Curriculum of the

Integrated Teacher Education Program (ITEP)

4-year Integrated BSc-BEd Program (Secondary Stage)

Indian Institute of Technology Jodhpur

July 2025

Integrated Teacher Education Program (ITEP) at IIT Jodhpur

1. Introduction

India boasts a large youthful population, contributing to a demographic dividend. However, for this demographic advantage to translate into economic growth, there must be a corresponding investment in quality education. Quality teachers play a pivotal role in developing the human capital needed to maximize the potential of the young workforce. They shape the skills, knowledge, and attitudes of students, preparing them for the challenges of the modern workforce, especially in the area of science and technology. Such education is intrinsically linked to productivity and innovation. Quality teachers contribute to enhancing the learning experience, fostering critical thinking, problem-solving skills, and creativity among students, which are essential for economic advancement in the twenty-first century. Quality teachers are instrumental in producing a skilled and adaptable workforce.

Therefore, the NEP 2020 mandates that HEIs like IITs also should offer programmes in teacher education. The policy document notes that, "*The 4-year integrated B.Ed. offered by such multidisciplinary HEIs will, by 2030, become the minimal degree qualification for school teachers. The 4-year integrated B.Ed. will be a dual-major holistic bachelor's degree, in Education as well as a specialized subject such as a language, history, music, mathematics, computer science, chemistry, economics, art, physical education, etc. Beyond the teaching of cutting-edge pedagogy, the teacher education will include grounding in sociology, history, science, psychology, early childhood care and education, foundational literacy and numeracy, knowledge of India and its values/ethos/art/traditions, and more*" [Para 15.5, NEP 2020].

The significance of the proposed four-year Integrated Teacher Education Programme (ITEP) gains greater weight with the forthcoming reconfiguration of the curricular and pedagogical structure of school education involving a 5 + 3 + 3 + 4 design as recommended by NEP 2020. ITEP will develop accomplished teachers who have the knowledge, capacities, and values and dispositions required for developing and improving the practice of teaching at a particular Stage of school education, i.e. Foundational Stage (Preschool to grade 2) or Preparatory Stage (grade 3-5) or Middle Stage (grade 6-8) or Secondary Stage (grade 9-12). **Through ITEP, the student shall specialize in one of the following Stages of school education which will qualify them to become a teacher for that Stage.** An important point to be noted is that the NCTE envisions that through the ITEP, a graduate will be prepared even to teach at the Secondary Stage (Classes 9 to 10 and Classes 11 to 12) even **without having** a postgraduate subject specific degree as is the current practice ([NCTE ITEP Curricular Framework, p. 7, point iv](#)).

2. ITEP at IIT Jodhpur

1. The **Integrated Teacher Education Programme** (ITEP), as envisioned by the National Education Policy, 2020, offers a unique opportunity for the IIT ecosystem as a whole to directly contribute to shaping the next generation of leaders.

2. The **Secondary Stage (classes IX to XII)**, which represents a critical point of transition between school and higher education, deserves special attention in the Indian context. The significant challenges at this stage include the issue of retaining students in the school system, streaming them according to their innate potential and interests, and preparing them to acquire the necessary technological and discipline specific exposure for future academic and career choices.

3. The pedagogical ideals at the heart of **the *Guru-Shishya* parampara** are an important resource which can revitalize teacher education in India. This is acknowledged by the NEP 2020 as well as the guidelines of the National Council of Teacher Education (NCTE). However, there is more scope for focusing on the aspects of this pedagogical relationship between the *guru* and the *shishya*, which enables the student to cultivate lifelong learning practices that lead to self knowledge. Importantly, greater attention can be devoted at the institutional level to how one can translate this ideal into concrete and actionable curricular goals as well as pedagogical practices suitable for a just, equitable and inclusive Bharat.

4. While the ITEP is a progressive and holistic preparation for teacher education, the NCTE guidelines also envision **institutional freedom and innovation** in designing and implementing the BSc Components as well as the pedagogy of the BEd portions of the curriculum envisioned by NCTE offers an important opportunity to interpret and develop a truly innovative dual degree teacher education programme that serve as **a model for other Institutes of technology as well as Higher Education Institutions.**

5. The Jodhpur model of Teacher Education envisions **the all-round development of the Graduate Teacher for the Secondary Stage** who will have (i) strong technological, pedagogical and content knowledge (ii) motivation for self-improvement and self-organization (iii) commitment to constitutional values and fundamental duties (iv) strong ethics and values (v) passion and drive for innovation in teaching (vi) effective communication skills (vii) dedication to lifelong learning, and (viii) empathy for students and commitment to their well-being.

6. In addition to the NCTE guidelines, **the Curriculum for the BSc-BEd programme** must be **research-based**, drawing on the state of the art research in education as well as education technology, lessons from innovative and contemporary best practices in teacher education and pedagogical practices inspired by the rich philosophical and cultural traditions of our country. The Curriculum should foster nation-building, justice and inclusivity.

7. The **Pedagogy of the BSc-BEd** must build a strong foundation for learning, with a focus on (i) strong disciplinary knowledge, (ii) technology integration, (iii)learning opportunities for making connections between the local, national and global levels, (iv) exemplary commitment to equality, equity, inclusivity and social justice in every interaction with students, and (v) upholding the best of our nation's values and cultural traditions, for this present period.

8. **The USP of the Jodhpur model** in terms of curriculum enhancement and pedagogical innovation will have the following aspects:
   a. **The design and content of the Science Courses** over four years, designed keeping in mind the multiple exit options in this program as well as the need to prepare interested students to pursue further studies in their chosen Science Major.
   b. **A focus on Education Technology** spread over the last four semesters of the program, so that students will be able to apply the theoretical insights they have gained.
   c. **Non-graded one-credit courses** (focusing on topics like sustainability, ethical living and values, inclusion and equity etc.) will give space for building greater reflexivity and ethical foundations in the students.
   d. **A model for local engagement** which will demonstrate how the knowledge, practices and traditions of local communities can be used by the students in their future development of lesson plans and content which engage children, etc.
   e. **Diversity of school exposure experiences** will be provided to the students in addition to the school practicum component, beginning from their first year.

9. The BSc-BEd programme (with a Major in Physics/Chemistry/Mathematics) will commence at IIT Jodhpur from the Academic Year 2024-2025 and 50 students will be selected based on their scores in the National Common Entrance Test (NCET), and is being coordinated by the Center for Education Technology (CET), IIT Jodhpur.
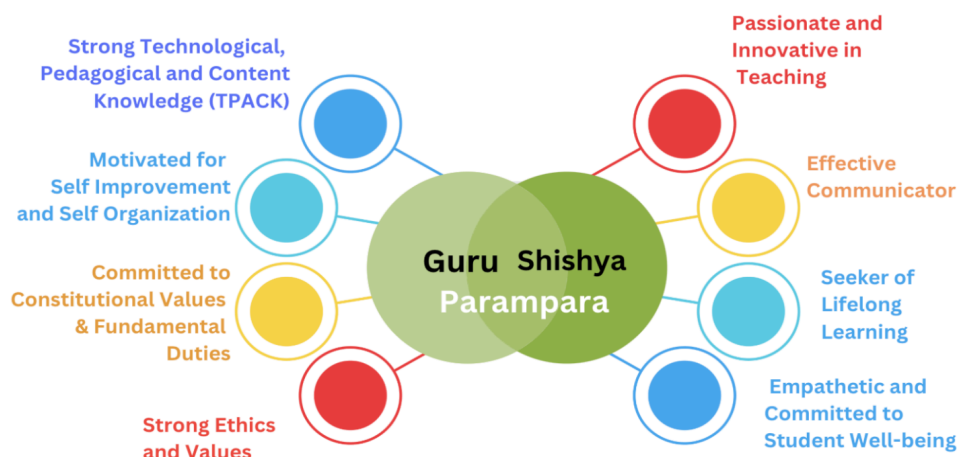
Proposed Jodhpur Model of Teacher Education: Vision of the all-round development of a Graduate Teacher for the Secondary Stage

3. Program Objectives

To ensure that future educators are equipped with the skills, especially in the area of science, technology, and pedagogy, which are required to adapt to evolving educational needs, the objectives of the ITEP program are:

1. Developing necessary competencies in graduates for teaching at the secondary stage of school education (classes 9 to 12) (as envisioned by NEP and NCTE Curriculum Framework, p.18)
2. Capacity building in the area of Science & Technology Education in India
3. Developing pedagogical skills among teachers in India
4. Enabling technology integration in the classroom for future learners of India
5. Building connection with the society and inculcate the required communication skills

4. Expected Graduate Attributes

After completing this programme, the graduate will have:
1. a deep understanding of educational theories and principles, suitable for teaching at the secondary stage of school education (classes 9 to 12) (as envisioned in NEP and NCTE Curriculum Framework, p.18)
2. the ability to demonstrate attributes specific to teaching in Grades (9-10) and Grades (11-12)
3. a comprehensive knowledge of the subject to be taught
4. skillset to integrate technology into teaching to enhance learning experiences
5. an understanding of various forms of assessments to measure student progress
6. a commitment to continuous professional development
7. a commitment to build positive connections with the surrounding society through their teaching practice and model this to their future students by example.

5. Program Outcomes

After completing this program, the students will be able to:
1. demonstrate a deep understanding of educational theories and principles as required for the Secondary Stage Specialization.

2. demonstrate comprehensive knowledge of the subject to be taught, in order to teach at the Secondary Stage.
3. integrate technology into teaching to enhance learning experiences.
4. apply various forms of assessments to measure student progress.
5. engage in continuous professional development to cater to the needs of the learners.
6. build valuable connections with society through their teaching practice and inculcate a sense of social responsibility in learners.

6. Credit Structure

To bring parity with other programs in the Institute, the equivalent credit structure of the proposed ITEP program is as shown in Table 1.

Table 1 Credit Structure for the proposed programme

1	Recommended By NCTE	An induction programme at the start of each semester	Non-graded
2		Foundations in Education	30 credits
3		Disciplinary/Interdisciplinary courses	64 credits
4		Ability Enhancement and Value-Added courses	28 credits
5		Stage-specific content-cum-pedagogy	16 credits
6		School Experience	20 credits
7		Community Service	02 credits
8	Recommended by IITJ	- Non-graded courses - Open Electives - Design Credit Project	15 credits
		TOTAL CREDITS	**175 credits**

7. Courses for ITEP First Year

In accordance with the broad-based curriculum structure of IIT Jodhpur, the courses offered in the first and second year of the program are common to all students, and are listed in Table 2 and Table 3. The aim of the first year BSc courses is to provide a broad overview of the sciences. Students will have specialized courses according to their Major and Minor from the second year.

Table 2 First-year courses for the BSc-BEd (ITEP)

Course	L-T-P-D*	Credits	Course	L-T-P-D*	Credits
Semester I			Semester II		
Mathematics - I	2-0-2-0	3	Mathematics - II	2-0-2-0	3
General Chemistry - I	2-0-2-0	3	General Chemistry - II	2-0-2-0	3
Physics - I	2-0-2-0	3	Physics - II	2-0-2-0	3
Evolution of Indian Education	3-0-0-2	4	Introduction to Data Science	2-0-0-0	2
Language - I (Hindi)	3-0-2-0	4	Introduction to Life Sciences	2-0-0-0	2
Understanding India (Indian Ethos and Knowledge Systems) - I	2-0-0-0	2	Language - II (English)	3-0-2-0	4
Art Education Methods and Materials in Visual Art OR Elements of Theatre-making	1-0-2-0	2	Understanding India (Indian Ethos and Knowledge Systems) - II	2-0-0-0	2
			Teacher and Society	2-0-0-0	2
Design Thinking Workshop - I	0-0-1-0	0.5	Design Thinking Workshop - II	0-0-1-0	0.5
Social Connect and Responsibilities - I**	0-0-1-0	0.5	Social Connect and Responsibilities - II**	0-0-1-0	0.5
	Total	22		Total	22

*L-Lecture, T-Tutorial, P-Practical, D-Discussion

** *Social Connect and Responsibilities* is an Institute-wide first-year common course for all UG students.

Table 3 Second-year courses for the BSc-BEd (ITEP)

Course	L-T-P-D*	Credits	Course	L-T-P-D*	Credits
Semester III			Semester IV (To be Updated)		
(Maths Major) Real Analysis	3-1-0-0	4 (Major 1)	(Maths Major) Multivariable Calculus	3-1-0-0	4 (Major 3)
(Chem Major) Basic Principles of Chemistry	3-0-2-0		(Chem Major) Chemistry-V	3-0-2-0	
(Physics Major) Fundamentals of Optics	3-0-2-0		(Physics Major) Physics-V	3-0-2-0	
(Maths Major) Linear Algebra	3-1-0-0	4 (Major 2)	(Maths Major)- Probability Theory	3-1-0-0	4 (Major 4)
(Chem Major) Molecular Structure and Spectroscopy	3-0-2-0		(Chem Major) Chemistry-VI	3-0-2-0	
(Physics Major) Fundamentals of Thermodynamics	3-0-2-0		Physics-VI	3-0-2-0	

Any course (from other 2 Science Subjects majors offered for BSc BEd)		4 (Minor 1)	Any course (from other 2 Science Subjects majors offered for BSc BEd)	3-0-2-0	4 (Minor 2)
Child Development and Educational Psychology (3-0-2)	3-0-2-0	4	Philosophical and Sociological Perspectives on Education- I	3-0-0-2	4
Basics of Pedagogy in the Secondary Stage	3-0-2-0	4	Content-Cum-Pedagogy of Mathematics at the Secondary Stage-1	1-0-2-0	2
Non Graded Course on Computational Thinking	0-0-2-0	1	Content-Cum-Pedagogy of Physical Sciences at the Secondary Stage-1	1-0-2-0	2
			DESIGN CREDIT	1	21
	Total	21	Total	21	

*L-Lecture, T-Tutorial, P-Practical, D-Discussion

The detailed course contents of the first year and second year (third semester) courses can be found in this document.

First Year Courses

ITEP BSc-BEd

Title	**Mathematics - I**	Course No.	MAL1030
Department	Mathematics	L-T-P-D [C]	2-0-2-0 [3]
Offered for	BSc-BEd	Type	Core
Prerequisite	None		

Objectives
1. To train the student in the area of Geometry and Calculus.
2. To give sufficient knowledge of the subject which can be used by students for further applications in their respective domains of interest.

Learning Outcomes
1. Understanding of Axiom of choice and Zorn's lemma
2. Understanding of Conics and Conicoids
3. Understanding of ε-δ definitions of Limit, continuity and differentiability of a function

Contents

Review of Set Theory: Sets and Set operations, Finite and infinite sets, Power set, Partition of a set, Algebra of sets, Cardinality of a set, Countable and uncountable sets (2 Lectures)

Relations: Cartesian product of Sets, Product of Sets, Equivalence relation, Equivalence classes and partitions, Partial order relation, Poset, Linear order relation, Axioms of choice, Zorn's lemma (4 Lectures)

Functions: Function on Sets, Injective, Surjective, and Invertible functions, composition of functions, relation between composition of functions and various set theoretic operations (4 Lectures)

Two Dimensional Geometry: Review of Conic Sections in 2D, General equation of conic, Tangent, Normal, Chord of contact, Diameter, Special properties of Parabola, Ellipse and Hyperbola (4 Lectures)

Three Dimensional Geometry: Review of lines and planes in 3D, Change of axes, Shift of origin, Rotation of axes, Sphere, Section of a sphere by a plane, Sphere through a given circle. Intersection of a line and sphere, tangent line, tangent plane, Angle of intersection of two spheres and condition of orthogonality, Equations of ellipsoid, hyperboloid, paraboloid in the standard form, Tangent plane, and Normal (6 Lectures)

Polar Coordinates: Polar equations of straight line, circle and conics. Polar equation of Chord of contact, Tangent, and Normal (2 Lectures)

Calculus: Epsilon-Delta definition of the limit of a function, Basic properties of limits, Continuous functions and classification of discontinuities, Differentiability, Applications of Derivatives, Integration of a function (6 Lectures)

Lab: Visualization using Geogebra/Mathematica/ MATLAB/ CoCalc

Textbooks
1. Moerdijk, I., Oosten, J. V., Sets, Models and Proofs, Springer, 2018.
2. Chatterjee, D. , Analytical Geometry: Two and Three Dimensions, Alpha Science International Limited, 2009.
3. Spivak, M., Calculus, Third Edition, Cambridge University Press, 1994.

Reference Books
1. Hamilton, A. G., Number, sets and axioms, Cambridge University Press, 2012.
2. Thomas, G. B., Finney, R. L., Calculus and Analytic Geometry, Ninth Edition, Addison Wesley, 1998.

Online Course Material
1. Kubar, A., Set Theory and Mathematical Logic, NPTEL Course Material, Department of Mathematics, IIT Kanpur.
2. Singh, A., Basic Calculus-I, NPTEL Course Material, Department of Mathematics, IIT Madras. https://archive.nptel.ac.in/courses/111/106/111106146/

Title	**Chemistry - I**	Number	CYL1020
Department	Chemistry	L-T-P-D [C]	2–0–2–0 [3]
Offered for	BSc-BEd	Type	Core
Prerequisite	None		

Objective
The Instructor will provide basic understanding of all areas of chemistry: inorganic, organic, and physical chemistry

Learning Outcomes
> The students are expected to have the ability to:
1. understand and appreciate the concepts involved in major chemical processes
2. access and interpret information to solve problems

Contents
Inorganic Chemistry: Atomic structure and periodic table, Introduction to Periodicity, general trends, blocks of periodic table, s-block, p-block and d-block elements. Introduction to Acid-base theories and oxidation reduction processes (9 Lectures)

Organic Chemistry: Hybridization, atomic and molecular orbitals, structures, IUPAC nomenclatures, Classification of organic compounds and functional groups, electronic and steric effects, organic acid and base, pKa, basics of stereochemistry, representations of small organic molecules (9 Lectures)

Physical Chemistry: Kinetics and Thermodynamics: System and Surroundings, State and Path functions, Reversible and irreversible processes, Laws of Thermodynamics, Thermodynamics functions, Rates of reactions, order and Molecularity, Arrhenius Equation (10 Lectures)

Laboratory Experiments
Preparation of a Double Salt; Estimation of percentage of water in metal hydrates.; *Determination of rate constant for first order acid catalysed hydrolysis of an ester.;Estimation of sodium carbonate using standardized HCl. Detection of functional groups: chemical and spectroscopic methods, Reduction of ketone/aldehyde*

Textbooks
1. J.D. Lee, Concise Inorganic Chemistry, (5th Edition), ELBS, 1996.
2. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice Hall of India Pvt. Ltd., 5th Ed., 1990
3. G. Solomons and C. Fryhle, Organic Chemistry, John Wiley& Sons (Asia) Pvt. Ltd.
4. D. A. McQuarrie and J. D. Simons, Physical Chemistry 1st Edn, Viva Books Private Limited, New Delhi, 1998.
5. Irving M. Klotz and Robert M. Rosenberg, Chemical Thermodynamics: Basic Concepts and Methods, Wiley,2008.
6. A.J. Elias, A Collection of Interesting General Chemistry Experiments, Universities Press (1 January 2008).

Online Resource:
NPTEL Course, NOC: Basics in Inorganic Chemistry, IIT Bombay (https://nptel.ac.in/courses/104101121)
NPTEL Course, Basic Organic Chemistry, IIT Guwahati (https://nptel.ac.in/courses/104103071)
NPTEL Course, NOC: Introduction to Chemical Thermodynamics and Kinetics, IISER Mohali (https://nptel.ac.in/courses/104106089)

Title	**Physics - I**		Course No.	PHL1020
Department	Physics		L-T-P-D [C]	2-0-2-0 [3]
Offered for	BSc-BEd		Type	Core
Prerequisite	None			

Objectives

The Instructor will:
1. Introduce basic concepts of dynamics in point particles, rigid bodies and planetary objects
2. Introduce oscillations, different types of waves and their propagation

Learning Outcomes

The learners are expected to:
1. Explain the dynamics of various physical objects using laws of motion and propagation of waves in different media
2. Apply physics concepts using differential equations and solving them under approximation
3. Design simple hands on experiments to demonstrate the concepts

Contents

Unit I Mechanics: Revision of Laws of Motion, Energy and Momentum conservation, Work, Energy and Power Motion of Rigid Bodies: Center of Mass, Calculation of moment of inertia with examples, Basic ideas of elasticity including Poission's ratio, Motion without slipping, Gyroscope, Gravitation, Motion under central force field, Kepler's laws, Satellites in circular orbits, Geosynchronous orbits, Basic idea of global position system (14 lectures)

Unit II Waves and Oscillations: Simple harmonic motion, Differential equation and its solution, Simple and Compound pendulum, Damped oscillation and Forced Oscillation, Resonance, Examples of Resonance, Types of waves, Mechanical wave, Transverse Wave in a string, Standing wave, Sound wave production and propagation, Resonance and Beats, Doppler effect, Superposition of waves, Interference, Diffraction, Dispersion and Polarization (14 lectures)

Laboratory Experiments
1. Measurement using Vernier callipers, Screw Gauge, Spherometer and Error Analysis
2. Moment of Inertia of a wheel
3. Determination of value of g using bar pendulum
4. Gyroscope
5. Study of vibration frequency and wire length using Sonometer
6. Standing wave
7. Dispersive power of a prism
8. Young's double slit experiment

Textbooks
1. Mechanics, Berkeley Physics, vol.1, C. Kittel, W. Knight, et.al. 2007, Tata McGraw-Hill
2. Fundamental of Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley
3. Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
4. Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
5. Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill

Reference Books
1. Feynman Lectures, Vol. I, R.P. Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
2. An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill
3. Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.
4. The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
5. Optics – Brijlal & Subramaniam- (S. Chand Publication) 2014.

Self Learning Material

https://nptel.ac.in/courses/115105098
https://archive.nptel.ac.in/courses/115/106/115106119/

Title	**Evolution of Indian Education**		Course No.	EDL1010
Department	CET		L-T-P-D [C]	3-0-0-2 [4]
Offered for	BSc-BEd (ITEP)		Type	Compulsory
Prerequisite	Nil			

Objectives
- To develop an understanding about the evolution of education systems and practices in India from the ancient period to the contemporary times
- To orient students to the contribution of Indian thinkers in the evolution of Indian Education system
- To develop a historical sensibility in assessing the impact of educational processes and changes

Learning Outcomes
- Students will be able discuss the genesis, vision, and evolution of education in ancient India to the contemporary India,
- The course will enable students to contextualize their preparation to be a teacher as well as to understand how institutional characteristics of education are shaped by history.

Lecture Modules/Contents (42 Lectures)
1. **Introduction:** Importance of History of Education; Overview of Indigenous Knowledge Traditions and Models; Contributions of Indian Science and Knowledge Systems **(5 Lectures)**
2. **Education in Ancient India:** Vision, objectives and salient features of key historical epochs (Vedic Period, Buddhist and Jain period; Traditions of music, art, etc. **(8 lectures)**
3. **Education from the Gupta Period to the Colonial Period:** Features and transformations of teaching-learning process; finance and management of education institutions **(8 lectures)**
4. **Education during the Colonial Period:** Institutional transformations, ideas of 'modernity', Swadeshi and nationalist experiments by Indian reformers and thinkers **(8 lectures)**
5. **Education in Independent India:** The organization of school and higher education in India after Independence; Education for citizenship, Constitutional Values and Education Provisions, Landmark Education Policy Documents (NEPs 1968, 1986 (PoA 1992), 2020; RTE 2008; NCF 2005, 2023), Role of NGOs in shaping policy (eg. ASER Reports) **(8 lectures)**
6. **Contemporary concerns and issues in Indian Education:** Education for entrepreneurship and innovation; Discourses of skill development, training and employability; Phygital and other hybrid models of education delivery **(5 lectures)**

Discussion Component (28 Sessions)
1. **Weekly Group Discussion:** Group-based discussion of selected extracts from various texts/reading that are relevant to the course **(14 Sessions)**
2. **Weekly Seminar:** Group-based presentation of pre-assigned topics **(14 Sessions)**

Textbook
1. Sarangapani, P. M., & Pappu, R. (Eds.). (2019). *Handbook of Education Systems in South Asia*. Springer Singapore.
2. Kumar, K. (2005). *Political agenda of education: A study of colonialist and nationalist ideas*. SAGE Publications India.

References
1. Dharampal. *The Beautiful Tree: Indigenous Education in the Eighteenth Century*. New Delhi: Biblia Impex Private, 1983.
2. Scharfe, H. (2018). *Education in ancient India* (Vol. 16). Brill.
3. Khilnani,Sunil (1999).The idea of India. Farrar,Straus and Giroux,New York
4. Jain, M., Mehendale, A., Mukhopadhyay, R., Sarangapani, P. M., & Winch, C. (Eds.). (2018). *School education in India: Market, state and quality*. Taylor & Francis.
5. Naik,J.P. & Nurullah,S.(1974). A Student's History of Education in India:Macmillan;Delhi

Online Resources
Mohanty, Atasi. Education for Sustainable Development https://nptel.ac.in/courses/109105190

Title	**Language I - Hindi** (हिंदी)		Course No.	LAL1010
Department	School of Liberal Arts		L-T-P-D [C]	3-0-2-0 [4]
Offered for	BSc-BEd (ITEP)		Type	Compulsory
Prerequisite	Nil			

उद्देश्य / Objectives

1. छात्रों को हिंदी भाषा में कौशल और प्रभावी भाषा शिक्षण के लिए शैक्षणिक उपकरणों का प्रशिक्षण देना / To train students into language skills in Hindi Language and pedagogical tools for effective language teaching
2. आलोचनात्मक सोच, मौखिक क्षमता, शब्दावली निर्माण और प्रभावी मौखिक और लिखित संचार विकसित करने के लिए साहित्य का उपयोग करना / To use literature to develop critical thinking, verbal ability, vocabulary building, and effective oral and written communication
3. विभिन्न प्रकार के लेखन कौशल सिखाना: तकनीकी और गैर-तकनीकी जैसे रिपोर्ट लेखन, रचनात्मक लेखन, सारांश और पैराग्राफ लेखन / To teach different types of writing skills: technical and non-technical such as report writing, creative writing, summary and paragraph writing

शैक्षणिक प्रतिफल Learning Outcomes:

1. हिंदी भाषा में प्रभावी मौखिक और लिखित संचार / Effective verbal and written communication in Hindi language
2. सहकर्मी शिक्षा के माध्यम से आलोचनात्मक सोच और आलोचनात्मक लेखन की क्षमता / Ability for critical thinking and critical writing through peer learning
3. कक्षा में सीखे गए ज्ञान को दैनिक संचार गतिविधि में एकीकृत करने की क्षमता, और फलस्वरूप, सीखने को चिंतनशील और अनुभवात्मक बनाना / Ability to integrate classroom learning into an everyday communicative activity, and thus, making the learning both reflective and experiential

पाठ्यक्रम/Course Contents

परिचय (10 व्याख्यान) / Introduction (10 Lectures)

पाठ्यक्रम का परिचय; भारत की भाषाई बहुलवाद और सांस्कृतिक विविधता; राजभाषा(ओं) की अवधारणा; भाषा और सांस्कृतिक पहचान; भाषा और उसकी लिंग प्रकृति; भाषा, शक्ति और आधिपत्य

Introduction to the course; Linguistic pluralism and cultural diversity of India; the concept of official language(s); Language and cultural identity; Language and its gender(ed) nature; Language, power and Hegemony

रोज़मर्रा का संचार (10 व्याख्यान) / Everyday Communication (10 Lectures)

प्रभावी मौखिक संचार के लिए भूमिका-खेल और परिस्थितियाँ; दी गई परिस्थितियों के अनुसार बातचीत; सुनने और समझने का कौशल; संचार कौशल विकसित करने के लिए चयनित विषयों पर समूह चर्चा; प्रसिद्ध भाषणों को सुनना/समझना; मौखिक और गैर-मौखिक अभिव्यक्ति; शारीरिक भाषा, बुनियादी ध्वन्यात्मकता/उच्चारण शिष्टाचार

Role-play and situations for effective verbal communication; conversations as per given situations; listening and comprehension skills; Group Discussion on selected topics to develop communication skills; listening/comprehending famous speeches; verbal and non-verbal expression; Body Language, Basic Phonetics/Pronunciation etiquette

साहित्य के माध्यम से भाषा सीखना (10 व्याख्यान) / Learning Language through Literature (10 Lectures)

प्रेमचंद की छोटी कहानियाँ जैसे "ईदगाह", "बड़े घर की बेटी", "पूस की रात", "बूढ़ी काकी", "कफ़न" आदि पढ़ना; भाषा और साहित्यिक कौशल सीखने के लिए महादेवी वर्मा, सूर्यकांत त्रिपाठी निराला और अन्य हिंदी लेखकों को पढ़ना; निबंध लेखन और आलोचनात्मक सोच; भाषा के रचनात्मक उपयोग को समझने के लिए कविताएँ पढ़ना और सुनाना; कविताएँ लिखना; पैराग्राफ़ लिखना; सारांश बनाना; हिंदी में रचनात्मक लेखन; कबीरदास की चयनित कविताएँ: "पोथी पढ़ि पढ़ि जग मुआ", "गुरु गोबिंद दो खड़े", "पत्थर पूजे हरि मिले," "कस्तूरी कुंडल बसे", "जल में कुम्भ, कुम्भ में जल है" सुभद्रा कुमारी चौहान की कविताएँ: "जलियाँवाला बाग में बसंत", "मेरा बचपन", "ये कदम्ब का पेड़", महादेवी वर्मा की कविता: "मैं नीर भरी दुख की बदली", सूर्यकांत त्रिपाठी निराला की कविता "वह तोड़ती पत्थर"

Reading short stories of Premchand such as "Eidgah", "Bade Ghar Ki Beti", "Poos Ki Raat", "Boodhi Kaaki", "Kafan" etc. Reading Mahadevi Verma, Suryakant Tripathi Nirala, and other Hindi writers to learn language and literary skills; Essay writing and critical thinking; Reading and Reciting Poems to understand creative usage of language;

composing poems; writing paragraphs; summarizing; creative writing in Hindi; Kabirdas's selected poems: "Pothi Padhi Padhi Jag Mua", "Guru Gobind Do Khade", "Paathar Pooje Hari Mile", "Kastoori Kundal Base", "Jal Mein Kumbh, Kumbh Mein Jal Hai" Subhadra Kumari Chauhan's poems: "Jallianwala Bagh Mein Basant", "Mera Bachpan","Yeh Kadamb Ka Ped" Mahadevi Verma's poem: "Main Neer Bhari Dukh Ki Badli", Suryakant Tripathi Nirala's poem "Vah Todti Patthar"

अनुवाद (12 व्याख्यान) / Translation (12 Lectures)
अनुवाद क्या है? बहुभाषी दुनिया में अनुवाद की आवश्यकता; तकनीकी और गैर-तकनीकी अनुवाद; अंतर-भाषा और आंतरिक भाषा अनुवाद; प्रभावी संचार के लिए अंग्रेजी से हिंदी और इसके विपरीत अनुवाद अभ्यास; रचनात्मक अनुवाद और अभ्यास

What is translation? Need for translation in a multilingual world; Technical and non-technical translation; inter and intra translation; Translation exercises from English to Hindi and vice-versa for effective communication; creative translation and exercises

प्रयोगशाला / Laboratory
व्यक्तिगत और समूह गतिविधियाँ और व्यावहारिक अनुभवात्मक शिक्षण मॉड्यूल:
1. भाषण कौशल पर कार्यशाला (व्यक्तिगत साक्षात्कार, एक्सटेम्पोरे)
2. अनुवाद कार्यशाला (निबंध, रचनात्मक लेखन जैसे लघु कहानी/कविता लेखन)
3. श्रवण कौशल पर कार्यशाला सत्र (ऑनलाइन व्याख्यान, ऑडियो-विजुअल क्लिप)
4. फिक्शन, समाचार पत्र लेख पढ़ना और उनकी समीक्षा और विश्लेषण करना
5. फिल्म स्क्रीनिंग और चर्चा

Individual and group activities and hands-on experiential learning modules:
1. Workshop on Speaking Skills (Personal Interview, Extempore)
2. Translation Workshop (Essay, Creative Writing such as short story/ Poetry writing)
3. Workshop Session on Listening Skills (online lecture, audio-visual clip)
4. Reading Fiction, Newspaper Articles and reviewing and analyzing them
5. Film Screening and Discussion

पाठ्यपुस्तक / Textbooks
कोर्स के लिए सभी पठन सामग्री रचनात्मक और आलोचनात्मक सोच को बढ़ावा देगी और इसमें शामिल होंगे: समाचार पत्रिकाएँ, प्रसिद्ध भाषण, जीवनी, उपन्यास, गैर-काल्पनिक साहित्य और फिल्म से अंश/कथाएँ, शब्द खेल और पहेलियाँ, जिन्हें प्रशिक्षकों द्वारा संकलित किया जाएगा और छात्रों के साथ साझा किया जाएगा।

All reading material for the course will enhance both creative and critical thinking and will include the repertoire- newspaper articles, famous speeches, biographies, passages/narratives from fiction, non-fiction and film, word games and puzzles and will be compiled by the instructors and shared with the students.

संदर्भ पुस्तकें / Reference Books
1. हिंदी साहित्य का सरल इतिहास" - विष्णनाथ त्रिपाठी, ओरिएंट ब्लैकस्वान / "Hindi Sahitya Ka Saral Itihas" by Vishwanath Tripathi, Orient BlackSwan
2. "हिंदी साहित्य का इतिहास" - डॉ. नागेंद्र, मयूर पब्लिकेशंस / "Hindi Sahitya Ka Itihas" by Dr. Nagendra, Mayur Publications
3. "आधुनिक हिंदी कविता: एक संकलन" - विद्या निवास मिश्र, इंडियाना यूनिवर्सिटी प्रेस / "Modern Hindi Poetry: An Anthology" by Vidya Niwas Mishra, Indiana University Press
4. "साहित्य की पहचान" - नामवर सिंह, राजकमल प्रकाशन, दिल्ली / "Sahitya ki Pahchan" by Namvar Singh, Rajkamal Prakashan, Delhi
5. "हिंदी" - काचरू, यमुन, जॉन बेन्जामिन्स, फिलाडेल्फिया / "Hindi" by Kachru, Yamuna, John Benjamins, Philadelphia

Self-learning Material
http://premchand.co.in/stories; https://www.rekhta.org/poets/harivanshrai-bachchan/all

Title	**Understanding India (Indian Ethos and Knowledge Systems) - I**	Number	MSL1010
Department	School of Management and Entrepreneurship	L-T-P-D [C]	2–0–0-0 [2]
Offered for	BSc-BEd (ITEP)	Type	Core
Prerequisite	None		

Objectives

This course aims to introduce indigenous knowledge in the educational curriculum formally. The course consists of sessions that:

- introduce students to the contributions by India to Foundational knowledge, Science, Engineering & Technology, and Humanities & Social Sciences through a structured classification
- introduce students to the thinking patterns and the knowledge repository created by the thinkers and practitioners of yore and many generations that provides great value
- enable the current generation to understand the thought processes and frameworks, and synthesize new knowledge

Learning Outcomes

The course enables participants to:

- develop an early appreciation of the Indian ethos and knowledge system
- appreciate the matter being discussed with contextual reference

Contents

Part I: Indian Knowledge System: An Introduction

- Indian Knowledge System: An Overview (4 sessions) - Importance of Ancient Knowledge, Defining Indian Knowledge System, The IKS Corpus – A classification framework, Caturdaśa-Vidyāsthāna, Historicity of IKS, Some Unique Aspects of IKS, Discover IKS exercises on topic
- The Vedic Corpus (4 sessions) - Introduction to Vedas, The Four Vedas, Vedāṅgas, Vedic Life: Distinctive Features, Discover IKS exercises on topic
- Philosophical Systems (4 sessions) - Indian Philosophical Systems – Development and Unique features, Vedic Schools of Philosophy, Non-Vedic Philosophical, Discover IKS exercises on topic
- Wisdom through the Ages (4 sessions) - Purāṇas – An encyclopedic work, Itihāsa as a source of Wisdom, Rāmāyaṇa – Key issues and messages, Mahābhārata – A sourcebook for worldly wisdom, Nīti-śāstras – Collection of snippets of Wisdom, Subhāṣitas – A collection of insights from various text, the knowledge systems of India as practiced by Farmers, Artisans, and Forest Dwellers, Discover IKS exercises on topic

Part II: Foundational Concepts relevant for Science, Engineering, and Technology Applications

- Linguistics (4 sessions) - Components of a Language, Pāṇini's work on Sanskrit Grammar, Phonetics in Sanskrit, Four Stages of Speech, Role of Sanskrit in Natural Language Processing, Indian Language Families, Introduction to Dravidian family of languages, Discover IKS exercises on topic
- Number System and Units of Measurement (4 sessions) - Number System in India – Historical Evidence, Salient features of the Indian Numeral System, Unique approaches to represent numbers, Measurements for time, distance, and weight, Piṅgala and the Binary system, Discover IKS exercises on topic
- Knowledge: Framework and Classification (4 sessions) - The Knowledge Triangle, Prameya, Paramana, Samsaya, Framework for Establishing Valid Knowledge, Deductive/Inductive Logic Framework, Potential Fallacies in the Reasoning Process, Established Tenets in a Field of Study, Discover IKS exercises on topic

Pedagogy

The course will be delivered through lectures, participative discussion of research articles, and student presentations. Evaluation of course shall be based on individual and group assessment methods such as assignments, projects etc. including an end-term examination. Each topic shall have discovered IKS Exercises for the students to work on and present.

Text Book
Mahadevan, B., Bhat, Vinayak Rajat, Nagendra Pavana R. N., (2022) Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Pvt. Ltd.

Recommended Readings
- Rao, S. S. (2006). Indigenous knowledge organization: An Indian scenario. International Journal of Information Management, 26(3), 224-233.
- Beer, S. (1994). May the whole earth be happy: Loka Samastat Sukhino Bhavantu. Interfaces, 24(4), 83-93.
- Danino, M. (2010). The lost river: On the trail of the Sarasvatī. Penguin Books India.
- Matilal, B. K. (2008). Logic, Language and Reality: Indian Philosophies and Contemporary Issues (Vol. 2). Motilal Banarsidass.
- Matilal, B. K. (2001). Introducing Indian Logic. Indian Logic: a Reader, 183-215.
- Kumar, R., & Prakash, O. (Eds.). (2023). Language Studies in India: Cognition, Structure, Variation. Springer Nature.
- Satguru Sivaya Subramuniyaswam (2008) Tirukkural: The American English and Modern Tamil Translations of an Ethical Masterpiece, (https://www.himalayanacademy.com/media/books/tirukural/tirukural.pdf available in link as on March 30, 2024)
- Bose, D. M., Sen, S. N., & Subbarayappa, B. V. (1971). A concise history of science in India. A concise history of science in India.
- Bag, A. K. (2015). Ideas and Researches on Physical Concepts in India. Indian Journal of History of Science, 50(3), 361-409.
- Bag, A. K. (1982). Technology in India in the eighteenth-nineteenth century. Indian journal of history of science, 17(1), 82-90.
- Bag, A. K. (2018). Indo-European Encounter and Features of Modern Science in Pre-Colonial & Colonial India. Indian Journal of History of Science, 53, T1-T20.
- Mishra, L. C. (Ed.). (2003). Scientific basis for Ayurvedic therapies. CRC press.
- https://en.wikipedia.org/wiki/Siddha_medicine
- Siddha Medicine by Ramon Martinez Lopez (Ref: https://www.amazon.in/Siddha-Medicine-Ramon-Martinez-Lopez/dp/1519302002)
- Dutta, A. K. (2016). Was there sophisticated mathematics during Vedic Age. An anthology of disparate technical thoughts at a popular level (ed. A. Chaudhuri), ISIREA.
- Bidyāraṇya, S., & Singh, A. N. (1962). History of Hindu mathematics: a source book. (No Title).
- Joseph, G. G. (2016). Indian mathematics: Engaging with the world from ancient to modern times. World scientific.
- Amma, T. S. (1999). Geometry in ancient and medieval India. Motilal Banarsidass Publ.
- Kolachana, A., Mahesh, K., & Ramasubramanian, K. (Eds.). (2019). Studies in Indian mathematics and astronomy: selected articles of Kripa Shankar Shukla. Springer Singapore.
- Collected Writings of Shri Dharmapal (https://www.dharampal.net/publications)
  Volume I -Indian Science and Technology in the Eighteenth Century
  Volume II -Civil Disobedience in Indian Tradition
  Volume III -The Beautiful Tree: Indigenous Indian Education in the Eighteenth Century
  Volume IV - Panchayat Raj and India's Polity
  Volume V- Essays on Tradition, Recovery and Freedom
- A History of Hindu Chemistry Vol. 1. Internet Archive. Retrieved April 03 2024.
- A History Of Hindu Chemistry,Vol. 2. Internet Archive. Retrieved April 03 2024
- R., T. A History of Hindu Chemistry from the Earliest Times to the Middle of the Sixteenth Century A.D., with Sanskrit Texts, Variants, Translation and Illustrations. Nature 68, 51–52 (1903). https://doi.org/10.1038/068051a0
- History of Ancient India (Set of 11 Volumes), 2023, Edited By: Dilip K. Chakrabarti, Publisher: Aryan Books International

Title	**Art Education: Elements of Theatre Making**	Number	LAL1020
Department	School of Liberal Arts	L-T-P-D [C]	1–0–2-0 [2]
Offered for	BSc-BEd (ITEP)	Type	
Prerequisite	None		

Course Objectives
- Generate an idea of theatre: its history, aesthetics, social significance and contemporary practice
- Understand the significance of theatre as a medium for education and introduction to contemporary theatre-in-education practices
- Develop basic knowledge and skills in script-writing, acting, blocking, stage design, sound design, light design, costume design and production management
- Enhance confidence, communication, coordination, teamwork and presentation skills through collaborative theatre practice

Learning outcomes
- Knowledge of theatre as an art form: history, aesthetics and social significance
- Understand theatre's importance as a medium for education
- Acquire practical knowledge and basic skills in script-writing, acting, stage design, sound design, light design, costume design and production management
- Develop confidence, creativity, coordination, adaptability, and problem-solving aptitude through immersive theatrical experiences

Course Contents
Topic 1: Introduction to Theatre and its role in Education (5 Lectures)
An overview of theatre history, different forms/genres of theatre globally and the power of performative storytelling. Introducing the different elements of theatre making and the roles designed to manage these different elements. Understanding the significance of theatre as a medium for education and knowledge of contemporary theatre-in-education practices.

Topic 2: Script-writing and Dramaturgy (2 Lectures & 6 Studio Hours)
Different kinds of dramatic plots and structures will be analyzed and discussed. Understanding concepts related to preparing the performance text: playwriting, character-development, plot-design, editing, adaptation and incorporating stage directions. Students will write or adapt a short stageable dramatic piece in groups.

Topic 3: Acting Techniques and Character Development (3 Lectures & 6 Studio Hours)
Different approaches to acting will be analyzed and discussed with special emphasis on Stanislavsky's method. Concepts like 'character-analysis' , 'emotional memory', 'gestus', 'psycho-physical acting' will be introduced. Students will learn various skills like voice projection/modulation, play-reading, dialogue delivery, recitation, facial and physical gestures, movements and coordination. The students will analyze a given character and develop methods to enact the character.

Topic 4: Theatre Design (4 Lectures & 6 Studio Hours)
Understanding different aspects of theatrical design including direction, stage-design, light-design and sound-design. Students will learn various concepts and practical techniques relating to theatrical design. They will work hands-on in groups to formulate a design for a given dramatic piece.

Topic 5: Collaborative Production (10 Studio Hours)
The course will culminate in the creation of a short theatrical performance in front of an audience. Through this the students will understand the production management roles, coordination, cooperation and teamwork needed to develop and stage a performance. They will also showcase their newly learnt theatrical skills and immerse in a collaborative creative process.

Pedagogy

The course will be delivered through lectures, demonstrations, workshops and Practical tasks. Evaluation can be based on writing assignments, practical projects (process, product and/or reflection), performance, script creation, documentation or presentation. The students might be required to work outside designated hours of the course to fulfill the given practical assignments.

Reference Text Books and Articles

- Stanislavsky, Constantin. *An Actor Prepares* London: Bloomsbury, 1937.
- Brecht, Bertolt. *On Theatre* London: Bloomsbury, 2018.
- Boleslavsky, Richard. *Acting: The First Six Lessons*. London: Routledge, 2013
- Zimmerman, Suzi. *Introduction to Theatre Arts (Vol I & II)* New York: Meriwether Publication, 2007.
- Spolin, Viola. *Theatre Games for the Classroom: A Teacher's Handbook*. Northwestern University Press, 1986.
- Bhatia, Nandi. *Modern Indian Theatre: A Reader*. Oxford: Oxford University Press, 2011.
- Boal, Augusto. *Theatre of the Oppressed*. New York: Theatre Communications Group, 1993.
- Dawson, Kathryn and Lee, Bridget Keeger. *Drama-Based-Pedagogy: Activating Learning Across the Curriculum*. Chicago: University of Chicago, 2018.

Online Resources

- Youtube Short Lecture Series titled "An Actor's Work: Stanislavsky for Actors". Youtube Link: https://youtube.com/playlist?list=PL0gfVPKadSLyH68Mjp-e9v6_RVovv6111&si=YLP2sryKTI5rRHup
- Lecture Series Titled "Introduction to Theatre and Dramatic Arts" by Missouri State University. Youtube Link:https://www.youtube.com/watch?v=_ELP95UxEmQ&list=PLdLiRaajwSXTBmnGHra9kCNm3z_74Khv0
- Swayam Course on "Introduction to Modern Indian Drama" by Prof. Kiran Keshavamurthy". Link: https://onlinecourses.nptel.ac.in/noc20_hs34/preview

Title	**Art Education: Methods and Materials in Visual Art**	Number	LAL1030
Department	School of Liberal Arts	L-T-P-D [C]	1–0–2-0 [2]
Offered for	BSc-BEd (ITEP)	Type	
Prerequisite	None		

Course Objective

- To understand and appreciate art in a deeper sense and realise the importance of Art in education
- To explore various methods and materials used in art making.
- To foster an understanding of the relationship between form, content, and materiality in art making.
- To develop students' problem-solving skills and creative thinking through hands-on projects and assignments.
- To enhance imagination and aesthetic sensibility

Learning Outcomes

By the end of this course, students will be able to
- Appreciate and understand the significance of art in education.
- Develop aesthetic sensibility and learn how to appreciate artworks.
- Through hands-on activities, students will learn how various mediums collaborate in art.
- Compose and produce expressive artworks (2D and 3D) such as self-portraits, landscapes, and collages.
- Learn fundamental skills such as drawing, painting, modelling, carving, casting, and assembling while exploring unconventional and mixed-media approaches to visual arts.
- Learn how to display or present their artwork.

Contents

Topic 1: Introduction to the Role of Art and Aesthetics in Education (5 Lectures)

Students will explore the world of Art and aesthetics in education through various activities, discussions, and dialogues. students will collectively view a series of artworks and critically analyse and observe. Through this process, students will start making connections and develop an appreciation for the aesthetic means of daily life. Additionally, this course will help students develop their aesthetic judgment and learn how to recognise and awaken emotions through art.

Topic 2: Methods and Material Exploration (3 Lectures 8 studio hours)

To investigate traditional and contemporary techniques, tools, and mediums across various artistic disciplines, like drawing, painting, cutting, printmaking, and mixed media. Through hands-on experiments, research, and critical analysis, students will comprehensively understand how different materials and processes can be used to convey artistic concepts and expressions effectively.

Topic 3: Mixed Media Art Practice: (3 Lectures 8 studio hours)

Through hands-on activities, students will produce artworks using various art materials, such as charcoal, graphite, ink, acrylic paint, oil paint, clay, plaster, found objects, and digital media. Students will explore the properties and possibilities of each material through guided exercises and experimentation.

Topic 4: Material Experiments: (3 Lectures 8 studio hours)

Students will experiment and document their process and findings through sketchbooks, journals, or digital portfolios. This involves exploring unfamiliar uses of familiar materials or experimenting with alternative techniques and processes.

Topic 5: Reflection and Exhibition (4 studio hours)

Culminate the course with a final exhibition or portfolio review where students showcase their artworks created throughout the semester. The exhibition allows students to celebrate their achievements, share their creative journey with others, and receive feedback from peers and instructors.

Pedagogy

The course will be delivered through lectures, demonstrations, and practical tasks.

Reference Text Books and Articles

- Klee, Paul. (1968), *Pedagogical Sketchbook*, New York, N.Y: Faber & Faber Publisher.
- John Berger. (1972), *Ways of Seeing*, based on the BBC television series with John Berger, Published by Brītish Broadcasting Corporation, London, ISBN 0563122447 and Penguin Books, London.
- Mayer, R., & Sheehan, S. (1991). *The Artist's Handbook of Materials and Techniques*. Viking.
- The Grove Encyclopedia of Materials and Techniques in Art. (2008). United Kingdom: Oxford University Press.

Online Resources
https://onlinecourses.nptel.ac.in/noc22_hs133/preview

Title	**Design Thinking Workshop - I**	Number	DSN1010
Department	School of Design	L-T-P-D [C]	0–0–1-0 [0.5]
Offered for	BSc-BEd (ITEP)	Type	Compulsory
Prerequisite	None		

Objectives

Introduce the students to

1. Thinking holistically, taking into consideration different stakeholders' perspectives
2. Understand the context, and identify and define a problem

Learning Outcomes

The students will be able to apply the design thinking method to everyday challenges in and outside the classroom.

Contents

● Introduction to Design Thinking: Applicability of design thinking to different situations; Case studies; Overview of the process: Understanding context, developing empathy, problem statement, ideation, prototyping, testing and critiques, iteration towards a workable solution. [3.5 hours, conducted as workshop of three and a half hours]

● Discovery and definition: Understanding the problem context; Asking questions to identify the right problem; Identifying stakeholders; Stakeholder or user personas - developing empathy by observation and interviews; Identifying constraints and requirements; Framing a problem without introducing bias; "How might we…" [3.5 hours, conducted as workshop of three and a half hours]

References

1. Tim Brown, "Change by Design" Revised and updated edition, Harper Business, 2019
2. IDEO.org, "The Field Guide to Human-Centered Design" 1st edition, IDEO.org, 2015
3. Don Norman, "The Design of Everyday Things," 2nd Edition, Basic Books, 2013

Title	**Mathematics - II**	Course No.	MAL1040
Department	Mathematics	L-T-P-D [C]	2-0-2-0 [3]
Offered for	BSc-BEd	Type	Core
Prerequisite	None		

Objectives
1. To train the student in the area of matrix theory, theory of equations, infinite series, complex numbers
2. To give sufficient knowledge of the subject which can be used by students for further applications in their respective domains of interest

Learning Outcomes
1. Consistency and solution of systems of linear equations
2. Determinants, eigen-values, eigenvectors of a matrix
3. Number of roots of an equation, Descartes' rule of signs
4. Convergence and divergence of a series
5. Algebra of complex numbers

Contents
Matrix Algebra [4 Lectures]: Systems of linear equations, matrices, elementary row operations, Gauss elimination method, row-reduced matrices, row-reduced echelon matrices, row-rank, consistency and solution of systems of linear equations using matrix

Determinants [4 Lectures]: Determinants, Singular and non-singular matrices, eigen-values, eigenvectors, and the characteristic equation of a matrix, statement of Cayley-Hamilton theorem and its use in finding the inverse of a matrix

Theory of Equations [6 Lectures]: Polynomials in one variable and the division algorithm, graphical representation, relations between the roots and the coefficients, real roots, imaginary roots, number of roots of equation, Transformation of equations, Descartes' rule of signs, approximate solutions of polynomials

Infinite Series [12 Lectures]: Bounded and monotonic sequences, Cauchy's convergence criterion, series of non-negative terms, tests for convergence, alternating series, absolute and conditional convergence, convergence of Taylor Series, error estimates, applications of power series

Complex Numbers [2 Lectures]: Complex numbers and functions of complex variables, algebra of complex numbers

Laboratory: Visualization using Mathematica/ MATLAB

Textbooks
1. Mapa, S.K., Higher Algebra: Abstract and Linear, Sarat Book House
2. Mapa, S.K., Higher Algebra: Classical, Sarat Book House
3. Bartle, R.G., Sherbert, D.R., Introduction to real analysis, Wiley
4. Kumaresan, S., A Pathway to Complex Analysis, TECHNO WORLD

Reference Books
1. Kumaresan, S., Linear Algebra : A Geometric Approach, Prentice Hall India Learning Private Limited
2. Thomas, G.B., Hass, J., Heil, C., Weir, M.D., Thomas' calculus (14th edition), Pearson Education
3. Mapa, S. K., Introduction to Real Analysis, Sarat Book House

Self-learning Material
1. Jaikrishnan J., Real Analysis I, NPTEL Course Material, Department of Mathematics, IIT Palakkad, https://nptel.ac.in/courses/111106142
2. Haridas P., Linear Algebra, NPTEL Course Material, Kerala School of Mathematics, https://nptel.ac.in/courses/111106135.

Title	Chemistry - II	Number	CYL1030
Department	Chemistry	L-T-P-D [C]	2–0–2-0 [3]
Offered for	BSc-BEd	Type	Core
Prerequisite	None		

Objectives
> The Instructor will:
> 1. Provide basic understanding of all areas of chemistry: inorganic, organic, and physical
> 2. Impart depth of knowledge involving chemical principles to apply the concepts in any scientific discipline

Learning Outcomes
> The students are expected to have the ability to:
> 1. understand and appreciate the concepts involved in major chemical processes
> 2. will demonstrate the ability to access and interpret information to solve problems

Contents

Inorganic Chemistry: General introduction to the concepts of bonding, the ionic, covalent, coordinate bonding: concept of bond energy; examples. Simple bonding theories of molecules, VSEPR theory, VBT, introduction to Molecular orbital theory, Homonuclear diatomic molecules. (9 Lectures)

Organic Chemistry: conformation of cyclic and acyclic molecules, Addition, Elimination, substitution reactions and functional group transformations, aromaticity and reactions of aromatic compounds (9 Lectures)

Physical Chemistry: Introduction to Spectroscopy: General features, Experimental methods, Linewidths, Pure rotation spectra, Rotational Raman spectra, Vibrational Spectroscopy, Molecular Vibrations, Electronic Spectra, Fluorescence and Phosphorescence   (10 Lectures)

Laboratory Experiments

Estimation of Water Hardness by EDTA; Iodometric determination of copper using thiosulphate.; Measuring IR and UV spectra for common compounds.; Acid catalyzed esterification: Aspirin synthesis, Determination of optical purity of chiral molecules by polarimeter

Textbooks
1. J. D. Lee, Concise Inorganic Chemistry, (5th Edition), ELBS, 1996.
2. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice Hall of India Pvt. Ltd., 5th Ed, 1990
3. G. Solomons and C. Fryhle, Organic Chemistry, John Wiley & Sons (Asia) Pte. Ltd.
4. P.W. Atkins, Julio de Paula, Physical Chemistry, Oxford University Press, 2008.
5. A.J. Elias, A Collection of Interesting General Chemistry Experiments, Universities Press (1 January 2008).

Self-learning Material
NPTEL Course, NOC: Basics in Inorganic Chemistry, IIT Bombay **(**https://nptel.ac.in/courses/104101121)
NPTEL Course, Basic Organic Chemistry, IIT Guwahati, (https://nptel.ac.in/courses/104103071)
NPTEL Course, NOC: Fundamentals of Spectroscopy, NCL Pune, IISER Pune, (https://nptel.ac.in/courses/104106122)

Title	**Physics - II**	Number	PHL1030
Department	Physics	L-T-P-D [C]	2–0–2–0 [3]
Offered for	BSc-BEd	Type	Core
Prerequisite	None		

Objectives
The Instructor will:
1. Provide basic understanding of electrostatics, magnetostatics and electrodynamics
2. Introduce two modern concepts in physics, i.e., Quantum mechanics and Special theory of relativity

Learning Outcomes
The learners are expected to:
1. Understand behavior of charges at rest and in motion and the concepts of fields and their applications, the difference between classical and quantum world
2. Solve Maxwell's equations, Schrodinger's equation under various physical situations
3. Design simple experiments to demonstrate the concepts

Contents
(1) *Electrostatics, Magnetostatics and Electrodynamics*: Gauss's law, Boundary value problems, multipoles, dielectrics, Biot and Savart law, Ampere's law, Faraday's law, Displacement current, Motion of charge particle in electric and magnetic field, Concept of Mass spectrometers, Basic ideas of Maxwell's equations, Electromagnetic waves (12 lectures)

(2) *Quantum Theory of light:* Black Body Radiation and failure of classical theory, Planck's Radiation Law, Photoelectric effect, Compton Scattering, De Broglie waves, Wave-particle duality, Heisenberg uncertainty relation, Advent of quantum Mechanics, Rutherford model, Bohr orbit, Atomic configuration, Schrodinger Wave equation, A few 1D problems, Radioactivity, Properties of Nucleus, Nuclear decay, Nuclear Models, Nuclear reactions (10 lectures)

(3) *Part A-Special Theory of relativity:* Galilean Transformation and Maxwell's equation, Postulates of Special theory of relativity (STR), Length contraction, Time dilation, Twin paradox, Energy and momentum in STR, Energy mass equivalence (3 lectures)

Part B Properties of Materials: Mechanical, Electrical, Magnetic, Dielectric and Optical properties (3 lectures)

Laboratory Experiments
1. Verification of Biot-Savart Law
2. Current Balance
3. Faraday Rotation (Verdet Constant)
4. Demonstration of Bohr's orbit and atomic configuration
5. Measurement of e/m ratio
6. Finding the plateau region of Geiger Muller (GM) Tube
7. Measurement of Planck's constant
8. Measurement of Speed of Light

Textbook
1. Electricity and Magnetism, A Mahajan and A Rangwala, McGraw Hill Education 2017.
2. Introduction to Electrodynamics, D. J. Griffiths, PHI
3. Concepts of Modern Physics, Arthur Beiser, TMH, 2003
4. Introduction to Special Relativity, Resnick, Wiley 2007.
5. Principles of Physics, Walker, Halliday, Resnick, Wiley.

Reference Books

1. Lorrain, P. and Corson, D., Electromagnetic Fields and Waves, CBS Publishers, 2003.
2. Panofsky W.K.H. and Philips M., Classical Electricity and Magnetism, Dover Publishers, 1990.

Self-learning Material

1. Dighe, A., *Electrodynamics*, Tata Institute of Fundamental Research, Mumbai, https://nptel.ac.in/syllabus/115101004/.
2. Gut, A., *Lecture notes on Electromagnetism II*, MIT open course ware https://ocw.mit.edu/courses/physics/8-07-electromagnetism-ii-fall-2012/lecture-notes/.

Title	**Introduction to Data Science**	Course No.	MAL1050
Department	Mathematics	L-T-P-D [C]	2-0-0-0 [2]
Offered for	BSc-BEd	Type	Core
Prerequisite	None		

Objectives
1. To orient the students to the field of data science
2. To give some knowledge of Probability and Statistics which can be used by students for analysis of data in their respective domains of interest

Learning Outcomes
1. Understanding of Descriptive Statistics
2. Understanding of Correlation and Regression
3. Understanding of Special Probability Distributions and their Applications

Contents
Data Collection and Visualization [4 Lectures]: Population and Sample, Frequency Distribution, Cumulative frequency, Graphic and diagrammatic representation of data, techniques of data collection, bar chart, histogram, pie chart, scatter diagram, box plot

Descriptive Statistics [4 Lectures]: Measures of central tendency: Mean, Median, Mode, Geometric mean and Harmonic mean. Measures of dispersion: Range, Mean Deviation, Standard deviation, Coefficient of variation, Quartile deviation, Skewness, Kurtosis

Correlation and Regression [6 Lectures]: Coefficient of Correlation – Karl Pearson and Rank Correlation. Partial and Multiple correlation analysis, Regression analysis – Estimation of regression line in a bivariate distribution, least square method, interpretation of regression coefficients.

Probability Distributions [14 Lectures]: Random Variable, Special discrete distributions with applications (Binomial, Poisson, Negative Binomial, Geometric), Special continuous distributions with applications (Exponential, Gamma, Gaussian), Moments and Generating functions, Convergence of Random Variables

Lab: Data Analysis using R

Textbooks
1. Speigal, M.R. Theory and Problems of Statistics McGraw Hill Book, London
2. Dekking, F., Kraaikamp, C., Lopuhaä, H., Meester, L. (2005). A Modern Introduction to Probability and Statistics: Understanding Why and How. Netherlands: Springer London.

Reference Books
1. Ross, S. M. (2010). Introductory Statistics. Netherlands: Elsevier Science.
2. Rohatgi, V. K., Saleh, A. K. M. E. (2015). An Introduction to Probability and Statistics. Germany: Wiley.

Self-learning Material
NPTEL Course, Probability and Statistics by Dr. Somesh Kumar, Department of Mathematics, IIT Kharagpur (http://nptel.iitm.ac.in)

Title	**Introduction to Life Sciences**	Number	BBL1200
Department	Bioscience & Bioengineering	L-T-P-D [C]	2-0-0-0 [2]
Offered for	BSc-BEd	Type	
Prerequisite	None		

Objectives
The Instructor will
1. Provide a foundation of biology and its applicability to different disciplines
2. Provide multidisciplinary learning

Learning Outcomes
The students are expected to have the ability to:
1. Prepared for the advanced course in the next semester
2. Able to perceive an understanding from cell to tissue organization
3. Explain the basic concepts of cellular and molecular biology

Contents
Life & Origin: Chemical basis of life, water sustains life, biomolecules, biological macromolecules, unity in diversity among life forms, concept of organic evolution and phylogeny (Lectures 4)

Functioning of Biological Systems: Molecules of life, Nucleic acids, Proteins, Carbohydrates and Lipids. From organisms to cells, structure-function relationships, free energy, entropy, reactions, biocatalysis, energy coupling (Lectures 8)

Control in living systems: Gene expression, control of cell division, hormones, signals & receptors, feedback control, control failure & disease (Lectures 8)

Responses of Biological systems: Interactions, communication, stress responses, tolerance, adaptation, rhythms & cycles, ecosystems (Lectures 8)

Textbook and Reference Books
1. Molecular Biology of the Gene. Watson J. D. et al. 6th edition (2009). Publisher: Pearson International edition
2. Molecular Cell Biology. Lodish H. et al. 7th edition (2013). Publisher: W.H. Freeman and Company
3. Molecular Biology of the Cell. Alberts B. et al. 5th edition. Publisher: Garland Science
4. Urry L.A., Cain M.L., Wasserman S.A., Minorsky P.V., Reece J.B., (2016), Campbell biology. 11th Edition, Pearson.
5. "Life" - by David Sadava et al.; (2) "Biological Science" - by Scott Freeman et al.

Self-learning Material
NPTEL Course, Basic Biology, Dr. Vishal Trivedi, IIT Guwahati (http://nptel.ac.in/courses/122103039/)

Title	**Language II - English**	Number	LAL1040
Department	School of Liberal Arts	L-T-P-D [C]	3-0-2-0 [4]
Offered for	BSc-BEd	Type	
Prerequisite	None		

Objectives
1. Enhancing reading, listening, speaking and writing skills of the participants
2. Developing their critical thinking ability
3. Improving their study skills and ability to write for professional purposes

Learning Outcomes:
At the end of the course, the participants will be able to:
1. Write different types of paragraphs frequently used in scientific writing
2. Read academic texts for specific and global information and make notes
3. Listen to academic lectures and take notes
4. Participate in academic and general conversations and make presentations on familiar topics
5. Explain various issues related to pedagogy and solve classroom-related language issues
6. Write CVs, e-mails and blogs without much difficulty

Course Contents

Introduction (8 lectures)
Introduction to the course; Diagnostic test to assess grammatical and comprehension ability;

Reading and Writing (20 lectures)
Analysing the structure of paragraphs, essays; Introduction to reading techniques: Skimming and Scanning; Types of reading techniques such as Intensive and Extensive reading; Critical analysis of literary, cultural and scientific texts; Reading and note-taking; How to read different types of writings such as academic, technical, literary and analyse them; Basic grammatical skills such as sentence construction, syntax, punctuation and vocabulary enhancement; Email writing; Paragraph Writing; Summarizing; Essential Parts of an Academic Essay; Making CVs and Résumés; Technical Report Writing; essay writing; and letter writing

Listening and Speaking (14 lectures)
Language and sensitivity; language and cultural understanding; Modes of Communication - Formal and Informal, Verbal and Non-verbal Communication, Group Discussions, Mock Personal Interviews; Listening to academic lectures and making notes; Listening for specific information and listening for meaningful observation; Participating in conversations; Asking questions; responding to questions; making presentations; Listening comprehension exercises; Listening and note-taking using Outline method; Listening and Summarising; Listening and comprehending while watching an audio-visual clip;

Laboratory

Will include individual and group activities and hands on experiential learning modules:
- Workshop on Speaking Skills (Group Discussion, Personal Interview. Extempore)
- Writing Workshop (Essay, Creative Nonfiction/Advertising, Journal Writing, Letter & Email Writing)
- Workshop Session on Listening Skills
- a) Reading Fiction, Newspaper Articles, Journals and reviewing and analyzing them
  b) Film Screening and Discussion

Textbook

All reading material for the course will enhance both creative and critical thinking and will include the repertoire-newspaper articles, famous speeches, biographies, passages /narratives from fiction, nonfiction and film, word games and puzzles and will be compiled by the instructors and shared with the student.

Reference Books

1. Bolton. D. (2008). *English Grammar in Steps: English Grammar presented, explained and practiced in context.* Orient Longman. New Delhi: India
2. Wren PC, Martin H. (2018) *High School English Grammar & Composition*. *Revised by N.D.V. Prasad Rao.* S Chand Publishing Blackie. ELT Books, New Delhi: India.
3. Hewings, Martin (2012) *Cambridge Academic English*.
4. Davis, Jason and Rhonda Liss (2012) *Effective Academic Writing*. Oxford University Press.

Online Course Material

1. Iqbal, Ayesha. *English Language for Competitive Examinations*. NPTEL Course Material, Department of Humanities and Social Sciences, Indian Institute of Technology-Madras, https://nptel.ac.in/courses/109106116/
2. Choudhary, Shreesh. *Better Spoken English.* NPTEL Course Material, Department of Humanities and Social Sciences, Indian Institute of Technology-Madras, https://nptel.ac.in/courses/109106067/.
3. http://www.uefap.com
4. https://owl.purdue.edu/owl/

Title	**Understanding India (Indian Ethos and Knowledge Systems) - II**	Number	MSL1020
Department	School of Management and Entrepreneurship	L-T-P-D [C]	2–0–0-0 [2]
Offered for	BSc-BEd (ITEP)	Type	Core
Prerequisite	Understanding India (Indian Ethos and Knowledge Systems) - I		

Objectives

This course aims to introduce indigenous knowledge in the educational curriculum formally. The course consists of sessions that:

- introduce students to the contributions by India to Foundational knowledge, Science, Engineering & Technology, and Humanities & Social Sciences through a structured classification
- introduce students to the thinking patterns and the knowledge repository created by the thinkers and practitioners of yore and many generations that provides great value
- enable the current generation to understand the thought processes and frameworks, and synthesize new knowledge

Learning Outcomes

The course enables participants to:

- develop an early appreciation of the Indian ethos and knowledge system
- appreciate the matter being discussed with contextual reference

Contents

Part III: Science, Engineering and Technology in IKS

- Mathematics (4 sessions) - Unique Aspects of Indian Mathematics, Great Mathematicians and their contributions, Arithmetic, Geometry, Trigonometry, Algebra, Binary Mathematics and Combinatorial Problems, Discover IKS exercises on topic
- Astronomy (4 sessions) - Unique Aspects of Indian Astronomy, Historical Development of Astronomy in India, The Celestial Coordinate System, Elements of the Indian Calendar, Āryabhaṭīya and the Siddhāntic Tradition, Pañcāṅga – The Indian Calendar System, Astronomical Instruments (Yantras), Discover IKS exercises on topic
- Engineering and Technology: Metals and Metalworking (4 sessions) - The Indian Science and Technology (S&T) Heritage, Mining and Ore Extraction, Metals and Metalworking Technology, Iron and Steel in India, Lost Wax Casting of Idols and Artefacts, Apparatuses used for extraction of metallic components, Discover IKS exercises on topic
- Engineering and Technology: Other Applications (4 sessions) - Literary Sources for Science and Technology, Physical Structures in India, Irrigation and Water Management, Dyes and Painting Technology, Surgical Techniques, Shipbuilding, Sixty-four Art Forms, Status of Indigenous S&T, Discover IKS exercises on topic
- Town Planning and Architecture (4 sessions) - Arthasastra on Town Planning, 1 Indian Architecture – A historical perspective, Vāstu-śāstra – The Science of Architecture, Town Planning, Unitary Buildings, Temple Architecture, Indo-Saracenic architecture, Discover IKS exercises on topic

Part IV: Humanities and Social Sciences in IKS

- Health, Wellness and Psychology (4 sessions) - Āyurveda – Definition of health, Tri-doṣas – Relationship to Health, Disease Management, Yoga way of life – Relevance to health and wellness, Indian Approach to Psychology, The Tri-guna System, The Body–Mind–Intellect–Consciousness Complex, Consciousness – The true nature of an individual, Siddha Medicine, Discover IKS exercises on topic
- Governance and Public Administration (4 sessions) - Arthaśāstra – Governance and Administration, Vidura-niti – Advice to a King, The Administrative Set-up, Relevance of Arthaśāstra, Public Administration – Perspectives from the Epics, Discover IKS exercises on topic

Pedagogy

The course will be delivered through lectures, participative discussion of research articles, and student presentations. Evaluation of course shall be based on individual and group assessment methods such as assignments, projects etc. including an end-term examination. Each topic shall have discovered IKS Exercises for the students to work on and present.

Text Book

Mahadevan, B., Bhat, Vinayak Rajat, Nagendra Pavana R. N., (2022) Introduction to Indian Knowledge System: Concepts and Applications, PHI Learning Pvt. Ltd.

Recommended Readings

- Rao, S. S. (2006). Indigenous knowledge organization: An Indian scenario. International Journal of Information Management, 26(3), 224-233.
- Beer, S. (1994). May the whole earth be happy: Loka Samastat Sukhino Bhavantu. Interfaces, 24(4), 83-93.
- Danino, M. (2010). The lost river: On the trail of the Sarasvatī. Penguin Books India.
- Matilal, B. K. (2008). Logic, Language and Reality: Indian Philosophies and Contemporary Issues (Vol. 2). Motilal Banarsidass.
- Matilal, B. K. (2001). Introducing Indian Logic. Indian Logic: a Reader, 183-215.
- Kumar, R., & Prakash, O. (Eds.). (2023). Language Studies in India: Cognition, Structure, Variation. Springer Nature.
- Satguru Sivaya Subramuniyaswam (2008) Tirukkural: The American English and Modern Tamil Translations of an Ethical Masterpiece, (https://www.himalayanacademy.com/media/books/tirukural/tirukural.pdf available in link as on March 30, 2024)
- Bose, D. M., Sen, S. N., & Subbarayappa, B. V. (1971). A concise history of science in India. A concise history of science in India.
- Bag, A. K. (2015). Ideas and Researches on Physical Concepts in India. Indian Journal of History of Science, 50(3), 361-409.
- Bag, A. K. (1982). Technology in India in the eighteenth-nineteenth century. Indian journal of history of science, 17(1), 82-90.
- Bag, A. K. (2018). Indo-European Encounter and Features of Modern Science in Pre-Colonial & Colonial India. Indian Journal of History of Science, 53, T1-T20.
- Mishra, L. C. (Ed.). (2003). Scientific basis for Ayurvedic therapies. CRC press.
- https://en.wikipedia.org/wiki/Siddha_medicine
- Siddha Medicine by Ramon Martinez Lopez (Ref: https://www.amazon.in/Siddha-Medicine-Ramon-Martinez-Lopez/dp/1519302002)
- Dutta, A. K. (2016). Was there sophisticated mathematics during Vedic Age. An anthology of disparate technical thoughts at a popular level (ed. A. Chaudhuri), ISIREA.
- Bidyāraṇya, S., & Singh, A. N. (1962). History of Hindu mathematics: a source book. (No Title).
- Joseph, G. G. (2016). Indian mathematics: Engaging with the world from ancient to modern times. World scientific.
- Amma, T. S. (1999). Geometry in ancient and medieval India. Motilal Banarsidass Publ.
- Kolachana, A., Mahesh, K., & Ramasubramanian, K. (Eds.). (2019). Studies in Indian mathematics and astronomy: selected articles of Kripa Shankar Shukla. Springer Singapore.
- Collected Writings of Shri Dharmapal (https://www.dharampal.net/publications)
  Volume I -Indian Science and Technology in the Eighteenth Century
  Volume II -Civil Disobedience in Indian Tradition
  Volume III -The Beautiful Tree: Indigenous Indian Education in the Eighteenth Century
  Volume IV - Panchayat Raj and India's Polity
  Volume V- Essays on Tradition, Recovery and Freedom
- A History of Hindu Chemistry Vol. 1. Internet Archive. Retrieved April 03 2024.
- A History Of Hindu Chemistry,Vol. 2. Internet Archive. Retrieved April 03 2024
- R., T. A History of Hindu Chemistry from the Earliest Times to the Middle of the Sixteenth Century A.D., with Sanskrit Texts, Variants, Translation and Illustrations. Nature 68, 51–52 (1903). https://doi.org/10.1038/068051a0
- *History of Ancient India* (Set of 11 Volumes), 2023, Edited By: Dilip K. Chakrabarti, Publisher: Aryan Books International

Title	**Teacher and Society**		Number	EDL1020
Department	CET		L-T-P-D [C]	2–0–0-0 [2]
Offered for	BSc-BEd (ITEP)		Type	Core
Prerequisite	Nil			

Objectives
1. To explore the multiple identities of a teacher (personal, professional, institutional, policy constructions etc.) and its overlap with the teaching-learning process
2. To introduce students to the ethical dimensions of a teacher's role in Indian society and its links to democratic citizenship and nation-building
3. To inculcate a sensitivity in the students to the needs of learners from diverse cultural, linguistic, gender, social and economic backgrounds as well as those who are differently abled

Learning Outcomes
1. The ability to conceptualize how the agency of teachers is shaped by individual, contextual, and structural dimensions
2. Creation of a professional sensibility that will contribute to their future professional practice, including the creation of positive learning environments.
3. The ability to critically reflect on personal and collective practice so as to improve learning and teaching

Course Contents
1. **The social construction of teaching as a profession**: Understanding the personal and social dimensions of a teacher's identity; Teaching and Professionalism- History, aspirations, expectations; Teaching and Mentorship (7 lectures)
2. **The ethical elements of teaching as a profession**: Teacher's values, beliefs and philosophies; the teacher and the state: teaching, citizenship-education and nation-building; Reflexive practice (7 lectures)
3. **The agency of teachers**: Individual, cultural and structural dimensions of teacher agency; Pedagogical content knowledge; Challenges in the way of fostering teacher agency; performativity, non-academic engagements; Policy and Practice gaps (7 Lectures)
4. **Contemporary issues around the teacher as a professional**: New political economy of teaching; Technology adoption, 'digital divide and inequalities" and teaching 'digital natives', etc. (7 lectures)

Textbooks
1. Razzack, A., Sarangapani, P. and Jain, M. 2023 (eds). Education, Teaching and Learning: Histories, Cultures, Conversations, New Delhi: Orient Blackswan
2. Zeichner, K. M., & Liston, D. P. (2013). Reflective teaching: An introduction. Routledge.

Reference Books
1. Bruner, J. (1996). Folk pedagogy. In The culture of education (pp. 44–65). Cambridge: Harvard University Press.
2. Sriprakash, A. (2012). Pedagogies for development – the politics and practice of Child Centered Education in India. Dordrecht: Springer Publication

Online Resources
Cope, William. Learning, Knowledge and Human Development.
https://www.coursera.org/learn/learning-knowledge-human-development

Title	**Design Thinking Workshop - II**		Number	DSN1020
Department	School of Design		L-T-P-D [C]	0–0–1-0 [0.5]
Offered for	BSc-BEd (ITEP)		Type	Core
Prerequisite	Nil			

Objectives

Introduce the students to
1. Methods of ideation
2. Prototype solutions and user feedback
3. Communicating the design thinking outcome for investment decisions

Learning Outcomes

The students will be able to
1. Apply the method of design thinking to challenges they face.
2. Come up with compelling ideas and solutions.
3. Communicate their ideas to decision-makers/ investors

Contents
- Exploration and ideation: Mind maps; Thinking visually; Collaborative ideation–whiteboards, digital whiteboard tools (Google Jamboard, Mural, Miro, etc.); Synthesis of ideas; Evaluating ideas from the perspective of constraints, requirements, and feasibility. [One workshop of 2.5 hours]
- Prototyping: Introduction to prototyping; Importance of prototyping; Types of prototyping - low to high fidelity; Prototyping for products, services, and experiences; Making prototypes–physical, digital, role-playing; Prototype key use cases; Elevator pitch and Poster presentation. [One workshop of 2.5 hours]
- Validation: Taking user feedback on the prototype for key use cases; the Think-Aloud protocol; Refining the prototype based on feedback and insights gained; Iterating. [One workshop of 2 hours]

References
1. Tim Brown, "Change by Design" Revised and updated edition, Harper Business, 2019
2. IDEO.org, "The Field Guide to Human-Centered Design" 1st edition, IDEO.org, 2015
3. Don Norman, "The Design of Everyday Things," 2nd Edition, Basic Books, 2013

Second Year Courses

ITEP BSc-BEd

Title	**Real Analysis**	Number	MAL2050
Department	**Mathematics**	L-T-P	3-1-0
Offered for	B.Sc-B.Ed.	Type	Core
Prerequisite			

Objectives
1. To train the students in the area of Real Analysis.
2. To give sufficient knowledge of real analysis and its applications which can be used to do advanced courses in pure and applied mathematics.

Learning Outcomes
The students will be able to
1. analyse limits, convergence of sequences and series, and continuity and differentiability of functions.
2. apply Bolzano-Weierstrass to prove boundedness, and Mean Value Theorems to analyse function behaviour.
3. compute Riemann integrals and use them to find areas, average values, and solve problems in physics and engineering contexts.

Contents
The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supremum property; intervals. (3L)

Sequences and their limits, Convergent sequences, Cauchy's criterion, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences, Bolzano-Weierstrass theorem, Cauchy Sequences, Cauchy's general principle of convergence. (8L)

Introduction to series, convergence of series. Cauchy's general principle of convergence for series, tests for convergence of series, Absolute convergence and conditional convergence. (5L)

Real valued Functions, Bounded functions, Limits of functions, Limits at infinity, Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity. (6L)

The derivability of a function: on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Rolle's Theorem, Lagrange's Theorem, Cauchy's Mean value Theorem. (7L)

Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient conditions for R-integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems. (10L)

Textbooks:
1. Robert G.Bartle and Donald R. Sherbert, Introduction to Real Analysis, John Wiley.
2. Sudhir R. Ghorpade and Balmohan V. Limaye, A Course in Calculus and Real Analysis, Springer-Verlag New York Inc.; 2006.

Reference Books
1. K.R. Davidson, and A.P. Donsig, Real analysis and applications: Theory in practice, Springer Publications, 2010.
2. Tom M. Apostol, Mathematical Analysis, Second edition, Narosa, 2002.

Self-learning/Online Material
Rana, I.K., Basic Linear Algebra, NPTEL Course material, Department of Mathematics, IIT Bombay, https://archive.nptel.ac.in/courses/111/101/111101134/

Course Title	Linear Algebra	Number	MAL2060
Department	Mathematics	L-T-P	3-1-0 (4)
Offered for	BSc BEd	Type	Core
Prerequisite	None		

Objectives:
1. Understand the structure of vector spaces and subspaces.
2. Understand linear transformations and their representations.
3. Analyze eigenvalues and eigenvectors and apply them to various problems.

Learning Outcomes
The students will be able to:
1. Solve systems of linear equations using methods such as Gaussian elimination and matrix inversion
2. Compute eigenvalues and eigenvectors to analyze the properties of matrices and their transformations
3. Apply vector space concepts, including linear independence, span, and basis, to model and solve real-world problems such as image compression, data dimensionality reduction (e.g., PCA), and machine learning feature transformations

Contents
Part 1: Introduction to Linear Algebra [12 lectures]
Review of Matrix Theory, Vector Spaces, Subspaces, Linear Independence, Basis and Dimension, Direct Sum, Quotient Space, Elementary row operations, Row reduced echelon form, Row space, Column space, and Rank of a matrix.
Part 2: Eigenvalues and Eigenvectors [12 Lectures]
Linear Transformations, Matrix Representation, Rank Nullity theorem, Eigenvalues and Eigenvectors, Diagonalization, Characteristic Equation, Eigenvectors and Eigenspaces, Applications of Eigenvalues and Eigenvectors, Symmetric Matrices and Spectral Theorems (without Proof), Eigen Value Decomposition.

Part 3: Advanced Topics in Linear Algebra [9 Lectures]
Inner Product Spaces, Normed linear space, Orthogonal Vectors, Cauchy-Schwarz inequality, Gram-Schmidt Process, Orthogonal Projections.

Part 4: Applications of Linear Algebra [6 lectures]
Least Squares, LU factorization, QR factorization, Singular Value Decomposition (SVD), Principal Component Analysis (PCA)

Textbooks:
1. "An Introduction to Linear Algebra" by I. K. Rana, Ane Books Pvt. Ltd., 2010.
2. "Linear Algebra and Its Applications" by Gilbert Strang, Cengage Learning, 2018

Reference Books:
1. Kumaresan, S. (2000). Linear Algebra – A Geometric Approach, PHI Learning.
2. Artin, M., Algebra, Prentice Hall of India, 1994.
3. Sharma, R. K., Shah, S. K. and Shankar, A. G., Algebra I: A Basic Course in Algebra, Pearson Education, 2011.
4. "Linear Algebra Done Right" by Sheldon Axler, Springer, 1997.
5. "Introduction to Linear Algebra" by Serge Lang, Springer New York, 2012.
6. Jorge Rebaza, "A first course in applied mathematics," Wiley, 2012

Online Course Material
Rana, I.K., Basic Linear Algebra, NPTEL Course material, Department of Mathematics, IIT Bombay, https://nptel.ac.in/courses/111101115/

Title	**Basics Principles of Chemistry**	Number	CYL2060
Department	**Chemistry**	L-T-P [C]	3–0–2 [4]
Offered for	B.Sc.-B.Ed.	Type	Compulsory
Prerequisite	Nil		

Objectives

The instructor will:

1. Provide basic understanding of all areas of chemistry: inorganic, organic, and physical.

2. Impart depth of knowledge involving chemical principles to apply concepts in any scientific discipline

Learning Outcomes

The student will be able to

1. Describe the concepts involved in major chemical processes

2. Interpret intermediates to solve reactions and mechanisms

Contents

In-organic Chemistry: Introduction to Organometallic Chemistry, 18 electron rule, Common organometallic ligands and their bonding, Oxidative addition, Reductive elimination, Selective applications. Introduction to Solid State Chemistry; Types of solids, Symmetry in crystals, Bravais lattice, unit cell, X-ray diffraction, Braggs law, Structure of crystalline solids such as NaCl, Diamond. **(13 Lectures)**

Organic Chemistry: Mechanism and Intermediates: Reaction mechanisms and different methods for their determination, Isomerization, Resonance, Inductive effect, hyperconjugation, structure and reactivity of carbocation including nonclassical carbocation, carbanion, radical, carbene, nitrene, concerted and stepwise mechanism, transition states and intermediates, early and late transition states, exothermic and endothermic reactions with examples. **(13 Lectures)**

Physical Chemistry: Probability. Average, Central Limit Theorem, Binomial distribution, Stirling's approximation, Microstate, Macrostate, NVT, NVE ensemble, Boltzmann distribution, significance of Boltzmann distribution in physical chemistry, Average vs observed quantity, definition of entropy, 2nd law of thermodynamics, heat capacity, Helmholtz and Gibbs free energy. **(13 Lectures)**

Laboratory Experiments:

Extraction: Separation of an Acidic, a Basic and a Neutral Substance, Green Chemistry: A Solvent-Free Aldol Condensation; Solid phase Synthesis and characterization of trans bis glycinato Cu(II); Synthesis and characterization of acetylferrocene from ferrocene; Determination of equilibrium constant by partition method, Determination of free energy from equilibrium constant using UV-visible spectroscopy.

Textbooks
1. J.D. Lee, Concise Inorganic Chemistry, (5th Edition), ELBS, 1996.
2. R.T. Morrison and R.N. Boyd, Organic Chemistry, Prentice Hall of India Pvt. Ltd., 5th Ed, 1990
3. D. A. McQuarrie, Physical Chemistry: A Molecular Approach, Viva Books, 2017.

Reference Books
1. Clayden,J., Greeves,N., and Warren,S., (2012), Organic Chemistry, 2nd Edition, Oxford
2. G. Solomons and C. Fryhle, Organic Chemistry, John Wiley & Sons (Asia) Pte Ltd.

Online Resource:

Basics in Inorganic Chemistry, Prof. Debabrata Maiti, IIT Bombay:

https://nptel.ac.in/courses/104101121;

Basic organic Chemistry, Prof. T. Punniyamurthy, IIT Guwahati

https://nptel.ac.in/courses/104103071;

Fundamentals of Spectroscopy, NCL Pune, IISER Pune, Prof. Anirban Hazra, Prof. Sayan Bagchi

https://nptel.ac.in/courses/104106122

Title	Molecular Structure and Spectroscopy	Number	CYL2070
Department	Chemistry	L-T-P [C]	3–0–2 [4]
Offered for	B.Sc.-B.Ed.	Type	Compulsory
Prerequisite	Nil		

Objectives

The instructor will:

1. Attempt to provide fundamental aspects of theory in view of foundations of quantum chemistry
2. Discuss a few applications of quantum theory to chemistry
3. Establish the relation between fundamentals of spectroscopy and quantum chemistry

Learning Outcomes

By the end of this lesson, the student will be able to:

1. Describe fundamentals of quantum mechanics and its applications to chemistry
2. Solve and analyze exactly solvable problems and interpret solutions to discuss symmetry, energy levels, spectroscopy, atomic orbitals and spins

Contents

The transition from classical to quantum regime, Uncertainty principle, the Schrödinger equation and its physical interpretation, Time-independent Schrödinger equation, wave functions, operators, commutator algebra and Uncertainty principle, Eigenvalues and Eigenvectors in quantum mechanics **(10 lectures)**

Particle in a one-dimensional box, Measurement outcomes and Fourier series, Postulates and theorems in quantum mechanics, Particle in a three-dimensional box- separation of variables, Wave functions and symmetry in quantum mechanics, Finite square well and tunnelling **(10 lectures)**

Classical Harmonic oscillator, The Harmonic oscillator model for a diatomic molecule and its relation to infrared spectra, Vibrations of diatomic molecules, Harmonic oscillator selection rules **(9 lectures)**

The rigid-rotator model for a diatomic molecule, Angular momentum, Rigid-rotator selection rules, the hydrogen atom solution and atomic orbitals, Introduction to electron spin-Stern-Gerlach experiment, Zeeman effect and spin-orbit coupling, Many-electron systems **(10 lectures)**

Lab Experiments: 1] Determination of lambda max and calculation of transition energy by UV-visible spectroscopy, 2] Determination of force constant of a diatomic molecule using IR, 3] proton NMR spectra of acetone, 4] Calculation of extinction coefficient using Beer Lambert's Law, 5] Effect of solvent polarity on emission spectra, 6] Plotting wave functions using Mathematica.

Textbooks

1. Levine, I. N., (1983), *Quantum Chemistry*, 3rd Edition, Allyn and Bacon

Reference Books

1. McQuarrie, D. A., (1983), Quantum Mechanics, 2nd Edition, University Science Books
2. Atkins, P. and Friedman (2005), R., Molecular Quantum Mechanics, 4th Edition, Oxford University Press, London
3. Pauling, L., (1985), Introduction to Quantum Mechanics with Applications to Chemistry, Dover Publications Inc.

Self-Learning Material

Datta, A., Quantum Chemistry of Atoms and Molecules, NPTEL Course Material, Department of Chemistry, Indian Institute of Technology Bombay: https://www.youtube.com/playlist?list=PLOzRYVm0a65eW1kTGOrjBetXFMl4eaYVi

Title	**Fundamentals of Optics**	Number	PHL2030
Department	**Physics**	L-T-P-D [C]	3-0-2-0 (4)
Offered for	BSc-BEd	Type	Compulsory
Prerequisite			

Objective
The instructor will:
1. Provide a basic understanding of fundamental optics.
2. Explain the classical approaches for understanding the characteristics of light waves

Learning Outcomes
The students will be able to:
1. Explain the fundamentals of geometrical and wave optics
2. Identify and characterise the phenomenon of Fourier optics in various optical instruments

Contents:
Geometrical optics: Introduction to light - Corpuscular model, Wave model, Fermat's principle - laws of reflection and refraction, Ray paths in an inhomogeneous medium - Mirage, Reflection and Refraction by spherical surfaces, focal lengths of a lens, thin lens, magnification, matrix method, Optical aberrations [10 Lectures]

Wave optics: Review of waves, group and phase velocity, wave propagation, wave equation, definition and properties of wave front, Huygens Principle and its applications [4 Lectures]

Interference: division of wavefront and amplitude, Lloyd's Mirror and Fresnel's Biprism. Interference in Thin Films: parallel and wedge shaped films, Newton's Rings, Temporal and Spatial Coherence, Young's double slit experiment, Michelson Interferometer [10 Lectures]

Diffraction: Fraunhofer diffraction, Single slit diffraction pattern, Circular aperture, Resolution, Two slits, Multiple slits, Diffraction grating. Resolving power of grating. Rayleigh criterion for resolution.
Fresnel Diffraction, Half period zones, rectilinear propagation of light, diffraction by a long narrow slit, transition to Fraunhofer region [10 Lectures]

Electromagnetic character of light: Introduction to polarised light, Malus law, Brewster angle, phenomenon of double refraction, interference of polarized light: quarter and half wave plates, Analysis of polarised light [5 Lectures]

Laboratory Experiments:
1. Young's Double Slit experiment
2. Newton's rings
3. Determination of Cauchy's Constants
4. Determining the thickness of a thin object by using a wedge-shaped film
5. Michelson Interferometer
6. Malus's law
7. Basic holography demonstration

Text Books
1. Ghatak A, Optics, 7th Edition Mcgraw Hill Publisher, 2021
2. Hecht E., Optics, 4th Edition, Pearson Publisher, 2007.

References
1. Born & Wolf, Principles of Optics (7th edition), Pergamon press
2. K K Sharma, Optics: Principles and Applications, Academic Press 2006.

Title	**Fundamentals of Thermodynamics**	Number	PHL2020
Department	**Physics**	L-T-P-D [C]	3-0-2-0 (4)
Offered for	BSc-BEd	Type	Compulsory
Prerequisite			

Objective

The instructor will:
1. Provide a basic understanding of the fundamentals of thermodynamics.
2. Explain the laws of thermodynamics, thermodynamic equations, and their applications.

Learning Outcomes

The students will be able to:
1. Explain the macroscopic properties of gases by relating them to the microscopic behavior of their constituent molecules, utilizing the kinetic theory of gases and the Maxwell-Boltzmann speed distribution.
2. Calculate the temperature change during the Joule-Thomson expansion of a real gas, given its equation of state and initial conditions.

Contents:

Kinetic theory of gases: Maxwell-Boltzmann speed distribution law, Mean free path, collision probability, Fundamentals of transport phenomena, Brownian motion and its significance, Viscosity, diffusion, effusion, thermal conductivity in gas [6 Lectures]

Temperature, Definition of thermal equilibrium, Temperature scales, Specific heat of solids, Dulong-petit law, Zeroth law, Conservation of mass for closed and open systems, First law of Thermodynamics for Cyclic and Non-cyclic processes, Concept of total energy E, Various modes of energy, Internal energy and Enthalpy [8 Lectures]

Reversible and irreversible processes, Carnot's cycle and Carnot's theorem, Second and third law of thermodynamics, Clausius inequality, definition of Entropy, entropy change in reversible and irreversible processes. Entropy and disorder, Principle of increase of entropy, Entropy and unavailable energy, Entropy of ideal gases, Entropy as a thermodynamic variable, S-T diagram [9 Lectures]

Thermodynamic potentials, Equation of state for Real gasses, deviation from ideal gas equation, The Van-der Waals equation of state, Clausius–Clapeyron relation, Gibbs- Helmholtz and energy equations, Enthalpy, Helmholtz and Gibbs free energies, Maxwell's thermodynamic equations and their applications [10 Lectures]

Phase Transitions: 1st and 2nd order phase transitions, Phase diagram and Triple point, Ehrenfest equations, Gibbs phase rule and simple applications, Joule-Thomson effect, Thermodynamic analysis, Inversion temperature [6 Lectures]

Laboratory Experiments:
1. Band gap of a semiconductor from temperature-dependent resistivity
2. Thermal conductivity
3. Power radiation
4. Heat capacity
5. TGA/DTA/DSC
6. Joule-Thomson effect

Text Books
1. Zemansky M W and Dittman R H, Heat and Thermodynamics, McGraw Hill, 2017
2. Heat and Thermodynamics: Brij Lal and N. Subramanyam.
3. Thermal Physics: B.K. Agarwal.

References
1. Schroeder D, An Introduction to Thermal Physics, Oxford University Press, 2021

2. Heat and Thermodynamics: Dayal, Verma and Pandey

Online Materials
https://www.damtp.cam.ac.uk/user/tong/kinetic.html
https://www.math.uwaterloo.ca/~mscott/Little_Notes.pdf
https://ocw.mit.edu/courses/8-333-statistical-mechanics-i-statistical-mechanics-of-particles-fall-2013/

Course Title	Child Development & Educational Psychology	Course No.	LAL2180
School	SoLA	L-T-P-C	3-0-2 [4]
Offered for	UG	Type	Programme Compulsory
Pre-requisite		None	

Objectives
1. To develop a basic understanding of child development milestones.
2. To explain various aspects of child development, such as physical, cognitive, emotional, and moral development.
3. To explain the basics of educational psychology.
4. To understand the dynamics of learning and teaching in the classroom contex

Learning Outcomes

The students will be able to

1. Understand the basics of child development, including various theories and models.
2. Examine various aspects (e.g., physical, cognitive, emotional, moral) of child development.
3. Analyze the role of socio-cultural context in child development.
4. Apply various learning approaches in Indian classroom settings.
5. Apply knowledge in planning and managing classes.

Contents
Introduction to child development: Historical perspectives; Principles of development; Brief overview of stages in human development; Work of Freud, Piaget, Vygotsky, Erikson, Kohlberg, Kakar, other Indian Perspective, etc., related to child development. (10 Lectures)

Development across various domains: Physical development, Cognitive development, Language development, Socio-Emotional development, Moral development, Development in Neurodivergent Population. (9 Lectures)

Basics of educational psychology: Introduction to learning, teaching, and educational psychology; Education and cultural diversity; Individual differences and learning. (5 Lectures)

Various approaches to learning: Behavioural views of learning; Cognitive learning; Complex Cognitive Processes; Constructivism and interactive learning; Social cognitive views, Bronfenbrenner Ecological Framework. (10 Lectures)

Learning and teaching in the classroom: Motivation in Learning and Teaching; Technology and Instruction Planning, Managing the classroom; Classroom assessment. (5 Lectures)

Suggested Practicum
1. Examine the pattern of play activities in childhood.
2. Analysis of a book based on a child story, such as Totto-Chan, Swami and friends.
3. Compare the daily life of two children from different socio-economic status.
4. Cognitive/intelligence assessment of a child.
5. Spending a day in a school and writing a report about classroom functioning.
6. Interviews with students to explore the school's sensitivity to socio-cultural inclusiveness.
7. Interview of teachers on children's learning problems, especially for underachievers.

Text Book
1. Hurlock, E. (2017). *Child development, 6th edition.* New Delhi: Tata McGraw Hill.
2. Woolfolk. A. & Usher, E. L. (2023). *Educational psychology*, *15th edition*. Pearson

Reference Books
3. Berk, L. E. & Meyers, A. B. (2019*). Child development, 10th edition.* Pearson.
4. Santrock, J. W. (2011). *Educational Psychology, 5th edition.* Pearson.
5. Long, M. (2000). *The psychology of education*. Routledge.

6. Miller, P. H. (2011). *Theories of developmental psychology.* Worth Publishers.

Online Reading Materials
https://ugcmoocs.inflibnet.ac.in/index.php/courses/view_ug/207

Course Title	**Basics of Pedagogy at the Secondary Stage**	Course No.	EDL2010
Department	CET	Structure (L-T-P)	3-0-2 [4]
Offered for	ITEP	Type	Compulsory
Prerequisite	None		

Objectives
1. To establish a foundational understanding of the principles and concepts of pedagogy in relation to secondary stage of education (classes IX to XII)
2. To develop an understanding of the cognitive, social, and emotional development of adolescents and its implications for teaching and learning.
3. To introduce fundamental pedagogical principles for effective teaching at the secondary stage, assessment techniques, and classroom management strategies.

Learning Outcomes
At the end of the course, the students will be able to
1. Explain the key theories of learning and their implications for secondary education.
2. Identify the unique capabilities and strengths of secondary stage learner
3. Design teaching--activities activities informed by student-centered and inclusive pedagogy
4. Demonstrate the application of digital tools for assessments suitable for the secondary stage

Contents
I. **Understanding Secondary Stage Learners (7 Lectures)**: The Physical, Mental, Social and Emotional Growth of learners at this stage; Cognitive theories of learning and models; psychological and social orientations; social and academic lives of learners; management of conflict and challenges
II. **Foundations of Pedagogy at the Secondary Stage (6 Lectures)** Definition, scope and importance of pedagogy; Classification of Pedagogy w.r.t. Social aims (Inclusive Pedagogy, Culturally relevant Pedagogy, Dialogic and Socratic Pedagogy, Critical Pedagogy)
III. **Strategies for Teaching and Learning (7 Lectures):** Pedagogical Approaches for Effective learning (Constructivist, Cognitivist, Collaborative, Inquiry-based based learning; Active-learning based; Art-integrated; Sports-integrated)
IV. **Assessment (6 Lectures)**: Types (Formative, Summative, Diagnostic, Performance-based), Rubrics, Portfolios and Peer Assessment; Feedback mechanisms)
V. **Role of Technology in Pedagogy, Assessment and Classroom Management (7 Lectures)** (Digital tools and resources for teaching, learning and assessment, blended learning and flipped classrooms, Learning Management Systems, Ethical considerations in using technology
VI. **Reflective Practices and Professional Development (7 Lectures)** (Importance of reflective practice in teaching, Techniques for self-assessment and peer feedback, Continuous professional development for teachers, Building a teaching portfolio)

Practical Sessions (26 Hours)
The following are some suggestions for practical sessions. The list is not exhaustive.
1. Policy and Curriculum Analysis with respect to the concerned subject.
2. Analysis and Reflection on the Qualities of an 'Innovative Teacher' in Context of National Professional Standards for Teachers (NPST) and National Mentoring Mission (NMM).
3. Evaluation of different platforms such as National Teacher's Portal, NISHTHA, DIKSHA, and SWAYAM for an online course and prepare a report.
4. Designing a Lesson Plan (Project-based or Inquiry-based)
5. Develop teaching learning strategies to address the needs of diverse learners in the context of gender, equity and inclusion and prepare a PowerPoint presentation.
6. Case-study analysis of the challenges faced by secondary stage learners

7. Any other relevant tasks assigned by the instructor

Textbook
1. Mangal, S. K., and Mangal, S. (2019). *Learning and teaching*. PHI Learning Pvt. Ltd.
2. Gage, N. L. (2009). *A conception of teaching*. Springer Science & Business Media LLC

References
1. Little, A., & Wolf, A. (1996). Assessment in transition: learning, monitoring and selection in international perspective. Pergamon.
2. Bloom, B. S. (1984) Taxonomy of educational objectives. Longman.

Online Resources
Education: Concept, Nature and Perspectives https://onlinecourses.swayam2.ac.in/nou25_ed12/preview

Course Title	Computational Thinking		Course No.	EDN2010
Center	CET		L-T-P-C	0-0-2 [1]
Offered for	BSc-BEd		Type	Programme Compulsory
Pre-requisite			None	

Objectives
1. Introduce to the foundational concepts, practices, and perspectives of Computational Thinking (CT),
2. Develop hands-on proficiency in using block-based programming tools like Scratch to explore CT concepts
3. Enable pre-service teachers to reflect on and apply CT practices and perspectives in the context of their own teaching.

Learning Outcomes
By the end of this course, students will be able to
1. Demonstrate core CT concepts (e.g., sequences, loops, conditionals, operators, variables) by designing and implementing simple interactive programs or activities using block-based programming platforms like Scratch
2. Apply CT practices such as incremental development, debugging, and modularization to design and refine learning artifacts using block-based programming
3. Articulate how CT can be meaningfully integrated into pedagogy

Contents (Lab)
1. Introduction to CT in Education: Computational Thinking: Concepts, Practices, Perspectives; Understanding CT beyond coding; Introduction to Scratch (or any block-based programming platform) as a learning tool (2 sessions)
2. CT Concepts (Hands-on Activities on Block-based platform): Sequences & Loops: Understanding sequences, loops, and events through interactive storytelling and design; Conditionals: Decision-making using branching logic; Parallelism: Simultaneous execution in animations; Operators & Variables: Data manipulation in simple games (4 sessions)
3. CT Practices: Designing & Debugging with Scratch: Incremental Development & Testing, Building projects in small steps; Debugging, Identifying and fixing errors; Abstraction & Modularization, Breaking problems into smaller parts (3 sessions)
4. CT Perspectives (Reflection & Application in Teaching): Computational Identity, Creative Expression with CT; CT in Pedagogy, Brainstorming lesson ideas integrating CT in teaching (3 sessions)
5. Mini-Project: Project Exhibition (1 session)
Textbook:
1. Denning, P. J., & Tedre, M. (2019). Computational thinking. Mit Press.

Online Resource:
Scratch in Practice https://sip.scratch.mit.edu/scratchathome/
Code.org: https://code.org/students

Note: This lab course should include hands-on tasks in the lab sessions where PSTs will engage with concepts from their major/minor subjects (Mathematics, Physics, Chemistry), with a focus on contextualizing CT within disciplinary content.