

Curriculum Structure for the Integrated Teacher Education Programme (ITEP) B. Sc. B. Ed. (Chemistry, Mathematics, Physics)









 $\left(z = \frac{Z_L}{Z_0}\right)$ 







National Institute of Technology Tiruchirappalli - 620 015

# CONTENTS

SI. No.	Programme	Page No.
1.	B.Sc. B.Ed. (Chemistry)	2 - 17
2.	B.Sc. B.Ed. (Mathematics)	19 - 27
3.	B.Sc. B.Ed. (Physics)	29 - 39
4.	Language	41 - 47
5.	Education	49 - 59

# CURRICULUM B.Sc. B.Ed. (CHEMISTRY)

# CURRICULUM STRUCTURE FOR THE INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP) / B.Sc. B.Ed. (CHEMISTRY)

#### Semester I

Course Code	Course Title	L	Т	Ρ	С
CHPC11	Structure and Bonding	3	0	0	3
CHLR11	Inorganic Qualitative Analysis Lab	0	0	3	1
MAAL11	Basic analysis and analytical geometry	3	1	0	4
EDLT11	Language I –Tamil Epic Literature and Grammar	4	0	0	4
EDLH11	Language I – Hindi Language Learning (For Non-native speakers)				
EDLH12	Language I – Hindi Language Structure and Literature (For Native speakers)				
EDPC11	Evolution of Indian Education	4	0	0	4
EDPC12	Art Education - I	1	0	2	2
EDPC13	Understanding India - I	2	0	0	2
			Total		20

#### Semester II

Course Code	Course Title	L	Т	Ρ	С
CHPC21	Organic Chemistry: Fundamentals and	3	0	0	3
	Mechanism				
CHPC22	Basic Concepts of Physical Chemistry	3	0	0	3
CHLR21	Organic Qualitative and Quantitative Analysis	0	0	6	2
	Laboratory				
MAAL21	Calculus And Differential Equations	3	1	0	4
EDLE21	Language II - English for Communication	4	0	0	4
EDPC21	Understanding India - II	2	0	0	2
EDPC22	Teacher and Society	2	0	0	2
		Total		20	

# Semester III

Course Code	Course Title	L	Т	Ρ	С
CHPC31	Analytical and Instrumental Methods in	3	0	0	3
	Chemistry				
CHPC32	Chemistry of Functional Groups and	3	0	0	3
	Aromaticity				
CHLR31	Quantitative and Analytical Laboratory	0	0	6	2
PHAL31	Physics I	3	0	1	4
EDPC31	Child Development & Educational Psychology	3	0	2	4
EDPC32	Basic Pedagogy at Secondary Stage	4	0	0	4
			Total		20

# Semester IV

Course Code	Course Title	L	Т	Ρ	С
CHPC41	Transition Metal Chemistry	3	0	0	3
CHPC42	Statistical Thermodynamics, Chemical Kinetics and Equilibrium Processes	3	0	0	3
CHLR41	Physical Chemistry Lab.	0	0	6	2
PHAL41	Physics II	3	0	1	4
EDPC41	Philosophical & Sociological Perspectives of Education -1	4	0	0	4
EDPC42	Content Cum Pedagogy of Physical Sciences at Secondary stage -I	4	0	0	4
		Total			20

#### Semester V

Course Code	Course	L	Т	Ρ	С
	Title				
CHPC51	Organometallic and Bioinorganic Chemistry	3	0	0	3
CHPC52	Quantum Chemistry, Group Theory and	3	0	0	3
	Photochemistry				
CHPC53	Chemistry of Carbonyls and Nitrogen	3	0	0	3
	Compounds				
CHPE51/52/53	Program Elective /Online Courses	3	0	0	3
EDPC51	Content Cum Pedagogy of Physical	4	0	0	4
	Sciences atSecondary stage -II				
EDPC52	ICT in Education	1	0	2	2
EDPC53	Pre-internship Practice	0	0	4	2
	Total				20

# Semester VI

Course Code	Course	L	Т	Ρ	С
	Title				
CHPC61	Spectroscopy and Applications	3	0	0	3
CHPC62	Heterocycles and Natural Products	3	0	0	3
CHPE61/62/63	Program Elective/Online Courses	3	0	0	3
EDPC61	Assessment and Evaluation	2	0	0	2
EDPC62	Inclusive Education	2	0	0	2
EDPC63	Content Cum Pedagogy of Physical	4	0	0	4
	Sciences at Secondary stage -III				
EDPC64	Mathematical & Quantitative Reasoning	1	0	2	2
EDPC65	School Observation	0	0	4	2
	Total				21

# Semester VII

<b>Course Code</b>	Course Title	L	Т	Ρ	С
EDPC71	Perspectives on School Leadership and	2	0	0	2
	Management				

EDPC72	Secondary Stage Curriculum Planning & Development	2	0	0	2
EDPC73	Art Education II	1	0	2	2
EDPC74	Sports, Nutrition and Fitness	2	0	0	2
EDPC75	School-based Research Project	0	0	4	2
EDPC76	Internship in Teaching	0	0	20	10
	Total				20

# **Semester VIII**

Course	Course Title	L	Т	Р	С
Code					
EDPC81	Philosophical & Sociological Perspectives of	4	0	0	4
	Education -2				
EDPC82	Education Policy Analysis	2	0	0	2
EDEL81-88	Elective Course in Education. One Elective	4	0	0	4
	from the offered courses as per the choice of				
	student-teachers (e.g., Adolescence				
	education, Education for Mental Health,				
	Education for Sustainable Development,				
	Emerging Technologies in Education, Gender				
	Education, Guidance and Counselling, Peace				
	Education, Sports and Fitness Education, or				
	any other, relevant course decided by the				
	University / Institution)				
EDPC83	Yoga and Understanding Self	2	0	0	2
EDPC84	Citizenship Education, Sustainability and	2	0	0	2
	Environment Education				
EDPC85	Post Internship (Review and Analysis)	2	0	0	2
EDPC86	Creating Teaching Learning Material/Work	0	0	4	2
	Experience (Educational Toy making, local /				
	traditional vocations, etc.)				
EDPC87	Community Engagement and Service	0	0	4	2
	(Participation in NSS-related activities, New				
	IndiaLiteracy Programme etc.)				
	Total				20
	Total credits				161

# **Program Electives**

Course Code	Course Title	L	Т	Ρ	С
CHPE51	Nano Science and Technology	3	-	-	3
CHPE52	Medicinal Chemistry	3	-	-	3
CHPE53	Environmental Chemistry	3	-	-	3
CHPE61	Biocatalytic processes in Chemical Industries	3	-	-	3
CHPE62	Lanthanide and Actinide Chemistry	3	-	-	3
CHPE63	Polymer Chemistry	3	-	-	3
	NPTEL, SWAYAM, Coursera, edX Online				
	courses				

L	Т	Ρ	С
3	0	0	3

# PRE-REQUISITE: Higher Secondary Chemistry

#### COURSE LEARNING OBJECTIVES

Upon completion of the course the student will be able:

- To understand the atomic structure and principle.
- To understand periodic table and it's trends
- To understand chemical bonding concepts and weak chemical forces.
- To understand the chemical properties and reactions of s-block and p-block elements
- To understand the chemical properties, structure of key compounds of Group 15-18elements

#### **COURSE CONTENTS**

**Atomic Structure:** History of atom (Dalton – Thomson- Rutherford); Moseley's Experiment and Atomic number, Atomic Spectra; Black-Body Radiation and Planck's quantum theory - Bohr's model of atom; The Franck-Hertz Experiment; Interpretation of H- spectrum; Photoelectric effect, Compton effect; Dual nature of Matter - De-Broglie wavelength - Davisson and Germer experiment- Heisenberg's Uncertainty Principle; Schorodinger wave equation- shapes of s-p-d- f orbitals -Electronic Configuration of Atoms and ions - Hund's rule, Pauli's exclusion principle and Aufbau principle.

**Periodic Trends:** Periodic Law - Periodic table, group trends and periodic trends-Classification of elements on the basis of electronic configuration. Position of hydrogen and noble gases - Effective nuclear charges, screening effects, Slater's rules, atomic radii, ionic radii - covalent radii. Ionization potential, electron affinity, electronegativity – Pauling and Mullikan Schales- Effective nuclear charge- Slater rules - Inert pair effect. Group trends and periodic trends in these properties in respect of s-, p- and d-block elements

**Structure and Bonding:** Octect rules and its limitations -lonic bonding: lattice energy – Born Lande Equation – Born Haber cycle -polarizing power and polarizability, ionic potential, Fajan's rules. Covalent bonding: Lewis structures, formal charge. Valence Bond Theory, concept of resonance – Hybridization - equivalent and non-equivalent hybrid orbitals, Bent's rule, VSEPR theory, shapes of molecules and ions containing lone pairs and bond pairs – MOTheory and LCAO – molecular orbitals and diagrams of homonuclear and heteronuclear molecules – bond length and magnetic behaviour – Intramolecular forces.

**Chemistry of S- & P- Block Elements-I:** Position of hydrogen, isotopes, Alkali metals and their compounds. Diagonal relationship of Li with Mg. Anomalous behaviour of Be. Preparation and structure of diborane and borazine. Chemistry of borax. Extraction of Al and its uses. Extraction of Aluminium.. Carbon-di-sulphide – Preparation, properties, structure and uses. Percarbonates, per monocarbonates and per dicarbonates.

**Chemistry of S- & P- Block Elements-II:** General characteristics of elements of Group 15; Chemistry of nirogen and Phosporus containing compounds. General properties of elements of group16 - Structure and allotropy of elements - Classification and properties of oxides - oxides of sulphur and selenium – Oxy acids of sulphur - Chemistry of Halogens: -Inter-halogen compounds -pseudo halogens - basic nature of Iodine. Noble gases: Position - Preparation, properties and structure of XeF2, XeF4, XeF6 and XeOF4 - clathrate compounds.

# **REFERENCE BOOKS**

- 1. R. K Prasad, Quantum Chemistry, New Age international
- 2. Manas Chandra, Atomic Structrue and Chemical Bonding in Molecualar spectro, Tata, McGraw Hill,
- 3. Prakash. S., Tuli. G. D., Basu. S. K. & Madan, R. D. (2022). Advanced inorganic chemistry, Vol. 1. S. Chand & Company.
- 4. Lee, J. D. (1991). Concise inorganic chemistry, (4th Ed.). ELBS William Heinemann.
- 5. Catherine E. Housecroft; Alan G. Sharpe. (2018). Inorganic Chemistry, (5<sup>th</sup> Ed.). PearsonEducation Limited.
- 6. Huheey, J. E., (1993). Inorganic chemistry: Principles of structure and reactivity, (4th Ed.).Addison-Wesley Publishing Company.

# COURSE OUTCOME

#### Upon completing the course, the student will be able to understand

CO1	The atomic structure and principle
CO2	The periodic table and it's trends
CO3	The chemical bonding concepts and weak chemical forces.
CO4	The chemical properties and reactions of s-block and p-block elements
CO5	The chemical properties, structure of key compounds of Group 15-18
	elements

CHLR11	Inorganic Qualitative Analysis Laboratory	L	Τ	Ρ	С
		0	0	3	1

# PRE-REQUISITE: Higher Secondary Chemistry

#### COURSE LEARNING OBJECTIVES

Upon completion of the course the student will be able

- To develop the skill on systematic analysis of simple acid radicals.
- To develop the skill on systematic analysis of interfering acid radicals.
- To eliminate interfering acid radicals and identify the group of radicals.
- To analyse basic radicals
- To develop the skill on systematic analysis of mixture of inorganic salts.

#### **Semi-Micro Qualitative Analysis**

- 1. Analysis of simple acid radicals: Carbonate, sulphide, sulphate, thiosulphite, chloride, bromide, iodide, nitrate
- 2. Analysis of interfering acid radicals: Fluoride, oxalate, borate, phosphate, arsenate, arsenite.
- 3. Elimination of interfering acid radicals and identifying the group of basic radicals
- 4. Analysis of basic radicals (group wise): Lead, copper, bismuth, cadmium, tin, antimony, iron, aluminium, arsenic, zinc, manganese, nickel, cobalt, calcium, strontium, barium, magnesium, ammonium
- 5. Systematic Analysis of a mixture I to VIII containing two cations and two anions (of whichone is interfering type) (max. 10 Mixtures)

#### **REFERENCE BOOKS**

- 1. Venkateswaran.V., Veeraswamy, R., & Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry*, (2nd Ed.). New Delhi, Sultan Chand and Sons.
- 2. V. V. Ramanujam, *Inorganic Semi-micro Qualitative Analysis*, 3rd Edition, NationalPublishing Company, 1990.
- 3. G. Brauer (Ed.), *Handbook of Preparative Inorganic Chemistry (Vol. I and II)*, AcademicPress, 1963.

#### COURSE OUTCOME

#### Upon completing the course the student will be able to

CO1	develop the skill on systematic analysis of simple acid radicals.
CO2	develop the skill on systematic analysis of interfering acid radicals.
CO3	eliminate interfering acid radicals and identify the group of radicals.
CO4	analyse basic radicals
CO5	develop the skill on systematic analysis of mixture of inorganic salts.

CHPC21	Organic Chemistry: Fundamentals and	L	Τ	Ρ	С
	Mechanism	3	0	0	3

# PRE-REQUISITE: Higher Secondary Chemistry

#### COURSE LEARNING OBJECTIVES

Upon completion of the course the student will be able to understand

- The basic properties of organic molecules
- the preliminary concept of reaction mechanism
- the basic concept of stereochemistry
- the chemistry of organic acid, bases and alkynes

#### COURSE CONTENTS

**POLARITY OF BONDS AND PHYSICAL PROPERTIES**: Inductive effect, Field effect, Mesomeric effect, steric effects, steric inhibition of resonance, hyperconjugation and their influence on acidity and basicity of organic compounds. Hybridization: effects on bond length, angle (including Baeyer's strain), dissociation energy. Covalent and non-covalent interaction: Melting-/ boiling point, solubility of common organic molecules. Heat of hydrogenation / combustion / formation.

**REACTION MECHANISM:** Types of Mechanism: ionic, radical (homolytic and heterolytic) and pericyclic (definition and example); Types of reaction: addition, elimination, and substitution reactions (definition and example); electrophiles and nucleophiles (elementary idea); electrophilicity and nucleophilicity. Reactive intermediates: carbocation, carbanion, carbene. Nucleophilic substitution: SN1, SN2, SNi mechanisms. Eliminations reactions: E1, E2, E1CB, Ei mechanisms. Elimination versus substitution reactions, energy profile diagrams- transition states (general considerations; free energy, entropy etc.).

**STEREOCHEMISTRY-1:** Stereochemistry and stereoisomerism, Optical activity, Plane- polarized light, the polarimeter, Specific rotation, Chirality and it elements, the chiral centre, enantiomers, Enantiotopic and diastereotopic atoms, the racemic modification, Molecules with more than one asymmetric center., groups and faces. Stereo specific and stereo selective synthesis Specification of configuration: R and S, Sequence rules, D/L, erythrose, threose, geometrical isomerism - E/Z nomenclatures, syn/anti nomenclature.

**ORGANIC ACID AND BASES:** Structural, substituent and solvent effect on acidity and basicity; proton sponge; gas-phase acidity and basicity; Nucleophlicity and basicity; HSAB principle; thermodynamic principles in acid-base equilibria.

**CHEMISTRY OF ALKENES AND ALKYNES :** Addition reactions (electrophilic and free radical), hydration, hydroxylation, iodolactonization, hydroboration, oxy-/ demercuration, epoxidation, ozonolysis, hydrohalogenation and polymerization. Conjugated and isolated dienes: 1,2- versus 1,4-addition. Birch reduction, reactions of terminal alkynes (explaining theacidity).

# **REFERENCE BOOKS**

- 1. Peter Sykes, *A Guide book to Mechanism in Organic Chemistry*, 6<sup>th</sup> Edn., PearsonEducation, New Delhi, 2013. 2
- 2. S. M. Mukherjee, S. P. Singh, *Reaction Mechanism in Organic Chemistry*, Macmillan, 1984.
- 3. K. S. Tewari, N. K. Vishnoi, S. N. Mehrotra, *A Textbook of Organic Chemistry*, 2*nd* Edn., Vikas Publishing House, New Delhi, 2004.
- 4. M. K. Jain, S. C. Sharma, *Modern Organic Chemistry*, 3<sup>rd</sup> Edn., Vishal Publishing CompanyCo., 2010.
- 5. R. T. Morrison, R. N. Boyd, *Organic Chemistry*, 7<sup>th</sup> Edn., Pearson Education, New Delhi,2013.
- 6. I. L. Finar, *Organic Chemistry*, Vol. I, 5 th Edn., Pearson Education, New Delhi, 2013.
- 7. Jerry March, *Advanced Organic Chemistry*, 5 th Edn., John Wiley & Sons, NewYork, 2004.
- 8. Reinhard Bruckner, Advanced Organic Chemistry, Elsevier, 2002.
- 9. J. Clayden, N. Greeves, S. Warren, P. Wothers, *Organic Chemistry*, 2<sup>nd</sup> Edn., OxfordUniversity Press, New York, 2012.
- 10.P. S. Kalsi, Organic Reactions, Stereochemistry and Mechanisms, 4<sup>th</sup> Edn., New AgeInternational Publishers, New Delhi, 2006.
- 11.D. Nasipuri, *Stereochemistry of Organic Compounds: Principles and Applications*, 3<sup>rd</sup>Edn., New Age International Publishers, New Delhi, 2011.
- 12.P. S. Kalsi, Stereochemistry, *Conformation and Mechanisms*, New Age InternationalPublishers, 2005
- 13. P. Y. Bruice Organic Chemistry, 8th Edition, Pearson, 2016

#### **COURSE OUTCOME**

#### Upon completing the course, the student will be able to :

CO1	learn the basic properties of organic molecules
CO2	understand the elementary idea of reaction mechanism
CO3	learn the concepts of stereochemistry
CO4	identify the nature of organic acids and bases
CO5	grasp the chemistry of alkenes and alkynes

CHPC22	Basic Concepts of Physical Chemistry	L	Т	Ρ	С
		3	0	0	3

# PRE-REQUISITE: Higher Secondary Chemistry

# COURSE LEARINING OBJECTIVE

#### Upon completion of the course the student will be able to -

- 1. Understand the behavior of ideal and non-ideal gas.
- 2. Understand fundamental thermodynamic properties and processes
- 3. Apply thermodynamic principle to elucidate properties of liquids.
- 4. Apply thermodynamic principles to understand ionic conductivity in solutions.
- 5. Understand the function of an electrochemical cell.

#### **COURSE CONTENTS**

**Gaseous State:** *Ideal gas-* Calculation of pressure and temperature using kinetic theory. Maxwell's velocity distribution equation. Equipartition theorem. Average/Mean/RMS/Most Probable speed calculation. *Real gas-* Van der Waals equation of state. Virial equation of state, critical state variables, liquefication of a gas, compressibility factor, Boyle temperature, Law of corresponding states, fugacity

**Thermodynamics:** System and environment, *Zeroth law*- Reversible and irreversible processes. *First law*- Calculation of internal energy, enthalpy, and heat capacity. Joule- Thompson coefficient. Relationship between Cp and Cv. *Second law*- Thermodynamical and statistical definitions of entropy, Carnot cycle and its efficiency, Clausius inequality, Gibbs- Helmoltz equation, criteria of spontaneity, *Third law*- Concept of absolute zero.

**Liquid State:** *Properties of liquid* - Radial distribution function, physical properties of liquids, vapour pressure, surface tension and coefficient of viscosity, their determination, effect of various solutes and temperature, cleansing action of detergent. *Solutions* - Thermodynamic description of liquid mixtures, ideal solutions, Roult's law and Henry's law, *Colligative properties*- relative lowering of vapor pressure, elevation of boiling point, depression of freezing point, osmosis, and osmotic pressure, applications in calculating molar masses of solutes in solution.

**Ionic Equilibrium:** *Conductance* - specific/molar/eq. conductance. Arrhenius's theory and Ostwald dilution law. Conductance measurement: Kohlrausch's law. Debye-Hückel limiting law and activity coefficient. Transport number, Principles of Hittorf's and Moving-boundary method, Relaxation effect, and electrophoretic effect. Wien effect, Debye-Falkenhagen effect, Walden's rule. Applications of conductivity measurements: Applications of conductivity measurements:

**Electrochemistry:** Different classes of reversible chemical cells and their mechanisms. Salt bridge. Liquid junction potential. Electrical double layer, polarization, and overvoltage. Chemical cells with and without transport. *Thermodynamic approach*- Electromotive force. Nernst equation. Standard electrode potential and calculation of cell potentials. Electrochemical series. Measurement of enthalpy, entropy, equilibrium constant, activity coefficients, and pH values using a glass electrode.

# **REFERENCE BOOKS**

- 1. Atkins, P. W. & Paula, J. de, Atkins' Physical Chemistry, Oxford University Press(Latest Edition).
- 2. Castellan, G. W. Physical Chemistry, Narosa (Latest Edition).
- 3. Puri B. R., Sharma L. R., Pathania M. S., Principles of Physical Chemistry, ShobanLal Nagin Chand & Co. (Latest Edition).
- 4. Viswanathan M., Principles of Physical Chemistry I, University of Kerala, Jai Sai Publications (Latest Edition).
- 5. Viswanathan M., Principles of Physical Chemistry II, University of Kerala, Jai SaiPublications (Latest Edition).

# COURSE OUTCOME

Upon completing the course, the student will be able to -

CO1	Apply kinetic theory to explain the behaviour and the distribution of
	molecular speeds of gasses
CO2	Understand the concept of energy flow and calculate changes in
	thermodynamic properties such as potential, enthalpy, internal energy,
	entropy etc.
CO3	Apply thermodynamic principle to elucidate the effect of solute
	concentration on solution properties
CO4	Understand ionic conductivity in solutions.
CO5	Understand the concepts of electrochemistry and development of an
	electrochemical cell.

CHLR21	Organic Qualitative and Quantitative Analysis	L	Τ	Ρ	С
		0	0	6	2

# PRE-REQUISITE: Higher Secondary Chemistry

# COURSE LEARNING OBJECTIVES

Upon completion of the course the student will be able to understand

- Practical determination of melting point
- Practical determination of boiling point
- Separation of organic compounds
- Detection of elements

# COURSE CONTENTS

- 1. Melting point determination: oxalic acid, succinic acid, m dinitro benzene, p-dichlorobenzene
- 2. Boiling point determination: aniline / nitrobenzene /chlorobenzene
- 3. Crystallization: Benzoic acid from hot water, naphthalene from ethanol
- Separation of components using like water (cold, hot), dil. HCl, dil. NaOH, dil. NaHCO3, etc., Purification of one of components by crystallization. (Benzoic acid/p-Toluidine; p-Nitrobenzoic acid/p-Aminobenzoic acid; p-Nitrotolune/p-Anisidine)
- 5. Distillation of water alcohol mixture using water condenser; Distillation of chlorobenzene –nitrobenzene mixture using air-condenser
- 6. Systematic Analysis and preparation of a Solid derivative- Detection of extra elements (N, S and halides) and functional groups (phenolic, carboxylic, carbonyl, esters, carbohydrates, alcohols, amines, amides, nitro and anilides). (Minimum 10 compounds)

#### **REFERENCE BOOKS**

- 1. B. Dey and M. V. Sitharaman, *Laboratory Manual of Organic Chemistry*, Revised by T. R. Govindachari, Allied Publishers Ltd., New Delhi, 4<sup>th</sup> Revised Edn., 1992, ISBN: 9788170232520.
- 2. Vogel, *Text book of Practical Organic Chemistry*, 5<sup>th</sup> Edn., ELBS, London, I989. ISBN: 978- 8177589573
- 3. F. G. Mann, B. C. Saunders, Practical Organic Chemistry, 4<sup>th</sup> Edn., Pearson Education, Noida, 2011

#### COURSE OUTCOME

#### Upon completing the course, the student will be able to -

CO1	develop practical skills in different organic compounds analysis methods
CO2	Learn crystallization techniques
CO3	learn hands-on experience in separation and purification techniques.
CO4	Identify organic functional groups and prepare their derivatives
CO5	Identify the compounds applying physical properties

# Allied Chemistry Courses offered to Mathematics and Physics Departments

CHAL31	Fundamentals Aspects in Chemistry	L	Т	Ρ	С
		З	0	0	3

#### PRE-REQUISITE: NIL

#### **COURSE LEARNING OBJECTIVES**

Upon completion of the course, the student will be able to:

- Understand basic concepts of atomic structure and bonding in simple molecules.
- Understand basic concepts of thermodynamics.
- Understand the basic concepts of aromaticity and stereochemistry of organic molecules.
- Distinguish between different organic reaction mechanisms.
- Estimate of acid/base strengths using titrimetric methods.

#### **COURSE CONTENTS**

**Structure and bonding:** Atomic structure and periodic table – Schrödinger equation of H-atom- Introduction to bonding – Transitions between main types of bonding - Inert pair effect – Ionic bonding – AX and AX2 type- Lattice energy-covalent bonding- LCAO method - VSEPR Theory – Metallic bond - Basics of MO Theory – General Properties of Elements.

**Aromaticity and Stereochemistry:** Aromaticity and principles- concepts and Concept of optical activity, specific rotation, enantiomeric excess, and racemic mixtures. Chiral centre identification. Fischer/Newmann projection and inter translations, Stereoisomerism: cis/trans, E/Z, R/S, D/L, erythro/threo/meso. Enantiomers and Diastereomers. Optical isomers of Glucose. Conformational analysis of ethane and butane.

**Organic reaction mechanisms:** Types of organic reactions (Addition/Substitution/Elimination) with examples and their nomenclature. Electrophilicity and Nucleophilicity. Concepts of Inductive effect, Resonance, and Aromaticity. Introduction to important functional groups: Alkane /Alkene /Alkyne /Alcohol /Aldehyde /Ketone

/Carboxylic Acid /Ester /Ether /Amine /Amide.

Acid base and redox reactions: Concepts of acid-base: Brønsted-Lowry, Lewis. pH and pKa. Strengths of organic/inorganic acids/bases and their dependence on atomic/molecular structure. HSAB principle. Solvent effect. Buffer mechanism. Henderson-Hasselbach equation. Ion- electron method. Concept of molarity/molality/formality/Eq. wt./wt%/ppm. Acid-base, redox, and iodometric titration. Indicators.

**Thermodynamics:** Maxwell's velocity distribution of an ideal gas. Equipartition theorem.  $1^{st/2^{nd}/3^{rd}/0^{th}}$  laws of thermodynamics. Statistical concept of entropy. Concept of chemical equilibrium. Relationships between Kp – Kc and Keq –  $\Delta G$ . LeChatelier's principle. Born-Haber cycle and Hess's law. Phase Rule - Phase diagram of single, two-componentsystems.

# **REFERENCE BOOKS**

- 1. Prakash. S., Madan. R. D., Tuli. G. D., & Basu. S. K. (2022) Advanced InorganicChemistry: Vol. I (Library Edition), S. Chand Publishing.
- 2. Puri. B. R., Sharma. L. R., & Pathania. M. S., (2022) Principles of Physical Chemistry,48<sup>th</sup> Edition, Vishal Publishing Co.
- 3. Morrison R.T, Boyd, R.N, Bhattacharjee, S. K, Organic Chemistry, 7<sup>th</sup> Ed. Dorling Kindersley (India) Pvt. Ltd, (Pearson Education) 2011

# **COURSE OUTCOMES**

Upon completing the course, the student will be able to -

CO1	Understand the basic concepts of atomic structure and bonding in simple molecules
CO2	Understand the basic concepts of thermodynamics.
CO3	Understand the basic concepts of aromaticity and stereochemistry of organic molecules.
CO4	Distinguish between different organic reaction mechanisms.
CO5	Estimate of acid/base strengths using titrimetric methods.

Inorganic Analysis	L	Τ	Ρ	С
		0	3	1

#### PRE-REQUISITE

NIL

# **COURSE LEARNING OBJECTIVES**

Upon completion of the course, the student will be able to -

- understand and apply the principles of qualitative analysis for detection of inorganiccations and anions.
- acquire practical skill to estimate various parameters of water and steel.

#### **COURSE CONTENTS**

- 1. Semi-micro analysis & Analysis of mixtures
- Cations: NH4<sup>+</sup>, Pb<sup>2+</sup>, Cu<sup>2+</sup>, Fe<sup>3+</sup>, Fe<sup>2+</sup>, Al<sup>3+</sup>, Co<sup>2+</sup>, Mn<sup>2+</sup>, Ni<sup>2+</sup>, Zn<sup>2+</sup>, Ba<sup>2+</sup>, Ca<sup>2+</sup>, Sr<sup>2+</sup>, Mg<sup>2+</sup>
- Anions: CO<sub>3</sub><sup>2-</sup>, NO<sub>2</sub><sup>-</sup>, SO<sub>3</sub><sup>2-</sup>, Cl<sup>-</sup>, Br<sup>-</sup>, l<sup>-</sup>, CHCOO<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup>, S<sup>2-</sup>, PO<sub>4</sub><sup>3-</sup>, SO<sub>4</sub><sup>2-</sup>
- 2. Estimation of carbonate, non-carbonate, and total hardness in the given water sampleusing EDTA.
- 3. Estimation of Dissolved Oxygen
- 4. Determination of the percentage of Fe(II) in the given steel sample using  $KMnO_4$

# **REFERENCE BOOKS**

- 1. Allied Practical Manual (2024). Department of Chemistry. National Institute of Technology Tiruchirappalli. (Private circulation).
- 2. Venkateswaran.V., Veeraswamy, R., & Kulandaivelu, A. R. (1997). *Basic Principles of Practical Chemistry*, (2nd Ed.). New Delhi, Sultan Chand and Sons.
- 3. V. V. Ramanujam, *Inorganic Semi-micro Qualitative Analysis*, 3rd Edition, National Publishing Company, 1990.

#### **COURSE OUTCOMES**

Upon completing the course, the student will be able to -

CO1	understand and apply the principles of qualitative analysis for detection of
	inorganic cations and anions
CO2	acquire practical skill to estimate various parameters of water and steel.

L	Т	Ρ	С
3	1	0	4

#### **PRE-REQUISITE**

CH xxx: Fundamentals Aspects in Chemistry

# **COURSE LEARNING OBJECTIVES**

#### Upon completion of the course, the student will be able to:

- 1. explain the concepts in coordination chemistry and apply them to infer the properties of complexes.
- 2. solve the problems on reaction rates using principles of chemical kinetics.
- 3. outline the principles and applications of electrochemistry.
- 4. explain about macromoleces and applications of industrially relevant polymers
- 5. summarize principles of photochemistry and photophysics.

#### **COURSE CONTENTS**

**Coordination Chemistry:** Werner's theory- central metal atom- types of ligands nomenclature and isomerism of coordination compounds- effective atomic number-VBT - prediction of structure and calculation of spin only magnetic moment-crystal field theory of octahedral, tetrahedral and square planar complexes- effects of crystal field splitting- chelates-important biological complexes- haemoglobin, chlorophyll, cisplatin (representative structureand functions).

**Chemical Kinetics:** Concept of rate, order, and molecularity of a reaction. Rate equations (0<sup>th</sup>, 1<sup>st</sup>, 2<sup>nd</sup>, and n<sup>th</sup> order). Determination of half-life. Activation energy: Arrhenius equation. Multi-step reactions: opposing, consecutive, parallel. Rate-determining step. Enzyme catalysis:Michaelis-Menten equation. Basic concepts of transition state theory.

**Electrochemistry:** Arrhenius theory, Ostwald dilution law. electrolytic conductance and transference – laws of electrolysis – conductance – ionic mobiliy – kohlrauschs law – applications of conductance measurements – galvanic cells – Nernst equation – Electrochemical series – EMF and equilibrium constant of cell reactions – applications of EMF measurements – Basics of Corrosion- Fuel cells and applications.

**Macromolecules:** Polymerization reaction and mechanism- type of polymers – Tacticity – Degree of polymerization - determination of molecular mass of polymers - Synthesis and applications of industrially relevant polymers - Structure and classification of Nucleic acids/Lipids/Carbohydrates/Amino acids. Structure of DNA, proteins, and cell membrane. Isoelectric point and electrophoresis.

**Photochemistry:** Difference between photochemical reactions and dark reactions, Laws of photochemistry Beer - Lambert's Law - derivation and applications, Einstein law of photochemical equivalence - quantum yield - kinetics of hydrogen-chlorine reaction, hydrogen-bromine reaction and decomposition of HI. Photophysical processes- Jablonski diagram, chemiluminescence.

# **REFERENCE BOOKS**

- 1. Prakash. S., Madan. R. D., Tuli. G. D., & Basu. S. K. (1994) Advanced InorganicChemistry: Vol. II, S. Chand Publishing.
- 2. Lee, J. D. (Reprint 2023) Concise Inorganic Chemistry, 5<sup>th</sup> Edition, Wiley Inda Pvt. Ltd.
- 3. Puri. B. R., Sharma. L. R., & Pathania. M. S., (2022) Principles of Physical Chmistry,48<sup>th</sup> Edition, Vishal Publishing Co.

# COURSE OUTCOMES

Upon completing the course, the student will be able to -

CO1	explain the concepts in coordination chemistry and apply them to infer the properties of complexes. summarize principles of photochemistry and photophysics.
CO2	solve the problem son reaction rates using principles of chemical kinetics.
CO3	outline the principles and applications of electrochemistry.
CO4	explain about macromoleces and applications of industrially relevant polymers
CO5	summarize principles of photochemistry and photophysics.

# CURRICULUM B.Sc. B.Ed. (MATHEMATICS)

# CURRICULUM STRUCTURE FOR THE INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP) / B.Sc. B.Ed. (Mathematics)

#### Semester I

Course Code	Course Title	Credit
MAPC11	Differential and Integral calculus	4
PHAL11	Physics - I	4
EDLT11	Language I – Tamil Epic Literature and Grammar	4
EDLH11	Language I – Hindi Language Learning	
	(For Non-native speakers)	
EDLH12	Language I – Hindi Language Structure and Literature	
	(For Native speakers)	
EDPC11	Evolution of Indian Education	4
EDPC12	Art Education (Performing and Visual) 1	2
EDPC13	Understanding India (Indian Ethos and Knowledge	2
	Systems) 1	
	Total	20

# Semester II

Course Code	Course Title	Credit
MAPC21	Analytical geometry and Vector Calculus	4
MAPC22	Theory of equations and Trigonometry	4
PHAL21	Physics – 2	4
EDLE21	Language-II English for communication	4
EDPC21	Understanding India (Indian Ethos and Knowledge Systems) 2	2
EDPC22	Teacher and Society	2
	Total	20

#### Semester III

Course Code	Course Title	Credit
MAPC31	Differential equations	4
MAPC32	Abstract algebra	4
CHAL31	Inter-disciplinary Course 3-Chemistry-1	4
EDPC31	Child Development & Educational Psychology	4
EDPC32	Basic Pedagogy at secondary stage	4
	Total	20

# Semester IV

Code	Course of Study	Credit
MAPC41	Real analysis	4
MAPC42	Linear Algebra	4
CHAL41	Inter-disciplinary Course 4- Chemistry - 2	4
EDPC41	Philosophical & Sociological Perspectives of Education-I	4
EDPC42	Content Cum Pedagogy of Mathematics at Secondary stage -1	4
	Total	20

# Semester V

Code	Course of Study	Credit
MAPC51	Complex analysis	4
MAPC52	Statistics with R	4
MAPC53	Numerical methods and MATLAB	4
EDPC51	Content Cum Pedagogy of Mathematics at Secondary	4
	stage -2	
EDPC52	ICT in Education	2
EDPC53	Pre-internship Practice (Demonstration lessons, Peer	2
	teaching)	
	Total	20

# Semester VI

Code	Course of Study	Credit
MAPC61	Programming Language and LaTeX	4
MAPE 61/62	Integral Transforms/Operations research	4
EDPC61	Assessment & Evaluation	2
EDPC62	Inclusive Education	2
EDPC63	Content Cum Pedagogy of Mathematics at Secondary	4
	stage -3	
EDPC64	Mathematical & Quantitative Reasoning	2
EDPC65	School Observation (Field Practice)	2
	Total	20

# Semester VII

Code	Course of Study	Credit
EDPC71	Perspectives on School Leadership and Management	2
EDPC72	Curriculum Planning & Development (textbooks,	2
	material development, etc.) – (Secondary Stage)	
EDPC73	Art Education (Performing and Visual) 2	2
EDPC74	Sports, Nutrition and Fitness	2
EDPC75	School-based Research Project	2
EDPC76	Internship in Teaching	10
	Total	20

# Semester VIII

Code	Course of Study	Credit
EDPC81	Philosophical & Sociological Perspectives of Education-II	4
EDPC82	Education Policy Analysis	2
EDEL81-88	One Elective from the offered courses as per the choice of student-teachers (e.g., Adolescence Education, Education for Mental Health, Education for Sustainable Development, Emerging Technologies in Education, Gender Education, Guidance and Counselling, Peace Education, Sports and Fitness Education, or any other relevant course decided by the University / Institution)	4
EDPC83	Yoga and Understanding Self	2
EDPC84	Citizenship Education, Sustainability and Environment Education	2
EDPC85	Post Internship (Review and Analysis)	2
EDPC86	Creating Teaching Learning Material / Work Experience (Educational Toy making, local / traditional vocations, etc.)	2
EDPC87	Community Engagement and Service (Participation in NSS-related activities, New India Literacy Programme etc.)	2
	Total	20

Course Code	MAPC11
Title of the Course	DIFFERENTIAL AND INTEGRAL CALCULUS
Prerequisite	Nil
Credits (L-T-P)	4 (3L + 1T + 0P)
Course Type	Disciplinary Course

Course Learning Objectives: Objective of the course is to

- 1) discuss the differentiation and higher order derivatives of functions in detail and to study theirapplications.
- 2) introduce partial derivatives of functions of several variables.
- 3) investigate maxima and minima of multivariable functions.
- 4) learn the topic of the definite integral extensively.
- 5) study the double and triple integrals and their applications.

#### **Course Contents:**

Basic review of differentiation – Successive differentiation – Leibnitz's Theorem: higher order derivatives of the product of two functions – Curvature – Radius and centre of curvature – Evolute and involute – Rolle's and Mean Value Theorems (without proofs) - Relative extrema.

Partial derivatives – Chain rules - Directional derivatives and gradients - Tangent planes and normal vectors – Differentiability for functions of several variables – Maxima and minima of functions of two and three variables – Lagrange multipliers.

Riemann sums - The Riemann integral – The Fundamental Theorem of calculus – Area between curves - Volumes by slicing and rotation about an axis - The disk method - The washer method - Volumes by cylindrical shells - Lengths of plane curves.

Double Integrals - Fubini's Theorem - Changing the order of integration - Double integrals in polar form – Changing Cartesian integrals into polar integrals - Finding areas, volumes and centers of mass using doubleintegrals.

Triple integrals in rectangular, cylindrical and spherical Coordinates – Jacobians – Change of variables in multiple integrals – Converting triple integrals from rectangular to cylindrical/spherical coordinates – Finding volume using triple integrals.

#### **Reference Books:**

- 1. J. Hass, C. Heil, P. Bogacki and M.D. Weir, *Thomas' Calculus*, Pearson Education, India, 2024.
- 2. H. Anton, I. Bivens and S. Davis, *Calculus*, Wiley, New Delhi, 2017.
- 3. T.M. Apostol, Calculus Volumes I and II, Wiley, New Delhi, 2022.
- 4. N. Piskunov, *Differential and Integral Calculus Volume I*, G.K. Publications, New Delhi, 2016.
- 5. L. Brand, *Advanced Calculus: An Introduction to Classical Analysis,* Dover Publications, New York, 2006.

**Course Learning Outcomes:** On completion of the course, the students will be able to:

- 1. find the higher order derivatives of functions and calculate the curvatures and radius of curvatures of curves at the indicated points.
- 2. compute the partial derivatives of functions and determine maxima and minima of functions of several variables.
- 3. evaluate definite integrals and apply them to find the length of a curve and the area betweencurves.
- 4. compute double integrals and calculate the area of a region and the center of mass of a thin plateusing double integrals.
- 5. evaluate triple integrals and to find the volume of a region.

Course Code	MAPC21
Title of the Course	ANALYTICAL GEOMETRY AND VECTOR CALCULUS
Prerequisite	NIL
Credits (L-T-P)	4 (3L + 1T + 0P)
Course Type	Disciplinary Course

Course Learning Objectives: Objective of the course is to

1) familiarize students with the geometric properties and relationships of lines and planes.

- 2) equip students with the skills to calculate distances, angles, and intersections in threedimensional space.
- 3) explore the geometry of spheres, cylinders, and cones.
- 4) introduce concepts of line integrals, surface integrals, and volume integrals.

5) enable students to solve real-world problems by applying key theorems of vectorcalculus.

#### Course Content

Revision of two-dimensional analytical geometry. Conic sections: equations of straight line, circle, parabola, ellipse and hyperbola. Pair of straight lines and system of circles. Curves in polar coordinates. Rectangular coordinate axes, distance, centroid of a triangle and tetrahedron.

Straight line: Directional ratios and directional cosines, canonical equation of the line of intersection of two intersecting planes, angle between two lines, distance of a point from a line, co-planarity of two lines, shortest distance between two skew lines. Plane: Equation of a plane passing through the intersection of two planes, angle between two intersecting planes, bisectors of angles between two intersecting planes. Orthogonal projection of a point on a plane. Reflection of a point with respect to a plane.

Sphere: Plane section of a sphere. The intersection of two spheres. Equation of a sphere passing through a given circle. Tangent plane to a sphere. Length of tangent to a sphere from a point. Angle between spheres. Cone and Right circular cone. Cylinder and Right circular cylinder.

Review of vectors in two and three dimensions. Vector operations. Vector-valued functions and their derivatives. Parametric equation of a curve and a surface. Scalar and vector fields. Limit and continuity. Gradient of a scalar field, divergence and curl of a vector field. Conservative, irrotational, solenoidal vector fields.

Line integrals of scalar functions and vector fields. Fundamental theorem for line integrals. Green's theorem and its applications. Surface integrals. Stokes' theorem and its applications. Triple integral of scalar functions and vector fields. Gauss Divergence theorem.

#### Reference Books:

- 1. H. Anton, I. Bivens and S. Davis, *Calculus*, 10<sup>th</sup> Edition, John Wiley & Sons Inc., USA, 2015.
- 2. J. E. Marsden and A. J. Tromba, *Vector Calculus*, 6<sup>th</sup> Edition, Freeman and company, New York, 2011.
- 3. J. Stewart, *Calculus: Early Transcendentals*, 8<sup>th</sup> Edition, Cengage Learning, Boston, 2015.
- 4. G. B. Thomas Jr. and R. L. Finney, *Calculus and Analytic Geometry*, 9<sup>th</sup> edition, Addison-Wesley, New Delhi, 1996.
- 5. A. A. Albert, Solid Analytic Geometry, Dover Publications, New York, 2016.

6. A. C. Burdette, *Analytic Geometry*, Elsevier Science, London, 2014.

Course Learning Outcomes: On completion of the course, the students will be able to:

- 1. analyse the geometric properties and relationships of lines and planes.
- 2. solve problems involving distances, angles, and intersections in three-dimensional space.
- 3. understand the geometry of spheres, cylinders, and cones.
- 4. evaluate line integrals, surface integrals and volume integrals.
- 5. apply the major theorems of vector calculus to solve real-world problems.

Course Code	MAPC22
Title of the Course	THEORY OF FOUATIONS AND TRIGONOMETRY
Prerequisite	
Credits (I -T-P)	4(31 + 1T + 0P)
Course Loarning Obio	tives: Objective of the course is to
1) on able the students t	a analyze and find the roots of a nelynomial equation
<ol> <li>equip the students to equations.</li> <li>explore the application</li> </ol>	o compute the solution of reciprocal, cubic and biquadratic
4) Introduce hyperbolic inverse functions.	functions, their relations to circular functions, and their
5) solve problems using	trigonometric identities and relations.
Course Content	
General properties of p between the roots and roots, Sum of the powers	oolynomial equations, Descartes' rule of signs, Relation the coefficients of equations, Symmetric function of the sof the roots of an equation.
Transformation of equa cubic equations – Care biquadratic equations – I	tions, Solutions of reciprocal equations, Solution of the don's method & Trigonometric method, Solution of the Ferrari method.
Inverse circular function and its applications.	s, De Movire's Theorem with deductions, Euler's theorem
Hyperbolic and inverse h	hyperbolic functions, Trigonometrical expansions.
Introduction to sequence product of sine and cosi	es and series, Gregory series, Summation of series, Infinite ne.
Reference Books:1. W. S. Burnside and NewSouth Wales, 20	A.W. Panton, <i>The Theory of Equations,</i> Wentworth Press, 016.
2. L. E. Dickson, <i>F</i> Publications,Turkey,	<i>irst course in the theory of equations</i> , Holistence 2024.
3. S. L. Loney, <i>Plane</i> Limited, India, 2016.	e Trigonometry, Part II, New Age International Private
4. R. F. Blitzer, Algebra 2017.	a and Trigonometry, 6 <sup>th</sup> Edition, Pearson Publishers, India,
Course Learning Outco	omes: On completion of the course, the students will be
able to:	<b>, , , , , , , , , , , , ,</b>
1. apply Descartes' rule	or signs in determining the roots of a polynomial equation.
2. formulate the equation	on with the given roots and determine the solution of cubic
anapiquaaratic equat	lions. A from De Meutre's Theorem on d Sular's theorem.
3. EXTRACT VARIOUS RESULT	s nom De Movire's ineorem and Euler's meorem.
4. explain the relationsr	ving infinite sum and product using trigonometric identities

5. solve problems involving infinite sum and product using trigonometric identities and relations.

Course Code	MAAL11		
Title of the Course	BASIC ANALYSIS AND ANALYTICAL GEOMETRY		
Prerequisite	NIL		
Credits (L-T-P)	4 (3L + 1T + 0P)		
Course Type	Inter-disciplinary Course 1		
<b>Course Learning Objectives:</b> Objective of the course is to			

Course Learning Objectives: Objective of the course is to

- 1) solve algebraic solutions of cubic and reciprocal equations.
- 2) apply various tests for determining convergence and divergence of an infinite series.
- 3) introduce the theory of analytic functions and techniques to evaluate integrals of complex functions.
- 4) present the theory behind eigenvalues and eigenvectors.
- 5) analyze the geometric properties and relationships of lines and planes.

#### Course Content

General properties of polynomial equations - Descartes' rule of signs - relation between the roots and the coefficients of equations - symmetric functions of the roots - sum of the powers of the roots of an equation - Transformation of equations - solution of reciprocal equations - solution of cubic equations-Cardon's method.

Introduction to sequences. Infinite series-convergence tests for positive term series – comparison, integral test, root test, ratio test, Raabe's tests, logarithmic test. Alternating series – Leibnitz's rule – absolute and conditional Convergence.

Analytic functions – Cauchy – Riemann equations – properties of analytic functions – Cauchy's integral theorem, Cauchy's integral formula and for derivatives– Taylor's and Laurent's expansions (without proof) – singularities – residues – Cauchy's residue theorem.

Eigenvalues and eigenvectors of a matrix – properties of eigenvalues — Cayley-Hamilton Theorem- diagonalization of matrix.

Straight line: direction ratios and direction cosines - angle between two lines - distance of a point from a line - co-planarity of two lines - shortest distance between two skew lines. Plane: equation of a plane passing through the intersection of two planes - angle between two planes - bisectors of angles between two intersecting planes. Orthogonal projection of a point on aplane.

#### **Reference Books:**

- 1. Leonard E. Dickson, *First course in the theory of equations*, Holistence publications, Turkey, 2024.
- 2. Gilbert Strang, Introduction to Linear Algebra, 6th Edition, Wellesley-CambridgePress, U.S., 2023.
- 3. James Ward Brown and Ruel V. Churchill, *Complex variables and Applications*, 9<sup>th</sup> Edition, McGraw Hill Education (India) Private Limited, 2021.
- 4. Abraham Adrian Albert, Solid analytical geometry, Dover Publications, New York, 2016.
- 5. P.R.Vittal, Analytical geometry 2D and 3D, Pearson Education India, 2013.
- 6. Walter Rudin, *Principles of Mathematical Analysis*, 3<sup>rd</sup> Edition, McGraw Hill Education (India) Private Limited, 2023.

**Course Learning Outcomes:** On completion of the course, the students will be able to:

- 1. find the convergence of infinite series by applying various test.
- 2. find eigenvalue and eigenvectors of a matrix. Also, diagonalize matrices using eigenvalues and eigenvectors.
- 3. discuss analyticity of complex functions and find integral of complex function using Cauchy's integral theorem.
- 4. utilize the relationships between coefficients and roots in solving equations and find roots of cubic polynomial equations.
- 5. determine the intersection and angle between line and plane.

Course Code	MAAL21
Title of the Course	CALCULUS AND DIFFERENTIAL EQUATIONS
Prerequisite	NIL
Credits (L-T-P)	4 (3L + 1T + 0P)
Course Type	Inter-disciplinary Course 2

Course Learning Objectives: Objective of the course is to

1) discuss extrema of function of several variables.

- 2) understand partial differentiation and multiple integration of multivariable functions.
- introduce differential operators for vector valued function and techniques for computing line integrals, surface integrals, and volume integrals.
- 4) introduce the classification and solution methods for different types of differential equations.

5) discuss power series solution for differential equations.

#### Course Content

Functions of several variables – partial derivatives and transformation of variables – Jacobian and its properties- Taylor series-maxima and minima of function of several variables.

Double integral – changing the order of Integration – change of variables from Cartesian topolar coordinates – area using double integral in Cartesian and polar coordinates – triple integral – change of variables from Cartesian to spherical and cylindrical coordinates – volume using double and triple integrals.

Gradient, divergence and curl – directional derivative – tangent plane and normal to surfaces – solenoidal and irrotational fields. Line, surface and volume integrals – Green's theorem, Stokes' theorem and Gauss divergence theorem.

Higher order linear differential equations with constant coefficients: second order linear differential equations with variable coefficients. Method of variation of parameters, CauchyEuler equation.

Power series solutions- Legendre polynomials, Bessel functions and its properties. **Reference Books:** 

- 1. Maurice D. Weir, Joel Hass , Christopher Heil, Przemyslaw Bogacki , *Calculus*, 15<sup>th</sup>Edition, Pearson Education, India, 2024.
- 2. Tom M. Apostol, *Calculus, Volume I*, 2<sup>nd</sup> Edition, Wiley India Pvt Ltd, 2022.
- 3. Tom M. Apostol, *Calculus, Volume II*, 2<sup>nd</sup> Edition, Wiley India Pvt Ltd, 2022.
- 4. William E. Boyce, Richard C. DiPrima, Douglas B. Meade, *Elementary Differential Equations and Boundary Value Problems*, Wiley India Pvt Ltd, 2021.

**Course Learning Outcomes:** On completion of the course, the students will be able to:

- 1. write Taylor's series and discuss maxima and minima of function of several variables.
- 2. evaluate multiple integral and its applications in finding area, volume.
- 3. compute the dot product of vectors, lengths of vectors, and angles between vectors.
- 4. use Green's, Gauss divergence and Stoke's theorems to solve problems.
- 5. solve second order differential equations of some standard type.

LIST OF DISCIPLINARY AND INTER-DISCIPLINARY COURSES					
	DISCIPLINARY COURSES				
S. NO.	COURSE TITLE	CREDITS			
1.	DIFFERENTIAL AND INTEGRAL CALCULUS	4			
2.	ANALYTICAL GEOMETRY AND VECTOR CALCULUS	4			
3.	THEORY OF EQUATIONS AND TRIGONOMETRY	4			
4.	DIFFERENTIAL EQUATIONS	4			
5.	ABSTRACT ALGEBRA	4			
6.	REAL ANALYSIS	4			
7.	LINEAR ALGEBRA	4			
8.	COMPLEX ANALYSIS	4			
9.	STATISTICS WITH R	4			
10.	NUMERICAL METHODS AND MATLAB	4			
11.	PROGRAMMING LANGUAGE AND LATEX	4			
12.	INTEGRAL TRANSFORMS/OPERATIONS RESEARCH	4			
	INTER DISCIPLINARY COURSES				
13.	INTER-DISCIPLINARY COURSE 1- PHYSICS - I	4			
14.	INTER-DISCIPLINARY COURSE 2- PHYSICS – II	4			
15.	INTER-DISCIPLINARY COURSE 3- CHEMISTRY - I	4			
16.	INTER-DISCIPLINARY COURSE 4- CHEMISTRY - II	4			
INTER DISCIPLINARY COURSES					
(OFFERED TO OTHER DEPARTMENTS)					
1.	BASIC ANALYSIS AND ANALYTICAL GEOMETRY	4			
2.	CALCULUS AND DIFFERENTIAL EQUATIONS	4			

# CURRICULUM B.Sc. B.Ed. (PHYSICS)

# CURRICULUM STRUCTURE FOR THE INTEGRATED TEACHER EDUCATION PROGRAMME (ITEP) / B.Sc. B.Ed. (PHYSICS)

#### Semester I

Course Code	Course Title	L	Τ	Ρ	С
PHPC11	Mechanics	3	1	0	4
MAAL11	Basic analysis and analytical geometry	3	1	0	4
EDLT11	Language I –Tamil Epic Literature and Grammar	4	0	0	4
EDLH11	Language I – Hindi Language Learning (For Non-native speakers)				
EDLH12	Language I – Hindi Language Structure and Literature (For Native speakers)				
EDPC11	Evolution of Indian Education	4	0	0	4
EDPC12	Art Education - I	1	0	2	2
EDPC13	Understanding India (Indian Ethos and Knowledge Systems) 1	2	0	0	2
		T	ota		20

#### Semester II

Course Code	Course Title	L	Τ	Ρ	С
PHPC21	Properties of Matter	3	1	0	4
PHLR21	Mechanics Laboratory	0	0	4	2
PHLR22	Optics Laboratory	0	0	4	2
MAAL21	Calculus And Differential Equations	3	1	0	4
EDLE21	Language II – English For communication	4	0	0	4
EDPC21	Understanding India (Indian Ethos and Knowledge Systems) II	2	0	0	2
EDPC22	Teacher and Society	2	0	0	2
		Total		20	

#### Semester III

Course Code	Course Title	L	Т	Ρ	С
PHPC31	Thermal and Statistical Physics	3	1	0	4
PHPC32	Electricity and Magnetism	3	1	0	4
CHAL31	Fundamentals aspects in chemistry	3	0	2	4
EDPC31	Child Development & Educational	3	0	2	4
	Psychology				
EDPC32	Basic Pedagogy at secondary Stage	4	0	0	4
		Total		20	

# **Semester IV**

Course Code	Course Title	L	Т	Ρ	С
PHPC41	Analog and Digital Electronics	3	1	0	4
PHPC42	Waves and Optics	3	1	0	4
CHAL41	Concepts in Chemistry	3	0	2	4
EDPC41	Philosophical & Sociological Perspectives of Education	4	0	0	4
EDPC42	Content Cum Pedagogy of Physical Sciences at Secondary stage -I	4	0	0	4
		Total			20

# Semester V

Course Code	Course Title	L	Т	Ρ	С
PHPC51	Relativity and Quantum Mechanics	3	1	0	4
PHPC52	Atomic and Nuclear Physics	3	1	0	4
PHLR51	General Physics Laboratory	0	0	4	2
PHLR52	Electronics and Computational Laboratory	0	0	4	2
EDPC51	Content Cum Pedagogy of Physical Sciences	4	0	0	4
	at Secondary stage II				
EDPC52	ICT in Education	1	0	2	2
EDPC53	Pre-internship Practice	0	0	4	2
		Total			20

# Semester VI

Course Code	Course Title	L	Т	Ρ	С
PHPC61	Solid State Physics	3	1	0	4
PHPC62	Project work and Viva-voce	-	-	-	4
EDPC61	Assessment and Evaluation	2	0	0	2
EDPC62	Inclusive Education	2	0	0	2
EDPC63	Content Cum Pedagogy of Physical Sciences	4	0	0	4
EDPC64	Mathematical & Quantitative Reasoning	1	0	2	2
EDPC65	School Observation	0	0	4	2
		1	otal		20

# Semester VII

Course Code	Course Title	L	Т	Ρ	С
EDPC71	Perspectives on School Leadership and	2	0	0	2
	Management				
EDPC72	Secondary Stage Curriculum Planning &	2	0	0	2
	Development				
EDPC73	Art Education II	1	0	2	2
EDPC74	Sports, Nutrition and Fitness	2	0	0	2
EDPC75	School-based Research Project	0	0	4	2
EDPC76	Internship in Teaching	0	0	20	10
		T	otal		20

# Semester VIII

Course Code	Course Title	L	Т	Ρ	С
EDPC81	Philosophical & Sociological Perspectives of Education	4	0	0	4
EDPC82	Education Policy Analysis	2	0	0	2
EDEL81-88	Elective Course in Education. One Elective from the offered courses as per the choice of student-teachers (e.g., Adolescence education, Education for Mental Health, Education for Sustainable Development, Emerging Technologies in Education, Gender Education, Guidance and Counselling, Peace Education, Sports and Fitness Education, or any other, relevant course decided by the University / Institution)	4	0	0	4
EDPC83	Yoga and Understanding Self	2	0	0	2
EDPC84	Citizenship Education, Sustainability and Environment Education	2	0	0	2
EDPC85	Post Internship (Review and Analysis)	2	0	0	2
EDPC86	Creating Teaching Learning Material/Work Experience (Educational Toy making, local / traditional vocations, etc.)	0	0	4	2
EDPC87	Community Engagement and Service (Participation in NSS-related activities, New India Literacy Programme etc.)	0	0	4	2
		٦	otal		20

#### Semester I Mechanics

# **Course Objectives**

The course aims to

- 1. Analyze the relationships between force, mass, and the motion of objects.
- 2. Comprehend concepts in momentum, energy and dynamics.
- 3. Understand rigid body motion.
- 4. Realize the planetary motion under the influence of gravity.

# The laws of Newton

Algebra of vectors – position and displacement vectors – velocity and acceleration – solution if kinematic equation – motion in plane polar coordinates – Newton's laws – base units and dimensions – dynamics using polar coordinates – gravity – acceleration due to gravity – some phenomenological forces: contact force, tension, normal force, friction, viscosity, spring force.

# Momentum, energy and dynamics

Dynamics of a system of particles – center of mass – conservation of momentum – impulse – mass flow – rocket motion – momentum flow – pressure of a gas – center of mass of 2D and 3D objects – work and energy – conservation of energy – potential energy – energy diagram – non-conservative forces – small oscillations – stability – normal modes – collision and conservation laws.

# Angular momentum and rigid body motion

Angular momentum – moment of inertia – torque – dynamics of fixed axis rotation – pulley - simple pendulum – translation and rotation – work-energy theorem and rotational motion - angular momentum vector – rotation in xy-plane – gyroscope – conservation of angular momentum – rigid body rotation and tensor of inertia.

# Non-inertial systems and central force motion

Galilean transformation – uniformly accelerating systems – the principle of equivalence – rotating coordinate system – central force motion as one body problem – universal features - energy equation and energy diagram – planetary motion and elliptical orbits – properties of the ellipse.

#### **Course Outcomes**

After completion of the course, the students would

- 1. Understand the relationship between forces, mass and apply them in statics and dynamics.
- 2. Realize the concepts in gravitation and apply them to objects under the influence of gravity.

#### Textbook

 D. Kleppner and R. Kolenkow, An Introduction to Mechanics, Cambridge University Press (2014).

#### References

- 1. H. D. Young and R. A. Freedman, University Physics, Pearson (2020).
- 2. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, Wiley (2013).
- 3. R. Shankar, Fundamentals of Physics, Yale University Press (2014).
- S. Timoshenko, D. H. Young, J.V. Rao, S. Pati, Engineering Mechanics, McGraw Hill (2017).
- C. Kittel, W. Knight, M. Ruderman, C. Helmholz, B. Moyer, Mechanics: Berkeley Physics Course, McGraw-Hill (2017).

#### Semester II Properties of Matter

#### **Course Objectives**

The course aims to

- 1. Understand the properties of materials learning concepts in elasticity.
- 2. Comprehend the nature of oscillations in solid objects.
- 3. Realize the properties of fluids and their dynamics.
- 4. Identify the application of surface tension.

# Elasticity

Stress, strain, and elastic moduli-Poisson's ratio-Hook's law-Moduli of elasticity-Young's modulus, Bulk modulus, rigidity modulus-Bending of a beam-Bending moment-Uniform and Non-uniform bending-Theory and experiment-Determination of Poisson's ratio- Cantilever-Torsional Pendulum.

# Oscillations

Simple Harmonic oscillations - Calculation of kinetic energy, potential energy, total energy, and their time-average values - Damped and Forced oscillations – Solution to damped and forced oscillators - Resonance and sharpness of resonance- Laws of transverse vibration of strings.

# **Fluid Mechanics**

Fluids-Pressure in a fluid -Pascal's law - The continuity equation - Bernoulli's equation- Viscosity - Coefficient of viscosity - Critical velocity-Laminar and vortex flow - Poiseuille equation for the flow of liquid through a tube - Poiseuille's method and stokes method - Oswald Viscometer - Determination of Viscosity of gases - Rankine's method.

#### Surface Tension

Surface Tension - Force energy of a surface and surface tension - Excess pressure inside a liquid drop and inside a soap bubble - Work done in blowing a bubble - Angle of contact - Capillary rise - Experimental determination of surface tension by capillary rise - Pitot tube and Venturi meter-Bernoulli's theorem.

#### Course Outcomes

After completion of the course, the students would

- 1. Remember the elastic properties of materials.
- 2. Know about the oscillatory behavior of solid objects.
- 3. Realize the properties of fluids and their dynamics.
- 4. Identify the application of surface tension.

#### Textbooks

1. H. D. Young and R. A. Freedman, University Physics, Pearson (2020).

2. P. K. Kundu and I. M. Cohen, Fluid Mechanics, Elsevier (2004).

#### References

- 1. B. Brown, General Properties of Matter, Springer (1969).
- 2. H. J. Pain. The Physics of Vibrations and Waves, John Wiley, (2005).
- 3. A.P French, Vibration and Waves, MIT Introductory Physics, Arnold– Heinmann India (1973).

# Semester II **Mechanics Laboratory Course Objectives** The course aims to 1. To understand the concepts of mechanics and properties of matter through experiments 2. Apply the theoretical concepts in mechanics to practical problems. List of experiments 1. Determination of g, radius of gyration and moment of inertia using the compound pendulum. 2. Determination of g using a simple pendulum. 3. Determination of Young's modulus - non-uniform bending. 4. Determination of Poisson's ratio of a rubber tube. 5. Find the velocity of ultrasonic waves in a solid 6. Verification of Hookes law 7. Verify the laws of transverse vibration using Melde's apparatus. 8. Determine the coefficient of viscosity of water by capillary flow method 9. Rigidity modulus - torsional oscillations without masses. 10. Surface tension of a liquid and interfacial surface tension using the method of drops. **Course Outcomes** After completion of the course, the students would 1. Realize the concepts in mechanics and properties of matter through various experiments. 2. Acquire practical knowledge of concepts such as elasticity and fluid mechanics. References 1. Physics Laboratory Manual, Department of Physics, National Institute of Technology Tiruchirappalli (2018).

- 2. R.K. Shukla, Anchal Srivastava, Practical Physics, New Age International (2011).
- 3. C.L Arora, B.Sc. Practical Physics, S. Chand & Co. (2012).

Semester II
Optics Laboratory
Course Objectives
The course aims to
1. To understand the concepts of optics and propagation of light through
experiments
<ol><li>Apply theoretical concepts such as interference, diffraction and polarization in practical problems.</li></ol>
List of experiments
1. Determine the dispersive power of a prism
2. Determine the wavelength of the laser using a diffraction grating
3. Find the radius of curvature of lens-Newton's Rings
4. Determine the numerical aperture of an optical fiber
5. Find the specific rotation of a liquid – Half Shade Polarimeter
6. Find the wavelengths of various colors using a white light source –
Spectrometer
7. Determine the focal lengths of various lenses
8. Determine the thickness of a thin wire – Air Wedge
9. Determine the velocity of light in solid and liquid media - Snell's law.
10. Verify the interference of monochromatic light through fringe formation.
Course Outcomes
After completion of the course, the students would
1. Realize the concepts in optics through various experiments.
2. Acquire practical knowledge in interference, diffraction and polarization.
References
1. Physics Laboratory Manual, Department of Physics, National Institute of
Technology Tiruchirappalli (2018).
2. R.K. Shukla, Anchal Srivastava, Practical Physics, New Age International (2011).

3. C.L Arora, B.Sc. Practical Physics, S. Chand & Co. (2012).

# ODD SEMESTER / Offered to Other Departments Physics I

3-0-2 (4 credits)

# **Course Objectives**

The course aims to

- 1. Analyze the motion of a single particle under the influence of a force.
- 2. Explain the laws of electricity and magnetism.
- 3. Understand basic concepts in quantum mechanics and their applications in atomic physics.
- 4. Practical exposure to the properties of materials and modern physics.

# Mechanics

Review of Newton's laws and motion of a particle in one dimension. Position, velocity and acceleration in Cartesian and polar coordinates. Work, energy and, Conservative forces. Central forces. Gravitational force and potential. Kepler's laws of planetary motion. Motion of Satellites - Introduction to special theory of relativity.

# **Electricity and Magnetism**

Coulomb's law - Gauss's law – proof of Gauss's law- Electrostatic field in the matter: dielectric polarization, polarizability and susceptibility - types of polarization – internal field and Claussius-Mosotti equation. Magnetostatics: Lorentz force - Steady current and equation of continuity - Biot-Savart law – Ampere's law – Magnetostatic field in matter: torques and forces on magnetic dipoles-Magnetization-Faraday's law of induction.

# Quantum mechanics

Waves behaving as particles; Photoelectric effect- Black body radiation and Planck's hypothesis. Particles behaving as waves; de Broglie hypothesis, matter waves, diffraction of electron waves. Heisenberg Uncertainty principle.Wave function - Position and momentum operators. One dimensional Schrödinger equation. Particle in a box. Potential well. Potential barrier and tunneling (qualitative discussion).

# Atomic and Molecular Physics

Hydrogen atom energy – Spectral series – The Bohr atom – Origin of line spectra -Correspondence principle – Rutherford scattering formula – The molecular bond – the hydrogen molecule – rotational energy levels – vibrational energy levels – Electronic spectra.

List of Experiments

- 1. Determination of Young's modulus non-uniform bending.
- 2. Find the velocity of ultrasonic waves in a solid.
- 3. Determine the coefficient of viscosity of water by capillary flow method.
- 4. Surface tension of a liquid and interfacial surface tension using the method of drops.
- 5. Study the Photoelectric effect: photo current versus intensity and wavelength of light.

#### Course Outcomes

After completion of the course, the students would

- 1. Learn about the motion of a single particle under the influence of a force.
- 2. Understand the laws of electricity and magnetism and derive its consequences.
- 3. Acquire knowledge of concepts in quantum mechanics and their applications in atomic physics.
- 4. Appreciate the experimental aspects on the properties of materials and modern physics.

#### Textbooks

 A. Beiser, S. Mahajan, S. R. Choudhury, Concepts of Modern Physics, 7<sup>th</sup> Edn., McGraw-Hill (2017).

2. H. D. Young and R. A. Freedman, University Physics, Pearson (2020).

#### References

1. P. A. Tipler and R. A. Llewellyn, Modern Physics, W. H. Freeman and Co. (2008).

- 2. Edward M. Purcell, Electricity and Magnetism, McGraw-Hill (1986).
- 3. D. J. Griffiths, Introduction to Quantum Mechanics, Pearson (2005).
- 4. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, Wiley (2013).
- Physics Laboratory Manual, Department of Physics, National Institute of Technology Tiruchirappalli (2018).

# EVEN SEMESTER / Offered to Other Departments Physics II

3-0-2 (4 credits)

# **Course Objectives**

The course aims to

- 1. Expose on the essential aspects of crystallography.
- 2. Distinguish different types of waves and demonstrate with examples.
- 3. Understand basic phenomena in optics and concepts such as interference and diffraction.
- 4. Assimilate knowledge in electromagnetic waves.
- 5. Experimental skills in basic physics concepts.

# Crystallography

Crystalline and amorphous solids – lattice and unit cell – Reciprocal lattice - seven crystal system and Bravais lattices – symmetry operation – Miller indices – atomic radius – coordination number – packing factor calculation for sc, bcc, fcc – Bragg's law of X-ray diffraction.

#### Waves

Simple harmonic motion; examples and solution to the simple harmonic oscillator. Classification of damped oscillators. Driven oscillator. Wave equation; solutions of wave equation. Energy and power transmitted in a wave. Sound waves and their speed. Introduction of the plane waves of electromagnetism. Poynting vector and intensity of light.

#### Optics

Interference and coherent sources. Two sources-interference of light. Intensity in an interference pattern. Interference in thin films. Michelson interferometer. Fresnel and Fraunhofer diffraction. Diffraction from a single slit. Diffraction from multiple slits. Diffraction grating.

#### **Electromagnetic waves**

Maxwell equations – Electromagnetic energy and Poynting vector – radiation pressure electromagnetic wave equation in a vacuum – propagation of EM waves in non-conducting media – waves in conducting media.

#### List of Experiments

- 1. Determine the dispersive power of a prism
- 2. Determine the wavelength of laser using a diffraction grating
- 3. Find the radius of curvature of lens-Newton's Rings
- 4. Determine the numerical aperture of an optical fiber
- 5. Find the specific rotation of a liquid Half Shade Polarimeter

#### **Course Outcomes**

After completion of the course, the students would

- 1. Appreciate different types of wave motion.
- 2. Understand concepts such as interference and diffraction under various scenarios.
- 3. Acquire knowledge of optics and electromagnetic waves.
- 4. Appreciate the experimental aspects of interference, diffraction and polarization

# Textbooks

- 1. A. R. West, Solid State Chemistry and its Applications, Wiley (2014).
- 2. H. D. Young and R. A. Freedman, University Physics, Pearson (2020).

#### References

- 1. C. Kittel, Introduction to Solid State Physics, Wiley (2019).
- M.N. Avadhanulu and P.G.Kshirsagar, A textbook of Engineering Physics, S. Chand and Company, New Delhi (2009).
- 3. Ajoy Ghatak, Optics, McGraw Hill (2008).
- 4. D. J. Griffiths, Introduction to Electrodynamics, Cambridge Univ. Press (2017).
- 5. D. Halliday, R. Resnick, J. Walker, Fundamentals of Physics, Wiley (2013).
- Physics Laboratory Manual, Department of Physics, National Institute of Technology Tiruchirappalli (2018).

# CURRICULUM (LANGUAGE)

#### Language – II

EDLE21 English for Communication	
----------------------------------	--

L T P C 3 0 1 4

Course Objectives: The Objectives of the course are,

- To improve basic communication skills such as listening, speaking, reading and writing skills among L2 language learners.
- To enhance grammatical knowledge of L2 and enable the students to formulate grammatically correct and contextually appropriate sentences.
- To reinforce students' critical thinking capacities and demonstrate effective communication skills and provide hands on activities to student teachers to develop their linguistic skills through practical sessions.
- To enable a framework for an English Curriculum through self-directed approach to the Fundamentals of language in the context of NEP 2020.

#### **Course Outcomes**

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

	Course Outcomes	Level
CO1	Become proficient in grammar usage for communication.	Understand
CO2	Acquire the significance of listening in communication and Vocabulary development.	Apply
CO3	Think critically and analytically to comprehend the idea and solve problems.	Analyse
CO4	Assess the nuances of public speaking and everyday conversation.	Evaluate
CO5	Understand the use of effective writing for professional and Academic communication.	Skill

#### Contents

#### English Grammar: Usage and Mechanics

Parts of Speech – Articles – Tenses – Active and Passive voice – Subject-Verb Agreement – Direct and Indirect Speech – Transition words – Collocation – types of sentences

#### Listening Comprehension

Listening Skill and its importance –Active listening – Listening for specific information – main idea – details – conversational phrases and vocabulary -predicting and recognizing emotions –Listening and comprehending news reports – structured talks – TED talks – Conversation videos – practice notetaking – Barriers to listening and strategies to overcome.

# Reading Comprehension

Kinds &Ways of reading – benefits and purpose of read-aloud strategy -traits of a good reader - reading short articles and news reports - understanding sentence structure – main themes and ideas– reading for analytical, critical and creative thinking – understand the connection between paragraphs - cause and effect – vocabulary development.

#### Art of Talk

Phonetic transcription, Vowels, Consonants and others, Suprasegmental: Stress, Pitch, Tone, Intonation, and Juncture, Acoustic phonetics. Formal Vs. informal conversation – self-intro – anchoring - types of presentation - oral presentation: extempore and extemporaneous speech - present tables, charts and graphs – group discussion – conversation practice: role play – strategies for fluency – barriers and techniques to overcome them.

#### **Effective Writing**

Formal Vs. informal writing – note making and summarizing - topic sentence and paragraph making – cohesion and coherence in writing - precise writing — paraphrasing – effective use of transition words and punctuations – descriptive writing–writing resume - transcoding – letter writing – email writing – writing etiquette.

Directed Study: To be done by the individual student. (Tutorial component) Language, Society, and Learning: Bi-/Multilingualism and scholastic achievements, need to promote multilingualism, Language variation and Social variation, Languages, Dialects, varieties, Cultural transmission of language, Language and Gender, Language and Identity, Language and Power.

Language acquisition and Language learning, Language learning from mother tongues to other tongues, Advantages of learning other languages, Language and education, Notion of first language, Second language and others. Constitutional provisions and National Education Policy 2020.

#### **Suggestive Practicum:**

- Listen to a recorded speech and classify it based on sounds: vowels, consonants, and others, suprasegmental: stress, pitch, tone, intonation, and juncture, Acoustic phonetics.
- Analyze sentences and their constituents as simple, complex, and compound sentences from written work.

Tasks and exercises will be given depending on the course instructors.

#### **References:**

 A.J. Thomson, A.V. Martinet, A Practical English Grammar, OxfordUniversity Press Murphy, Raymond (2004). Essential English Grammar. 3<sup>rd</sup> ed., Cambridge UP, Word

- 2. Power Made Easy- Norman Lewis- Penguin Publishers
- 3. Hewings, M. (2013). Advanced grammar in use: A reference and practice book for Advanced learners of English. Cambridge UniversityPress.
- 4. Kallos, Judith. Email Etiquette Made Easy. Online. Killian, Crawford. Writing for the Web. 5th ed., Self Counsel Press, 2015.
- 5. Howard, Peter, Perfect Your Punctuation, Orient Longman, Delhi.
- 6. Romaine, Suzanne. Language in Society: An Introduction to Sociolinguistics. New York, Oxford University Press. ISBN: 978-0198731924.

Language – I Tamil

# EDLT 11 Tamil Epic Literature and Grammar

L T P C 4 0 0 4

# Course Outcome (CO)

On the successful completion of the course, the student will be able to

	Course Outcome	Level
CO1	காப்பிய இலக்கியத்தின் தோற்றம், பின்புலம்	தெரிந்து
	முதலியவற்றை தெரிந்து கொள்தல்	கொள்தல்
CO2	காப்பியங்களின் அமைப்பு, பாடுபொருண்மை, கவிநயம்	அறிந்து
	போன்றவற்றைக் கண்டுணர்தல்	கொள்ளுதல்
CO3	காப்பிய இலக்கிய வரலாறு குறித்து மொழிதல்	புரிந்து
		கொள்ளுதல்
CO4	மொழித்திறன்(எழுத்து, சொல்) பயிற்சி பெறுதல்	தெரிந்து
		கொள்ளுதல்
CO5	எழுத்திலக்கண, சொல்லிலக்கண வரலாற்றைச் சுருக்கமாக	அறிந்து
	புரிந்துகொள்தல்.	கொள்ளுதல்

#### CONTENTS

Units	Content	Hrs.
I	காப்பியங்கள்	10
	அ) சிலப்பதிகாரம் – மதுரைக்காண்டம் - <b>'அடைக்கலக்காதை'.</b>	
	ஆ) மணிமேகலை - ' <b>மணிமேகலா தெய்வம் வந்து தோன்றிய</b>	
	காதை'.	
II	பக்திக் காப்பியங்கள்	10
	அ) பெரியபுராணம் - <b>நமிநந்தியடிகள் நாயனார் புராணம்'.</b>	
	கம்பராமாயணம் - <b>கிட்கிந்தா காண்டம் - 'நட்புகோட் படலம்'.</b>	
	(தேர்ந்தெடுத்த பத்துப் பாடல்கள் மட்டும்)	
	இ) சீறாப்புராணம் - நுபுவத்துக்காண்டம் - <b>மானுக்குப் பிணை</b>	
	நின்ற படலம்'.	
	(தேர்ந்தெடுத்த பத்துப் பாடல்கள் மட்டும்)	
	ஈ <b>) தேம்பாவணி</b> - இரண்டாம் காண்டம் - <b>'சித்திர கூடப் படலம்'.</b>	
	(தேர்ந்தெடுத்த பத்துப் பாடல்கள் மட்டும்)	
III	இலக்கணம் - எழுத்து, சொல்	9
	இலக்கணம் (எழுத்து): எழுத்தின் வகைகள், ஒலிப்பு முறைகள்,	
	புணர்ச்சி முறைகள், ர-ற; ல-ள-ழ; ந-ன-ண ஆகிய ஒலிகளை	
	வேறுபடுத்தி அறியும் முறை, உயிர்மெய்க் குறில், உயிர்மெய்	
	நெடில் வேறுபாடு அறியும் முறை, ஒலிப்பு முறை)	
IV	இலக்கணம்(மொழிப்பயிற்சி)	9
	இலக்கணம் (சொல்): தொடரியல் அமைப்பு, சொல்லின் வகைகள்	
	பெயர்ச்சொல் -அறுவகைப்பெயர், ஆகுபெயர்; வினைச்சொல் -	
	தெரிநிலை வினை <b>; இடைச்சொல் '-</b> உம்' இடைச்சொல்; <b>உரிச்சொல்</b>	
	- மிகுதிப்பொருள் தரும் சொற்கள்), <b>வேற்றுமைகள்(வகை,</b>	
	உருபுகள்), வடசொற்களைத் தமிழ்ச்சொற்களாக மாற்றும்	
	<b>முறைமை வாக்கிய வகைகள்</b> (தன்வினை-பிறவினை; செய்வினை-	
	செயப்பாட்டு வனை).	
V	காப்பிய வரலாறு, இலக்கண வரலாறு	9
	அ) காப்பியத்தின் தோற்றமும் வளர்ச்சியும்	

ஆ) தமிழ் எழுத்திலக்கணம், சொல்லிலக்கணம் வரலாறு	
பாடநூல்கள் / பார்வைநூல்கள்:	
இலக்கணம்:	
1. பரந்தாமனார், அ.கி., நல்ல தமிழ் எழுத வேண்டுமா?,	
பாரிநிலையம், சென்னை. 1988.	
2. பரமசிவம், கு., இக்காலத் தமிழ் மரபு, அடையாளம் பதிப்பகம்,	
சென்னை.2011.	
3. வேல்முருகன், ப., எழுத்திலக்கண மாற்றம், தி பார்க்கர் பதிப்பகம்,	
சென்னை. 2006.	
இலக்கிய வரலாறு:	
1. சிவத்தம்பி, கா., தமிழில் இலக்கிய வரலாறு, நியூ செஞ்சுரி புக்	
ஹவஸ், சென்னை. 2000.	
2. சிற்பி பாலசுப்பிரமணியம்., தமிழ் இலக்கிய வரலாறு, நறுமலர் 🛛	
பதிப்பகம், சென்னை. 1992.	
இலக்கண வரலாறு:	
1. இளவரசு,சோம., இலக்கண வரலாறு, மெய்யப்பன் பதிப்பகம்,	
சிதம்பரம். 2003.	
2. புலவர்.இளங்குமரன்.இரா.,இலக்கண வரலாறு., மணிவாசகர்	
பதிப்பகம்., சிதம்பரம். 1999	

#### EDLH11

# Hindi Language Learning

L T P C 4 0 0 4

# (For Non native speakers)

# Course Outcome (CO)

On the successful completion of the course, the student will be able to

	Course Outcome	
CO1	पाठ्यक्रम की इस इकाई से विद्यार्थियों में हिन्दी लिपि की समझ बनेगी ।	
CO2	इस इकाई से विद्यार्थी हिन्दी वाक्य संरचना के बारे में जानकारी प्राप्त करेंगे।	
CO3	इस इकाई से विद्यार्थी हिन्दी की दैनंदिन क्रियाओं के विषय में जानकारी प्राप्त करेंगे।	
CO4	इस इकाई से विद्यार्थी में हिन्दी भाषा में निहित लिंग एवं वचन के संबंध में समझ बनेगी।	
CO5	समूह चर्चा एवं संभाषण के माध्यम से विद्यार्थियों में भाषण - कला   का विकास होगा।	

#### a. Syllabus

Units	Content	Hrs.		
I	<ul> <li>वर्णमाला स्वर), व्यंजन और वारहखड़ी (</li> </ul>			
	<ul> <li>फल, फूल, सब्जियों का नाम, पशुपक्षियों का नाम-</li> </ul>			
	<ul> <li>दिनों और महीनों का नाम, शारीरिक अंगों का नाम</li> </ul>			
	<ul> <li>एक से पचास तक गिनती</li> </ul>			
II	<ul> <li>मैं, हम, तुम, आप, यह, वह, ये, वे,</li> </ul>			
	<ul> <li>क्या, कौन कितना, कब, क्यों</li> </ul>			
	<ul> <li>को, से, का, के, की, में, पर</li> </ul>			
	<ul> <li>मेरा, हमारा, तुम्हारा, आपका</li> </ul>			
	<ul> <li>चाहिए, पसंद का प्रयोग</li> </ul>			
	<ul> <li>वर्तमान काल (उदाहरण सहित )</li> </ul>			
	<ul> <li>भविष्यत् काल (उदाहरण सहित )</li> </ul>			
	<ul> <li>भूतकाल (उदाहरण सहित )</li> </ul>			
	<ul> <li>ने प्रत्यय का नियम</li> </ul>			
IV	<ul> <li>लिंग, वचन, कारक, क्रिया</li> </ul>			
	<ul> <li>समानार्थ शब्द, विलोम शब्द</li> </ul>			
	<ul> <li>संवाद दुकान में - अस्पताल में, मार्केट में राम, सफर</li> </ul>			
	<ul> <li>अनुवाद अभ्यास हिंदी से) अंग्रेज़ी और अंग्रेज़ी से हिंदी (</li> </ul>			
V	• कन्याकुमारी, (पाठ (			
	<ul> <li>चाह, एक बूँद (कविता)</li> </ul>			
	<ul> <li>भगवान सब का एक है ( कहानी )</li> </ul>			
	<ul> <li>दोहे - कबीर ) 1, तुलसी-1 और रहीम -1 )</li> </ul>			
	छात्रों के लिए प्रदत्त कार्य जरूरी है-			
	सभी छात्र नियत विषय पर कक्षा संगोष्ठी में प्रपत्र - वाचन करेंगे।			
सभी छात्र नि	यत विषय-वस्तु पर समूह चर्चा कर अपना   मन्तव्य व्यक्त करेंगे।			
संदर्भ ग्रंथ -				
1. हि	न्दी वातायण, डॉ. के. एम. चंद्रमोहन, विश्वविद्यालय प्रकाशन, वाराणसी, 2008.			
2. हो	<ol> <li>होटल प्रबंधन, डॉ. के. पी. राजरत्नम., मैथ क्रियेटर्स, कोयम्बत्तूर, 2021.</li> </ol>			
3. प्राथमिक पाठ्य पुस्तक, दक्षिण भारत हिन्दी प्रचार। सभा, मद्रास, चेन्नई, 2022.				
4. मध	4. मध्यमा पाठ्य पुस्तक, दक्षिण भारत हिन्दी प्रचार सभा, मद्रास, चेन्नई, 2022.			
5. देव	ानागरी लिपि तथा हिन्दी का मानकीकरण, डॉ अनुराधा सेंगर, केन्द्रीय हिन्दी निदेशाल	य भारत		
सं	रकार, नई दिल्ली, 2019.			

EDLH12 Hindi Language structure and literature L T P C

# (For Native speakers)

4 0 0 4

# Course Outcome (CO)

On the successful completion of the course, the student will be able to

	Course Outcome	
CO1	पाठ्यक्रम की इस इकाई से विद्यार्थियों में हिन्दी व्याकरण की समझ। बनेगी	
CO2	इस इकाई के माध्यम से विद्यार्थी के शब्द-भंडार में वृद्धि होगी।	
CO3	इस इकाई से विद्यार्थी में विषय-विस्तार एवं विषय-संक्षेपण की कला विकसित होगी।	
CO4	पाठ्यक्रम की इस इकाई से विद्यार्थियों को पत्रकारिता एवं व्यावहारिक हिन्दी की जानकारी प्राप्त	
	होगी।	
CO5	समूह चर्चा एवं संभाषण के माध्यम से विद्यार्थियों में संवाद-कला का विकास होगा।	

#### CONTENTS

Units	Content	Hrs.	
I	हिन्दी भाषा का विकास : परिचय		
	अपभ्रंश, हिन्दी का विकास ; हिन्दी की बोलियाँ ; हिन्दी और हिन्दुस्तानी ;   खड़ीबोली हिन्दी :		
	राष्ट्रभाषा राजभाषा-संपर्क भाषा		
П	हिन्दी भाषा की संरचना		
	संज्ञा, सर्वनाम, विशेषण, क्रिया विशेषण, संबंधबोधक, समुच्चयबोधक अव्यय, कारक एवं		
	विभक्तियाँ, लिंग, वचन, काल, वाच्य		
III	हिन्दी साहित्यका इतिहास : संक्षिप्त परिचय		
	। आदिकाल - सामान्य परिचय, भक्तिकाल - सामान्य परिचय -रीतिकाल, परिचय सामान्य - काल		
	आधुनिक परिचय सामान्य		
IV	पाठध्ययन एवं अध्यापन के लिए (प्राचीन पद्य):		
	1. कबीरदास साखी)- गाँच दोहे (		
	2. तुलसीदास (दोहे पाँच)		
	3. सूरदास वर्णन बाल)- दो पद (		
	4. बिहारीलाल (दोहे पाँच)		
V	पाठाध्ययन एवं अध्यापन के लिए (आधुनिक पद्य):		
	1. सूर्यकान्त त्रिपाठी निराला - तोड़ती पत्थर		
	2. सच्चिदानंद हीरानंद वात्स्यायन 'अज्ञेय - नदी के द्वीप		
	3. निर्मला पुतुल् - उतनी दूर मत ब्याहना बाबा		
	। छात्रों के लिए प्रदत्त कार्य जरूरी है-		
	सभी छात्र नियत विषय पर कक्षा संगोष्ठी में प्रपत्र- वाचन करेंगे।		
	सभी छात्र नियत विषय-वस्तु पर समूह चर्चा कर अपना मन्तव्य व्यक्त करेंगे।		
	सहायक ग्रथ:		
	1. कामता प्रसाद गुरु, साक्षप्त हिन्दा व्याकरण, नागराप्रचारिणा सभा, वाराणसा (2005)		
	2. बाबू गुलाबराय हिन्दा साहित्य का सुबाध इतिहास, लक्ष्मा नारायण अग्रवाल एजुकशनल		
	पब्लिशस, आगरा		
	3. विश्व नाथ त्रिपठा, हिन्दी साहित्य की सरेल इतिहास, आरिएन्ट ब्लॅकेस्वन,   हदराबीद (2007)		
	4. दंगल झाल्ट, प्रयाजनमूलक हिन्दी : सिद्धात और प्रयाग, वाणी प्रकाशन, नया faceft (2015)		
	5. विनीद गांदर, प्रयाजनमूलक हिन्दा, वाणा प्रकाशन, नया दिल्ला (2016) 		
	७. प्रमयन्द्र, 19व म हिन्दा, तदाशला प्रकाशन, नथा दिल्ला (2015) र निमानिसम मिश्र तां भ्रेशन के लोकमिम किन्दी उन्हीय समयन प्रमुख प्रमुख के 2000		
	7. विद्यानिवास मिश्र (स.), आज के लाकाप्रय हिन्दा कवि-अज्ञय, राजपाल एण्ड facell (2002) a. रामनित्यम कार्य तां, राम निर्मेष त्वेक्शारनी मकाणन वज्यवानम् (1000)		
	א לא און און (א.), אויו ומלויו, לווסאולתו אסואר, גלווגושוע (1998) ה בלידוד דווות נולג דוראהואר באמי איריאא איריא אויא איריא		
	. हरराम त्रमाप (त.), तमकालान दाहा कांश, शब्दालाक प्रकाशन, ।दल्ली (2015) 10 कविनकोण		
	וט. איואמואיואו		

# CURRICULUM (EDUCATION)

#### Semester I

	Evolution of Indian Education	L		Р	C
EDPC11		Δ	Δ	Δ	Δ

Course Objectives: The Objectives of the course are

- To discuss genesis, vision, and evolution of education in ancient India to the contemporaryIndia
- To enable them to shape their educational perspective to act as an effective teacher.

Ancient Indian Education: Vedic Period: Vision, objectives and salient features of Vedic Education System. Teaching and Learning Process. Development of educational institutions: Finances and Management. Famous Educational institutions and Guru-Shishya. Education at the time of Epics: Ramayana and Mahabharata.

Ancient Indian Education: Buddhist and Jain Period: A. Vision, objectives and salient features of Buddhist and Jain Education System. Teaching and Learning Process. Finance and Management of Educational Institutions. Educational Institutions: Nalanda, Taxila, Vikramshila, Vallabhi, Nadia. Famous Guru-Shishya.

Post-Gupta Period to Colonial Period: A. Vision, objectives, brief historical development perspective as well as salient features of Education in India. Teaching and Learning Process. Finance and Management of educational institutions

Modern Indian Education: Colonial Education in India- Woods Despatch, Macaulay Minutes and Westernization of Indian Education. Shiksha ka Bhartiyakaran - Indigenous Interventions in Education. (Bird's eye view of their contribution). Swadeshi and Nationalist attempts of educational reforms with special reference to general contribution of Indian thinkers – Savitribai and Jyotiba Phule, Rabindranath Tagore, Swami Vivekananda, Mahatma Gandhi, Sri Aurobindo, Gijubhai Badheka, Pt. Madanmohan Malaviya, Jiddu Krishnamurti and Dr. Bhima Rao Ambedkar others – to the education systems of India. Education in Independent India: Overview of Constitutional values and educational provisions. Citizenship Education: Qualities of a good citizen, Education for fundamental rights and duties: Overview of 20th Century Committees, Commissions and Policies -UEE, RMSA, RTE Act 2009: Overview and impact - NEP 2020: vision and implementation for a vibrant India.

# Suggestive Practicum:

- 1. Prepare a report highlighting educational reforms with special reference to schooleducation in the light of NEP 2020
- 2. Critically analyze the concept of good citizen from the perspective of education fordemocratic citizenship.
- 3. Compare vision, objectives, and salient features of education during different periods.
- 4. Working out a plan to develop awareness, attitude and practices related to

Fundamental Rights or fundamental duties or democratic citizenship qualities execute it in the class and write the details in form of a report.

- 5. Sharing of student experiences (in groups) related to Indian constitutional values, help them to reshape their concept and enable them to develop vision, mission and objectives for a school and their plan to accomplish the objectives in form of a group report.
- 6. Analyses of current educational strengths and weaknesses of one's own locality and work out acritical report
- 7. Visit to places of educational significance and value centers and develop a project report.
- 8. Observation of unity and diversity in a social locality and matching it with unity and diversity in the class and work out a plan for awareness for nationalemotional integration for class to develop awareness, attitudes, skills, and participatory values, execute it in the class and report the details.

# Reference Books:

- 1. NCERT (2014). Basics in Education: Textbook for B.Ed Course. NCERT, New Delhi. ISBN 978- 93-5007-283-7.
- 2. Taneja, V.R (1978). Educational Thought and Practice. Sterling Publishers Pvt Limited, NewDelhi. ISBN 9788120701021.
- 3. Ghosh, Suresh Chandra (2001). The History of Education in Ancient India. Munshiram Manohar LalPublications, New Delhi, ISBN 9788121509763.
- 4. J.C. Aggarwal (2010). Landmarks in the History of Modern Indian Education. Vikas PublishingHouse, New Delhi, ISBN 9788125937180.
- 5. R.N. Sharma (2021). History of Education in India. Atlantic Publishers and Distributors Pvt.Ltd. NewDelhi, ISBN: 9788171565993.
- 6. Samuel S. Ravi (2021). Philosophical and Sociological Bases of Education. Publisher:
- 7. Swami Chidbhavananda (2017). The Indian National Education. Sri Ramakrishna Tapovanam Publications. Thirupparaithurai, Tamil Nadu, ISBN 978-81-8085-150-6.
- 8. M.V. Srinivasan (2019). Education in Contemporary India. Pearson India Publication, NewDelhi. ISBN 9789353940898.
- 9. A S Altekar (2013). History of Education in Modern India. Orient Black swan Private Limited, NewDelhi. *ISBN 978*-8125052623.
- 10.S. Altekar (2010). Education in Ancient India Hardcover. Gyan Books, New Delhi, ISBN 978-8182055186.
- 11.J C Aggarwal (2008). The Philosophical and Sociological Perspectives of Education. ShipraPublications, New Delhi, ISBN 9788175411111.
- 12.R.P. Pathak (2007). Philosophical and Sociological Perspectives of Education. Atlantic Publishers, New Delhi, ISBN *9788175411111.*
- 13. Singh Yogesh Kumar & Ruchika Nath (2005). History of Indian Education System. AphPublishing Corporation, New Delhi, ISBN *9788176489317.*
- 14.R.P. Pathak (2021). Education in The Emerging India. Atlantic Publishers, New Delhi, ISBN9788126907557.
- 15.S.S. Chandra R.K. Sharma (2020). Philosophy of Education. Atlantic publication, New Delhi, *ISBN* 9788171566389.
- 16.M.S Sachdeva; K.K.Sharma and Chanchal K (2015). Contemporary India and Education: Gracious Books. Patiala , ISBN 978-9385446696.

- 17. S. Thakur, Sandeep Berwal (2008). Development of Educational System in India: A Source Book For Teacher Educators And Teachers-In-Training. Sunrise book store, New Delhi, ISBN9788175414259.
- Upinder Singh (2009). A History of Ancient and Early Medieval India: From the Stone Age to the 12th Century (PB). Publisher -Pearson Education India, ISBN 978-8131716779.
- 19.J.C. Aggarwal (2012). Modern Indian Education: History, Development and Problems. Shipra Publications; 5th edition, New Delhi, ISBN 978-8175413320.
- 20. Nayan Basu, Sajidur Rahman (2023). Trends And Issues of Modern Indian Education, Global net publication, ISBN 978-9383546572.
- 21. Khursheed Ahmad Butt (2022). National Higher Education Policy 2020. Atlantic Publishers and Distributors (P) Ltd, ISBN 978-8126934393.
- 22. Joseph K Thomas (2022). The Write Order Publications. India's New National Education Policy 2020. ISBN 978-9355652409.
- 23. MHRD (2020) National Education Policy, Government of India, pp.33-49. https://www.education.gov.in/sites/upload\_files/mhrd/files/NEP\_Final\_English\_0. pdf

#### EDPC12 Art Education (Performing and Visual) 1 L T P C 4 0 0 4

# Importance of Aesthetics and Art education

Aesthetics and Art – its meaning, dimensions and constituents. - Importance of Arts in Education - Types of Arts – visual and performing; Renowned Indian Arts and Artists – Classical, folk and contemporary. -Indian festivals and their artistic significance. The value of art in Education - use as an instrument in education; moral dimensions of works of art and the controversial distinction between the value of Popular art and High art

#### **Visual Arts**

Different materials of visual arts– Rangoli, pastels, posters, clay, paintings. Using different methods of visual arts- Paintings, block printing, collage, clay modelling, paper cutting and folding; Listening/viewing performing art forms of music, dance and theatre.

#### **Designing and Performing of Puppets**

Puppets - history of Puppets; meaning, definition; Characteristics of Puppets and types. Different Types of Puppetry in India. Designing, creativity performance of Puppets. Puppets and communication skills- Create a good engaging story and perform with own puppets; Performing with small group and to prepare their own skits with the puppets. Techniques of using Puppets in classroom situation.

#### Performing arts in Drama

Drama as a medium of education- Identification of local performing art forms and their integration in teaching – learning. - Listening/viewing performing art skit, mime, one act play or theatre. Evaluation strategies; assessing the different forms of Art.

#### **Fundamentals of Drawing and Painting**

Concept and Types of drawing- Colours and Sketching- understanding of various means and perspectives, Different forms of painting. Use of Drawing and Painting in Education -Chart making, Poster making, match-stick drawing and other forms, Model making – Clay modelling, Origami, Decorative – Rangoli, and any other local art.

#### Tasks and Assignments:

Each student is required to submit **any Four** assignments from the following:

- Textbook analysis to find scope to integrate art forms either in the text or activities or exercises
- Preparation of instructional material for education in the arts for secondary school.
- Documentation of the processes of any one art or craft with the pedagogical basis such as Weaving or printing of textiles, making of musical instruments and

Folk performances in the community, etc. - how the artists design their products, manage their resources, including raw materials, it is marketing, problems they face, including historical, social, economic, scientific and environmental concerns.

- Art and Craft Exhibition
- Representative of Art in the Art Club
- Case studies of the children's work of art and their understanding of the concept of Art.
- Select a concept from the school curriculum which includes a social message and identify an appropriate art form to spread the message in public and prepare a report.
- Identify a local art form and integrate it in teaching an appropriate lesson from school curriculum Prepare a lessonplan
- Select an appropriate lesson from the school curriculum and rewrite it in the form of a drama.
- Organize a show on dance/ music / dramas and Prepare report

# **References**:

- 1. Dewey, J. (1934). Art as experience. New York: Minton.
- Reed, H. (1968). Education through art. New York: Faber and Faber. Eisner, E. W. (1972). Educating artistic vision. New York: Macmillan.
- 3. John, B., Yogin, C., & Chawla, R. (2007). Playing for real: Using drama in the classroom. New York: Macmillan. Jefferson, B. (1969). Teaching art to children Continental view point.
- 4. Boston: Allyn Bacon. Tagore, R. (1962). Lectures and addresses. New Delhi: Macmillan. Coomaraswamy, A. K.(1974). Christian and oriental philosophy of art.
- 5. New Delhi: Munshiram Manoharlal. Rupali Tripathi, (2004), Teaching of music, New Delhi: Mohit Publication.
- Dash B.N, (2002), Teacher and Education in the Emerging India Society (Vol. I & II) New Kalaimani Saraswathi, (1994), Bharata Natyakalai, Madras: Thirumagal Nilayam.

#### **Course Objectives:**

The objectives of the course are:

- 1. To recognize the vast corpus of knowledge traditions of India, while developing an appreciation for it,
- 2. To apply their acquired research and critical thinking skills in multidisciplinary themes,
- 3. To summarize and pass on their learning to their students of different Indian traditions in an easilydigestible manner.

Introduction to the Knowledge of India: Definition & scope; Relevance of this knowledge, Need to revisitour ancient knowledge, traditions, and culture.

Culture - Art and Literature: Fine arts (traditional art forms, contemporary arts, arts & spirituality, arts and Identity, and art and globalization), Performing Arts (Indian dance systems, traditional Indian pieces of music, visual arts, folk arts, etc.,). Literature (Sanskrit literature, religious literature, Indian poetry, folk literature, Indian fiction, Sangam literature, Kannada, Malayalam literature, Bengali literature, etc.

Polity and Law: Kingship & types of government (oligarchies, republics); Local administration (village administration), Basis of Law: Dharma & its sources; Criminal Justice: police, jails, and punishments; Lessons from Chanakyaniti; Lessons for modern-day India: Towards a tradition-driven equitable and just polity and law system.

Economy: Overview of the Indian Economy from the Stone Age to the Guptas: The new culture of Urbanization (including castes, guilds, and other economic institutions; Harappan civilization economy; growth of agriculture and proliferation of new occupations; growth of writing), Internal & external trade and commerce, including trade routes, Indo-roman contacts, and maritime trade of South India; Temple economy, Land ownership - land grants & property rights, land revenue systems, Understanding Arthashastra: Ideas & Criticism; Locating relevance of ancient Indian economic thought in modern-day Indian Economy.

Environment & Health: Understanding Equilibrium between Society & Environment: Society's perceptions of natural resources like forests, land, water, and animals, Sustainable architecture & urban planning; Solving today's environmental challenges (best practices from indigenous knowledge, community-led efforts, etc.), India's Health Tradition: Ayurveda, Siddha, Ashtavaidya, Unani, and other schools of thought; Lessons from Sushruta Samhita and Charaka Samhita, Mental health in ancient India: towards time-tested concepts of mental wellness (concept of mind, dhyana, mind-body relationship, Ayurveda, yoga darshan, atman, etc.)

# Suggestive Practicum:

- Practicum will include organization of day trips that help student teachers watch events relating tovisual and performing art; activities that enable student teachers to identify and record through photos, videos, etc. the elements of ancient architecture still existing in the city around them;
- Organization of Individual and group presentations based on themes such as Polity, Law and Economy etc.,
- Organization of a 'Knowledge of India' day in the institution to celebrate the culture (food, clothes, etc.) that they would have been explored in lectures and tutorials; interactions with family members, elders, neighbors, and other members of society about the evolution of local systems and economyetc.

# Reference Books:

- 1. Adil Firdous Wani (2023) Understanding India. Prabhakar Prakshan Publication, ISBN: 978-9356821491.
- 2. Anshul Saluja (2023). Indian Knowledge System Unveiling Traditions Perspectives and Narratives.Book Rivers Publication, ISBN: 978-9358428384.
- 3. Bhag Chand Chauhan (2023) IKS: The Knowledge System of Bharata. Garuda PrakashanPublication, ISBN: 979-8885750882.
- Ravindra Sing Rana, Rajesh Purohit, Manish Vishwakarma, Vimlesh Kumar Soni, & Satish Pal Singh Rajput (2023). Indian Knowledge System of Materials in Science and Technology. WalnutPublication, ISBN: 978-9359114736.
- 5. Sanjay Sen (2023). Understanding India. Ashok Publication, ISBN:978-9389491746.
- Neil DeVotta & sumit Ganguly (2021). Understanding Contemporary India (3<sup>rd</sup> Edn). Lynne RiennerPublishers. ISBN: 978-1-62637-940-4
- 7. Baliyan, S. (2020). A Compendium of Indian Art and Culture. Oxford University Press, ISBN:9780199496587.
- 8. MHRD (2020) National Education Policy, Government of India, pp.33-49. https://www.education.gov.in/sites/upload\_files/mhrd/files/NEP\_Final\_English\_0.pdf
- Upinder Singh (2009). A History of Ancient and early Medieval India: from the Stone Age to the 12<sup>th</sup> Century. Pearson Education India Publication, ISBN: 978-8131716779.
- 10. Sisir Kumar Das (2005). A History of Indian Literature 500 1399 from The Courtly to thePopular, ISBN: 9788126021710.

# Semester II

# EDPC21Understanding India (Indian Ethos and<br/>Knowledge Systems) 2L T P C<br/>2 0 0 2

#### **Course Objectives:**

The Objectives of the course are

- To recognize the vast corpus of knowledge traditions of India, while developing an appreciation for it,
- To apply their acquired research and critical thinking skills in multidisciplinary themes,
- To summarize and pass on their learnings to their students of different Indian traditions in an easily digestible manner.

#### **Contents:**

Introduction of Knowledge of India: Recap of the previous semester's definition and introduction.Recap of previous knowledge.

Philosophy, Ethics & Values: Schools of Philosophy: Vaishesika, Nyaya, Samkhya, Yoga, Purva Mimansa and Vedanta or Uttara Mimansa (theory and the major thinkers) – and Jain, Buddhist, and Charvak traditions.Vedanta: philosophical systems (Advaita, Vishishtadvaita, Dvaita). Ethics, morality, and social dilemma (including self-leadership) and their relevance in today's time. How do Indians value spirituality? Spirituality and Social Responsibility; Importance of Spirituality in current times. Using ethics in a technologically volatile world: leading an ethical and modern life. Practical Vedanta for well- being (mindfulness, inter-connectedness, society-self relationship, etc.).

Culture- Lifestyle: Food (regional cuisines, ayurvedic diet, food and festival, vegetarianism, Jainism in food, food and hospitality, and globalization). Clothes (traditional Indian clothing, textile arts, religious costumes, clothing status, clothing, gender, globalization in clothing). Sports (traditional Indian sports, martial arts, sports, and gender, sports & globalization). The lifestyle of Yoga; adapting ancient lifestyle –A path towardslongevity.

Science & Technology: Arithmetic and logic. Natural sciences: math, physics, metallurgy, and chemistry. Astronomy: India's contributions to the world. Indian notions of time and space. Technology in the economy: agriculture, transportation, etc.

Linguistic Traditions: History of linguistics in India (conceptualizing ancient Indian linguistics, oral traditions, etc.). Language as Culture: Evolution of Languages over the years & language as building blocks to different cultures and society. Language: Identity, culture, and History.

# Suggestive Practicum:

- 1. The modes of curriculum transaction will include lectures, Tutorials, and Practicum.
- 2. Practicum will include organization of day trips that help student teachers watch events relating to visual and performing art; activities that enable student teachers to identify and record through photos, videos, etc. the elements of ancient architecture still existing in the city around them;
- 3. Organization of Individual and group presentations based on themes such as Polity, Law andEconomy etc.,
- 4. Organization of a 'Knowledge of India' day in the institution to celebrate the culture (food, clothes, etc.) that they would have been explored in lectures and tutorials; interactions with family members, elders, neighbors, and other members of society about the evolution of local systems and economy etc.

# **Reference Books:**

- 1. Adil Firdous Wani (2023) Understanding India. Prabhakar Prakshan Publication, ISBN: 978- 9356821491.
- 2. Anshul Saluja (2023). Indian Knowledge System Unveiling Traditions Perspectives and Narratives. Book Rivers Publication, ISBN: 978-9358428384.
- 3. Bhag Chand Chauhan (2023) IKS: The Knowledge System of Bharata. Garuda Prakashan Publication, ISBN: 979-8885750882.
- Ravindra Sing Rana, Rajesh Purohit, Manish Vishwakarma, Vimlesh Kumar Soni, & Satish Pal SinghRajput (2023). Indian Knowledge System of Materials in Science and Technology. Walnut Publication, ISBN: 978-9359114736.
- 5. Sanjay Sen (2023). Understanding India. Ashok Publication, ISBN:978-9389491746.
- Neil DeVotta & sumit Ganguly (2021). Understanding Contemporary India (3<sup>rd</sup> Edn). Lynne RiennerPublishers. ISBN: 978-1-62637-940-4
- 7. Baliyan, S. (2020). A Compendium of Indian Art and Culture. Oxford University Press, ISBN:9780199496587.
- MHRD(2020) National Education Policy, Government of India, pp.33-49. <u>https://www.education.gov.in/sites/upload\_files/mhrd/files/NEP\_Final\_English\_0.</u> pdf
- 9. Upinder Singh (2009). A History of Ancient and early Medieval India: from the Stone Age to the 12<sup>th</sup>Century. Pearson Education India Publication, ISBN: 978-8131716779.
- 10. Sisir Kumar Das (2005). A History of Indian Literature 500 1399 from the Courtly to the Popular, ISBN: 9788126021710.

**Teacher and Society** 

#### **Course Objectives:**

The objectives of the course are

- 1. To examine the relationship between teacher beliefs, values, character, life history, social and cultural context and teaching critically,
- 2. To explain the teacher roles and characteristics; the personal and professional self; the teacher as a communicator, the charismatic influencer, the reflective practitioner, competent, learner and much more and their significant role in nurturing the posterity.
- 3. To differentiate between the narrow curricular aims of education and the broader educational aims and their role in shaping self, school, and society,
- 4. To demonstrate an ability to develop positive classrooms through engaging in the ethic ofcare,
- 5. To demonstrate an ability to critically reflect on personal and collective practice so as to improve learning and teaching,
- 6. To conceptualize teacher agency, its individual, contextual, and structural dimensions andhow it gets impacted and in turn shapes education.

#### Contents:

Understanding the Teacher: Exploring the Personal and Professional Teacher: Exploring the wider Personal and General Social Context of Teacher: Life History, Teacher Beliefs, Values and Aspirations, Diverse Identities, Social Contexts and Commitment to Learning and Education. Exploring the Professional Teacher: Qualifications, Education in teaching, Attitude, Aptitude, Experience and Exposure. The Charismatic Teacher, the Communicator Teacher, The Missionary Teacher, The Competent Practitioner, The Reflective Practitioner, The Learning Teacher. Reflexive Practice: Nurturing the Professional Capital through collaborative and/or collective engagement with self, others, the social context.

Nurturing the Teacher: A Dialogue beyond the curricular goals, for Life and Posterity: Teaching: One profession, many roles. Teaching Character: Nurturing Teachers for Human Flourishing. Holistic Teacher Development: Nurturing the Panchakoshas. Teacher Values, Beliefs, and current Philosophy of Teaching: A Reflective Dialogue. Developing an Ethic of Care in Teacher Education: Nurturing Teachers towards a pedagogy of care.

Understanding and Fostering Teacher Agency: Role in shaping Education Systems of Tomorrow: Teacher Agency: What is it and why does it matter? Individual, Cultural and Structural Dimensions of Teacher Agency. Teacher discourses, Philosophy, Relationships, Networks and Professional Development: Shaping teacher agency

and Creative insubordination. Challenges and Issues inffostering Teacher Agency: Performativity, Non-academic engagements, Systemic apathy, Policy and Practice gaps and others. Role of Teacher in shaping the educational policy, practice, and reforms

Teacher as an Architect of the New India: Shaping the Society of Tomorrow: Engaging in Critical Education: Dialogues on power relations associated with Gender, Ethnicity, Culture, Disability, Class, Poverty, the reproduction of disadvantage and realizing the true human potential. Being a Critical Teacher: Raising debates around rapid technological advancement and impact on individual, family and social life; the growing isolation and impact on mental and social health and well-being, changing relationships between the 'state' and the 'market' and their impact on formal education; the conceptualization of teacher, teaching and teacher roles, 'globalization' and the reconstructed nationalism shaping the socio-political milieu and impact on social psyche, growing materialistic urge, sensory drives and the gradual deterioration of the individual and societal character.

# Suggestive Practicum:

- Take up a case study of any one teacher education Institution.
- Write a biography of any one of your favourite teachers/ Educationists.

#### **Reference Books:**

- 1. Sujata Bhan (2014). Understanding Learners A Handbook for Teachers. Prasad PsychoCorporation. ISBN: 978-9384764012.
- 2. Mark. A. Paige. (2016). Building a Better Teacher. Rowman & Littlefield. ISBN: 978-1475807295.





National Institute of Technology Tiruchirappalli - 620 015 Tamil Nadu, India

