature
- Key authors: F. Scott Fitzgerald, Langston Hughes, Ernest Hemingway, and Toni Morrison

Unit 4: Contemporary American Literature

- Contemporary voices and diverse perspectives
- LGBTQ+ literature and themes of identity
- Immigration and multiculturalism in literature
- Eco-criticism and literature about environmental concerns
- Key authors: Jhumpa Lahiri, Junot Díaz, Louise Erdrich, and Claudia Rankine

Semester-3

Literary Research Methodology II

Practical (Submission)

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Conducts an extensive literature review to identify relevant sources and gaps in existing research.
- Identifies and analyzing key theoretical frameworks to inform the research approach and conceptual foundation.
- Organizes the dissertation structure and chapters coherently to present a logical and well-structured argument.
- Crafts a compelling introduction and conclusion that succinctly outline the research objectives and findings.

Unit 1: Literature Review and Theoretical Framework

- Conducting an extensive literature review
- Identifying and analyzing key theoretical frameworks
- Situating the research within existing scholarly debates

Unit 2: Dissertation Writing and Structure

- Organizing the dissertation structure and chapters
- Crafting a compelling introduction and conclusion
- Ensuring coherence and flow throughout the document
- Reviewing and revising the draft dissertation
- Seeking feedback from peers and mentors
- Polishing the language, style, and presentation

Science

Chemistry

Semester-3

Molecular Spectroscopy

Compulsory
Credit: 04
Marks:100

Learning outcomes:
Prospective teacher educator...

- Understands theory of IR and interpret IR spectrum
- Differentiates PMR and ^{13}C NMR technique and interpret the same
- Explains different types of MS techniques
- Develops skill to use spectroscopic techniques in structural elucidation

Course Content:

Unit 1: Infrared Spectroscopy

1.1 Principle of IR spectroscopy
1.2 Various IR Regions
1.3 Stretching and bending vibrations and IR absorption bands
1.4 Conventional IR Instrumentation
1.5 FTIR Instrumentation
1.6 Advantages such as Felgett's, Jacquinot, Connes etc.
1.7 Characteristic group frequencies for alkanes, alkenes, alkynes, aromatics, alcohols, ethers, phenols, amines, nitro compounds, aldehydes, ketones, Nitriles etc.
1.8 IR interpretation practice

Unit 2: PMR Spectroscopy

2.1 Proton Resonance Condition
2.2 Aspects of PMR Spectra – Number of Signals
2.3 Chemical Shifts
2.4 Shielding and Deshielding
2.5 Diamagnetic Anisotropy
2.6 Factors Affecting Chemical Shifts
2.7 Splitting of the Signals
2.8 Spin-Spin Coupling
2.9 Coupling Constants – Vicinal, Geminal, Long Range and Virtual Couplings
2.10 First Order and Second Order Spectra
2.11 Nuclear overhauser effect and MRI

Unit 3: ^{13}C NMR Spectroscopy

3.1 Difficulties and Solution for Recording ^{13}C NMR Spectra
3.2 ^{13}C NMR Spectra Scale
3.3 Prediction of Number of signals from various isomers in ^{13}C NMR Spectra
3.4 Broad Band Decoupling and Off Resonance Technique
3.5 Chemical Shift Calculation for Alkanes, Alkenes and Alcohols
3.6 Introduction to DEPT and 2D NMR Spectroscopy
3.7 Introduction to COSY, HETCOR and DEPT techniques
3.8 Elucidation of structure using IR,PMR and 13C NMR Data

Unit 4: Mass Spectrometry

4.1 Theory and Principles of Mass Spectroscopy
4.2 Instrumentation
4.3 Low and High Resolution Mass Spectra
4.4 Isotopic abundance
4.5 Ionization Techniques such as Electron Impact (EI) Ionization, Chemical Ionization (CI), Field Desorption(FD), FAB, ESI and MALDI
4.6 Techniques used to separate charged fragments
4.7 Determination of Molecular Weight and Molecular Formula
4.8 Nitrogen Rule, Mclafferty Rearrangement
4.9 Metastable Ion Peak
4.10 Rules Governing the Fragmentations
4.11 Interpretation of Mass Spectra of Saturated and Unsaturated Hydrocarbons, Alcohols, Ethers, Ketones, Aldehydes, Carboxylic acids and Amines

Mode of Transaction: PPTs. Video Lectures, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Tests

Semester-3

Polymer Chemistry

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Gains knowledge about introduction, classification and application of Polymer
- Learns characterisation technique used for the determination of structure of polymers.
- Learns various techniques such as SEC, solution viscosity, VPO etc.
- Gains knowledge about synthesis, properties and application of thermosetting Polymers.

Course Content:

Unit 1: Classification and Mechanism of Polymers

1.1 Introduction
1.2 Classification of polymer on the basis of structure, source and polymerization
1.3 Chain growth polymerization (Addition Polymerisation)
1.4 Mechanism of polymerization (Free Radical, Cationic and Anionic)
1.5 Step Growth Polymerization
1.6 Number Average and Weight Average Molecular Weight
1.7 Polydispersity and molecular weight distribution in polymers
1.8 The Practical Significance of Polymer Molecular Weight

Unit 2: Technique used for characterization of polymer

2.1 Molecular weight distributions
2.2 Various techniques such as SEC, solution viscosity, VPO, light scattering for to determine relative and ab solute molecular weight of polymer, Osmometry
2.3 Glass Transition Temperature
2.4 Glass Transition Temperature and molecular weight
2.5 Glass Transition Temperature and Plasticisers

Unit 3: Properties of polymer

3.1 Polymer reactions
3.2 Thermal, mechanical and solution properties of polymers
3.3 Thermoplastics, thermosets and elastomers, Fibres
3.4 Plastic Materials
3.5 Branched polymers (starch, dendritic and hyper branched polymers)

Unit 4: Behavior of Polymers

4.1 Crystalline Behavior: Degree of Crystallinity, Crystallisability, Factor affecting crystallinity of polymer
4.2 Polymer Crystallisation
4.3 The Process of polymer Dissolution
4.4 Thermodynamics of polymer dissolution
4.5 Degradation- Thermal, Mechanical and Photodegradation
4.6 The Flory Huggins:Theory of Polymer solutions

Mode of Transaction: PPT, Video Lecture, Chalk and Talk Method,

Suggested Activities: Experiments and Hands on training of Ostwald Viscometer

Semester-3

Advanced Inorganic Chemistry

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of advanced inorganic chemistry.
- Understands the importance of Organometallic Chemistry and Bioinorganic Chemistry.
- Uses for Characterization of inorganic compounds using FTIR, Raman, NMR, EPR, Mossbauer, UV-vis, NQR, MS.
- Uses the evidence based comparative chemistry approach to explain the inorganic compounds synthesis, reaction mechanism and analysis.

Course Content:

Unit 1: Organometallic chemistry

1.1 Introduction
1.2 Reaction of Organometallic chemistry: Substitution, insertion, elimination, Nucleophilic and Electrophilic reactions
1.3 Applications of Organometallic compounds as catalyst

Unit 2: Bioinorganic chemistry

2.1 Introduction
2.2 Porphyrins
2.3 Metallo enzymes
2.4 Oxygen transport
2.5 Electron- transfer reactions
2.6 Nitrogen fixation
2.7 Enzyme-Carbonic anhydrase
2.8 Xanthine oxidase
2.9 Aldehyde oxidase
2.10 Biochemistry of iron

Unit 3: Characterization of Inorganic compounds

3.1 Introduction
3.2 Infrared spectroscopy
3.3 Raman spectroscopy
3.4 NMR spectroscopy
3.5 EPR spectroscopy
3.6 Mössbauer spectroscopy
3.7 UV-vis spectroscopy
3.8 NQR spectroscopy
3.9 Mass spectroscopy
3.10 Photo electron spectroscopy
3.11 Microscopic techniques

Unit 4: Inorganic reactions

4.1 Introduction
4.2 Reaction, kinetics and mechanism
4.3 Trans effect and trans influence
4.4 Applications of trans effect in synthesis and analysis
4.5 Theories of trans effect: Polarisation theory and π- bonding theory
4.6 Lability, inertness, stability and instability.
4.7 Electron transfer reaction
4.8 Mechanism of redox reaction (inner-sphere and outer-sphere)

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test

Semester-3

Laboratory Experiments in Chemistry III

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Acquires knowledge about the structure determination through various spectroscopic techniques such as UV-Vis, IR, PMR and Mass.
- Synthesises polymers properly
- Operates colorimeter and can determine concentration of metal ions
- Sharps their analytical skills

Course Content:
Paper: Molecular Spectroscopy (minimum Eight)
Structural elucidation by spectroscopy: integration of all Spectroscopic techniques such as FTIR,PMR,CMR and MS for structure determination of organic molecules

1. Interpretation of IR/PMR/Mass Spectrum of Alkane derivatives.
2. Interpretation of IR/PMR/Mass Spectrum of Alkene derivatives.
3. Interpretation of IR/PMR/Mass Spectrum of Alkyne derivatives
4. Interpretation of IR/PMR/Mass Spectrum of Aromatic derivatives
5. Interpretation of IR/PMR/Mass Spectrum of Phenol derivatives
6. Interpretation of IR/PMR/Mass Spectrum of alcohol derivatives
7. Interpretation of IR/PMR/Mass Spectrum of aldehyde derivatives
8. Interpretation of IR/PMR/Mass Spectrum of ketone derivatives
9. Interpretation of IR/PMR/Mass Spectrum of amine derivatives.
10. Interpretation of IR/PMR/Mass Spectrum of halogen derivatives.

Paper: Polymer Chemistry (minimum Four)
To prepare polymers using different techniques and determination of Avg. molecular weight

1. Preparation of polymers through bulk polymerization technique
2. Preparation of polymers through solution polymerization technique
3. To determine average molecular weight of polymeric materials using Ostwald viscometer

Paper: Advanced Inorganic Chemistry-I (minimum Four)
To Carry out systematic quantitative analysis of inorganic metal complexes:

1. To carryout colorimetric analysis of metal complexes containing Fe^{+3},Ni^{+2},Cu^{+2},$CrO4^{-2}$,Mn^{+2}etc. Metals
2. To verify Debye-Huckel theory of HCl using conductometer
3. To verify DH theory of NaCl using conductometer
4. To verify Debye-Huckel theory of KCl using conductometry

Mode of Transaction: Demonstration ,Chalk and Talk Method, Videos

Suggested Activities: Viva, Internal Test

Semester-3

Dissertation in Chemical Sciences II

Practical (Submission)

Compulsory
Credit: 02
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Gets knowledge about literature survey in chemical sciences.
- Understands of how to write research paper in chemical sciences.
- Carries out the research work in chemical sciences.
- Learns synthesis, purification, characterisation, application of organic compounds.
- Studies of Results and Discussion coming out from Dissertation work in Chemical Sciences.
- Makes summary and conclusion along with references.

Course Content:
Dissertation work in Chemical Sciences

- Students will prepare a report/synopsis/thesis of dissertation work on the topic of their study comprising of
- An introduction on the topic along with literature survey and justification for the selection of the topic.
- Materials and Methods
- Methodology and Characterisation
- Results and discussion
- Summary and conclusion along with the references.
- Each student has to give a midterm presentation of his or her work.

Mode of Transaction: Demonstration ,Chalk and Talk Method,Videos, Experimental work

Suggested Activities: Viva, Internal Test

Mathematics

Semester-3

Number Theory

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of Divisibility, Congruence & Arithmetic functions.
- Develops the skills of calculation of Divisibility & Congruence and the skills of Identifying the role of Arithmetic functions.
- Acquires the Knowledge of Number Theory.
- Applies the knowledge of Number Theory for any real-time problem.

Course Content:

Unit 1: Elementary function

1.1 Review of divisibility, Arithmetic function
1.2 Greatest integer function [x], multiplicative functions
1.3 Euler's (totient) function (n), Mobius function (n)
1.4 The function (n)and (n), Average orders, perfect number

Unit 2: Congruence Theory

2.1 Congruence-Definitions, Chinese Remainder theorem
2.2 Fermat theorem and Euler theorem
2.3 Wilson's theorem, Lagrange's theorem
2.4 Primitive roots, indices

Unit 3: Residue Theory

3.1 Quadratic residues, Legendre's symbol
3.2 Euler criterion
3.3 Gauss's lemma, Law of quadratic reciprocity
3.4 Jacobi's symbol

Unit 4: Diophantine Equation

4.1 Dirichlet theorem, Continued fraction
4.2 Rational approximations, Quadratic irrationals
4.3 Linear Diophantine equation, Pell's equation
4.4 Pythagorean triples

Semester-3

Mathematical Modelling

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the basics of mathematical modelling.
- Develops the skills of formulation and analysis of various models.
- Acquires Knowledge Mathematical Modelling.
- Applies the knowledge of Mathematical Modelling to any real-time problem.

Course Content:

Unit 1: Introduction to Models

1.1 Introduction to subject, its scope and limitations, Classification of models.
1.2 An arithmetic Model of Gravity, Simple population growth model.
1.3 Logistic Population growth Model
1.4 Geometric interpretation of logistic growth function.

Unit 2: Two Species Population Models

2.1 Prey Predator Models for population dynamics
2.2 Geometric Interpretation of Prey Predator Models
2.3 Stability of Prey Predator Models
2.4 Competition model

Unit 3: Epidemic Models

3.1 Simple deterministic model, SIS Model.
3.2 Epidemic Models with constant number of carriers
3.3 ISI Model, SI Model with removal
3.4 Epidemic model with removal

Unit 4: Bio Fluid Dynamics

4.1 Basic terms and Types of flows
4.2 Energy Equation
4.3 Euler's equation of motion
4.4 Modelling of blood flow

Semester-3

Mathematical Methods

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of special functions and transforms.
- Develops the skills of problem solving of Laplace transform.
- Acquires knowledge of types of integral equations and theory of operators.
- Applies the knowledge of this theory in problem solving.

Course Content:

Unit 1: Variational Problems with fixed Boundaries

1.1 Functionals, Euler's equation, other forms of Euler's equation

1.2 Some special forms of Euler's equation, geodesics

1.3 Isoperimetric problems, several dependent variables

1.4 Functionals involving higher order derivatives

Unit 2: Laplace Transform

2.1 Laplace transform, Laplace transforms of some functions, properties of Laplace transform

2.2 Inverse Laplace transform, convolution theorem

2.3 Applications to solutions of ordinary differential equations

2.4 Applications to the solutions of diffusion equation and wave equation

Unit 3: Basics of Integral Equation

3.1 Integral equations, types of integral equations

3.2 Conversion of differential equation into an integral equation and vice versa, solution of integral equation

3.3 Integral equations of convolution type

3.4 Abel's integral equations, integro-differential equations.

Unit 4: Solution of Integral Equation

4.1 Fredholm integral equations, Fredholm alternative theorem

4.2 Solutions of Fredholm integral equations for separable kernels.

4.3 Types of Kernels, Converting Initial value problem into a Volterra integral equation.

Semester-3

Practical: Number Theory

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of Divisibility, Congruence & Arithmetic functions.
- Develops the skills of calculation of Divisibility & Congruence and the skills of Identifying the role of Arithmetic functions.
- Acquires the Knowledge of Number Theory.
- Applies the knowledge of Number Theory for any real-time problem.

Course Content:

Unit 1: Testing Properties & verify theorems (Unit: 1 & 2)

1.1 Testing the properties of divisibility

1.2 Testing the properties of congruence, Verify Theorem based on congruence

1.3 Testing properties of various arithmetic functions and verify based on these functions

1.4 Verify the theorem on divisibility

Unit 2: Testing Properties & verify theorems (Unit: 3 & 4)

2.1 Application of Diophantine Equation, Application of Chinese remainder Theorem

2.2 Verify the Euler and Fermat theorem

2.3 Verify the Wilson theorem and its converse

2.4 Testing the properties of quadratic residues.

Semester-3

Dissertation in Mathematics: Completion

Practical (Submission)

Compulsory
Credit: 02
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the particular topic from its basics.
- Acquires the knowledge of all the subjects studied in the same semester.
- Develops ideas and reading skills for research.
- Studies applications of the same.

Course Content:

Unit 1: Secondary Investigation

1.1 Students are expected to find more results/ facts of the topics.

1.2 prepare temporary chaptering of the final report.

1.3 Present their findings in the seminar/ conference/ experts.

1.4 Prepare the progress report of secondary investigation.

Unit 2: Report Writing

2.1 Students are expected to write a final research report on selected topics

2.2 Which may cover the following: Introduction to the study, Review of related literature, all findings / results.

2.3 Which may cover the following: references, further scope, conclusion etc.

2.4 Prepare Final Report.

Physics

Semester-3

Thermodynamics and Statistical Mechanics

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands how a probabilistic description of nature at the microscopic level gives rise to deterministic laws at the macroscopic level.
- Relates the concepts of entropy and temperature as defined in statistical mechanics to their more familiar versions in thermodynamics.
- Appreciates that interactions between particles can explain the various phases of matter observed in nature, as well as the universality of critical exponents characterizing phase transitions.
- Solves for the thermal properties of classical and quantum gases and other condensed systems from a knowledge of their microscopic states.

Course Content:

Unit 1: Classical Statistical Physics

1.1 Statistical basis of thermodynamics, probability concepts, microstate and macrostate, link between statistics and thermodynamics, classical ideal gas, Gibbs paradox.

1.2 Theory of ensembles, phase space and Liouville's theorem, microcanonical ensemble, postulate of equal a priori probability

1.3 Canonical ensemble, system in canonical ensemble, partition function, classical systems, energy fluctuations in canonical ensemble, thermodynamics of magnetic systems, negative temperatures.

1.4 Grand canonical ensemble, system in grand canonical ensemble, grand partition function, fluctuations in grand canonical ensemble, equivalence to other ensembles.

Unit 2: Quantum Statistical Physics

2.1 Framework of quantum statistics, inadequacy of classical theory, density matrix, quantum mechanical ensembles, thermodynamics of black body radiation, photon counting.

2.2 Postulates of quantum statistical mechanics. Theory of gases, Maxwell–Boltzmann, Bose–Einstein and Fermi–Dirac statistics

2.3 Partition and grand partition functions, statistics of occupation numbers

2.4 Distinction between classical and quantum statistics, fluctuations. Ideal Bose gas, equations of state, properties of ideal Bose gas, Bose-Einstein condensation (BEC) and experimental evidences

2.5 Thermodynamic behaviour and properties of ideal Fermi gas, degenerate and nondegenerate Fermi gas

Unit 3: Fluctuations

3.1 Brownian motion, Langevin theory of random motion, Time dependence of fluctuation

3.2 Power spectrum of fluctuation, Persistence and correlation of fluctuation

3.3 Wiener - Khinching theorem

3.4 Johnson noise - Nyquist theorem, Shot noise

Unit 4: Critical phenomena and phase transitions

4.1 Phase transitions, Condition for phase equilibrium, First order phase transition, , Co - operative processes

4.2 Clausius - Clayperon equation, Second order phase transition, The Critical exponent

4.3 Curie - Weiss theory of Magnetic transition

4.4 Ising Model, Ising Model in zeroth approximation, Exact solution of one dimensional Ising Model, Order parameters

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Thermodynamics and Statistical Physics.
- Using Laboratory Work: Practical laboratory sessions are essential for understanding experimental aspects of Thermodynamics and Statistical Physics.
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Thermodynamics and Statistical Physics.
- Presentations: Students will be asked to give presentations on specific topics related to Thermodynamics and Statistical Physics enhancing their communication and research skills.

Suggested Activities:

❖ Hands-on activity helps them visualize and understand different concepts of Thermodynamics and Statistical Physics.

❖ Introduce students to computer simulations or software tools that simulate different concepts of Thermodynamics and Statistical Physics.

- Organize problem-solving sessions where students can work on complex problems related to Thermodynamics and Statistical Physics collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of Thermodynamics and Statistical Physics.

Semester-3

Nanotechnology and Thin Film Physics

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Has basic understanding of fabrication and characterization of nano structured materials by different analytical methods.
- Has enriched knowledge on the properties of materials at the nanoscale and implementing it for various applications.
- Understands the phenomena of new type of materials i.e. nanomaterials and its properties in details.
- Gets knowledge about various techniques of thin film depositions.

Course Content:

Unit 1: Introduction to Nanotechnology and Synthesis of Nanomaterials

1.1 Introduction, Definitions, Emergence, Fabrication Techniques, Challenges, Size Effects, Classification and Applications
1.2 Bottom-up and Top-down approaches - Mechanical method: High Energy Ball Milling, Methods based on evaporation (Physical Vapour Deposition)
1.3 Chemical Vapour Deposition, Chemical Methods: Colloidal Method and Sol-gel Method
1.4 Carbon Nanotubes (CNT), Types –Single walled, multiwalled CNT, Structures and properties of CNTs, Synthesis of carbon nanotubes

Unit 2: Nanomaterial Characterization Techniques

2.1 X-Ray Diffraction (XRD), Scanning Electron Microscopy (SEM)
2.2 Atomic Force Microscopy (AFM), Transmission Electron Microscopy (TEM)
2.3 Chemical Characterization**:** Optical Spectroscopy, Electron Spectroscopy
2.4 Photoelectron Spectroscopy (PS), Vibrational Spectroscopy, Raman Spectroscopy

Unit 3: Applications of Nanomaterials

3.1 Molecular Motors, Molecular Devices, Single Molecular Devices
3.2 Nanotribology: Nano Tribometer, Surface Force Apparatus,
3.3 Quartz Crystal Microbalance, Superlubricity, Hard Disk Capacity, Micro Electromechanical Systems (MEMS)
3.4 Nano sensors: Nanoscale Organization, Self Assembly, Quantum Size Effects, Electrochemical Sensors, Nano-Bio-Sensors, Future

Unit 4: Thin film Techniques

4.1 Thin Films Preparation methods: Electrochemical Deposition (ECD); Spin coating
4.2 Physical Vapor Deposition (PVD)- thermal evaporation, electron beam evaporation, rf-sputtering;
4.3 Pulsed Laser deposition (PLD); Chemical Vapor Deposition (CVD), Plasma-Enhanced CVD (PECVD),
4.4 Atomic Layer Deposition (ALD), Molecular Beam Epitaxy (MBE)

Mode of Transaction To Create a comprehensive and effective learning experience for students pursuing Nanotechnology. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities: Topic related live demonstration in the classroom, ICT based Teaching – learning, Experiment work in Physics Lab, Outreach program

Semester-3

Astrophysics and Cosmology

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Have a basic understanding of various aspects of observational astronomy, how data is acquired and interpreted to obtain physical properties of a variety of astronomical objects.
- Have a historical perspective of the development of Astronomy.
- Have a conceptual understanding of basic principles involved
- Have a flavour of current developments in this field and India's role in them.
- Appreciates the laws of nature that are discovered on Earth but which can explain successfully distant cosmic objects and the universe as a whole.

Course Content:

Unit 1: Observational tools and stellar structure

1.1 Celestial co-ordinate systems, Telescope—operational principles and mounting, Atmospheric extinctions, Magnitude systems, Constellations and Zodiac

1.2 Stellar Structure and Evolution: Mass, luminosity, chemical composition, temperature and equation of a star and their measurements

1.3 Stellar spectra and classifications, Main sequence stars, Colour-magnitude plot, Herzsprung-Russel (H-R) diagram.

1.4 Equation of hydrostatic equilibrium, Polytropic stars and related integral theorems, Stellar atmosphere, Black-body radiation, Saha equation, Post-main sequence stars. Red giants

Unit 2: Stellar System and evolution

2.1 Solar System: Sun and its properties. Planets and satellites. Asteroids. Comets and Oort's Cloud

2.2 Advanced Stages of Evolution of Stars, Gravitational collapse, Degeneracy pressure in stars, Supernova.

2.3 White dwarfs (WD), Onset of degeneracy, Chandrasekhar limit, Masses, radii and cooling of WD, Magnetic WD, Neutron stars (NS).

2.4 Pulsars (PLSR), History and discovery, Connections with fast rotating NS, Magnetic dipole model for PLSR, Braking index, PLSR emission mechanisms, PLSR glitches, X-ray PLSR.

2.5 Black holes (BH), Schwarzchild BH, Kruskal diagram, Test particle motion, Kerr BH, Area theorem, BH evaporation.

Unit 3: Galaxies

3.1 Hubble's classification of galaxies, Radio galaxies.

3.2 Rotation law, Evolution of galaxies.

3.3 Cluster of galaxies – Virgo and Coma clusters, Galaxy mergers.

3.4 Quasars, Active galactic nuclei (AGN).

Unit 4: Cosmology

4.1 Models of the universe, Hubble's law, Cosmological constant, Horizons

4.2 The early universe, Thermodynamics of the early universe, Primordial neutrinos, Helium synthesis and other nuclei, Microwave background

4.3 Jeans mass in the expanding universe, Growth in the postrecombination era, Observational constraints, Elementary ideas on structure formation

4.4 Measurement of Hubble's constant, Anisotropy of large-scale velocity fields, Age of the universe Abundance of light nuclei, Dark matter, Microwave background, Gravitational wave stochastic background

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Astrophysics and Cosmology.
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Astrophysics and Cosmology.
- Presentations: Students will be asked to give presentations on specific topics related to Astrophysics and Cosmology enhancing their communication and research skills.
- Computer Simulations: The use of computer simulations or software tools can aid in visualizing and understanding certain phenomena in Astrophysics and Cosmology.
- Access to Online Resources: Such as e-books, videos, and educational websites, can supplement the learning process.

Suggested Activities:

Hands-on activity helps them visualize and understand different models of the universe.

- Introduce students to computer simulations or software tools that simulate different concepts in Astrophysics and Cosmology.
- Organize problem-solving sessions where students can work on complex problems related to Astrophysics and Cosmology collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of Astrophysics and Cosmology.

Semester-3

Laboratory Experiments in Physical Sciences III

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Applies the various procedures and techniques for the experiments.
- Uses different measuring devices and meters to record the data with precision.
- Applies the mathematical concepts/equations to obtain quantitative results.
- Develops basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
- Applies knowledge of mathematics, science, and engineering to the physical problems.

Suggested Experiment :

Class A push pull power amplifier

1. Class B push pull power amplifier
2. To study Characteristics of Metal–Oxide–Semiconductor Field-Effect Transistor (MOSFET)
3. To study Characteristics of UJT
4. To determine the Planck's constant
5. Design and Verify truth table of RS flip-flop
6. Design and Verify truth table of clocked RS flip-flop
7. Design and verify truth table of JK flip-flop

Mode of Transaction: Laboratory Experiments, e-resources, ICT and Virtual Lab

Suggested Activities: Performing the experiments and discussing the physical significance and applications, Group discussion, Presentation, Assignment work and Quiz

Semester-3

Dissertation in Physical Sciences II

Practical (Submission)

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Do effective literature survey using different sources available online and offline.
- Understands the steps of writing a research paper/article.
- Carries out research work in physical sciences.
- Interprets the results and write summary after completion of the Dissertation work in physical Sciences.

Course Content:

Students will carry out dissertation work on the topic of their study comprising of

- An introduction on the topic along with literature survey and justification for the Selection of the topic.
- Materials and Methods
- Methodology and Characterization
- Each student has to give a midterm presentation of his or her work. Students will carry out dissertation work on the topic of their study comprising of (a) An introduction on the topic along with literature survey and justification for the Selection of the topic. (b) Materials and Methods (c) Methodology and Characterization (d) Each student has to give a midterm presentation of their work.

Mode of Transaction

- To Create a comprehensive and effective learning experience for students pursuing Dissertation work. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities:-

- ICT based Research activities, Experiment work in Physics Lab, Field work, Research institute visit

Botany

Semester-3

Cell Biology

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Gains the basic knowledge of prokaryotic and eukaryotic cells
- Understands the significance of cell-cell interactions and different types of cell junctions
- Understands the molecular mechanisms of cell signalling
- Acquires the knowledge of molecular structure and functions of cell organelles

Course Content:

UNIT 1: CELL THEORY, CELL STRUCUTRE AND CELL DIVISION

1.1 Cell Theory, Diversity of Cell Size and Shapes, S/V Ratio
1.2 Ultrastructure of Prokaryotic & Eukaryotic Cells
1.3 Cell Cycle and Equational Cell Division Mitosis
1.4 Reductional Cell Division Meosis and its Significance

UNIT 2: CELL JUNCTIONS & CELL SIGNALLING

2.1 Cell-Cell Interactions: Tight Junction, Adherence Junction, Gap Junction
2.2 Types of Cell Signalling Autocrine, Paracrine and Endocrine Regulation
2.3 Signalling Molecules: Cell Surface Receptors, Peptide and Steroid Hormones, Secondary Messengers
2.4 Molecular Mechanism of Cell Signalling Process

UNIT 3: CELL ORGANELLES-I

3.1 Molecular Organization of Mitochondria, Mechanism of Oxidative Phosphorylation, Electron Transport Chain
3.2 Molecular Organization and Functions of Chloroplast, Photosynthetic Pigments, Photosystem I & II
3.3 Ultrastructure and Functions of Nucleus
3.4 Structure and Functions of Ribosomes

UNIT 4: CELL ORGANELLES-II

4.1 Structure, Types and Functions of Endoplasmic Reticulum
4.2 Molecular Organization and Functions of Golgi Complex
4.3 Structure and Functions of Lysosomes
4.4 Microbodies: Peroxisomes and Glyoxysomes

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos, Charts

Suggested Activities: Analysis of Electron Micrographs

Semester-3

Environmental Biology and Climate Change

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands core concepts and methods from ecological and physical sciences and their application in environmental problem-solving.
- Appreciates that one can apply systems concepts and methodologies to analyse and understand interactions between social and environmental processes.'
- Understands the global environment threats and will start thinking in the direction to resolve them
- Knows the key concept of waste and its management

Course Content:

UNIT 1: THE ENVIRONMENT

1.1 The Environment: Physical environment; Composition of Atmosphere
1.2 Habitat and Niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.
1.3 Ecosystem structure; ecosystem function; energy flow; primary production and decomposition;
1.4 Biogeochemical Cycles Gaseous Cycle (N Cycle and Nitrogen Fixation), Sedimentary Cycle (P Cycle)

UNIT 2: THE BIOSPHERE

2.1 Biomes: Introduction about the types of Biomes, Characteristic features of Biomes
2.2 Major terrestrial biomes; theory of island biogeography; biogeographical zones of India
2.3 Biodiversity Types and biodiversity management approaches
2.4 Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves)

UNIT 3: POLLUTION & CLIMATE CHANGE

3.1 Pollution by pesticides, Biomagnifications of pesticide & their Biological control
3.2 Brief account on Water pollution (by Oil, Detergent, Heavy metal & industrial effluent)
3.3 Air Pollution, Acid rain and Mitigation of air pollution
3.4 Greenhouse effect, Ozone depletion and Global Warming
3.5 Novel Pollution: Noise Pollution, RA Pollution and Light Pollution

UNIT 4: ENVIRONMENTAL CHALLENGES & SOLUTIONS

4.1 Carbon Sequestration and Carbon credit,
4.2 Deforestation and Afforestation
4.3 Desertification
4.4 LiFE Mission (Lifestyle For Environment), Plastic pollution and concept of EPR

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos, Charts

Suggested Activities: Visit to a botanical garden, Understanding pollution and bioremediation through videos, Plastic collection drive

Semester-3

Biochemistry and Enzymology

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Learns the structure, function and metabolic pathways of essential biochemical molecules including their key chemical and physical properties.
- Learns about the alternative pathways of energy production and lipid metabolism
- Learns principles of enzyme kinetics and apply these through hands on problem sets. Students will be shown how enzyme properties contribute to metabolic processes.

Course Content:

UNIT 1: BIOENERGETICS & THERMODYNAMICS

1.1 Basic concepts of Enthalpy, Entropy, Free energy and chemical equilibrium Determination of ΔG & Energy rich compounds
1.2 Energy Metabolism: Role of ATP in metabolism, Role of Reducing power
1.3 Laws of Thermodynamics
1.4 Fuelling Reactions Catabolic pathways of carbohydrates – Glycolysis, TCA cycle

UNIT 2: METABOLIC PATHWAYS

2.1 Modes of ATP generation Substrate Level and Oxidative Phosphorylation
2.2 Carriers and Complexes of Respiratory Chain, Chemiosmotic Theory
2.3 PPP and Glyoxylate Cycle
2.4 Lipid catabolism – Fatty acid Beta oxidation Pathway

UNIT 3: INTRODUCTION TO ENZYMES

3.1 Enzymes – General Characteristics, Active and Allosteric Sites
3.2 Nomenclature and Classification
3.3 Mechanism of Enzyme Action, Concept of Activation Energy
3.4 Overview of Cofactors, Coenzymes, Isoenzymes, Ribozyme, Abzyme

UNIT 4 ENZYME KINETICS AND INHIBITION

4.1 Enzyme kinetics Effect of Temperature, pH, Substrate & Enzyme Concentration
4.2 Steady-state hypothesis, derivation of Michaelis-Menten equation, Double reciprocal plot
4.3 Significance of Km and Vmax and their determination using different plots
4.4 Enzyme inhibition, Enzyme kinetics in the presence of inhibitors

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos, Charts

Suggested Activities: Study of biomolecules using models, understanding enzyme kinetics using videos

Semester-3

Laboratory Experiments in Plant Sciences III

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Understands about the basic knowledge of molecular structure and functions of cell organelles
- Gains knowledge about the molecular mechanisms of cell organelles in living organisms
- Understands the structure, functions and significance molecules of organisms
- Utilises this knowledge in building career in the field of agriculture

Suggested Practicals :

CELL BIOLOGY

1. To study different stains used in cell biology
2. Observation of distinguishing features of prokaryotic and eukaryotic cells
3. Measurement of the size of cells and subcellular components in light microscope
4. To identify the Barr body from buccal smear
5. Study of different stages of mitosis in onion root tip cells
6. Study of the effect of colchicine on mitosis in onion Root tip cells
7. Study of divisional stages in Mitosis (different floral buds)
8. Staining of mitochondria in human cheek epithelial cells
9. Differential staining for DNA and RNA in human cheek Epithelial cells

BIOLOGICAL CHEMISTRY AND ENZYMOLOGY

1. To perform qualitative tests for carbohydrates
2. Preparation of standard curve for carbohydrates
3. To quantify carbohydrate from unknown plant sample
4. To perform qualitative tests for Protein
5. Preparation of standard curve for Protein
6. To quantify protein from unknown plant sample
7. To perform qualitative tests for lipids
8. To quantify lipids from unknown plant sample.
9. To perform qualitative tests for nucleic acids

ENVIRONMENTAL BIOLOGY & CLIMATE CHANGE

1. To study the water pollution
2. To study BOD of water sample
3. To study COD of water sample
4. To study the soil pollution
5. To study the air pollution
6. Study of greenhouse effects, global warming, acid rain, ozone depletion through charts
7. To study the aerosol types
8. To understand the global warming, its cause and consequences through scientific documentaries and movies.

Semester-3

Dissertation in Plant Sciences II

Practical (Submission)

Compulsory
Credit: 02
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Demonstrates ability to identify a research problem
- Formulates clear objectives for the study
- Designs a feasible methodology to research into the problem
- Increases their capacity to think critically, ability to design and execute an
- experiment
- Improves confidence and ability in communicating ideas
- This will serve as a lasting and practical basis for a career, for example, in research - whether industry or academia as well as teaching, media, law, commerce, government or management.

Dissertation work in Biological Sciences:

Students **will carry out dissertation work** on the topic of their study comprising of

(a) An introduction on the topic along with literature survey and justification for the Selection of the topic.

(b) Materials and Methods

(c) Results and Discussion

(d) Reference

(e) Each student has to give a midterm presentation of their work.

SEMESTER IV

Semester - IV

Semester-4 M.A. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
	Internship	1	60	2	100	0	100
	Research	1	60	2	50	0	50
M.A.	Theory	2	120	8	60	140	200
	Total	**6**	**360**	**20**	**270**	**280**	**550**

Semester-4 M.Sc. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
	Internship	1	60	2	100	0	100
	Research	1	60	2	50	0	50
M.Sc.	Theory	2	90	6	45	105	150
	Practical	1	60	2	15	35	50
	Total	**7**	**390**	**20**	**270**	**280**	**550**

Sr. No.	Subject	Title	Type	Hours	Credit	Marks Internal	Marks External	Total
1	Education	Management and Administration	Theory	60	4	30	70	100
2	Education	1. Foundational and Prepratory Stage in Education/ 2. Middle and Secondary Stage in Education/ 3. Higher Education/ 4. Teacher Education	Theory	60	4	30	70	100
3	Education	Internship M.Ed. I	Practical	60	2	100	0	100
4	Education	Dissertation I : Research Proposal	Practical	60	2	50	0	50
5	English	Neoclassical Literature	Theory	60	4	30	70	100
6	English	1. Indian English Literature/ 2. Autobiographical Writing and Memoirs	Theory	60	4	30	70	100
7	Chemistry	Heterocyclic Chemistry	Theory	60	4	30	70	100
8	Chemistry	1. Natural Products / 2. Physical Chemistry-II	Theory	30	2	15	35	50
9	Chemistry	Laboratory Experiments in Chemistry-IV	Practical	60	2	15	35	50
10	Mathemetics	Measure Theory	Theory	60	4	30	70	100
11	Mathemetics	1. Operation Research/ 2. Discrete Mathematics	Theory	30	2	15	35	50
12	Mathemetics	Practical: Measure Theory	Practical	60	2	15	35	50
13	Physics	Electrodynamics and Mathe-matical Physics	Theory	60	4	30	70	100
14	Physics	1. Spectroscopic Techniques/ 2. Crystallography and Material Science	Theory	30	2	15	35	50
15	Physics	Laboratory Experiments in Physical Sciences -IV	Practical	60	2	15	35	50
16	Botany	Advanced Plant Physiology	Theory	60	4	30	70	100
17	Botany	1. Analytical and Separation Techniques/ 2. Embryology of Higher Plants	Theory	30	2	15	35	50
18	Botany	Laboratory Experiments in Plant Sciences-IV	Practical	60	2	15	35	50

Education

Semester-4

Management and Administration

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the basic concepts of educational management.
- Reviews and applies theories of educational management in school management.
- Identifies appropriate leadership model as per educational institute requirement.
- Gains understanding regarding various quality monitoring agencies in India.

Unit 1:Introduction of Educational Management

1.1 Educational Management: Meaning, Nature and Characteristics
1.2 Importance and Scope of Educational Management
1.3 Functions of Educational Management
1.4 Structure of Educational Management in India (with reference to Higher Education, Teacher Education, School Education)

Unit-2:Theories and Approach of Educational Management

2.1 Scientific Management Theory
2.2 Fayol's Theory of Management
2.3 Human Relation Approach
2.4 Behaviour Science Approach

Unit-3: Models of Leadership

3.1 Leadership: Meaning and nature, quality of good leader
3.2 Blake and Mouton's Managerial Grid Mode
3.3 Fiedler's Contingency Model
3.4 Tri-dimensional Model, Hersey and Blanchard's Model

Unit 4: Quality in Education

4.1 Total Quality Management and Six Sigma
4.2 Cost of Quality: Appraisal Costs, Cost Benefit Analysis
4.3 National Assessment and Accreditation Council (NAAC)
4.4 Quality Council of India (with reference to Education)

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Visit and study of any one DEO, GCERT, etc. to understand its function
- Study of any educational institute with reference to leadership and its administrative functioning
- Designing strategy for effective management of educational institution by applying TQM or Six Sigma
- Prepare report on application of scientific theory and human relation theory in educational institution

Semester-4

Foundational and Preparatory Stage in Education

Optional;
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept, context and historical development of foundational and preparatory stage in education.
- Recognises and analyses the structure of foundational and preparatory stage in education.
- Appraises the national curriculum frameworks and pedagogy for foundational and preparatory stage in education.
- Reviews and reflects on the critical areas of addressing development needs, support systems and teacher empowerment.

Unit 1: Concept and Historical Development

1.1 Concept of Education and foundational and preparatory stage in education,
Overview of structure of school education in India

1.2 The Development of Early Childhood Care and Education in India and World ,
Pre-primary Education in India: Aims, characteristics, guiding principles

1.3 Historical overview of Foundational and preparatory stage education in pre and post independent era in India

1.4 Policy Perspective of Foundational and Preparatory Stage Education: National Policy of Education, 1986 (NPE-1986), Program of Action -1992 (POA, 1992), National Early Childhood Care and Education (ECCE) Policy (2013) and NPE (2020). w.r.t pre-primary and elementary stage recommendations

Unit 2: Structure of Foundational and Preparatory Stage

2.1 Schemes and Institutions involved in foundational and preparatory stage in education -Characteristics and impact of Operation Blackboard, District Primary Education Programme (DPEP), Integrated Child Development Services (ICDS) scheme, National Programme for Nutritional Support (Mid-day Meal), National Programme for Education of Girls at Elementary Level (NPEGEL)

2.2 Functions of Early Childhood Care and Education (ECCE) Centres
Aims, and Role of Samagra Shiksha Abhiyan in strengthening and universalisation

2.3 Regulatory Bodies for management and administration in foundational and preparatory stage in education - Role of Ministry of Education, NCERT, GCERT and DIET in Foundational and Preparatory Stage

2.4 Institutions for foundational and preparatory stage- Balwadis, Aganwadis and pre-primary schools etc.

Unit 3 National Curriculum Frameworks and Pedagogy

3.1 National Curriculum Framework (NCERT, 2009): Overview of major recommendations for foundation and preparatory stage education
Pre-school curriculum (NCERT, 2019) – Vision, concerns related to early learning, curriculum and learning environment

3.2 National Curriculum Framework for Foundational Stage (2022) – Aims, principles of and approach to language education and literacy.

3.3 Principle of Pedagogy and Pedagogical approaches- Theme-based approach, Play-based approach, Activity-based approach, Project-based approach, Integrating approach, strategies for literacy and numeracy

3.4 Assessment: Guiding principles, methods and tools, documentation and communication of assessment result at foundational and preparatory stage in education.

Unit 4: Addressing critical areas and developing support system

4.1 Developmental Aspects: Physical, Health, Motor, Sensory and perceptual Development Language & Cognitive Development during early ages

4.2 Addressing development delays and disability; ensuring safety and security in the school environment

4.3 Teachers at foundational and preparatory stage w.r.t teacher preparations, recruitment, competencies and professional development

4.4 Critical Reflection on the missions at Foundational Stage; Foundational Literacy and Numeracy (FLN), Pravrutti Dwara Gnan (PRAGNA)

Mode of Transaction: Lecture method, Discussion, Assignment work, Group Project

Suggested Activities:

Field Visits, Projects & Research, Case Studies and comparative studies

Semester-4

Middle and Secondary Stage in Education

Optional;
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept, context and historical development of middle and secondary stage Education.
- Recognises and analyses the structures of middle and secondary stage education.
- Appraises the national curriculum frameworks and pedagogy for middle and secondary stage education.
- Reviews and appraises role of teacher in ensuring quality at middle and secondary stage education.

Unit 1: Concept and Historical Development

1.1 Concept of Education and secondary education

Historical Overview of General Structure of school education

1.2 General Aims and Objectives, Nature and Characteristics, Scope and Functions of Middle and Secondary Education

1.3 Historical Perspectives of Middle and Secondary Stage in Education

Ancient, Medieval and Colonial India w.r.t nomenclature, curriculum and teaching methods

Post Independence – Recommendations of Mudaliar Commission, Kothari Commission and Knowledge Commission w.r.t middle and secondary education

1.4 Policy Perspective on Middle and Secondary Stage in Education

National Policy on Education (1986) & National Education Policy (2020) with reference to recommendation on curriculum, pedagogy, governance and universalisation.

Unit 2: Structure of Middle and Secondary Stage

2.1 Institutional Structure at secondary and middle stage: central, state and local level

2.2 Regulatory Bodies and Institutions and their functions:

National Council of Educational Research and Training, Stata Council of Educational Research and Training,

National Institute of Open Schooling, Kendriya Vidyalaya Sangathan, Navodaya Vidyalaya Samiti

2.3 Secondary School Boards: Central Board of Secondary Education, Council for the Indian School Certificate Examination, State Boards of Education, Cambridge International Examination and International Baccalaureate

2.4 Types of Management of schools and role of various bodies involved in school management

Unit 3: National Curriculum Frameworks and Pedagogy

3.1 Relevance and concerns of National Curriculum Framework Secondary Education (2005)

3.2 National Curriculum Framework for School Education (2023) : Major recommendations for school subjects, cross cutting themes, school culture and assessment

3.3 Ecosystem for Secondary Education Developing school culture and learning environment

3.4 Teaching Methods, Pedagogies and assessment for middle and secondary stage

Unit 4: Teacher, Teacher Development and Quality

4.1 Teachers at secondary and middle stage w.r.t teacher preparations, recruitment, competencies and professional development

4.2 Educational Initiatives for quality and universalisation: Samagra Shiksha Abhiyan (SSA), Rashtriya Madhyamik Shiksha Abhiyan (RMSA)

4.3 Quality Assurance in secondary schools: Quality Indicators, management of resources and strategies for quality improvement

4.4 Addressing issues of enrolment, access, stagnation, quality, professional development at Middle and Secondary Stage

Mode of Transaction: Lecture Method, Discussion, Group Project

Suggested Activities: Field Visits, Projects & Research, Case Studies and comparative studies

Semester-4

Higher Education

Optional;
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept, context and historical development of Higher Education.
- Recognises and analyses the structures of Higher Education in India
- Appraises the Higher Education Qualification Framework, Curriculum and credit framework for undergraduate programmes and related policies in Higher Education
- Reviews and reflects on challenges, trends and Innovation in Higher Education.

Unit 1: Concept and Historical Development

1.1 Concept of Higher Education: General Aims and Objectives, Characteristics, Scope and Functions

1.2 Overview of Institutions of Higher Learning in Ancient India till Independence

1.3 Policy Perspective on Higher Education in Independent India: University Education Commission (194849), Education Commission (196466), National Policy on Education (1968 & 1986) and National Education Policy 2020

1.4 Higher Education in Global and social Context: Global Vs Local, Universal Vs Individual, Tradition Vs Modernity, Spiritual Vs Material, Competition and concerns for Equality of opportunity

Unit 2: Structure of Higher Education

2.1 Structure and Status of Higher Education in India

Status and Types of Universities,

Concept and role of Act, Statutes, Regulations, Policy and Guidelines in management of universities.

2.2 Apex Bodies in Higher Education: University Grants Commission (UGC), NITI Ayog, Association of Indian Universities (AIU), National Assessment and Accreditation Council(NAAC)

Professional Councils in Teacher Education: National Council for Teacher Education (NCTE), Rehabilitation Council of India (RCI)

2.3 Management of Higher Education

Systemic Level: Role and responsibility of Central and State Government

Constitutional Provisions for Higher Education, Ministry of Education, Department of Higher and Technical Education, Commissionarate of Higher Education

2.4 Institutional Level : Organisational Framework,

Governance of Universities: Constitution, Executive Council, Academic Council, Faculty/School, Senate/Governing Council, Finance Committee, Board of Studies

Administrative Human Resource: The Visitor/Chancellor, Vice Chancellor, ProVice Chancellor, Dean, Registrar, Finance Officer, Faculty Members Academic Human Resource Senior Professor, Professors, Associate Professors and Assistant Professors

Unit 3: Frameworks and related Policies in Higher Education

3.1 NEP 2020 and Higher Education: Major Recommendations for higher education- Institutional Restructuring, Transforming regulatory system of higher education, Governance and Leadership

3.2 National Higher Education Qualification Framework: Characteristics, purpose, Nomenclature and Levels

National Vocational Education Qualifications Framework (NVEQF)

National Skills Qualification Framework (NSQF)

3.3 Curriculum and Credit Framework for Undergraduate Programme: Features, Credit Structure, Curriculum Components (Disciplinary/interdisciplinary major; Disciplinary/ interdisciplinary minor, Ability Enhancement Course, Skill Enhancement Courses, Value Added Courses, Internship, Research Project/Dissertation and Other activities

3.4 Policy Provisions: Academic Bank of Credit, Multiple Entry and Multiple Exit

Holistic and Multidisciplinary education,

Unit 4: Teacher, Teacher Development and Quality

4.1 Issues Related to Expansion, Inclusiveness, Quality and Finance

4.2 Internationalisation of Higher Education, Public Private Partnerships

4.3 Rashtriya Utchtar Shiksha Abhiyan (RUSA) - Objectives and Functioning.

PM Uchchatar Shiksha Abhiyan (PMUSA)-Objectives and Functioning.

4.4 National Research Foundation Bill 2023, UGC Guidelines for transforming Higher Education Institutions into multidisciplinary institutions w.r.t research in HEI Clusters.

Mode of Transaction: Lecture Method, Discussion, Group Project

Suggested Activities:

- Case studies and Group discussions.
- Visits to institutions of Higher Education and policy making institutions.
- Reading sessions and debates on recent policies and guidelines
- Surveys and empirical studies to review the policies
- Action research projects to identify concern or challenge in higher education

1. Dash, (2004) ; Education in India- Problems and Perspectives, Atlantic Publishers & Distributors,

Semester-4

Teacher Education

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends basic concepts of Teacher Education.
- Identifies and appraises the policies and organisations guiding Teacher Education.
- Critically analyses and reflects on Teacher Education Program and their significance.
- Reviews and examines research areas, innovations and issues in Teacher Education

Unit-1: Introduction to Teacher Education

1.1 Meaning Purpose and Objectives of Teacher Education w.r.t Pre-service Teacher Education Programs for various stages.

1.2 Types of Teacher Education and its need: Pre-Service and In Service

1.3 Organization of Components of Pre-service Teacher Education: Transactional Approaches, Expository, Collaborative and Experiential learning

1.4 Knowledge base of Teacher Education from the view point of Schulman, Deng and Luke & Habermas

Unit-2: Policies & Organisations guiding Teacher Education

2.1 Policy Perspectives of Teacher Education and recommendation: NEP 1986 , NEP 2020

2.2 National Curriculum Framework for Teacher Education (2009) and subsequent guidelines after NEP 2020

2.3 Objectives, function and Impact of:

Statutory Bodies in Teacher Education: NCTE, RCI

Agencies of Teacher Education: NCERT, SCERT, DIETs

2.4 Objectives, function and Impact of:

Institutes for Teacher Education: IUCTE, IASE, CASE, IITE, RIEs

Unit-3: Critique on Teacher Education Programs

3.1 Overview of In-service Teacher Education Programs offered by NCTE at Various Stages and reforms in Teacher Education in light of NEP 2020

3.2 Need and Importance of stage specific Teacher Education at Foundational, Preparatory, Middle and Secondary Stage

3.3 Integrated Teacher Education Programme ITEP: Critical review of the curriculum framework, impact and challenges for Teacher Education Institutes and other organisations

3.4 Personal and Professional Development of Teachers w.r.t Teaching as a Profession, Professional Ethics and Continuous Professional Development,

Challenges for framing and implementing policy guidelines on National Professional Standards for Teachers and National Mentoring Mission

Unit-4: Research, Innovations, and Issues in Teacher Education

4.1 Research Trends and Innovations in Teacher Education

4.2 Best Practices in Teacher Education along with Futuristic Trends in Teacher Education

4.3 Issues and Challenges in Teacher Education

4.4 Maintaining Standards in Teacher Education: Admission Policies for Teacher Education Programs and Recruitment Policies for Teachers at school level and Teacher Educators at Tertiary Level.

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Observing and simulating classroom lesson: for developing skills and receiving feedback from peers.
- Documentary Study: Historical Overview of critical Policy reforms in Teacher Education and its impact on society.
- Research on comparative study for various teacher education programs at National and International Level.
- Status surveys for the implementation of recommendations of NEP 2020 and changes it has bought.
- Surveys and empirical research using primary or secondary data on issues and challenges/ innovative trends/curriculum/service conditions/professional development etc.

Semester-4

Internship M.Ed. I

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- develops skills of doing research on psychological attribute, social research and status surveys.
- develops skills of guiding and supervising microteaching lessons/ simulation lessons/practice teaching lessons of B.Ed. trainees.
- develops an understanding of role, functions and process various agencies related with teacher education.
- develops and understanding of the role of technology in content development and research.
- develops an understanding of social roles of teachers as volunteers.
- develops skills of effectively presenting the work done.

Activities:

- Implementation of a Psychological Test/Status Survey/Social Research
- Guidance, checking and supervision of Microteaching Lessons/ Simulation lessons/ practice teaching lessons of student teachers
- Visit to an agency of curriculum development/text book bureau/DIET/ GCERT/ Teacher Education Institution
- Visit to Secondary Teacher Training Institute, GCERT /INFLIBNET/ GIET / an institute of special education/NGO and contribute as a teacher/volunteer
- Presentation of submissions

Internal Assessment:

- Report of a Psychological Test/Status Survey/Social Research – 20 Marks
- Report of checking and supervision of Microteaching Lessons/ Simulation lessons/ practice teaching lessons of student teachers- 20 Marks
- Report of visit to an agency of curriculum development/text book bureau/DIET/ GCERT/ Teacher Education Institution- 20 Marks
- Report of visit to Secondary Teacher Training Institute, GCERT /INFLIBNET/ GIET / an institute of special education/NGO and contribute as a teacher/volunteer- 20 Marks
- Presentation of submissions- 20 marks

Semester-4

Dissertation I : Research Proposal

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Develops skills of literature review and conceptual framework.
- Comprehends and reviews the literature to frame a research problem.
- Analyses and synthesizes the information to write a research proposal.
- Presents and defends the research proposal.
- Critically reflect, analyses, evaluates, argues and negotiates during presentation of the proposal.

Details and Submissions

- Research Reviews (at least 10) and review of related literature.
- Preparation of Research Proposal and submission.
- Presentation of Research Proposal and approval.

Suggested Framework for developing Research Proposal

- Introduction
- Title of research and statement of the problem
- Review of related literature, conceptual framework
- Rationale and need for the study
- Objectives of Research
- Hypothesis and or Research questions
- Variables of Research
- Operational and conceptual definitions and or explanation of terms
- Scope, limitations and delimitations of Research
- Area of Research
- Type of Research
- Method of Research
- Population, sample and sampling technique
- Tool of Research
- Intervention Program (in case of experimental research)
- Data Collection
- Technique of data analysis
- Chapterization
- Time frame and Budget
- References

(The framework can be changed or modified depending upon the type and need of research problem)

Research proposal presentation will be in the form of seminar/presentations/discussion forums etc. The researcher will be given the 20-25 minutes for the presentation and 20-25 minutes will be given for discussion and feedback.

Mode of Transaction: Face to face, seminar, discussion, field visit to library, institutes etc.

Suggested Activities:

- Classroom discussions on various topics related to research in education.
- Readings for reviews and conceptual framework and visits to libraries and institutes for the same.
- Reflection and critiques of Research Proposal presentation on various themes.

Arts

Semester-4

Neoclassical Literature

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Describes the characteristics and key themes of the Neoclassical period and recognize their influence on literature.
- Analyses the structure, style, and form of Neoclassical poetry, including the use of heroic couplets and satire.
- Analyses various forms of Neoclassical prose, such as philosophical essays, satirical works, and critical writings, and comprehend their thematic and stylistic features.
- Analyses the relationship between Neoclassical literature and the Age of Enlightenment, understanding how they shaped each other's ideas and philosophies.

Unit 1: Introduction to Neoclassical Literature

- Overview of the Neoclassical period and its characteristics
- Key themes and ideals of Neoclassical literature
- Influence of classical antiquity on Neoclassical writing
- Comparison with preceding literary movements (e.g., Renaissance, Baroque)
- Representative authors and their contributions

Unit 2: Neoclassical Poetry and Drama

- Neoclassical poetry: Structure, style, and form (e.g., heroic couplets, satire)
- Major Neoclassical poets: Alexander Pope, John Dryden, and Anne Finch
- Neoclassical drama: The rise of comedy of manners and tragedies
- Examination of prominent playwrights: William Wycherley, George Etherege, and John Vanbrugh

Unit 3: Prose and the Rise of the Novel

- Neoclassical prose: Philosophical essays, satirical works, and critical writings
- Notable essayists and critics: Joseph Addison, Richard Steele, and Samuel Johnson
- The emergence of the English novel during the Neoclassical era
- Influential novelists and their contributions: Daniel Defoe, Samuel Richardson, and Henry Fielding

Unit 4: Neoclassical Literature in Context

- Neoclassical literature and the Age of Enlightenment
- Neoclassicism and its impact on other art forms (e.g., visual arts, music)
- Socio-political context and the role of literature in shaping society
- Neoclassical literature's legacy and its relevance in the modern world

Semester-4

Indian English Literature

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Gains an understanding of the historical and cultural context of Indian English Literature, including its emergence during the colonial era.
- Analyses how India's struggle for independence influenced and shaped literary expressions, contributing to a rich body of nationalist literature.
- Examines the themes and concerns that emerged in Indian English Literature after independence, reflecting the changing social, political, and cultural landscape of the nation.
- Explores the emergence of new voices and themes in contemporary Indian English Literature, reflecting the evolving socio-cultural fabric of modern India.

Unit 1: Emergence and Early Development

- Introduction to Indian English Literature: Historical and cultural context
- The role of English in colonial India: Language and literature
- Early Indian English writers and their themes
- Influences of Indian traditions and Western literary traditions
- Key authors: Raja Rammohan Roy, Bankim Chandra Chattopadhyay, and Rabindranath Tagore

Unit 2: The Progressive Movement and Nationalism

- The impact of India's struggle for independence on literature
- The Progressive Writers' Movement and its socio-political engagement
- Literary responses to nationalism and social reform
- Feminist voices in Indian English Literature
- Key authors: Mulk Raj Anand, R.K. Narayan, and Ismat Chughtai

Unit 3: Post-Independence and Modernity

- Post-independence themes and concerns in Indian English Literature
- Modernism and experimentation in literary forms
- Migration, diaspora, and identity in contemporary literature
- Indian English poetry and its evolving trends
- Key authors: Salman Rushdie, Arundhati Roy, and Amitav Ghosh

Unit 4: Contemporary Voices and Global Recognition

- New voices and themes in contemporary Indian English Literature
- The rise of Indian English Literature on the global stage
- Intersectionality and diverse perspectives in current writings
- Environmental concerns and eco-criticism in Indian English Literature
- Key authors: Jhumpa Lahiri, Arvind Adiga, and Kiran Desai

Semester-4

Autobiographical Writing & Memoirs

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the cultural significance of Indian autobiographical writing and its relevance in society.
- Traces the historical development of autobiographical writing in the Western world and understand its evolution.
- Explores the autobiographical narratives in African and Caribbean literary traditions and their cultural significance.
- Understands the diversity of autobiographical writing in Asian and Middle Eastern cultures and its representation of various perspectives.

Unit 1: Prominent Indian Autobiography Writers

- Introduction to Indian autobiographical writing and its cultural significance
- The tradition of self-narration in Indian literature
- Key themes in Indian autobiographies: identity, caste, gender, and nationhood
- Prominent Indian autobiography writers and their works
- Mahatma Gandhi: “The Story of My Experiments with Truth”
- Amrita Pritam: “The Revenue Stamp"
- Nirad C. Chaudhuri: “The Autobiography of an Unknown Indian”

Unit 2: Autobiography Writers from Western Literature

- Historical development of autobiographical writing in the Western world
- The impact of religious and philosophical traditions on Western autobiographies
- Themes of self-discovery, coming-of-age, and personal transformation
- Key authors and works:
- Jean-Jacques Rousseau: “Confessions”
- Virginia Woolf: “Moments of Being”
- Franz Kafka: “Letter to His Father”

Unit 3: Autobiography Writers from African and Caribbean Literature

- Autobiographical narratives in African and Caribbean literary traditions
- The influence of colonialism and post-colonialism on identity narratives
- Themes of displacement, diaspora, and cultural hybridity
- Key authors and works:
- Nelson Mandela: “Long Walk to Freedom”
- Maya Angelou: “I Know Why the Caged Bird Sings”
- Wole Soyinka: “Ake: The Years of Childhood”

Unit 4: Autobiography Writers from Asian and Middle Eastern Literature

- Autobiographical writing in diverse Asian and Middle Eastern cultures
- Themes of war, revolution, and social change in autobiographical accounts
- The representation of cultural heritage and family histories
- Key authors and works:
- Maxine Hong Kingston: “The Woman Warrior”
- Orhan Pamuk: “Istanbul: Memories and the City”
- Marjane Satrapi: “Persepolis”

Science

Chemistry

Semester-4

Heterocyclic Chemistry

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Carries out nomenclature of various heterocyclic compounds
- Gets detailed synthesis of heterocyclic compounds
- Prepares heterocyclic compounds in laboratory
- Gets knowledge of Chemical properties of heterocyclic compounds

Course Content:

Unit 1: Nomenclature and classification of heterocyclic compounds

1.1. Hantzsch-Widman Nomenclature system
1.2. Introduction and Classification of heterocyclic compounds
1.3. Chemistry and Reactions of pyridines
1.4 Synthesis of pyridines
1.5 Synthesis of Pyridine N-oxides
1.6 Chemistry and Reactions of pyridine N-oxides
1.7 Reactions of Pyrans
1.8 Synthesis of Pyrans

Unit 2: Five membered heterocycles with two hetero atoms

2.1. Preparation and properties of pyrazole
2.2 Preparation and properties of imidazole
2.3 Preparation and properties of thiazole
2.4 Preparation and properties of isoxazole
2.5 Preparation and properties of oxazole
2.6 Preparation and properties of isothiazole
2.7 Preparation and properties of benzoisothiazole

Unit 3: Six membered heterocyclic compounds with two hetero atoms

3.1 Synthesis and reactions of pyridazines
3.2 Synthesis and reactions of pyrimidines
3.3 Synthesis and reactions of pyrazines
3.4 Synthesis and reactions of Cinnolines
3.5 Synthesis and reactions of Quinazolines
3.6 Synthesis and reactions of Quinoxalines
3.7 Synthesis and reactions of Phthalazines

Unit 4: Seven membered heterocyclic compounds

4.1. Introduction
4.2. Synthesis and reactions of azepine
4.3. Synthesis and reactions of oxepine
4.4. Synthesis and reactions of thiepine
4.5. Synthesis and reactions of diazepine
4.6. Synthesis of azocine, 1,4-diazocine,1,4-dioxocin
4.7 Synthesis of Benzodiazepine

Mode of Transaction: PPTs, Video Lectures, Chalk and Talk Method,3-dimensional structures

Suggested Activities: Group Discussion, Unit Tests

Semester-4

Natural Products

Optional
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Illustrates classification and synthesis of Terpenoids
- Carries out classification and synthesis of Alkaloids
- Explains chemistry of Vitamins and their uses

Course Content:

Unit 1: Introduction and applications of Terpenoids and Alkaloids

1.1 Introduction of Terpenoids
1.2 Classification and isolation of Terpenoids
1.3 Constitution and synthesis of Terpenoids:
1.3.1 Menthol
1.3.2 Farnesol
1.4 Introduction of alkaloids
1.5 Nomenclature and classification of alkaloids
1.6 Structure and synthesis of alkaloids:
1.6.1 Nicotine
1.6.2 Atropine

Unit 2: Vitamins

2.1 Introduction
2.2 Classification and source of vitamins
2.3 Structure and synthesis of
2.3.1 Vitamin A1
2.3.2 Vitamin B1(Thiamine)
2.3.3 Vitamin C (Ascorbic acid)

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test

Semester-4

Physical Chemistry II

Optional
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of ideal solution, Henry's law and Nernst Distribution Law.
- Understands the concept of fugacity and activity.

Course Content:

Unit 1: Ideal solutions and Raoult's Law

1.1 Thermodynamics of mixing of dilute solutions
1.2 Henry's law and solubility of gases
1.3 Nernst distribution Law and its Applications
1.4 Determination of activity and activityncoefficients of non-electrolytes.
1.5 Fugacity and method of determination of fugacity of real gases.
1.6 Variation of fugacity with temperature and pressure
1.7 Numericals

Unit 2: Solid State Chemistry

2.1 Introduction
2.2 Properties of solid
2.3 Types of Solid
2.4 Miller Indices
2.5 Defects in Solid: Schottky and Frenkel Defect
2.6 Born-Haber cycle
2.7 The Bragg Equation
2.8 Powder Method: Debye Scherrer Method
2.9 Numericals

Mode of Transaction: PPT. Video Lecture, Chalk and Talk Method

Suggested Activities: Experiments, Group Discussion

Semester-4

Laboratory Experiments in Chemistry IV

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Learns more through experimental approach.
- Learns Synthesis of heterocyclic compounds.
- Finds out percentage yield of synthesized heterocyclic compounds.
- Identifies the structural reaction mechanism of heterocyclic compounds.
- Learns the basic concepts of Chemistry of Natural Products.
- Gets Hands on training of instruments like pH meter and Conductometer.

Course Content:

Heterocyclic Chemistry

Preparation of following heterocyclic compounds:

1. 7-hydroxy 4-methyl coumarin.
2. 6-methyl-4-oxo-1,2,3,4-tetrahydro-2-thiopyrimidine.
3. 2-methyl benzimidazole.
4. 2,3 diphenyl quinoxalines.
5. 5,5-diphenyl hydantoin.
6. 2-chloromethyl benzimidazole.
7. 2-hydroxy-4-methyl quinoline.
8. 4-phenyl-6-methyl-5 carbethoxy-2-pyrimidone.

Natural Products

Interpretation of IR, NMR and mass spectrographs of important Terpenoids and Alkaloids

a) Terpenoids

1 Nerol
2 Geraniol
3 Citral
4 Menthol
5 Beta-carotene
6 Carvone
7 Camphor

b) Alkaloids

1 Cocaine
2 Nicotine
3 Morphine
4 Piperine
5 Atropine
6 Ephedrine

Physical Chemistry-II

pH Metry

1 To determine dissociation constant of benzoic acid/acetic acid.

2 To determine Normality, Gram/Litre and Molarity present in Na_2CO_3 + $NaHCO_3$ by titrating against 0.1 N HCl solution.

Conductometry

1 Determination of λ0 or λα and dissociation constant of monochloro acetic acid.

2 To verify D.H.O. equation for strong electrolytes.

Chemical Kinetics

1 The study of Rate of Reaction between hydrogen peroxide and KI in an aqueous media. (a = b)

2 Study of order of reaction between hydrogen peroxide and KI in an aqueous media. (a ≠ b)

Mode of Transaction: Chalk and Talk Method, Experiments

Suggested Activities: Group Discussion

Mathematics

Semester-4

Measure Theory

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Increases their capacity to develop logics of analysis.
- Understands basic concepts of Real analysis with new ideas.
- Develops problem solving ability in the subject of Measure Theory.
- Develops confidence level to teach the same subject.

Course Content:

Unit 1: Set Theory

1.1 Sets, Sequences, and Functions

1.2 The Field, Positivity, and Completeness Axioms

1.3 The Natural and Rational Numbers, Countable and Uncountable Sets

1.4 Open Sets, Closed Sets, and Borel Sets of Real Numbers

Unit 2: Sequences & continuity of real numbers

2.1 Sequences of Real Numbers, monotone convergence criterion for real sequences, the Bolzano-Weierstrass theorem

2.2 Cauchy sequence, the Cauchy convergence criterion for real sequences, linearity and monotonicity of convergence of real sequences

2.3 Continuous Real-Valued Functions of a Real Variable, definition of continuous function

2.4 Lipschitz function, the intermediate value theorem, monotone function.

Unit 3: Measurable sets

3.1 Lebesgue measurable sets, properties of Lebesgue measure

3.2 Outer measure, counting measure, Lebesgue Outer Measure and its properties

3.3 Measurable sets, σ-Algebra of Lebesgue Measurable Sets, Borel sets

3.4 Borel σ-algebra, Outer and Inner Approximation of Lebesgue Measurable Sets

Unit 4: Measurable Functions

4.1 Lebesgue Measurable Functions- definition, Borel measurable function

4.2 Sums, Products, and Compositions of measurable function

4.3 Pointwise and uniform convergence of measurable functions

4.4 Simple function, simple approximation theorem.

Semester-4

Operations Research

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Inventory Models.
- Develops the skills of calculation of Inventory Problems and Game theory Problems.
- Acquires the Knowledge of Operation Research.
- Applies the knowledge of Operation Research for any real-time problem.

Course Content:

Unit 1: Inventory control Models

1.1 Inventory Problems-Introduction, Types of Inventory

1.2 Cost involved in inventory problems, EOQ model with infinite replenishment rate

1.3 EOQ model with finite replenishment rate, EOQ model with shortages

1.4 Order-Level lot-size model, Order-Level lot-size model with infinite replenishment rate.

Unit 2: Game Theory

2.1 Game Theory-Introduction, Two-person zero sum game

2.2 Max-min and min max Principles, payoff, solution of 2*2 game with mixed strategy

2.3 Method of oddments, Dominance-Principle

2.4 Solution of 2*n game, Simplex method for solving game

Semester-4

Discrete Mathematics

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Automata Theory & Basic Lattice Theory
- Develops the skills of calculation of Values of Boolean expression
- Acquires the Knowledge of Boolean function, SoP & PoS.
- Applies the knowledge of Automata Theory & Lattice Theory for any real-time problem.

Course Content:

Unit 1: Automata Theory

1.1 Languages and Grammars, Finite State Machines, Semigroups

1.2 Machines and Languages, Moore Machines, Simplification of Languages and Grammars

1.3 Machines, Moore Machines and Regular Languages

1.4 Kleene's Theorem, Pumping Lemma, Nondeterministic Finite State Automata.

Unit 2: Basic Lattice Theory

2.1 Meet and Join Operations. Boolean Algebra: Boolean expressions and their equivalence, Types of Boolean Algebra.

2.2 Boolean functions and expressions. Minterm and Maxterm- Sum of Product (SoP), Product of Sum (PoS) of Boolean expression.

2.3 Switching Network from Boolean expression using logic gates. Values of Boolean expression, canonical forms.

2.4 Boolean functions, representation of Boolean function, Karnaugh maps, minimization of Boolean function, Quine_Mccluskey algorithm.

Semester4

Practical: Measure Theory

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Increases their capacity to develop logics of analysis.
- Understands basic concepts of Real analysis with new ideas.
- Develops problem solving ability in the subject of Measure Theory.
- Develops confidence level to teach the same subject.

Course Content:

Unit 1: Testing Properties & Verify Theorems (Unit: 1 & 2)

1.1 Creating the examples for given conditions.

1.2 Testing the properties Measure, sequences of functions, measurable sets.

1.3 Verification of theorems.

1.4 Check necessary and sufficient conditions.

Unit 2: Creating Examples & Verify Theorems (Unit: 3 & 4)

2.1 Open and closed sets in a metric space.

2.2 Creating the examples for given condition.

2.3 Testing the properties of countable and uncountable Sets.

2.4 Verification of theorems.

Physics

Semester-4

Electrodynamics and Mathematical Physics

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Learns the relevance of different tools of pure mathematics in the context of the laws of physics and hence will be able to apply the same to deal with the different concrete problems of natural phenomena.
- Have a fair degree of familiarity with tensors and tensorial formulation of relativity and electrodynamics.
- Solves problems of motion of charged particles in various field formations as well as find the radiation patterns from different time varying charge and current densities.

Course Content:

Unit 1: Propagation of Electromagnetic Waves

1.1 Maxwell equations in matter and boundary conditions, Momentum conservation in Electrodynamics, Maxwell's stress tensor – Angular momentum, electromagnetic potentials, gauge transformation, Lorentz and Coulomb gauge, gauge invariance.

1.2 Propagation of electromagnetic waves in free space, non-conducting and conducting media, in bounded media, wave guides

1.3 Non relativistic motion of a charged particle in uniform constant fields, in a slowly varying field, gradient drift, magnetic mirror

1.4 Retarded potential, Larmor formula, Bremsstrahlung

Unit 2: Radiation and Relativity

2.1 Dipole radiation, Electric dipole radiation, Magnetic dipole radiation, Radiation from an arbitrary source, Point charges: Power radiated by a point charge, Radiation reaction, The Physical basis of radiation reaction.

2.2 Dynamics, Relativistic electrodynamics, How the fields transform, The field tensor, Electrodynamics in tensor notation, Lorentz force on a charged particle.

2.3 Experimental basis for special theory of relativity, Lorentz transformations , Relativistic velocity addition, Mass- Energy relation

2.4 Minkowski's space-time diagram, light cone, Four vectors, Lorentz transformation of Four vectors, Four vector potential

Unit 3: Fourier Transform and Green's Function

3.1 Fourier transform and its properties as well as applications such as Gaussian function, finite wave train, etc., transform and its properties

3.2 Non homogeneous boundary value problems and Green's functions, Green's functions for one - dimensional problems

3.3 Eigen function expansion of Green's function,

3.4 Fourier transform method of constructing the Green's function, Green's functions in higher dimensions

Unit 4: Complex Variable

4.1 Introduction, Analytical Function, Cauchy Riemann Equations
4.2 Contour Integral Theorem, Cauchy's Integral Formula
4.3 Laurent Series Theorem, Method of finding residues. The Residue Theorem, Evaluation of Definite, Integrals by use of the residue theorem
4.4 Mapping Examples, Conformal mapping, Some Application of conformal Mapping

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Electrodynamics and Mathematical Physics
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Electrodynamics and Mathematical Physics.
- Presentations: Students will be asked to give presentations on specific topics related to Electrodynamics and Mathematical Physics enhancing their communication and research skills.
- Computer Simulations: The use of computer simulations or software tools can aid in visualizing and understanding certain phenomena in Electrodynamics and Mathematical Physics

Suggested Activities:

Introduce students to computer simulations or software tools that are helpful to understand the concepts of Mathematical and Quantum Physics.

- Organize problem-solving sessions where students can work on complex problems related to Electrodynamics and Mathematical Physics collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of Mathematical Models and concepts in Electrodynamics.

Semester-4

Spectroscopic Techniques

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Have the knowledge and practical skills necessary to apply spectroscopic methods effectively in their research, industry, or academic pursuits
- Understands the fundamental principles underlying different spectroscopic techniques, such as the interaction of electromagnetic radiation with matter and the generation of spectral data.
- Analyses and interpret spectral data, including identifying functional groups, molecular structures, and chemical compositions based on characteristic spectral features.
- Understands the applications of spectroscopy in various scientific disciplines, such as chemistry, biochemistry, physics, materials science, and environmental science.

Course Content:

Unit 1: Molecular Spectroscopy Techniques

1.1 Definition and Fundamentals of Spectroscopy, Light and Energy, Electromagnetic Radiations, Wavelength and Frequency, Emission and Absorption of radiations, Basics of Fluorescence, Phosphorescence and Chemiluminescence spectrometry, rotational, vibrational and electronic spectra

1.2 Ultraviolet and Visible-visible (UV-vis) Molecular Spectroscopy: Introduction, Review of UV-Visible spectroscopy-Fundamental laws of spectrophotometry, Deviation from Beer's Law, Instrumentation and techniques

1.3 Infrared Spectroscopy: Introduction, Review of IR spectroscopy, Dispersive and Non-dispersive IR spectrophotometers, Fourier Transform Infrared Spectroscopy, Instrumentation and Techniques

1.4 Nuclear Magnetic Resonance (NMR) Basic Principle, Properties of Nuclei, Width of Absorption Lines, Chemical shifts, Spin-spin coupling, Instrumentation

Unit 2: Atomic Spectroscopy Techniques

2.1 Atomic Absorption Spectrometry: Introduction, Basic principles, Theory, Instrumentation and Techniques, FAAS and GFAAS, Interference in AAS-Background correction methods

2.2 Atomic Emission Spectroscopy: Introduction, Basic principles, Theory, Instrumentation and Techniques

2.3 X-ray Diffraction (XRD) spectrometry: Basic Principle, Theory, Instrumentation and Forensic applications.

2.4 X-Ray Fluorescence (XRF) Basic Principle, Theory, Instrumentation

Mode of Transaction:

- Classroom lectures will be used to introduce the principles, theories, and applications of different spectroscopic techniques.
- Practical sessions in the laboratory allow students to operate spectroscopy instruments, collect data, and analyze spectral results.
- Use computer simulations and software to simulate spectral data and explore the effects of different parameters on spectroscopic results.
- Conduct live demonstrations of few of spectroscopy experiments to showcase the capabilities and limitations of different techniques.

Suggested Activities:

- Organize a field trip to a research laboratory or facility where students can observe experimental setups and advanced techniques used in physics research.

Semester-4

Crystallography and Material Science

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Grasps the basic structure of solids, classification of materials based on the structure and the correlation between the structure and properties.
- Knows about the evolution of properties based on the structure.

Course Content:

Unit 1: Fundamentals of Crystallography

1.1 Salient feature of Reciprocal lattice, Graphical construction, Vector- algebraic discussion,

1.2 Relation to inter-planar spacing, Ewald construction, Interpretation of Bragg's law, Reciprocal lattice

1.3 X- ray diffraction, Laue equation – equivalence of Laue equation and Bragg's law, Projection Spherical, stereographic & gnomonic.

1.4 electron diffraction Electron diffraction pattern and indexing of polycrystalline and single crystal specimen

Unit 2: Analysis of Crystal Structure

2.1 Scattering of X- rays by crystal, Structure factor Equation for an electron, an atom and a unit cell

2.2 Structure factor calculation for different structures, X-ray optics, wavelength dispersion

2.3 Chemical analysis by X-ray spectrometer, Ferroelectric crystals: Rochelle Salts & $BaTiO_3$

2.4 Classification of Ferroelectric, electric displacive transition: Polarization catastrophe, 'Frozen in' Transverse Optical Phonons

Mode of Transaction:

- To Create a comprehensive and effective learning experience for students pursuing crystallography and Materials Science paper. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities:

- Topic related live demonstration in the classroom, ICT based Teaching – learning, Experiment work in Physics Lab, Outreach program

Semester-4

Laboratory Experiments in Physical Sciences IV

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Applies the various procedures and techniques for the experiments.
- Uses different measuring devices and meters to record the data with precision.
- Develops basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
- Applies knowledge of mathematics, science, and engineering to the physical problems.

Course Content:

1. Determining the focal lengths at collecting and dispersing lenses using collimated light
2. Newton's Rings in transmitted monochromatic light
3. Stefan-Boltzmann law: measuring the radiant intensity of a "black body" as a function of temperature
4. Lloyd's mirror experiment with an He-Ne laser
5. Determining the wavelength of the light of an He-Ne laser using a Michelson interferometer
6. Interference at Fresnel's biprism with an He-Ne laser
7. Characteristics of Hydrogen Spectra

Mode of Transaction: Laboratory Experiments, e-resources, ICT and Virtual Lab

Suggested Activities: Performing the experiments and discussing the physical significance and applications, Group discussion, Presentation, Assignment work and Quiz

Botany

Semester-4

Advanced Plant Physiology

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the various physiological phenomenon comprising of ascent of sap, transpiration, translocation and photosynthesis taking place in plants and correlate them with growth and development of plant
- Understands the stress physiology and plant response mechanisms
- Understands the practical applications of plant growth regulators in plant biotechnology
- Utilises the acquired knowledge in building career in the field of agriculture

Course Content:

UNIT 1: WATER AND SOLUTES TRANSPORT IN PLANTS

1.1 Water Absorption and Transport

1.2 Plant Water Relations: Water Potential, Osmosis, Plasmolysis, Imbibition

1.3 Ascent of Sap and Transpiration

1.4 Translocation: Mechanism of Loading and Unloading

UNIT 2: PHOTOSYNTHESIS

2.1 Light Harvesting Complexes, Photopigment Systems

2.2 Mechanism of Electron Transport Chain in Chloroplast

2.3 CO_2 Fixation: C_3/ C_4/ CAM Pathways

2.4 Factors Affecting Photosynthesis; Photorespiration

UNIT 3: STRESS PHYSIOLOGY

3.1 Abiotic Stress in Plants: Water, Temperature, Salt and Heavy Metals

3.2 Biotic Stress in Plants: Herbivores, Insects and Pathogens

3.3 Allelopathy: Tolerance and Significance

3.4 Response of Plants to Abiotic and Biotic Stress: Tolerance Mechanisms

UNIT 4: PLANT GROWTH REGULATORS

4.1 Plant Growth Promoters and Inhibitors: Characteristics and Significance

4.2 Biosynthesis, Mechanism of Action, Physiological Effects and Applications of Phytohormones (Auxin, Cytokinin, Gibberellins, ABA, Ethylene)

4.3 Physiological Actions of Jasmonic Acid and Salicylic Acid

4.4 Bioassays of Auxins, Cytokinins and Gibberellins

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos

Suggested Activities: Field Study, Collection of Plant Samples for Physiology Experiments

Semester-4

Analytical And Separation Techniques

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the working of different instruments utilized in the research of plant sciences
- Applies their theory-based knowledge about plants practically
- Opens new paths for scientific research
- Operates various instruments for analysis of various biomolecules

Course Content:

UNIT 1: SPECTROSCOPIC METHODS AND CHROMATOGRAPHY

1.1 Principal of Spectroscopy, UV- Visible Spectroscopy
1.2 IR Spectroscopy
1.3 NMR Spectroscopy
1.4 Principles of Chromatographic Separation
1.5 Theory, principle and applications of Paper Chromatography and Thin Layer Chromatography and Gas Chromatography

UNIT 2: CENTRIFUGATION AND ELECTROPHORESIS

2.1 Centrifugation: Principle
2.2 Types of Centrifugation: Analytical and Preparative
2.3 Basic Principles of Electrophoresis
2.4 Theory and Applications of Paper, Agarose and Polyacrylamide Gel Electrophoresis
2.5 Blotting Techniques

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos

Suggested Activities: Determination of absorption maxima of various natural samples, Educational videos

Semester-4

Embryology of Higher Plants

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the morphology, structure and functions of various parts of plants.
- Becomes aware about the basic knowledge of Embryology
- Utilises this knowledge to improve Breeding, Horticulture and Biotechnology

Course Content:

UNIT 1: Gametophyte Development

1.1 Structure and development of microsporangium. Microsporogenesis
1.2 Development of male gametophyte
1.3 Structure and development of megasporangium. Megasporogenesis
1.4 development of Female gametophyte
1.5 Different types of embryo sacs, ultra structure of embryo sac, Nutrition.

UNIT 2: Fertilization

2.1 Pollination, Pollen pistil interaction, Pollen viability, storage, germination, Fertilization
2.2 Sexual incompatibility
2.3 Embryo development, Types of embryogeny, Polyembryony, Nutrition, endosperm, seed development
2.4 Palynology — morphographic, aeropalynology, Mellitopalynology, Paleopalynology, forensic palynology.

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos

Suggested Activities: Field Study, Collection of Plant Samples for Embryology Experiments

Semester-4

Laboratory Experiments In Plant Sciences IV

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Correlates the physiological processes with the growth and development of plant
- Understands the practical application of plant growth regulators
- Understands the structure, functions and significance molecules of organisms
- Utilises this knowledge in building career in the field of agriculture
- Understands the working of different instruments utilized in the research of plant sciences
- Applies their theory based knowledge about plants practically

Suggested Practicals :

ADVANCED PLANT PHYSIOLOGY

1. Estimation of peroxidase activity in a given plant material
2. To determine the amylase activity from control and stress seeds
3. To determine the invertase activity from control and stress seeds
4. To estimate chlorophyll a, b and total chlorophyll content from given plan material
5. To study water potential of potato tuber
6. To estimate protein content from control and stress seeds
7. To study effect of different types of light on photosynthesis
8. To study effect of different temperature on photosynthesis
9. To study Relative Growth Rate (RGR)
10. To study Leaf Weight Ratio (LWR)
11. To study Net Assimilation Rate (NAR)

ANALYTICAL AND SEPARATION TECHNIQUES

1.To study UV/Visible spectroscopy
2.To study IR spectroscopy
3.To study NMR spectroscopy
4.To separate plant pigments by paper chromatography
5.To detect the unknown compound using thin layer chromatography
6.To study gas chromatography
7.To study the centrifuge machine
8.To study theory and applications of Paper and Gel electrophoresis
9.To study theory and applications of PAGE and SDS – PAGE
10.To study different types of blotting techniques

PLANT EMBRYOLOGY

1. Study of T.S. of young anther.
2. Study of T.S. of mature anther
3. Characters used for study of pollen Grains
4. The study of pollen grains of some common plants: *Canna indica, Datura stramonium, Hibiscus*
5. Germination of pollen grains
6. Types of ovules
7. L.s. of ovule showing cellular Endosperm
8. To dissect out globular embryo.
9. To dissect out heart-shaped embryo.
10. To remove mature dicot embryo.
11. L.S. of maize grain showing monocot embryo.
12. Study of embryology through permanent slides.

SEMESTER V

Semester - V

Semester-5 M.A. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
	Internship	1	60	2	100	0	100
	Research	1	60	2	50	0	50
M.A.	Theory	2	120	8	60	140	200
	Total	**6**	**360**	**20**	**270**	**280**	**550**

Semester-5 M.Sc. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
	Internship	1	60	2	100	0	100
	Research	1	60	2	50	0	50
M.Sc.	Theory	2	90	6	45	105	150
	Practical	1	60	2	15	35	50
	Total	**7**	**390**	**20**	**270**	**280**	**550**

Sr. No.	Subject	Title	Type	Hours	Credit	Internal	External	Total
1	Education	Inclusion: Concept and Policy Framework	Theory	60	4	30	70	100
2	Education	1. Educational Statistics-I/ 2. Guidance & Counselling Services/3. Measurement and Evaluation/4. Indian Knowledge System	Theory	60	4	30	70	100
3	Education	Internship M.Ed. II	Practical	60	2	100	0	100
4	Education	Dissertation II : Tool Development	Practical	60	2	50	0	50
5	English	Romantic Poetry	Theory	60	4	30	70	100
6	English	1. Australian Literature/ 2. Contemporary World Literature: Voices of Globalization	Theory	60	4	30	70	100
7	Chemistry	Medicinal Chemistry	Theory	60	4	30	70	100
8	Chemistry	1. Dyes/2. Environmental Chemistry	Theory	30	2	15	35	50

9	Chemistry	Laboratory Experiments in Chemistry-V	Practical	60	2	15	35	50
10	Mathemetics	Topology	Theory	60	4	30	70	100
11	Mathemetics	1. Classical Mechanics/ 2. Cryptography	Theory	30	2	15	35	50
12	Mathemetics	Computer Programming in “C”	Practical	60	2	15	35	50
13	Physics	Advanced Electronics	Theory	60	4	30	70	100
14	Physics	1. Space Physics and Technology/2. Experimental Methods and Techniques	Theory	30	2	15	35	50
15	Physics	Laboratory Experiments in Physical Sciences -V	Practical	60	2	15	35	50
16	Botany	Genetics & Molecular Biology	Theory	60	4	30	70	100
17	Botany	1. Principles of Horticulture/2. Bioinformatics & Computational Biology	Theory	30	2	15	35	50
18	Botany	Laboratory Experiments in Plant Sciences-V	Practical	60	2	15	35	50

Education

Semester-5

Inclusion: Concept and Policy Framework

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept and diversities in inclusive education.
- Analyses the classification and differentiates among various types of disabilities
- Develops barrier free environment for persons with disabilities in inclusive classroom
- Reviews and reflects on constitutional provisions and legal frameworks for facilitating inclusive education.

Unit 1: Understanding the diversities in inclusion

1.1 Understanding the Diversities in Inclusive Classroom

1.2 Understanding the journey from Exclusion to Inclusive : Meaning, concept, definitions

1.3 Principles of Inclusive Education: Access, Equity, Relevance, Participation & Empowerment

1.4 Models of Inclusive Education (Resource room, Pull & Push Model, Circle of Inclusion, Eternity Teacher Model)

Unit 2: Introduction to Classification and Types of Disabilities

2.1 Classification of disability: International Classification of Impairments, Disabilities and Handicaps (ICIDH) and International Classification of Functioning, Disability and Health (ICF)

2.2 Introduction to Neuro-Developmental Disabilities: Specific Learning Disabilities (SLD), Intellectual Disabilities (ID), Autism Spectrum Disorder (ASD)

2.3 Introduction to Sensory Disabilities: Hearing Impairment (HI), Visual Impairment (VI), Deafblind

2.4 Introduction to Disabilities according to RPWD-2016

Unit 3: Building Inclusive Classroom

3.1 Barriers to inclusive education and their solutions.

3.2 Adaptation, accommodation and Modification for creating learning environment.

3.3 ICT base Instructional Approaches: Assistive and Adaptive Technologies.

3.4 Instructional Approaches for diverse learners: Peer tutoring, Cooperative learning, Team teaching and Universal Design for Learning (UDL).

Unit 4: Policies, Provisions and Acts for Inclusive Education

4.1 Constitutional provisions in India:

Acts: Right to Education Act (2009), Right to Persons with Disability Act (2016), National Trust Act (1999)

Policy: National Policy on Education of Students with Disabilities (2006) and National Education Policy (2020),

4.2 International Perspective: Salamanca Statement (Framework for Action) 1994, United Nations Convention on the Rights of Persons with Disabilities (UNCRPD)- 2006

4.3 Concessions and Provisions for Persons with Disabilities (PwDs)

Schemes : Inclusive Education of the Disabled at Secondary Stage (IEDSS - 2009)

4.4 Role different stakeholders in rehabilitation of PwDs including National Institutes (NIs) and Non-Government Organisations (NGOs)

Mode of Transaction: Lecture cum Discussion, Field trip, Project, Case studies, Assignment, Practical work, Debates, and Self-study

Suggested Activities:

- Group discussions following videos and visits.
- Debate for Inclusion vs. Segregation &
- Self-study for legislations and frameworks
- Visit to different setups like special school, integration, inclusion and mainstream school.
- Dramas including role plays etc.

Semester-5

Educational Statistics I

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Learns the various statistical method used in analysis of data.
- Understands the basic concepts of educational statistics.
- Develops the ability to select proper statistics with various data.
- Develops the ability to evaluate critically the result of analysis of data.

Unit 1: Meaning of Educational Statistics

1.1 Meaning of statistics and statistics in Education
1.2 Scales of Measurement
1.3 Tabulation of data
1.4 Graphical forms of presentation and their uses in educational research

Unit 2: Descriptive statistics

2.1 Frequency distribution, measures of central tendency and variability, their calculation and use
2.2 Normal distribution- normal probability curve, properties and applications
2.3 Scaling of test items
2.4 Scaling of judgments

Unit 3: Correlation and Regression

3.1 Coefficient of correlation-Linear Biserial, Point Biserial, tetra choric, phi, contingency, product-moment
3.2 Rank Difference, Partial and Multiple Correlation
3.3 Regression and Prediction; Linear regression, regression line in prediction
3.4 Regression equations and accuracy of prediction

Unit 4: Reliability and Validity of Test

4.1 Item analysis
4.2 Reliability: Meaning, Methods, Calculations of split half, length of test and reliability methods of rational equivalent.
4.3 Validity: Meaning, Methods, Calculations, length of test of validity.
4.4 Process of Standardization of Test

Mode of Transaction: Face to Face, Lecture cum Discussion, Assignment, Project

Suggested Activities:

- Classroom discussions on various topics related to educational statistics.
- Projects and data analysis for any given data.

Semester-5

Guidance and Counselling Services

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the counselling process& Group guidance programme.
- Understands the organization of a Guidance programme.
- Understands the Testing in Guidance Service.
- Understands the Human adjustments and mental health & hygiene.

Unit 1: Guidance and Counselling : Concept, Approaches, Steps, Types

1.1 Guidance and Counselling: Concept, Characteristics and principles
1.2 Counselling approaches-directive, non-directive, Group counselling vs. Individual counselling, Counselling for adjustments
1.3 Concept, Importance & Steps of group guidance
1.4 Steps and techniques of Group guidance

Unit 2: Intelligence and Personality

2.1 Principles of Organization
2.2 Characteristics of well-organized guidance
2.3 Counselling service and Individual inventory service- Testing services
2.4 Information service, Orientation service, Remedial service, Placement service and follow up service

Unit 3: Aptitude, Interest, Thinking, Reasoning

3.1 Principles of use of test in guidance and counselling
3.2 Selection of Test, Type of Test, Ethics for Test,
3.3 Test of intelligence, aptitude, creativity, interest and personality
3.4 Administering, scoring and interpretation of test scores
3.5 Use of Test results in counselling process and Limitation of Test

Unit 4: Guidance and Counselling

4.1 Definition and meaning of adjustment, Characteristics of adjustment, Characteristics of well-Adjusted person, Characteristics of mal-adjusted person, Motivation and Adjustment, Perception and Adjustment
4.2 Definition and Meaning of Mental Hygiene. Objectives of Mental Hygiene
4.3 Approaches of counselling: cognitive-behavioural (Albert Ellis, REBT) and humanistic, person-centred counselling
4.4 Person-centred counselling (Carl Rogers), Theory of counselling- behaviouristic Theory, Reality Theory, and Rational emotive Theory

Mode of Transaction: Group discussion, Lecture-cum –discussion, Panel discussion, Symposium, Reports, Research Journals, School visits and sharing of experiences

Suggested Activities:

- To arrange seminar, career conference & career days.
- To provide Guidance and counselling of Students.
- To visit work places and related institutes.
- To visit institutes of who providing Guidance and Counselling.
- To collect information or paper cutting about career development of students.

Semester-5

Measurement & Evaluation (OS)

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends and reviews the process and theories of measurement and evaluation.
- Develops proficiency in construction of taxonomy based Norms Referenced and Criterion referenced Tests
- Identifies, compares and contrasts tools of measurement.
- Understands standardized tests and comprehends the process of standardization of tests.

Unit 1: Process & Theories of Measurement and Evaluation

1.1 Concept and need of evaluation, Inter relationship between measurement and evaluation

1.2 Functions of evaluation & basic principles of evaluation

1.3 Classical Test Theory(CTT) : Concept, Characteristics and Importance
Item Response Theory (IRT): Concept, Characteristics and Importance

1.4 True scores and Errors of Measurement, Marks and Grades

Unit 2: Taxonomy of Objectives and Construction of Tests

2.1 Taxonomy of educational objectives: Cognitive Domain Affective domain, Psychomotor domain

2.2 Concepts of Norms Referenced and Criterion referenced Test Difference between NRT and CRT

2.3 Steps for constructions of Criterion-Referenced Test: Instructional intent specifying the domain, item development, item review and test development.

2.4 Types of tests: Achievement Test, Diagnostic Test, Domain-Referenced Test

Unit 3: Tools of Measurement and Evaluation

3.1 Subjective tools of Evaluation

3.2 Objective tools of Evaluation

3.3 Supply type questions: Simple question, completion question, short answer question, long answer question/essay questions (Characteristics, merits, limitations and improvement of each type).

3.4 Selection type question: constant alternative, multiple choice, matching, Re-arrangement. (Characteristics, merits, limitations and improvement of selection type item).

Unit 4: Process of Standardizing a Test

4.1 Standardized Test: Nature and use of standardized test Criteria for selecting a good standardized test: planning, reliability, validity, objectivity, Discriminating power, Adequacy, Usability and Comparability

4.2 Reliability: Concepts and types of reliability.

4.3 Validity: Concept and types of validity.

4.4 Standard Scores and Norms: Z-score, t-score, stanine, Letter Grade, Percentile Rank.

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Classroom discussions on various topics related to educational statistics.
- Projects and data analysis for any given data.

Semester-5

Indian Knowledge System

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Identifies Indian concept and purpose of education.
- Reviews and Reflects on Process of knowledge acquisition and construction in Indian perspectives.
- Appreciates the methodology of Indian Knowledge system.
- Recognises and adopts traditional practices and applications in contextual perspective.

Unit 1: Indian Education and its Purpose

1.1 Concept of culture, tradition and dharma, role of education in preservation of culture
1.2 Sources of Knowledge; family and vansha as carriers of knowledge, tradition and Dharma
1.3 Types and Purpose of Knowledge
1.4 Concept of Para & Apara Vidya, Gyan & Agyan, Rita & Dharma

Unit-2: Indian perspectives on Process of Knowledge

2.1 Component of Knowledge Process and Approaches to acquiring Knowledge
2.2 Process of Knowing & Process of Construction of Knowledge
2.3 The role of Guru, Knower and Known in Construction and Transmission of Knowledge
2.4 Factors involved in construction of Knowledge

Unit-3: Methodology of Indian Knowledge System

3.1 Systematization of knowledge fields as Sastra
3.2 Means of Valid Knowledge (Pramana), Perception (Pratyaksha), Inference (Anumana) and Textual Tradition (Agama)
3.3 Importance of Pratyaksha and Agama in relation to Anumana
3.4 Knowing and Knowledge: The Indian Way

Unit 4: Traditional Practices, Applications and Relevance

4.1 Overview of 14 Vidya and 64 Kalas in Indian Perspectives
42. Concept of myths, rituals, taboos, belief systems, folk tales & songs, proverbs abd traditional narratives with examples and relevance
4.3 Concept of Tangible and Intangible cultural heritage and relevance of their preservation, Examples of UNESCO Tangible and Intangible cultural heritage in Gujarat
4.4 Indigenous practices for land, water and soil conservation and management with examples.

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Visit to local library or museum with collections of Indian art, literature, philosophy.
- Heritage walks and studies on tangible and intangible UNESCO sites.

- Sensitization, awareness camps and documentations for IKS.
- Translations from ancient texts and researches based on the knowledge in ancient texts.
- Documentation/infographics of traditional arts and practices with chronology of transfer of knowledge through family and vansha.

Semester-5

Internship M.Ed. II

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- develops skills of imparting lessons to Student Teacher.
- develops skills of observing peer lessons.
- develops an understanding of planning various curricular, co-curricular activities.
- develops and understanding of the role of institutional head and functioning of institution.
- develops skills of reflection and writing reflective diary.
- develops skills of effectively presenting the work done.

Activities:

- Six Lessons in Teacher Education Institution
- Six Observation of Lessons
- Planning of curricular and co-curricular activities, Time Table/unit planning guidance
- Interview of Head/ Institutional Analysis
- Reflective Diary
- Presentation of submissions

Internal Assessment:

- Six Lesson execution in Teacher Education Institution- 20 marks
- Observation of six Lessons of faculty members - 10 marks
- Planning of curricular and co-curricular activities, Time Table/unit planning guidance- 10 marks
- Interview of Head/ Institutional Analysis-20 Marks
- Reflective Diary- 20 Marks
- Presentation of submissions- 20 Mark

Semester-5

Dissertation II : Tool Development

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Develops skills of writing the introductory and conceptual framework for research report.
- Reviews, reflects and synthesizes the facts and data for constructing the tool for research.
- Develops and validates the research tool.
- Presents and defends the progress in research work.

Details and Submissions

- Development and validation of tool
- Submission of Chapter 1, 2 and 3
- Presentation of work done

Suggested Framework for developing Research Proposal

- Introduction
- Title of research and statement of the problem
- Review of related literature, conceptual framework
- Rationale and need for the study
- Objectives of Research
- Hypothesis and or Research questions
- Variables of Research
- Operational and conceptual definitions and or explanation of terms
- Scope, limitations and delimitations of Research
- Area of Research
- Type of Research
- Method of Research
- Population, sample and sampling technique
- Tool of Research
- Intervention Program (in case of experimental research)
- Data Collection
- Technique of data analysis
- Chapterization
- Time frame and Budget
- References

(The framework can be changed or modified depending upon the type and need of research problem)

Research Tool proposal presentation will be in the form of seminar/presentations/discussion forums etc. The researcher will be given the 20-25 minutes for the presentation and 20-25 minutes will be given for discussion and feedback.

Mode of Transaction: Face to face, seminar, discussion, field visit to library, institutes etc.

Suggested Activities:

- Classroom discussions on various topics related to research in education and tool development.
- Discussions on process of tool developments and standardized tools available.
- Meeting and field visits with various experts/institutions/libraries etc.
- Presentation and critique of the standardized tools and developed tools for research.

Arts

Semester-5

Romantic Poetry

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends the overview of the Romantic literary movement and its impact on literature.
- Evaluates the significance of nature in Romantic poetry and its role as a source of inspiration.
- Analyzes Romantic expressions of love, beauty, and sensibility in poetry and prose.
- Explores Romantic responses to industrialization and urbanization and their effects on society and the individual.

Unit 1: Introduction to Romanticism

- Overview of the Romantic literary movement
- Historical and cultural context of the Romantic era
- Key characteristics and themes of Romantic poetry
- Influence of the French Revolution and other social changes
- Representative poets and their early works

Unit 2: Nature and Imagination

- The significance of nature in Romantic poetry
- Exploration of the sublime and the picturesque
- The role of imagination, dreams, and visionary experiences
- Romantic poets' fascination with the supernatural and the unknown
- Key poets: William Wordsworth, Samuel Taylor Coleridge, and John Keats

Unit 3: Love, Beauty, and the Self

- Romantic expressions of love, beauty, and sensibility
- The Romantic notion of the self and individuality
- Themes of melancholy, longing, and unrequited love
- Reflections on the human condition and existentialism
- Key poets: Percy Bysshe Shelley, Lord Byron, and Elizabeth Barrett Browning

Unit 4: Revolution and Social Critique

- Romantic responses to industrialization and urbanization
- Poetic engagement with political and social issues
- Critique of societal norms and institutions
- Representation of the oppressed and the marginalized
- Key poets: William Blake, Anna Letitia Barbauld, and Robert Burns

Semester-5

Australian Literature

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Demonstrates an understanding of Indigenous Australian culture and storytelling traditions through analyzing traditional narratives and oral storytelling.
- Can contextualize early Australian settlement and colonization, examining how historical events shaped the themes and perspectives of colonial literature and exploration narratives.
- Examines how modern Australian literature reflects literary responses to Australian identity and nationalism, identifying recurring motifs and perspectives.
- Analyses contemporary Australian writing to understand the significance of diversity and inclusivity, recognizing the importance of representing various voices and perspectives.

Unit 1: Indigenous Australian Literature

- Overview of Indigenous Australian culture and storytelling traditions
- Exploration of Dreamtime narratives and oral storytelling
- The impact of colonization on Indigenous Australian literature
- Representation of identity, land, and spirituality in Indigenous literature
- Key authors and works: Oodgeroo Noonuccal, Kim Scott, and Alexis Wright

Unit 2: Colonial and Early Australian Literature

- Historical context of early Australian settlement and colonization
- The emergence of colonial literature and exploration narratives
- Themes of belonging, isolation, and identity in colonial writings
- Representation of the Australian landscape and environment
- Key authors and works: Henry Lawson, Barbara Baynton, and Adam Lindsay Gordon

Unit 3: Modern Australian Literature

- Literary responses to Australian identity and nationalism
- The impact of the World Wars and the Great Depression on literature
- Urbanization and the city in modern Australian writing
- Themes of multiculturalism and migration in contemporary literature
- Key authors and works: Patrick White, David Malouf, and Christina Stead

Unit 4: Contemporary Australian Literature

- Diversity and inclusivity in contemporary Australian writing
- The representation of gender, sexuality, and social issues
- Environmental concerns and eco-literature in the Australian context
- Indigenous voices in contemporary literature
- Key authors and works: Alexis Wright, Richard Flanagan, and Tara June Winch

Semester-5

Contemporary World Literature: Voices of Globalization

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of globalization and its impact on literary narratives and themes.
- Analyses literature as a powerful medium for exploring the themes of migration and displacement in a globalized society.
- Explores how literature responds to environmental challenges and its role in addressing global ecological crises.
- Examines how literature reflects the influence of technology and the virtual world on human experiences and relationships.

Unit 1: Globalization and Identity

- Understanding the concept of globalization in the context of literature
- Exploring the impact of globalization on cultural identities
- The representation of diaspora and transnational experiences in literature
- Voices of marginalized communities and their struggle for recognition
- Key authors and works: Chimamanda Ngozi Adichie, Junot Díaz, and Mohsin Hamid

Unit 2: Migration and Displacement

- Literature as a medium to explore migration and displacement
- The refugee experience and the portrayal of refugees in literature
- Cultural clashes and adaptation in a globalized world
- Narratives of border crossings and transnational movements
- Key authors and works: Jhumpa Lahiri, Khaled Hosseini, and Viet Thanh Nguyen

Unit 3: Environmental Concerns and Eco-Literature

- Literature's response to environmental challenges in a globalized era
- The impact of climate change and ecological crises on communities
- Eco-criticism and its role in contemporary world literature
- Representations of nature and human-environment interactions
- Key authors and works: Margaret Atwood, Amitav Ghosh, and Barbara Kingsolver

Unit 4: Technology and Virtual Realities

- Literature reflecting the influence of technology and the virtual world
- Virtual identities and the blurring of boundaries between reality and fiction
- The dark side of technology and its effects on humanity
- Social media and its impact on storytelling and narrative forms
- Key authors and works: Dave Eggers, Paolo Bacigalupi, and William Gibson

Science

Chemistry

Semester-5

Medicinal Chemistry

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the historical and advance concept of medicinal chemistry and its advantages
- Understands the fundamental principles of molecular structure and shape as they relate to organic molecules having application to human anatomy
- Understands the drug designing and activities of molecular structure of different drug molecules
- Understands pharmacokinetics and Pharmacodynamics and their importance in medicine
- Understands how to make drug become active through drug metabolism and also can under stand drug metabolic actions
- Understands application of combinatorial chemistry

Course Content:

Unit 1: Drug design

1.1 Concepts of drug design
1.2 Bio transformation
1.3 Analogues and prodrugs
1.4 Approaches to lead discovery
1.5 Classical examples of drug design
1.6 Factors governing drug design
1.7 Rational approach to drug design
1.8 The methods of variation
1.9 Drug design through disjunction and conjugation
1.10 Structure Activity Relationship (SAR)
1.11 Relation between SAR and biological activity
1.12 Quantitative structure activity relationships (QSARS)
1.13 The Hammett constant (σ) in drug design, Combinatorial Chemistry and Prodrugs

Unit 2: Pharmacokinetics

2.1 General classification of pharmacokinetics
2.2 Drug absorption
2.3 Drug distribution
2.4 Drug metabolism (general pathway of drug metabolism: Oxidative, reductive and hydrolytic reactions)
2.5 Drug metabolism: Phase I and Phase II
2.6 Metabolism Reactions
2.7 Plasma Concentration
2.8 Drug excretion
2.9 Drug administration
2.10 Lead optimization process
2.11 Parent drug

Unit 3: Pharmacodynamics

3.1 General introduction of Pharmacodynamics
3.2 Physiological influence on Pharmacodynamics
3.3 Affinity of drug molecules
3.4 Physiological signals
3.5 Receptors
3.6 Chemical messengers
3.7 Binding sites
3.8 Receptor types and subtypes (Protein receptors, DNA receptors with examples of Agonists and Antagonists)
3.9 Transmembrane and Transduction signaling
3.10 Reaction between a receptor and ligand

Unit 4: Combinatorial Chemistry

4.1 Introduction:
    4.1.1 Cutical Aspects: Combinatorial Chemistry
    4.1.2 Principles of Combinatorial Chemistry
    4.1.3 Minimizing the Effective Cost of Drug Discovery
4.2 Combinatorial Synthesis on Solid Phase
4.3 Combinatorial Synthesis on Solution Phase

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test, Visit of R & D and QC division of pharmaceutical industries

Semester-5

Dyes

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Gains knowledge about fundamentals of dyes
- Explains general classification of dyes and examples of dyes
- Gets thorough knowledge of properties of different dyes
- Gets idea about applications of dye in Non textile sectors
- Gets knowledge of Analysis of dyes and intermediates

Course Content:

Unit 1: Introduction and classification of dyes

1.1 General introduction
1.2 Concept of chromophores and Auxochromes
1.3 Classification of dyes on the basis of its applications
1.4 Classification of dyes in the context of its Chemical constitution
1.5 Nitroso and Nitro dyes
1.6 Azo dyes
1.7 Diphenyl and Triphenyl methane dyes
1.8 Phthalein and Xanthene dyes
1.9 Heterocyclic dyes
1.10 Cyanine and polymethine dyes
1.11 Anthraquinone dyes
1.12 Sulphur dyes and phthalocyanine dyes

Unit 2: Non textile dyes and synthesis of some Specific dyes

2.1 General introduction and examples of Leather dyes
2.2 Food dyes (colour)
2.3 Medicinal dyes
2.4 Hair(holographic) dyes
2.5 Indicator dyes
2.6 Ink
2.7 Paper dyes
2.8 Cosmetic dyes
2.9 Dyes for synthetic fibres
2.10 Synthesis of some specific dyes

Mode of Transaction: PPTs. Video Lectures, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Tests

Semester-5

Environmental Chemistry

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Gets familiarize with Chemistry of atmosphere and global warming.
- Gets knowledge of basics of Chemistry of water pollution in environment.

Course Content:

Unit 1: Chemistry of atmosphere

1.1 Properties of atmosphere
1.2 Air quality standard
1.3 Carbon monoxide
1.4 Oxide of nitrogen
1.5 Sulphur dioxide
1.6 Volatile organic chemistry
1.7 Acid rain
1.8 Depletion of ozone layer
1.9 Global warming

Unit 2: Chemistry of water pollution and solid wastes disposal

2.1 Pollutants and sources
2.2 Sedimentation and siltation, pathogens, heavy metals and toxic organic compounds
2.3 Introduction to solid waste
2.4 Municipal solid waste
2.5 Municipal solid waste disposal method landfills and incineration
2.6 Recycling of solid wastes
2.7 Industrial wastes

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test, Visit of water resources and analysis of drinking water

Semester-5

Laboratory Experiments in Chemistry V

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the mechanism of molecular interaction.
- Identifies the structural behaviour of drug through optical properties.
- Identifies the concentration of drug molecules.
- Understands dye chemistry aspects and their importance.
- Understandsenvironmental aspects and their importance.

Course Content:

Medicinal Chemistry (minimum 4)

1. To study of optical activities of paracetamol
2. To study of optical activities of ibuprofen
3. Estimation of aspirin
4. Estimation of isoniazid
5. Estimation of Ibuprofen
6. Estimation of ascorbic acid from Vitamin C tablet
7. Determination of density of ibuprofen different Concentartion
8. Determination of pH of ibuprofen different Concentartion
9. Determination of pH of paracetamol different Concentartion
10. Determination of alkali content of antacid tablets using HCl Dyes

Dyes (minimum 4)

1. Preparation of Fluorescein.
2. Preparation of Phenyl azo-beta naphthol.
3. Preparation of Naphthol aniline dye.
4. Preparation of Malachite.
5. Preparation of synthetic indigo dye.
6. Determination of the concentration of Methylene blue dye.
7. Determination of the concentration of Methylene orange dye.
8. Determination of the concentration of Eriochrome Black T.

Environmental Chemistry (minimum 4)

1. Determination of dissolved oxygen in water
2. Determination of Chemical Oxygen Demand (COD)
3. Determination of Biological Oxygen Demand (BOD)
4. Percentage of available chlorine in bleaching powder
5. Measurement of chloride of water samples by titration method.
6. Measurement of sulphate of water samples by titration
7. Measurement of fluoride of water samples by titration
8. Measurement of salinity of water samples by titration

Mode of Transaction: Chalk and Talk Method, Experiments

Suggested Activities: Group Discussion

Mathematics

Semester-5

Topology

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

- Understands the problems on topological spaces.
- Develops the skills of finding open sets, closed sets, limit points, etc.
- Acquires Knowledge of topological spaces.
- Applies the knowledge of Topology for any problem

Course Content:

Unit 1: Topological Spaces

1.1 Topological spaces, basis, sub basis
1.2 The product topology on X × Y, the subspace topology
1.3 Limit points, Closed sets, closure and interior, convergent sequence
1.4 T_1- spaces and Hausdorff spaces

Unit 2: Continuity & Homeomorphism of Topological spaces

2.1 Continuous functions, homeomorphisms,
2.2 Pasting lemma, the product topology, maps into product, metric topology,
2.3 Diameter and bounded sets, continuity in metric spaces
2.4 The sequence lemma, first countability axiom

Unit 3: Connectedness

3.1 Connected spaces, connected subspaces of the real line
3.2 Compact spaces, results on it
3.3 Heine-Borel theorem for real line, second countable spaces
3.4 Separable spaces, regular spaces

Unit 4: Completeness

4.1 Normal spaces, Urysohn's Lemma (statement only)
4.2 Tietze's Extension Theorem (statement only), complete metric spaces
4.3 Cantor's intersection theorem
4.4 Baire's category theorem for complete metric spaces

Semester-5

Classical Mechanics

Optional
Credit: 02
Marks:50

Learning Outcomes:

- Understands fundamental concepts in mechanics.
- Develops the skills for formulating and solving problems.
- Acquires Knowledge of Lagrangian and Hamiltonian Concepts Dynamics.
- Applies the knowledge of Mechanics for any real-time problem.

Course Content:

Unit 1: Constrained Motion

1.1 Constraints, their classification, examples, principle of
1.2 virtual work, Principle of Mechanics, D'Alembert's principle, Lagrange's equations
1.3 Constrained Motion: Constraints, their classification, examples, principle of
1.4 virtual work, Principle of Mechanics, D'Alembert's principle, Lagrange's equations

Unit 2: Lagrangian Formulation

2.1 Lagrangian Formulation: Degrees of freedom, Generalized coordinates, Lagrange's equations of motion of the second kind
2.2 Properties of kinetic energy function. Generalized momenta and energy, Gauge function, cyclic or ignor able
2.3 Coordinates, integral of motion, concept of symmetry
2.4 Invariance under Galilean transformations, Lagrangian for free particle motion

Semester-5

Cryptography

Optional
Credit: 02
Marks:50

Learning Outcomes:

- Understands fundamental concepts of cryptography.
- Develops the skillsof developing and correcting various codes.
- Acquires Knowledge of modern cryptography.
- Applies the knowledge of Cryptography for any real-time problem.

Course Content:

Unit 1: Basics of Number Theory

1.1 Congruence, modular arithmetic, the Chinese Remainder Theorem.

1.2 Primitive roots, inversion mod n.

1.3 Matrix inversion mod n, Legendre and Jacobi symbols

1.4 finite fields, and continued Fractions.

Unit 2: Modern Cryptography

2.1 DES, AES, RSA, discrete logarithms, information theory.

2.2 elliptic curves, digital signatures, and lattice methods.

2.3 Hash functions, security protocols, digital cash, sharing schemes.

2.4 games, zero-knowledge techniques, and quantum cryptography.

Semester-5

Computer Programming in "C"

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

- Understands the concept of 'C' Language.
- Develops the skills of obtaining various output through 'C' Programming.
- Acquires Knowledge of 'C' Language, various Mathematical Calculations.
- Applies the knowledge of 'C' Language for any Higher Mathematical Problem solving.

Course Content:

Unit 1: Basics of "C"

1.1 Structure of a C program, the concept of function, preprocessors in C, include statement, token in C, Key words in C.

1.2 Function prototype error, comments in C, data types in C, integer family, float family.

1.3 Mathematical expressions, logical expressions, precedence and associativity of operators, standard library functions, define statement, common programming errors. Arrays in C.

1.4 Branches in C - if, if-else, else-if statements, go to statement, switch statement Loops: while, do–while, for, break and continue statements, nesting of loops.

Unit 2: Practical related to Mathematical calculation

2.1 Basic Math Operations: Conversion of units: like mile to km. To convert Cartesian coordinates to polar coor dinates and vice versa, to convert degree to radian and vice versa, to find simple interest. To find maximum of given 4 numbers, to check given no is odd or even, to check given year is a leap year or not, to find real roots of a quadratic equation, to find all roots of a quadratic equation, to prepare the result of a student. To print multiplication tables, to find average height of male and female students, to find numbers of students getting first class, second class, pass class and fail.

2.2 Prime numbers, Perfect numbers & Palindrome numbers
To check whether given number is prime or not, to check whether given number is perfect or not, to print first k prime numbers, to print all prime numbers ≤ k, to print first k perfect numbers, to print all perfect numbers ≤ k, To check whether given number is palindrome or not, to list first k palindrome numbers, to list all palindrome numbers which are ≤ k. To print Floyd's triangle.

2.3 GCD, LCM, Factors, Floyd's Triangle: To find the GCD of two numbers, to find the LCM of two numbers, To find sum of positive divisors of n < n, number of positive divisors of n < n, number of relatively prime numbers to n, To print Floyd's triangle, To find sum of digits of a number, to print a given number in to reverse order of its digits, to find the factors of a natural number, To find square, Square root, cube, cube root of a number. To find Mean, Median, Mode & Permutation.

2.4 Higher Maths problems: Write programs to prepare a frequency distribution table, to prepare a menu generation, To compute approximate solutions of the equation f(x) = 0 by using bisection method, regula-falsi method, modified regula-falsi method, secant method, Newton's method.

Physics

Semester-5

Advanced Electronics

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Builds up on the basic knowledge of electronics with the introduction of advanced topics like circuit analysis and applications of semiconductor devices in analog and digital circuits.
- Understands the basic design principles and constructional details of specialized semiconductor devices used for high frequency applications in modern communication networks and systems.
- Understands the functional properties and characteristics of semiconductor devices in analog & digital circuits using analog and digital signals.

Course Content:

Unit 1: Solid State Switching Circuits

1.1 Switching Circuit, Switch, Simple Application of Transistor Switch, Switching Transistor

1.2 Multivibrator, Types of Multivibrator, Astable, Monostable and Bistable multivibrator using transistor

1.3 Differentiating circuit, Integrating circuit, Important applications of diodes

1.4 Clipping circuits, Applications, Clamping circuits, Positive and Negative clamber

Unit 2: Field Effect Transistor and Power Electronics

2.1 FET: Construction and characteristics of JFETs FET biasing: Fixed biased configuration, self-bias, voltage di vider bias

2.2 Metal Oxide Semiconductor capacitor, Accumulation, Depletion and Inversion regions

2.3 Capacitance-Voltage characteristics of the MOS structure, MOSFET I-V characteristics

2.4 Depletion and enhancement MOSFETs, Complementary MOSFETs

2.5 Uni Junction Transistor (UJT), Silicon Controlled Rectifier (SCR), DIAC, TRIAC–Construction, working, Characteristics and application

Unit 3: Operational Amplifiers

3.1 Operational Amplifier (OP-AMP), Differential Amplifier, OP-Amp with negative feedback

3.2 Application of Op-Amp, Inverting amplifier, Non-inverting amplifier, Effect of negative feedback

3.3 Summing amplifiers, Application of summing amplifiers

3.4 OP-Amp Integrators and Differentiators

Unit 4: Digital Electronics and ICs

4.1 Analog and Digital Signals, Number systems, Decimal to Binary and Binary to Decimal conversion

4.2 Hexadecimal Number system, BCD code, Logic gate: OR, AND, and NOT, NAND Gates and NOR Gates as Universal Gates

4.3 Multiplexer, De-multiplexer, De Morgan`s Theorems, Flip-Flop, SR, Clocked SR, D, JK Flip-flop

4.4 Integrated Circuit, Advantages and Disadvantages of ICs, Types of ICs, 741, 555, Timer ICs

Mode of Transaction:

- To Create a comprehensive and effective learning experience for students pursuing Solid State Electronics and Devices. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities:

- Topic related live demonstration in the classroom, ICT based Teaching – learning, Experiment work in Physics Lab, Outreach program

Semester-5

Space Physics and Technology

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the solar system, sun and the activity on the surface of the sun, its effect on the earth's environment, observational instruments and techniques related to space and astrophysics.
- Understands the fundamentals of Astronomy, earth, sun, moon and other planets of the solar system, Instruments used in space measurements.
- Understands the design and functional performance of Space lunched vehicle.

Course Content:

Unit 1: The Sun and Galaxy

1.1 Sun – a typical star, Photosphere limb darkening, Solar Granulation, Faculae, The Chromosphere, Solar corona, Prominences

1.2 The 11-year solar cycle, Solar magnetic fields, Theory of sunspots, Solar flares, Radio emissions from Sun, Solar wind, Solar neutrino puzzle

1.3 Introduction, Rotation of the galaxy, Determination of rotational parameters in solar neighborhood. Radio observation of galaxy at 21 cm wave length

1.4 Rotation curve of the galaxy, Density distribution of gas and spiral structure, Radio and optical data. The general structure of our galaxy, the mass of our galaxy, Magnetic field in our galaxy

Unit 2: Space Technology

2.1 Earth Station Technology: Transmitters, Receivers, Antennas, Tracking systems, Terrestrial Interface, Power Test methods, Lower Orbit Considerations

2.2 Satellite Navigation & Global Positioning Systems: Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers, GPS C/A code accuracy, Differential GPS.

2.3 Communication Satellite: Orbit and Description: A brief History of Satellite Communication, Satellite Fre quency bands, Satellite Systems,

2.4 Applications, Orbital Period and Velocity, Effects of Orbital inclination, Azimuth and Elevation,

2.5 Coverage and Slant range, Eclipse, Orbital perturbations, Placement of a Satellite in a Geo-Stationary Orbit

Mode of Transaction:-To Create a comprehensive and effective learning experience for students pursuing space physics and technology. ICT based learning, using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities:-Topic related live demonstration in the classroom, ICT based Teaching – learning, Experiment work in Physics Lab, Outreach program, Institute Visits.

Semester-5

Experimental Methods and Techniques

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Develops a mind-set of continuous learning and improvement in experimental techniques, data analysis, and scientific inquiry.
- Demonstrates proficiency in using various measurement techniques, instruments, and equipment relevant to the course's subject area
- Interprets experimental results, draw conclusions, and evaluate the significance of findings.
- Understands the relevance of experimental methods to the broader field of study or industry

Course Content:

Unit 1: Visualization techniques

1.1 Principle of working and applications of bright field microscopy

1.2 Phase contrast microscopy, fluorescence microscopy

1.3 Confocal microscopy, Basics of electron microscopes , scanning and transmission electron microscopy, electron beam specimen interaction

1.4 Scanning Probe Techniques, scanning tunneling microscopy, atomic force microscopy.

Unit 2: Analytical Methods

2.1 Principle and applications of cytophotometry and flow cytometry.

2.2 Transport measurements: Two probe, four probe - Vander Pauw techniques

2.3 Low Energy Electron Diffraction, Reflection High Energy Electron Diffraction, Electron Probe Micro Analyzer, X-Ray Spectrometry

2.4 Raman and Laser Raman Spectroscopic Technique

Mode of Transaction:

- Classroom teaching with ICT tools
- Laboratory Experiments
- Research institute visit with this analytical instruments

Suggested Activities:

- Workshops of the mentioned methods
- Seminar
- Paper Presentation

Semester-5

Laboratory Experiments in Physical Sciences V

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Applies the various procedures and techniques for the experiments.
- Uses different measuring devices and meters to record the data with precision.
- Applies the mathematical concepts/equations to obtain quantitative results.
- Develops basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.
- Applies knowledge of mathematics, science, and engineering to the physical problems.

Suggested Experiment :

1. Analysis of Rotational Spectra
2. Absorption Spectra of KMnO4
3. Study of photoconductivity, response time and gain factor
4. Study of magnetic hysteresis loop (B–H)
5. Method for Determining Crystal Grain Size by X-Ray Diffraction (Theoretical Concept)
6. Astable multivibrator using 555 IC Timer
7. Bistable multivibrator using 555 IC Timer
8. Mono-stable multivibrator using 555 IC Timer
9. Radioactive decay
10. I_2 Molecule absorption Spectra to find dissociation energy.

Mode of Transaction: Laboratory Experiments, e-resources, ICT and Virtual Lab

Suggested Activities: Performing the experiments and discussing the physical significance and applications, Group discussion, Presentation, Assignment work and Quiz

Botany

Semester-5

Genetics and Molecular Biology

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the terminologies, fundamental processes and applications of Genetics
- Learns significance of gene interactions.
- Understands genetic mutations and chromosomal aberrations
- Learns the modern concept of gene and gene expression
- Explains the process of inheritance, replication and change

Course Content:

UNIT 1: MENDELIAN AND POST MENDELIAN GENETICS

1.1 History of Genetics and Molecular Biology
1.2 Monohybrid and Dihybrid Cross and corresponding laws
1.3 Linkage in Drosophila melanogaster and Lathyrus odoratus, Sturtevant formula of gene mapping
1.4 Sex Determination Theories, Barrbody and Gynandromorph

UNIT 2: MUTATION AND CHROMOSOMAL ABBERATIONS

2.1 Mutation Mutation Rate, Types of Mutations Spontaneous and Induced Mutations, Reversion
2.2 Phenotypic Classes of mutation and Biochemical Basis of Mutation,
2.3 DNA Repair Mechanisms Mismatch repair, excision repair, photo reactivation, Recombinational repair and SOS repair
2.4 Changes in Chromosome number and structure: Polyploidy, aneuploidy, Chromosomal rearrangements - deletion, duplication, inversion, and Transposition

UNIT 3: GENETIC MATERIAL STRUCUTRE, PACKAGING & REPLICATION

3.1 NA is the universal genetic and hereditory material Experimental evidences
3.2 Chromatin structure: Histones, Nucleosome morphology & Chromosome Packaging Euchromatin, Heterochromatin
3.3 Concept of gene: Evolution of Gene Concept, Fine structure of gene, Gene Cistron Relationships in prokaryotes and Eukaryotes
3.4 DNA Replication Mechanism and Machinery

UNIT 4 Gene Expression and Gene Regulation

4.1 Transcription and post transcriptional modifications
4.2 Characteristics of Genetic Code and Types of RNA
4.3 Translation and post translational modifications
4.4 Principles of Gene Regulation Lac and Trp Operon

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos

Suggested Activities: Educational animations and videos, Understanding online biological databases

Semester-5

Principles of Horticulture

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understandsthe green-house and technology.
- Develops their better understanding toward the artificial favourable environment for the plants
- Makes students aware about the basic knowledge of Horticulture and improve the economy of the society
- Associates the natural medicines with their phytochemical in order to check the possibilities of validation of that traditional knowledge scientifically

Course Content:

UNIT 1: FUNDAMENTALS OF HORTICULTURE

1.1 Definition, branches, importance, scope and classification of Horticultural crops

1.2 Types of organic manures and their application in horticulture, Plant growth Regulators

1.3 Sexual and asexual propagation of plants

1.4 Cutting, layering, grafting, budding, Selection and preparation of scion, Stock scion incompatibility

UNIT 2: POMOLOGY AND FLORICULTURE

2.1 Orchard layouts and its types: Square, rectangle, quincunx, hexagons, fencing of orchards

2.2 Fruit preservation, Future prospectus nutritive value of fresh and processed fruits

2.3 Brief account on principles and methods of refrigeration, canning, dehydration and chemical preservation

2.4 Indoor gardening – Plants and management, Bonsai, Topiary

2.5 Maintenance of cut flowers, stage of harvest of cut flowers, Techniques involved in gardening, packing storage and transportation of cut flowers

Mode of Transaction: Lectures; Demonstration of Experiments in Life Science Laboratory; Educational Videos

Suggested Activities: Field Study, Visit to botanical garden and local nursery

Semester-5

Bioinformatics and Computational Biology

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Gains an understanding of the computational challenges (and their solutions) in the analysis of large biological data sets;
- Understands how some of the commonly used bioinformatics tools work,
- Understands how to use these tools effectively, and
- Understands how to read and evaluate research articles in the field.
- Understands the basics of bioinformatics and importance of database maintenance
- Demonstrates the various software developed for database management, retrieval and analysis
- Appreciates the various applications of Bioinformatics especially in drug designing, speciation, study of phylogenetic trees and evolution etc.
- Develops skills to use software related to bioinformatics b) can work in companies especially involved in drug development

UNIT 1: BIOINFORMATICS & DATABASES

1.1 Introduction to bioinformatics, Applications of bioinformatics

1.2 Biological databases and their growth, Introduction to NCBI

1.3 File formats, Primary and Secondary Biological databases

1.4 Structure databases, Miscellaneous databases

UNIT 2: SEQUENCE ALIGNMENT, BLAST & EMBOSS

2.1 Sequence Alignment Dynamic programming, global (Needleman-Wunsch) and local (Smith-Waterman) alignments

2.2 BLAST and its types

2.3 EMBOSS Needle and EMBOSS Water

2.4 Phylogenetic Analysis and UPGMA

Mode of Transaction:

- Apart from the conventional black board teaching, other modes of teaching that will be adopted are power points, problem solving, and group projects. Assignments will be designed such that students inculcate the habit of reading and science journals. The use of smart boards for teaching will also be promoted to enable more interaction-based teaching. Emphasis will be given to systematic designing of experiments in the laboratory sessions.

Suggested Activities: Understanding use of NCBI portal and Bioinformatics Databases

Semester-5

Laboratory Experiments In Plant Sciences V

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Correlates the genetic processes with the growth and development of plant
- Correlates the genetic processes with the growth and development of plant
- Understands the practical application of horticulture
- Utilises this knowledge in building career in the field of agriculture
- Understands the working of different instruments utilized in the research of plant sciences
- Applies their theory-based knowledge about plants practically

Suggested Practicals :

GENETICS & MOLECULAR BIOLOGY

1. To study the models/charts of DNA & RNA and its types
2. To study the charts of replication of DNA
3. To study the models/charts of genetic code
4. To prepare the standard curve of DNA
5. Estimation of DNA by diphenylamine method
6. Isolation of plant DNA and its quantification by spectrophotometric method
7. To prepare the standard curve of RNA
8. Isolation of plant RNA and its quantification by spectrophotometric method
9. To study the models/charts of DNA sequencing method, PCR, RFLP, RAPD
10. To perform Cloning (Blue White Screening) using teaching kit
11. Plasmid DNA cloning
12. Isolation of Lac negative mutants by physical mutagenesis
13. Isolation of antibiotic resistant mutants using gradient plate technique

PRINCIPLES OF HORTICULTURE

1. Identification of Fruits and Plantation Crops
2. Identification of Vegetables and Spices Crops
3. Identification of Annuals and Ornamental Plants
4. Plant propagation methods on Horticulture Crops Grafting, Budding and Layering
5. Preparation of Potting Mixtures Study of post harvest shelf life of cut flowers

BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

1. Study of Biological databases
2. Overview of NCBI portal
3. DNA sequence search using suitable databases
4. Protein sequence search using suitable databases
5. Find the 3D structure of a protein using NCBI database
6. Find research papers related to any topic using NCBI database
7. Find base pair sequences as .fasta format using NCBI website
8. Perform BLASTN and BLASTP analysis
9. Sequence alignment using EMBOSS Needle and EMBOSS Water
10. Primer Designing Software

SEMESTER VI

Semester - VI

Semester-6 M.A. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
	Research	1	120	4	30	70	100
M.A.	Theory	2	120	8	60	140	200
	Total	5	360	20	150	350	500

Semester-6 M.Sc. M.Ed.							
		Total papers	Hours	Credit	Internal	External	Total
Education	Theory	2	120	8	60	140	200
	Research	1	120	4	30	70	100
M.Sc.	Theory	2	90	6	45	105	150
	Practical	1	60	2	15	35	50
	Total	6	390	20	150	350	500

Sr. No.	Subject	Title	Type	Hours	Credit	Internal	External	Total
1	Education	Curriculum Planning, Evaluation and Research	Theory	60	4	30	70	100
2	Education	1. Psychological Testing/ 2. Academic Writing/ 3. Educational Statistics II/ 4. Environment Education	Theory	60	4	30	70	100
3	Education	Dissertation III : Report Submission	Practical	120	4	30	70	100
4	English	Modernist Literature: From Eliot to Woolf	Theory	60	4	30	70	100
5	English	1. Canadian Literature/ 2. Magical Realism in World Literature	Theory	60	4	30	70	100
6	Chemistry	Drugs	Theory	60	4	30	70	100
7	Chemistry	1. Disconnection Approach/2. Advanced Physical Chemistry	Theory	30	2	15	35	50
8	Chemistry	Laboratory Experiments in Chemistry-VI	Practical	60	2	15	35	50
9	Mathemetics	Ordinary Differential Equations	Theory	60	4	30	70	100
10	Mathemetics	1. Fuzzy Set Theory/ 2. Special Functions	Theory	30	2	15	35	50
11	Mathemetics	Introduction to Sci Lab	Practical	60	2	15	35	50

12	Physics	Nuclear and Particle Physics	Theory	60	4	30	70	100
13	Physics	1. Remote Sensing and Applications/ 2. Plasma Physics	Theory	30	2	15	35	50
14	Physics	Laboratory Experiments in Physical Sciences-VI	Practical	60	2	15	35	50
15	Botany	Plant Biotechnology: Scope and Principles	Theory	60	4	30	70	100
16	Botany	1. Genetic Engineering & Genomics/ 2. Forestry	Theory	30	2	15	35	50
17	Botany	Laboratory Experiments in Plant Sciences-VI	Practical	60	2	15	35	50

Education

Semester-6

Curriculum Planning, Evaluation and Research

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands concepts and levels of curriculum planning
- Comprehends various models of curriculum design and evaluation.
- Promotes critical inquiry in curriculum studies.
- Critically comments on various issues of curriculum development

Unit 1: Introduction to Academic Writing

1.1 Curriculum Planning: Meaning and Principles
1.2 Levels of Curriculum Planning
1.3 Curriculum Planning Framework
1.4 Stakeholders involvement in Curriculum Planning

Unit 2: Types of Writing and writing Styles

2.1 Curriculum Evaluation: Meaning, Purpose and stakeholders
2.2 Approaches to curriculum evaluation: Scientific & Humanistic, Formative & Summative,
2.3 Models of Curriculum Evaluation: Ralph Tyler: Curriculum Evaluation Model, Robert Stake: Congruence Contingency Model, Stufflebeam: CIPP Model
2.4 Concept of Curriculum Transaction and its role in instructional designing

Unit 3: Critique and Review

3.1 Scope and Areas of Research in Curriculum development, planning and evaluation
3.2 Critical Studies in Curriculum and Pedagogy w.r.t Cross-Cultural and Comparative Perspectives in teacher development, Social Justice, Cultural Linguistic difference
3.3 Relevance, Flexibility, Quality, Contextually and Plurality in curriculum
3.4 Influence of Education Policies, National curriculum frameworks etc. in research for school education, higher education and programme evaluation

Unit 4: Title : Critical Analysis of Policies and Programs

4.1 Role of NCERT, NCTE and UGC in curriculum development and policy documents after NEP 2020.
4.2 Major recommendations of NEP 2020 for curriculum and pedagogy of teacher education and school education and challenges in implementing the recommendations
4.3 Major recommendations of National Curriculum Framework for School Education- 2023 and National Curriculum for Foundation Stage 2022 for curriculum and pedagogy and challenges in implementing the recommendations
4.4 Concept of Academic Bank of Credit, Choice Based Credit system, Curricular components at undergraduate level(Disciplinary/interdisciplinary major and minor, ability enhancement courses, skills enhancement courses, summer internships, research projects)

Mode of Transaction: Lecture cum Discussion, Field trip, Assignment, Project

Suggested Activities:

- Analysing school curriculum with reference to NEP 2020
- Design draft curriculum by adopting any model or approach of curriculum
- Visit to NCERT, GCERT to understand process of curriculum development
- Critical study of teacher education curriculum with reference to NCFTE 2009

Semester-6

Psychological Testing

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Develops an understanding of nature of psychological measurement and its underlying principles.
- Acquaints with techniques of psychological measurement.
- Develops skills in testing select psychological constructs.
- Develops ability to administer, score, interpret and report psychological tests.

Unit 1: Psychological Measurement and Testing

1.1 Psychological Measurement: Meaning, Nature and Scope, Psychological and physical measurement: Difference

1.2 Need of psychological measurement in Educational Practices

1.3 Psychological testing: Meaning, nature and Characteristics of Psychological testing

1.4 Scope and Use of psychological test in educational practices

Unit 2: Techniques of Psychological Measurement: Meaning, Steps, importance, merits and limitations

2.1 Testing Techniques: Teacher-made tests

2.2 Testing Techniques: Standardized Psychological Tests

2.3 Non Testing Techniques : Rating Scale, Questionnaires, Interview, Inventories

2.4 Non Testing Techniques: Personal Records, Sociometric and Projective techniques

Unit 3: Testing of Psychological Constructs: Concept, need and available Standardized Tools

3.1 • Intelligence Test
• Aptitude Test
• Achievement Test

3.2 Attitude Scale: Thurston and Likert

3.3 • Interest Inventory
• Personality Inventory

3.4 Criteria for Ideal Tool selection

Unit 4: Administration, Scoring, Interpretation and Reporting of Psychological Tests

4.1 Administration: Steps and precautions to be taken during administration of psychological tests

4.2 Scoring: Scoring of psychological test with reference to available standardized tests and analysis of test results

4.3 Interpretation: Interpreting test result for stakeholders (students, parents and authorities)

4.4 Reporting of test: Preparing Psychological Test Report and Reporting the test results to students, teachers and parents.

Mode of Transaction: Group discussion, Lecture-cum –discussion, Panel discussion, Symposium, Reports, Research Journals, School visits and sharing of experiences

Suggested Activities:

- Reviewing of any Psychological Test
- Reviewing the test items for Thurston and Likert Scale

Semester-6

Academic Writing

Optional;
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of different types of writing and writing style
- Critically comments on the reports- project report, institutional report, minutes of staff meeting
- Comprehends the academics in the form of books, films and talks by academicians
- Appraises, reviews and debate on the academic readings and presentations.

Unit 1: Curriculum Planning

1.1 Concept and importance of Academic Writing

1.2 Differences between academic and non-academic writing.

1.3 Characteristics of Academic Writing

1.4 Overview of academic genres: essays, research papers, literature reviews, etc.

Unit 2: Curriculum Evaluation and Transaction

2.1 Meaning and Concept of Expository, Narrative, Descriptive, Argumentative and Persuasive Writings

2.2 Development of writing of Expository, Narrative, Descriptive, Argumentative and Persuasive paragraphs

2.3 Concept of Research paper and review paper and the difference between two

2.4 Writings of project reports, field visit, minutes of staff meetings, abstracts, paraphrasing and summarizing

Unit 3: Research in Curriculum

3.1 Review of select TED Talks

3.2 Review of select speeches of Swami Vivekananda, Rabindranath Tagore, A.P.J. Abdul Kalam, Dr. C. N. R. Rao

3.3 Review of two select contemporary award winning feature films and implications for education system and society.

3.4 Writing of review of related literature from various primary and secondary sources.

Unit 4: Trends in Curriculum

4.1 NEP 2020 critique on recommendations related to higher education and research.

4.2 National Curriculum Frameworks for Foundational Stage (2022) and National Curriculum Frameworks for School Education (2023) w.r.t changes in structure and curriculum.

4.3 Critique on Integrated Teacher Education Programme (ITEP) w.r.t. pre- service teacher education programs

4.4 Critical Analysis of UGC guidelines on Post Graduate and Research Degrees

Mode of Transaction: Face to Face, Seminar, Lecture cum Discussion, Assignment, Project

Suggested Activities:

- Short writing tasks to practice specific skills and concepts covered in each Units.
- Classroom discussion on various task, watching films and TED Talks
- Films viewing and reviews
- Debates/Panel Discussions/seminars for critical analysis

Semester-6

Educational Statistics II

Optional;
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Comprehends, measures and tests hypothesis and related measures of variability.
- Develops skills for analyzing and computing non-parametric tests.
- Develops skills for analyzing and computing analysis of variance and related measures.
- Develops skills for analyzing and computing different types of multivariate analysis.

Unit 1: Testing Hypothesis

1.1 Hypothesis of chance: null hypothesis

1.2 Meaning of statistical inference, significance of mean, median, measures of variability, of percentages, of coefficient of correlation

1.3 Significance of the difference between means and other statistics

1.4 Principals of sampling and the use of standard error formulas

Unit 2: Non Parametric Tests

2.1 Chi square Test, Sign Test, Median Test

2.2 Mann-Whitney U-Test

2.3 Kolmogorov- Smirnov Test

2.4 Kruskal Walis Testing, Candall Tests

Unit 3: Analysis of Variance

3.1 Analysis of Variance: Concept and Assumptions

3.2 Homogeneity test of Variance

3.3 Computation One way, Two way and factorial design

3.4 Analysis of covariance

Unit 4: Multivariate Analysis

4.1 Factor Analysis

4.2 Discriminant Analysis

4.3 Cluster Analysis

4.4 Meta-Analysis

Mode of Transaction: Face to Face, Lecture cum Discussion, Assignment, Project

Suggested Activities:

- Classroom discussions on various topics related to educational statistics.
- Projects and data analysis for any given data.

Semester-6

Environmental Education

Optional;
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Sensitizes self towards the basic concepts associated with environment education.
- Recognises the need for management and conservation of natural resources.
- Reviews and appraises policies and practices for safe lifestyle and sustainability.
- Appreciates the role of environmental management systems and adopts mission life.

Unit 1: Environmental Education and Environment Awareness

1.1 Environmental Education: Concept, Components, Types
Importance and multidisciplinary nature of environmental studies

1.2 Human Environment Relationship, Significance of Environment for life & sustainability, Anthropogenic activities and their impacts on environment

1.3 Ecosystem: Concept, Components and Major Ecosystems; Ecosystem and Human Intervention; Ecological Succession and its types

1.4 Biodiversity: Concept, Importance and Hotspots
Values in Biodiversity: Aesthetic, Cultural, religious and ethical values
Threats and conservation of biodiversity

Unit-2: Education for Management and Conservation of resources

2.1 Schemes and Institutions involved in foundational and preparatory stage in education 2.1 Natural Resources: Types (Renewable and non-renewable) and their management

2.2 Consequences of Mismanagement
Water : Degradation of Water Resources and overexploitation of ground water,
Floods & Droughts;
Land: Land Degradation and Overgrazing;
Air: Health Degradation, Climate Change, Eutrophication

2.3 Consequences of Mismanagement:
Forest: Deforestation and effect on Tribal Population, Impact of mining and Dam building on environment, forest and biodiversity
Energy: Energy Demand Vs. Population growth; Energy demands for industrialisation and impact in environment;

2.4 Initiatives for Conserving Natural Resources: Land, water, forest and energy,
Concept of Waste Management and waste minimisation

Unit-3: Environment Policies, Practices and Development

3.1 Millennium development and Sustainable development goals.
Indicators for Environmental sustainable assessment: Environmental sustainability Index and Environmental Performance Index

3.2 Indian Constitution and Environmental Protection: Environmental Protection Act (1986),

National Action Plan on Climate Change, The Biological Diversity Act, 2002

3.3 International Efforts : Montreal Protocol, Rio Summit, Convention on Biodiversity, Kyoto Protocol, Paris Agreement, International Solar Alliance

3.4 Concept and scope of environmental economics

Approach towards Developing Environmental Policy: command-and-control approach, market-based approach, environmental information disclosures, and voluntary measures.

Relation between Economic Growth and Environment

Unit 4 : Environmental Management Systems and Mission Life

4.1 Concept of Global Commons and methods to protect global commons

Concept of Environment Labels and its types

4.2 Concept of Environment Audit and its process, agencies involved in audit

4.3 Concept of Environment Management Systems and their role

EMS Standards and Certification: ISO 14000 by International Standards

Organization (ISO) and British Standards (BS) 7750, European Union's Eco Management and Audit Scheme (EMAS)

4.4 Mission Life: Vision and approach towards sustainability

Methods for Sustainable solutions and Types of green technologies

Strategies for Improvising classroom teaching towards sustainability

Mode of Transaction: Lecture Method, Discussion , Project Work, visits

Suggested Activities:

- Case studies on conservation of natural resources with visits and action research to identify and develop new case studies.
- Visits to ecosystems and biodiversity parks to study means of conserving ecosystems and documentation of biodiversity.
- Awareness campaigns and drives for conservation
- Audits on environment and energy and initiate student drives for environment audits of nearby places.
- Discussion and debates on Policies, practices that effect economics of environment.

Semester-6

Dissertation III : Report Submission

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Collects the data for the research work.
- Analyses the data and compute the results.
- Develops skills of writing the data analysis and results for research report.
- Presents, discuss and defends their research work and its findings.

Details and Submissions

- Data Collection
- Data Analysis & Results
- Submission of Chapter 4,5,/ 6
- Submission of Research Report
- Presentation of Summary of Research work

Mode of Transaction: Face to Face, field visit, library visit, institutes etc. for data collection

Suggested Activities:

- Classroom discussions on various topics related to research in education.
- Discussions and reflections on writing of research dissertation as per APA Manual and other defined guidelines.
- Pre-submission Seminars for approval of dissertation work.

Arts

Semester-6

Modernist Literature: From Eliot to Woolf

Compulsory
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Understands the historical background of Modernist literature and its significance in response to societal changes after World War I.
- Explores the narrative technique of stream of consciousness, recognizing its role in conveying inner thoughts, emotions, and consciousness in literature.
- Recognises the prevalent themes of alienation, disillusionment, and existential crisis in Modernist literature.
- Explores the role of Modernist movements in various art forms, such as Surrealism and Cubism, and their influence on literature.

Unit 1: The Modernist Movement and Its Contexts

- Introduction to Modernist literature and its historical background
- Key characteristics and themes of Modernist writing
- Literary responses to the changing world after World War I
- The influence of technological advancements and urbanization on literature
- Key authors: T.S. Eliot, Ezra Pound, and Gertrude Stein

Unit 2: Stream of Consciousness and Interiority

- Exploration of the stream of consciousness narrative technique
- Representation of inner thoughts, feelings, and consciousness
- The portrayal of fragmented identities and psychological complexities
- Experiments with narrative structure and time
- Key authors: Virginia Woolf, James Joyce, and Dorothy Richardson

Unit 3: Alienation and Existential Angst

- Themes of alienation, disillusionment, and existential crisis
- The search for meaning and identity in a fragmented world
- The influence of war, trauma, and the loss of traditional values
- The portrayal of urban life and the modern city as a site of alienation
- Key authors: Franz Kafka, Albert Camus, and Jean-Paul Sartre

Unit 4: Modernist Experimentation and Literary Innovations

- The role of Modernist movements in various art forms (e.g., Surrealism, Cubism)
- The blurring of boundaries between high and low culture
- Innovations in language, form, and style in Modernist literature
- The emergence of new literary genres and subgenres
- Key authors: D.H. Lawrence, H.D. (Hilda Doolittle), and William Faulkner

Semester-6

Canadian Literature

Optional
Credit: 04
Marks:100

Learning Outcomes:
Prospective teacher educator...

- Recognises and explain the significance of Indigenous Canadian literature in preserving cultural heritage and resisting colonial narratives.
- Analyzes Canadian literature as a reflection of the country's evolving identity and explore themes of multiculturalism, diversity, and belonging in the national context.
- Examines the immigrant experience through Canadian literature, understanding the themes of displacement, adaptation, and integration, and recognize the influence of diasporic communities on the literary landscape.
- Critically analyzes contemporary Canadian literature, focusing on themes of reconciliation, social justice, and environmental concerns, and explore the role of Canadian literature in a globalized and interconnected world.

Unit 1: Indigenous Voices and Oral Traditions

- Introduction to Indigenous Canadian literature and its significance
- Exploring Indigenous oral storytelling and cultural traditions
- Themes of identity, spirituality, and connection to the land
- The impact of colonization and the process of decolonization
- Key authors and works: Thomas King, Eden Robinson, and Richard Wagamese

Unit 2: Canadian Identity and Nationhood

- Canadian literature and the search for a national identity
- Themes of multiculturalism, diversity, and belonging
- Literature reflecting Canada's historical and social context
- Representations of Canadian landscapes and regions
- Key authors and works: Margaret Atwood, Michael Ondaatje, and Joy Kogawa

Unit 3: Immigration and Diaspora

- Literature exploring the immigrant experience in Canada
- Themes of displacement, adaptation, and integration
- The impact of diasporic communities on Canadian literature
- Identity negotiation and the intersection of cultures
- Key authors and works: Rohinton Mistry, Dionne Brand, and Kim Thúy

Unit 4: Contemporary Canadian Perspectives

- Literature reflecting contemporary social, political, and cultural issues
- Themes of reconciliation, social justice, and environmental concerns
- Indigenous resurgence and the acknowledgment of Indigenous rights
- Canadian literature in a globalized and interconnected world
- Key authors and works: Esi Edugyan, Leanne Betasamosake Simpson, and Madeleine Thien

Semester-6

Magical Realism in World Literature

Optional
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Defines magical realism and identify its key characteristics as a literary genre.
- Examines the roots of magical realism in Latin American literature and its connection to local myths, folklore, and indigenous beliefs.
- Understands how magical realism is woven into the rich storytelling traditions of Africa and its portrayal of spirituality, colonialism, and cultural identity.
- Investigates contemporary trends and innovations in magical realism and its influence as a global literary phenomenon.

Unit 1: Introduction to Magical Realism

- Defining magical realism and its characteristics
- The historical development of magical realism as a literary genre
- Magical realism in different cultural and regional contexts
- The blending of magical and everyday elements in literature
- Key authors and works: Gabriel Garcia Marquez, Isabel Allende, and Haruki Murakami

Unit 2: Magical Realism in Latin American Literature

- The roots of magical realism in Latin American literature
- The role of myth, folklore, and indigenous beliefs
- Political and social implications of magical realism in Latin America
- Magical realism as a tool for critiquing reality and power structures
- Key authors and works: Alejo Carpentier, Laura Esquivel, and Julio Cortazar

Unit 3: Magical Realism in African and Asian Literature

- Magical realism in the context of African storytelling traditions
- Themes of spirituality, colonialism, and cultural identity
- Magical realist elements in Asian literature and folktales
- The intersection of history and the supernatural in African and Asian works
- Key authors and works: Ben Okri, Salman Rushdie, and Yoko Ogawa

Unit 4: Magical Realism in Contemporary World Literature

- Contemporary trends and innovations in magical realism
- Magical realism as a global literary phenomenon
- Themes of migration, globalization, and diaspora in magical realist literature
- The role of magical realism in addressing contemporary societal issues
- Key authors and works: Marlon James, Angela Carter, and Karen Russell

Science

Chemistry

Semester-6

Drugs

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the drug structure at atomic and molecular basis and their action.
- Knows the impact of synthetic drugs in the fields of medicine, pharmacy and its impact biomedical sciences.
- Understands the fundamental principles of molecular structure of drug and their properties.
- Identifies the medicinal properties of different organic molecules by medicinal application in medical science

Course Content:

Unit 1: Antibiotics

1.1 General Introduction
1.2 Chemical Classification
1.3 Beta-lactam antibiotics: Penicillins and Cephalosporins
1.4 Beta-lactamase inhibitors
1.5 Amino glycosides
1.6 Antibiotics that interfere with the protein biosynthesis in microorganisms: non lactam antibiotics: tetracy cline and chloramphenicol
1.7 Structure actively relationship (SAR) among penicillins and tetracyclines
1.8 Synthesis of pencillin-V, ampicillin, cephalosporin and chloramphenicol

Unit 2: Cardiovascular, diuretics and hypoglycemic drugs

2.1 Introduction of Anti anginal and Vasodilators
2.2 Antihypertensive drugs
2.3 Anti arrhythmic drugs and Anti thyroid drugs
2.4 Synthesis of amyl nitrate, diltiazim, atenolol, methyl dopa

Unit 3: Antineoplastic Agents

3.1 Introduction and Classification
3.2 Psychoactive drugs
3.2.1 CNS depressant: General and local anaesthetics, Sedative and hypnotics
3.2.2 Antipsychotic drug: Antidepressant
3.3 Synthesis of the following drugs: Amobarbital, diazepam, and chlonazepan

Unit 4: Antimalarial and Antituberculosis drugs

4.1 Antimalarials: Modern chemotherapy of malaria, 4-amino and 8-amino quinolines,9-amino acridine
4.2 Synthesis of mefloquines, chloroquine, primaquine and daraprim
4.3 Mode of action of antimalarial agents
4.4 SAR of antimalarial agents
4.5 Anti tuberculosis: Synthesis of drugs: Isoniazid (INH), Ethionamide and Ethambutol

Mode of Transaction:PPT, Video Lecture, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Test

Semester-6

Disconnection Approach

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Explains the concept of Disconnection Approach in synthetic chemistry
- Explains mechanism of disconnections
- Carries out Disconnections based on Name Reactions
- Plans new molecule synthesis and make strategies for new synthesis

Course Content:

Unit 1: One and two group disconnection

1.1 Various terminology used in disconnection
1.2 One and two group disconnection
1.3 Disconnection and synthesis of alcohols
1.4 Disconnection and synthesis of olefins
1.5 Disconnection and synthesis of simple ketones
1.6 Disconnection and synthesis of acids and its derivatives
1.7 Disconnections in 1,3-dioxygenated skeletons
1.8 Disconnections in 1,3-diacrbonyls
1.9 Disconnections in 1,5-diacrbonyls
1.10 Use of Mannich reaction

Unit 2: Illogical Two group disconnection

2.1 Disconnection and synthesis of hydroxy compounds
2.2 Disconnection and synthesis of carbonyl compounds
2.3 1,2-diols
2.4 1,4 dicarbonyl compounds
2.5 1,6-dicarbonyl compounds
2.6 Protecting groups
2.7 Protection of organic functional groups
2.8 protecting reagents and removal of protecting groups

Mode of Transaction: PPTs. Video Lectures, Chalk and Talk Method

Suggested Activities: Group Discussion, Unit Tests

Semester-6

Advanced Physical Chemistry

Optional
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Understands the concept of photochemistry
- Understands of phase diagrams of phase rule

Course Content:
Unit 1: Photochemistry

1.1 Introduction
1.2 Difference between thermal and photochemical reactions
1.3 Laws of absorption
1.4 Laws of photochemistry
1.5 Quantum Efficiency
1.6 Fluorescence
1.7 Phosphorescence
1.8 Chemiluminescence, Photosensitized reactions
1.9 Application of photochemistry

Unit 2: Phase Rule

2.1 Introduction
2.2 Phase diagram for one component system (water and Sulphur system)
2.3 Two component system (Zn + Cd, Ag + Pb)
2.4 Zeotropic and Azeotropic mixture
2.5 Steam distillation
2.6 Zone refining
2.7 Numericals

Mode of Transaction: PPT. Video Lecture, Chalk and Talk Method

Suggested Activities: Experiments and Group Discussion

Semester-6

Laboratory Experiments in Chemistry VI

Compulsory
Credit: 02
Marks:50

Learning Outcomes:
Prospective teacher educator...

- Understands the mechanism of molecular interaction.
- Identifies the structural behaviour of drug through optical properties
- Syntheses new drug molecules.
- Learns retrosynthetic analysis of different molecules.
- Gets hands on training of instruments like pH metry, Potentiometry and Conductometry.
- Carrie out experiments on Chemical kinetics with accuracy and required skills.
- Carries out experiments on Distribution Coefficient and Adsorption with accuracy and required skills.
- Develops skills to carry out related experiments.

Drugs (minimum 4)

1. To synthesize of phthalimide from phthalic anhydride
2. To synthesize of Hippuric acid from glycine
3. Synthesis of p-nitro acetanilide from acetanilide
4. Synthesis of paracetamol drug
5. Synthesis of flouorescein from phthalic anhydride and resorcinol
6. Spectroscopic analysis of ibuprofen
7. Determination of λmax of paracetamol drugs
8. Determination of λmax of ibuprofen drugs
9. Determination of absorbance of various concentration of ascorbic acid
10. Determination of absorbance of various concentration of paracetamol

Disconnection Approach (minimum 4)

To carry out retrosynthetic analysis (Disconnection) of following drug molecules

1. Disconnection and synthesis of Paracetamol.
2. Disconnection and synthesis of Aspirin.
3. Disconnection and synthesis of Methyl salicylate.
4. Disconnection and synthesis of Phenacetine.
5. Disconnection and synthesis of Phenylbutazone.
6. Disconnection and synthesis of Propranolol/Inderal.
7. Disconnection and synthesis of Prilocaine.
8. Disconnection and synthesis of Loperamide.
9. Disconnection and synthesis of Sildenafil.
10. Disconnection and synthesis of Donepezil.

Advanced Physical Chemistry (minimum 4)

pH Metry

1. To determine dissociation constant of acetic acid.
2. To determine dissociation constant of mono chloro acetic acid.

Conductometry:

1. Determination of λ_0 or λ_α and dissociation constant of aceticacid.
2. To determine the equivalent conductance and dissociation constant of a weak electrolyte and to verify Ostwald's dilution law.

Potentiometry

1. To determine dissociation constant of Oxalic acid. (Any Dibasic Acid)
2. To determine dissociation constant of Malonic acid. (Any Dibasic Acid)

Chemical Kinetics:

1. To determine the Rate Constant for the reaction between $KBrO_3$ and KI in an aqueous media. ($a \neq b$)
2. Determination of the order of reaction between Potassium persulphate ($K_2S_2O_8$) and Potassium Iodide (KI) by fractional change method.

Distribution Method and Adsorption

1. To determine the formula of complex formed between cupric ion (Cu^{+2}) and ammonia.
2. Study of Adsorption of Acetic acid on Activated Charcoal.

Mode of Transaction: Chalk and Talk Method, Experiments

Suggested Activities: Group Discussion

Mathematics

Semester-6

Ordinary Differential Equations

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Ordinary Differential Equations.
- Develops the skills of obtaining solutions of Various Ordinary Differential Equations.
- Acquires Knowledge of Various Ordinary Differential Equations.
- Applies the knowledge of Various Ordinary Differential Equations for any real-time problem.

Course Content:

Unit 1: Second Order ODE

1.1 Review of second order linear equations
1.2 Series solutions of Second order equations
1.3 Second order linear equations
1.4 Ordinary points

Unit 2: Second Order Linear ODE

2.1 Second order linear equations
2.2 Regular singular points, irregular singular points
2.3 Gauss's hypergeometric equation
2.4 The point at infinity

Unit 3: Polynomials

3.1 Hermite polynomials
3.2 Chebyshev polynomials and the minimax property
3.3 Legendre polynomials
3.4 Properties of Legendre polynomials 1

Unit 4: Bessel's Function

4.1 Bessel functions, properties of Bessel functions
4.2 Bessel's integral formula
4.3 Existence and uniqueness of solutions: the method of successive approximations
4.4 Picard's theorem, systems of equations

Semester-6

Fuzzy Set Theory

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands fundamental concepts of Fuzzy Set Theory.
- Develops the skills of developing and correcting various codes.
- Acquires Knowledge of Zaden's Extension Principle.
- Applies the knowledge of Fuzzy Set Theory for any real-time problem.

Course Content:

Unit 1: Fuzzy Sets

1.1 Basics: Classical sets vs Fuzzy Sets

1.2 Definition and Mathematical representations

1.3 Level Sets – Fuzzy functions

1.4 Zadeh's Extension Principle

Unit 2: Operations on Fuzzy Sets

2.1 Operations on [0,1] – Fuzzy negation

2.2 Triangular norms, t- co-norms

2.3 Fuzzy implications, Aggregation Operations

2.4 Fuzzy Functional Equations

Semester-6

Special Functions

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Special Functions.
- Develops the skills of obtaining solutions of Various Special Functions.
- Acquires Knowledge of Various Special Functions..
- Applies the knowledge of Various Special Functions for any real-time problem.

Course Content:

Unit 1: Beta – Gamma Functions

1.1 Beta Function
1.2 Gamma Function
1.3 Properties of Beta Function
1.4 Properties of Gamma Function

Unit 2: Polynomials

2.1 Bessel Functions
2.2 Properties of Bessel's Function
2.3 Legendre Polynomials
2.4 Jacobi Polynomials

Semester-6

Introduction to Sci-Lab

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the concept of Sci-Lab Programming.
- Develops the skills of obtaining various output through Sci-Lab Programming in Mathematics.
- Acquires Knowledge of Sci-Lab Coding.
- Applies the knowledge of Sci-Lab for any Mathematical Calculation in Education & Real world.

Course Content:

Unit 1: Basics of Sci-Lab

1.1 Basic syntax, Mathematical Operators

1.2 Predefined constants, Built in functions.

1.3 Complex numbers, Polynomials, Vectors, Matrix.

1.4 Handling these data structures using built in functions.

Unit 2: Mathematical Programming

2.1 Programming by using Functions and Loops.

2.2 Conditional statements, Handling .sci files.

2.3 Various Mathematics Calculation

2.4 Graphics handling- 2D, 3D- Generating .jpg files

Physics

Semester-6

Nuclear and Particle Physics

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Has an in-depth understanding of the nucleus and its various properties.
- Describes the structure of the nucleus and the nature of the interaction that keeps the nucleus bound.
- Has an insight to the elementary particles and their structure.
- Has the ideas about different applications of nuclear physics.

Course Content:

Unit 1: General Properties of the nuclei

1.1 Basic Nuclear Properties: size, shape and charge distribution, spin, parity and isospin of nucleon and nuclei.
1.2 Magic numbers and experimental evidences of shell model, Single particle shell model and its application in predicting the spin and parity of even A and odd A nuclei
1.3 Two nucleon system - bound state problem, Characteristics of nucleon-nucleon interactions
1.4 Deuteron as the simplest two body bound system - its ground state spin, parity, magnetic dipole and electric quadruple moments

Unit 2: Nuclear reactions and applications

2.1 Concept of two body nuclear reaction for fixed target experiments - concept of flux, fluence, pnA, solid angle, cross-section
2.2 Classifications of nuclear reactions, Kinematics of two body nuclear reaction - Lab and CMS co-ordinate systems
2.3 Nuclear Fusion, Sources of energy in stars, nucleo- synthesis processes, Controlled fusion, Lawson Criterion.
2.4 Applications of Nuclear Physics: - Trace element analysis, Alpha decay application, Diagnostic and therapeutic nuclear medicine, Hadron therapy.

Unit 3: Elementary particles

3.1 Classification of fundamental forces, Elementary particles and their quantum numbers, Conservation laws
3.2 Charge conjugation and Time reversal, CPT theorem, charge independence of nuclear forces, Isospin, conse quences of isospin invariance, G-parity,
3.3 Strange particles, associated production, strangeness, Gell Mann-Nishijima scheme.
3.4 Quark model, Baryons and mesons- their quark structure, Gell Mann Okabo mass formula

Unit 4: Advances in Particle Physics

4.1 Parity non-conservation in weak decays, Wu's experiment
4.2 Summary of Standard model of Particle physics
4.3 Introduction to field theory, Gauge theory, Electro-Weak theory
4.4 Spontaneous symmetry breaking, Higgs boson, Grand Unification attempts and Early Universe.

Mode of Transaction:

To create a comprehensive and effective learning experience for students pursuing this course, combination of methods mentioned below will be used

- Lectures: Classroom lectures using ICT tools to explain the theoretical concepts and principles of Nuclear and Particle Physics
- Using Laboratory Work: Practical laboratory sessions are essential for understanding experimental aspects of Nuclear and Particle Physics.
- Assignments: By giving regular assignments and problem sets to allow students apply the theoretical concepts to solve problems related to Nuclear and Particle Physics
- Presentations: Students will be asked to give presentations on specific topics related to Nuclear and Particle Physics enhancing their communication and research skills.
- Computer Simulations: The use of computer simulations or software tools can aid in visualizing and understanding certain phenomena in Nuclear and Particle Physics.
- Access to Online Resources: Such as e-books, videos, and educational websites, can supplement the learning process.

Suggested Activities:

Hands-on activity to help the students visualize and understand different models of the nucleus.

- Introduce students to computer simulations or software tools that simulate nuclear phenomena like radioactive decay, binding energy, or nuclear force.
- Organize problem-solving sessions where students can work on complex problems related to Nuclear and Particle Physics collaboratively. This fosters teamwork and critical thinking.
- Arrange visits to industries or research laboratories to expose students to real-world applications and career opportunities.
- Facilitate group discussions on challenging topics or recent research papers, encouraging students to exchange ideas and opinions.
- Encourage students to create do-it-yourself (DIY) demonstrations of nuclear and particle physics

Semester-6

Remote Sensing and Applications

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the remote sensing system and activity in the space, its effect on the earth's environment, observational instruments and techniques related to space and astrophysics.
- Understands the design for possible potential application of remote sensing

Course Content:

Unit 1: Concepts and Foundations of Remote Sensing

1.1 Energy sources and Radiation principles, Energy interactions in the atmosphere, energy interactions with earth surface features

1.2 Data acquisition and Interpretations, Reference data, Characteristics of real remote sensing system

1.3 Practical applications of remote sensing, Land and Geographic Information System

Unit 2: **GPS**

2.1 GPS: Coordinate and time systems, Definition of global and local coordinate systems,

2.2 Relationship between satellite and conventional geodetic systems,

2.3 Satellite orbital motions: Description of motion, Forces acting on the satellites, Satellite NAV messages.

2.4 Applications, Orbital Period and Velocity, Effects of Orbital inclination, Azimuth and Elevation

Mode of Transaction:-To Create a comprehensive and effective learning experience for students pursuing remote sensing application paper. ICT based learning, Using Laboratory work, Presentation, Assignment and Access to online resources.

Suggested Activities:-Topic related live demonstration in the classroom, ICT based Teaching – learning, Experiment work in Physics Lab, Outreach program

Semester-6

Plasma Physics

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Defines plasma state, give examples of different kinds of plasma and explain the parameters characterizing them as well as analyze the motion of charged particles in electric and magnetic fields
- Understands different applications of Plasma

Course Content:

Unit 1: Basics of Plasma Physics

1.1 Basics of plasmas: Plasma as a state of matter, Plasma parameters, criteria for plasma, Concept of electron and ion temperature

1.2 Motion of Charged particle in Uniform B and E fields, non uniform B and E fields, time varying E field

1.3 Debye length, plasma frequency, collisions, dc conductivity, ac conductivity

1.4 Plasma production and measurements: dc discharge, rf discharge, photo-ionization, tunnel ionization, avalanche breakdown, laser produced plasmas, Langmuir probe.

Unit 2: Applications of Plasma Physics

2.1 Plasma confinement: motion in inhomogeneous and curved magnetic fields, magnetic moment invariance, mirror confinement, tokamak confinement.

2.2 Applications: Medium and short wave communication, plasma processing of materials, laser ablation, laser driven fusion, magnetic fusion.

2.3 Application of RF plasmas in semiconductor processing, chemical processes, metal cutting, surface activation and cosmetic applications.

2.4 Other industrial applications of Plasma

Mode of Transaction: Lectures, Audio visual demonstration, Laboratory experiments

Suggested Activities: Visit to Institute for Plasma Research

Semester-6

Laboratory Experiments in Physical Sciences VI

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the basic principles of Physics related to their courses in a practical way.
- Understands different atomic spectroscopic phenomena.
- Understands different molecular spectroscopy related developments after taking the course.
- Develops basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results.

Suggested Experiment :

1. To determine Vibrational Constant and anharmonicity constant of a vibrational rotational spectra (theoretical)
2. To determine of wavelength of LASER beam with diffraction grating
3. To study Hartmann Formula
4. To determine the thickness of a mica sheet using Edser Butler Plate
5. To determine the wavelength of laser light using Fabry Perot Etalon
6. Study of Phonon dispersion relation of monoatomic lattice. (theoretical)
7. To calculate the velocity of ultrasonic sound through different liquid media and to calculate the adiabatic compressibility of the given liquid through Ultrasonic Interferometer
8. Operational amplifier applications (Integrator, Differentiator, Adder, Subtractor, log amplifiers and Comparator)
9. Determination of lattice parameter from a photograph (electron diffraction ring pattern)

Mode of Transaction: Laboratory Experiments, e-resources, ICT and Virtual Lab

Suggested Activities: Performing the experiments and discussing the physical significance and applications, Group discussion, Presentation, Assignment work and Quiz

Botany

Semester-6

Plant Biotechnology: Scope And Principles

Compulsory
Credit: 04
Marks:100

Learning Outcomes:

Prospective teacher educator...

- Acquires fundamental understanding of micropropagation technique for plant tissue culture
- Gains the fundamental knowledge of plant improvement and complementary techniques
- Implements acquired theoretical knowledge to pursue scientific research in field of biotechnology
- Practically applies scientific knowledge in agricultural field and pharmaceutical industry

Course Content:

UNIT 1: PLANT TISSUE CULTUTRE

1.1 Laboratory Set Up and Instruments for Plant Tissue Culture
1.2 Aseptic Techniques
1.3 Nutrient Medium and Plant Growth Regulators
1.4 Micropropagation Technique: Stages and Applications

UNIT 2: IN VITRO HAPLOID PRODUCTION AND GERMPLASM CONSERVATION

2.1 Introduction to Haploid Plant Production
2.2 Androgenesis: Pathways, Factors Affecting Androgenesis, Advantages, Limitations, Applications
2.3 Gynogenesis: Procedure, Advantages, Limitations, Applications
2.4 Germplasm Conservation: Steps of Cryopreservation (Freezing - Thawing), Cryoprotectants, Applications

UNIT 3: PLANT IMPROVEMENT AND COMPLEMENTARY TECHNIQUES

3.1 Somatic Hybridization: Protoplast Isolation, Protoplast Fusion, Selection of Hybrids, Applications
3.2 Somaclonal Variations: Origin, Factors Inducing Variations, Advantages, Limitations
3.3 Embryo Culture: Embryo Rescue Technique, Advantages, Limitations
3.4 *In Vitro* Pollination/Fertilization and Distant Hybridization: Types and Applications

UNIT 4: APPLICATIONS OF PLANT BIOTECHNOLOGY

4.1 Somatic Embryogenesis: Advantages, Synthetic or Artificial Seeds
4.2 Virus Indexing, Virus Free Plant Production Techniques: Shoot Meristem Culture, Thermotherapy, Cryo therapy and Chemotherapy
4.3 Transgenic Plants for Crop Improvement: Insect Resistant and Herbicide Resistant Plants
4.4 Molecular Pharming

Mode of Transaction: Lectures; Experimental Demonstration in Laboratory; Educational Videos

Suggested Activities: Educational Institute and Industrial Visits

Semester-6

Genetic Engineering and Genomics

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator..

- .Understands genetic engineering techniques
- Understands vectors of R DNA technology
- Understands basics of genomics, metogenomics and DNA fingerprinting

Course Content:

UNIT 1: GENETIC ENGINEERING AND R-DNA TECHNOLOGY

1.1 Genetic engineering: aims and applications

1.2 Genetic manipulations of prokaryotes:

- Isolation of DNA
- Vectors of Recombinant-DNA Technology – pBR 322, pUC, Lamda Phage, Cosmid, BACs, YACs

1.3 Genetic manipulations of prokaryotes:

- Insertion of DNA molecules into a vector
- Transformation and Growth
- Detection of Recombinant molecules – Colony Hybridization
- Expression of foreign DNA

1.4 Genetic manipulations of Plant Cells: Ti Plasmid

UNIT 2: GENOMICS & APPLICATIONS OF GENOMICS

2.1 Principle of Polymerase chain reaction (PCR) and its types

2.2 Concept of Metagenomics

2.3 DNA sequencing Techniques, Automated Sequencer

2.4 DNA Fingerprinting, Molecular markers and their applications: RFLP and RAPD

Lectures; Experimental Demonstration in Laboratory; Educational Videos

Suggested Activities: Educational Institute and Industrial Visits

Semester-6

Forestry

Optional
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the classification of forests and different forest types of India
- Gains the basic knowledge of social forestry, joint forest management and modern nursery techniques
- Acquires detailed understanding of different types of agroforestry and associated benefits
- Experiences the benefits of silviculture systems for forest management

Course Content:

UNIT 1: FOREST TYPES AND MANAGEMENT

1.1 Classification of Forest
1.2 Forest Types in India
1.3 Social Forestry; Joint Forest Management
1.4 Modern Nursery Technology

UNIT 2: AGROFORESTRY AND SILVICULTURE SYSTEMS

2.1 Agroforestry: Features, Benefits, Limitations
2.2 Classification of Agroforestry Systems: Agrisilviculture Systems, Silvipastoral Systems, Agrisilvipastoral System, Aquaforestry
2.3 Silviculture: Objectives, Benefits, Classification of Silvicultural Systems
2.4 Silviculture for Mangroves and Shoreline Vegetation

Mode of Transaction: Lectures; Charts, Educational Videos

Suggested Activities: Field Trips of Forest Areas; Educational Visit of National Parks and National Sanctuaries

Semester-6

Laboratory Experiments In Plant Sciences VI

Compulsory
Credit: 02
Marks:50

Learning Outcomes:

Prospective teacher educator...

- Understands the working of different instruments utilized in the research of plant sciences
- Applies their theory based knowledge about plants practically
- Understands Plant Improvement and complementary Techniques
- Applies their theory-based knowledge about plants practically

Suggested Practicals :

PLANT BIOTECHNOLOGY: SCOPES AND PRINCIPLES

1.To acquaint with various instruments used in plant biotechnology laboratory
2.Preparation of stock solutions for MS medium
3.To prepare the MS medium
4.Inoculation of Explant
5.To study the callus culture
6.To study the bud culture
7.To study the pollen culture
8.To study the embryo culture
9.Preparation of Artificial seed and their germination
10.To study the homogeneity of *in vitro* generated plantlets by RAPD

GENETIC AND PROTEIN ENGINEERING

1.Study Blue White Screening using teaching kit
2.Study of Gene Cloning in prokaryotes
3.Understand DNA sequencing through suitable videos and animations
4.Prepare a project on Human Genome Project
5.Visit to Forensic Science Lab

FORESTRY

- Study of different types of wood samples.
- Study of non wood forest products Gums and Resins
- Study seed dormancy and its breaking methods
- Estimation of tree biomass
- Calculation of Tree canopy area
- Visit to forest nursery, nature park and eco sites

Evaluation Patterns

Type of Paper	Credit	Internal			External			Total Marks
		Particulars	Marks	Total Marks	Particulars	Marks	Total Marks	
Theory	4	Assignment/ Seminar/ Project/ Workshop	5	30	Semester end Written Examination	70	70	100
		Attendance	5					
		CCE	5					
		From Prelim Exam	15					
Theory	2	Assignment/ Seminar/ Project/ Workshop	5	15	Semester end Written Examination	35	35	50
		From Prelim Exam	10					
Practical	2	Attendance	5	15	Experiment	20	35	50
					Test	5		
		Practical Examination	10		Journal submission	5		
					Viva voce	5		
Submission (Sem-1)	2	Submission	20	50	--	--	--	50
		Presentation	20					
		Viva	10					
Submission (Sem-2 & 3)	2	Research Component	10	30	Research Component	25	70	100
		Research Submission	10		Thesis	10		
		Interaction & Viva	10		Presentation	10		
					Interaction & Viva	25		

DISSERTATION ASSESSMENT

Dissertation- I research proposal

Sem	Credit	Hrs.	Activity	Marks		
				Internal	External	Total
4	2	60	Research Review at least 10	10	-	10
			Preparation of Research Proposal	20	-	20
			Presentation of Research Proposal and approval	20	-	20
				50	-	50

Dissertation- II Tool Development

Sem	Credit	Hrs.	Activity	Marks		
				Internal	External	Total
5	2	60	Development and validation of tool	20	-	20
			Submission of chapter-1,2 and 3	20	-	20
			Presentation of work done	10	-	10
				50	-	50

Dissertation- III Report Submission

Sem	Credit	Hrs.	Activity	Marks		
				Internal	External	Total
6	4	120	Data Collection	10	-	10
			Data Analysis and Results	10	-	10
			Submission of Chapter 4,5 and 6	10	-	10
			Submission of Research Report	-	20	20
			Presentation of work done	-	50	50
				30	70	100

Internship in M.Ed. I						
Sem	Credit	Hrs.	Activity	Marks		
				Internal	External	Total
4	2	60	Implementation of a Psychological Test/Status Survey/ Social Research	20	-	20
			Guidance, checking and supervision of Microteaching/ Simulation Lessons of B.Ed. Students	20	-	20
			Visit to an agency of curriculum development/ text-book board/DIET/GCERT/Teacher Education Institution	20	-	20
			Visit to Secondary Teacher Training Institute, GCERT/ INFLIBNET/GIET/an institute of special education/NGO and contribute as a teacher/Volunteer	20	-	20
			Presentation of submissions	20	-	20
			Total	100	-	100
Internship in M.Ed. II						
Sem	Credit	Hrs.	Activity	Marks		
				Internal	External	Total
5	2	60	Lessons in Teacher Education Instiutute	20	-	20
			Observation of Lessons	10	-	10
			Planning of curricular/ co-curricular activity/ Time Table/ unit planning	10	-	10
			Interview of Head/ Institutional Analysis	20	-	20
			Reflective Diary	20	-	20
			Presentation of Submissions	20	-	20
				100	-	100

Format of Question Paper

General Instructions:

1. **All questions are compulsory, options are internal.**
2. **Digits marked at the end of questions shows total marks of that questions.**
3. **Answer briefly and to the point.**

For 70 Marks: (Time 3 Hours)

Question 1 Answer following questions as directed: (From Unit 1)	
(A): Answer any two out of three In 400 words	08 Marks
(B): Answer any two out of three In 250 words	06 Marks
Question 2 Answer following questions as directed: (From Unit 2)	
(A): Answer any two out of three In 400 words	08 Marks
(B): Answer any two out of three In 250 words	06 Marks
Question 3 Answer following questions as directed: (From Unit 3)	
(A): Answer any two out of three In 400 words	08 Marks
(B): Answer any two out of three In 250 words	06 Marks
Question 4 Answer following questions as directed: (From Unit 4)	
(A): Answer any two out of three In 400 words	08 Marks
(B): Answer any two out of three In 250 words	06 Marks
Question 5: Answer any 7 out of 10 questions: (From All four Units)	14 Marks

For 35 Marks:(Time 2 Hours)

Question 1 Answer following questions as directed: (From Unit 1 & 2)	
(A): Answer any two out of three In 400 words	08 Marks
(B): Answer any two out of three In 250 words	06 Marks
Question 2 Answer following questions as directed: (From Unit 3 & 4)	
(A): Answer any two out of three In 400 words	08 Marks
(B): Answer any two out of three In 250 words	06 Marks
Question 3: Answer any 7 out of 10 questions (From All four Units)	07 Marks

Note: For two credit papers question 1 should be asked frem Unit 1 & question 2 should be asked from Unit 2.

Instructions about Examination

1. ASSESEMNT

1.1 There shall be two components for assesment of learners

1. Continuous and Comprehensive Evaluation (Internal Assessment)
2. Semester End Examination (External Examination)

1.2 The assessment carries any of the following modes, as per the requirement of the Papers as notified by the University.

(a) Written
(b) Practical
(c) Oral/Viva-voce
(d) ICT based Tests
(e) Open Book Examinations
(f) Submission of Project/Report

1.3 The semester end examination shall be mandatory for every student to appear in every examination conducted by the University. The examination shall be held according to the scheduled notified by the University from time to time. Any of the students who fail to present himself/herself at the examination as per schedule at the place notified and those who appear at the examination and leave the examination hall voluntarily or boycott the examination for any of the reasons or whatsoever deemed as forfeiting his/her rights to appear at the said examination. The University shall not hold fresh examination for any or all subjects for such students under any circumstances.

1.4 Practical, Oral (Viva-voce) Examination

1. The practical examination shall be organised by the respective Institute as per the instructions of the University. Principal / HoD of the Institute concerrned shall submit the time table including the names of the paper setters/ examiners to the Controller of Examination, IITE 15 days in advance.
2. The practical examination shall be conducted in presence of Examinerrs appointed by the University and to assist external examiner there shall be one internal examiner duly appointed by the University.
3. In event of assessment is to be carried out by reviewing the submissions of candidate, the examination shall be carried out jointly by internal as well as external evaluators by the University.

1.5 The Principal / HoD of the respective Institute shall send a list of students eligible and not eligible for the End-Term Examinations. Only those students will be allowed to appear in the End-Term Theory and Practical Examinations, whose names appear in the list of eligible students. It is the sole responsibility of the Institute/Institute to check the eligibility of the students before sending the list and Examination Form to the University.

Since the B.Ed. Course is governed by the rules and regulations stipulated by the NCTE, the 80% of the presence is required in theory classes and 90% of the presence is required in Practice Teaching/field based practicum/School Internship for qualifing in semester end examination.

1.6 Only those candidates who have passed the internal assessment of the particular course shall be permitted to appear in the examination. In case, the result of internal assessment is submitted during the examination, the external examination appeared shall be void for the further process.

1.7 Hall tickets shall be issued to each student by the Examination Department prior to the commencement of the examinations. No student shall be permitted to enter the Examination Hall without the Hall Ticket. The Students will be permitted to appear only in those examinations indicated in her / his Hall ticket. It is further clarified that the issuance of a Hall ticket is not an acknowledgement by the University that the student has fulfilled all the requirements which would entitle him/her to appear for the examination, such as, minimum attendance in any such case University may restrict the student to appear for the examination.

1.8 The result of the last semester shall not be declared (kept withheld) unless and until the candidate clears all the courses/papers of a program.

2. MARK SHEET

The Mark sheet would contain the performance of the student in terms of grades and it should contain photographs of the student, hologram of the IITE, QR Code, Name of the Institute where student studied in student Certificates and mode of Study.

3. ASSESSMENT AND EVALUATION:

CCE (Continuous and Comprehensive Evaluation):

There will be continuous and comprehensive evaluation for the Course. The learners will be evaluated internally as well as externally. As the university has adopted CCE module for the evaluation, the pattern scheme for evaluation will be as under:

3.1 SCHEME OF EVALUATION

INTERNAL EVALUATION (30 % of Marks)

Internal evaluation will include assignment/project/seminar/practical/MCQ test/Quiz/VIVA/ written test. It is up to the department/ Institute to select any of these. The ratio of marks will be 1:1:1:3 for each. The detailed Marks statement shall be submitted to Examination Section on or before the last day of the respective semester. Plagiarism of any kind in assignment/ project work/ seminar/ any submission etc. will be punishable by the concerned departments.

EXTERNAL EVALUATION (70 % of Marks)

External evaluation will be semester end examination, theoretically and/or practically as case may be, conducted by the university at the end of each semester.

3.2 ASSESSMENT

There are two categories for evaluation: The student is eligible for Total for that subject, if there are more than 40 % of marks in Internal and External Evaluation.

3.3 GRADING SYSTEM AS PER UGC 10 POINT SCALE SYSTEM.

3.3 GRADING SYSTEM AS PER UGC 10 POINT SCALE SYSTEM.

Cumulative Grade Point Average (CGPA): It is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

i.e. CGPA = Σ(Ci x Si) / Σ Ci

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

Semester Grade Point Average (SGPA): It is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.

i.e SGPA (Si) = Σ(Ci x Gi) / ΣCi

where Ci is the number of credits of the ith course and Gi is the grade point scored by the Students.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters O+, O, A+, A, B+, B and F.

3.4 PROCEDURE OF AWARDING THE GRADES

Marks and Award of Grades:

The following TABLE gives the marks, numerically grades, letter grades and classification to indicate the performance of the candidate.

- **Grading Pattern Table**

  Conversion of Marks to Numerical Grade, Letter Grade & Course Performance

Sr. No.	% of Marks	Letter grade	Grade point	Remarks
1	90 and above	O+	10	Outstanding
2	80 to 89	O	9	Excellent
3	70 to 79	A+	8	Very Good
4	60 to 69	A	7	Good
5	50 to 59	B+	6	Above Average
6	40 to 49	B	5	Average
7	0 to 39	F	0	Fail

4. CONFERNMENT OF DEGREES

A student shall be awarded degree if he/she has registered himself/herself, undergone the course of studies, completed the project reports / dissertation specified in the curriculum of his/her programme and earned the minimum Credits required within the maximum period of Course Duration + 2 years

5. MERITORIOUS AWARDS

5.1 The Prizes and Medals, the award of which are instituted by the University shall be presented at the Convocation to the awardees, if they choose to remain present, immediately after the conferment of the degrees. In other cases the same will be delivered to them through the Principal / HoD of the concerned Institute.

5.2 Gold Medal(s) shall be awarded on the basis of Total Marks obtained by the student in all the semesters. Medal will only be awarded for the Courses in which minimum 5 Students are enrolled in last semester.

5.3 If two or more students have secured the same Marks, then the marks secured by the students in the external examination only shall be taken into consideration in awarding the Gold Medals.

5.4 If both students also secure the same external marks, then both the students should be awarded the Gold Medal

5.5 The Rank Holders on the basis of Marks shall be awarded the University Gold medal for being First. The Second and third Rank holders shall be given rank certificates by the university. The University shall also issue Certificates indicating the name of the Medal awarded to the students.

5.6 The University may also consider issuing other Certificates of Merit or overall conduct at any convocation organized by the University.

5.7 A student who has been fined or has been expelled from the Hostel / Institute/University for any act of indiscipline shall not be eligible for the award of gold medal(s). A student who has failed in any course and has cleared the course in a Repeat Examination shall not be eligible for award of Gold Medals.

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6	Dr. Paresh Acharya	Associate Professor, Department of Education, Sardar Patel University
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5	Prof. K. S. Chikhalia	Professor, Department of Chemistry, Veer Narmad South Gujarat University
6	Dr. Shailesh Zala	Associate Professor, M.G. Institute of Science
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6	Dr. Snehal Bagthariya	Joint Director, Gujarat State Biotechnology Mission
7	Dr. Ketan Tatu	Senior Scientist, GEER Foundation

યુનિવર્સિટી ગીત

રાષ્ટ્રની ઉજળી આવતી કાલના અમે છીએ ઘડવૈયા
અંધકારની સામે અડીખમ પ્રકાશના લડવૈયા
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भारतीय शिक्षक प्रशिक्षण संस्थान, गांधीनगर

Indian Institute of Teacher Education, Gandhinagar

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