



Affiliated to M.D.S. University, Ajmer
ITEP B.Sc.B.Ed. (Secondary Stage)
SEMESTER-I SYLLABUS

Recognized by National Council for Teacher Education (NCTE), New Delhi
Effective from Session: 2026-27

An Autonomous Institution | Accredited by NAAC with "B++" Grade

B.Sc.B.Ed. Secondary Stage

Semester-I Syllabus

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ITEP Structure and Scheme of Examination

B.Sc.B.Ed. Semester-I									
Courses	Paper Code	Course/paper	Periods per Week L+T+P	Credits	Internal/External			Max. marks	Exam Duration
					Internal		External		
					Th.	Pr.	Ext.		
SIP	SIP	Student Induction programme for Two Week	-	-	-	-	-	-	4 hrs. Per day
EC	EDFE-101	Evolution of Indian Education	3+1+0	4	25	5	70	100	3hrs.
*DSC Major Courses	DCBO-101	Basic concepts of Botany	3+0+1	4	25	5	70	100	3hrs.
	DCBO-102	Diversity of Microbes-I (Virus, Bacteria and Algae)	3+0+1	4	25	5	70	100	3hrs.
	DCCH-101	General Chemistry-I	3+0+1	4	25	5	70	100	3hrs.
	DCCH-102	Inorganic Chemistry-I	3+0+1	4	25	5	70	100	3hrs.
	DCMA-101	Calculus-I	3+1+0	4	25	5	70	100	3hrs.
	DCMA-102	Real Analysis-I	3+1+0	4	25	5	70	100	3hrs.
	DCPY-101	Mechanics	3+0+1	4	25	5	70	100	3hrs.
	DCPY-102	Mathematical Physics	3+0+1	4	25	5	70	100	3hrs.
	DCZO-101	Biology of Non-Chordates	3+0+1	4	25	5	70	100	3hrs.
	DCZO-102	Animal Taxonomy and Biodiversity	3+0+1	4	25	5	70	100	3hrs.
**DSC Minor Courses	DCBO-101	Basic concepts of Botany	3+0+1	4	25	5	70	100	3hrs.
	DCCH-101	General Chemistry-I	3+0+1	4	25	5	70	100	3hrs.
	DCMA-101	Calculus-I	3+1+0	4	25	5	70	100	3hrs.
	DCPY-101	Mechanics	3+0+1	4	25	5	70	100	3hrs.
	DCZO-101	Biology of Non-Chordates	3+0+1	4	25	5	70	100	3hrs.
	DCPE-101	Foundations of Physical Education, Anatomy and Physiology	3+1+0	4	25	5	70	100	3hrs.
Ability Enhancement and value Added Courses	AEVA-101	Language I (as per the 8th schedule of constitution of India)	3+0+1	4	25	5	70	100	3hrs.
	AEVA-102A	Art Education (Performing and Visual) and Creative Expressions Exemplar 1 - Puppetry	1+0+1	2	10	5	35	50	2hrs.
	AEVA-103	Understanding India (Indian Ethos and Knowledge Systems)	1+1+0	2	10	5	35	50	2hrs.
Total Credits				24	Total			600	
*200 Marks: One Major in Botany (DCBO-101 & 102)/Chemistry (DCCH- 101 & 102)/Mathematics (DCMA-101 & 102)/Physics (DCPY-101 & 102)/Zoology (DCZO-101 & 102).									
**100 Marks: One Minor in Botany (DCBO-101)/Chemistry (DCCH-101)/Mathematics (DCMA-101)/Physics (DCPY-101)/Zoology (DCZO-101).									
Semester-II									
*DSC Major Courses	DCBO-201	Diversity of microbes II (Fungi & Lichen)	3+0+1	4	25	5	70	100	3hrs.
	DCBO-202	Diversity of Cryptogams (Bryophytes and Pteridophytes)	3+0+1	4	25	5	70	100	3hrs.
	DCBO-203	Plant Cell Biology	3+0+1	4	25	5	70	100	3hrs.
	DCCH-201	Inorganic Chemistry-II	3+0+1	4	25	5	70	100	3hrs.
	DCCH-202	Organic Chemistry-I	3+0+1	4	25	5	70	100	3hrs.
	DCCH-203	Physical Chemistry-I	3+0+1	4	25	5	70	100	3hrs.
	DCMA-201	Calculus-II	3+1+0	4	25	5	70	100	3hrs.
	DCMA202	Real Analysis-II	3+1+0	4	25	5	70	100	3hrs.
	DCMA-203	Abstract Algebra-I	3+1+0	4	25	5	70	100	3hrs.
	DCPY-201	Optics	3+0+1	4	25	5	70	100	3hrs.
	DCPY-202	Oscillations, Waves and Acoustics	3+0+1	4	25	5	70	100	3hrs.
	DCPY-203	Relativity	3+0+1	4	25	5	70	100	3hrs.
	DCZO-201	Cell and Molecular Biology	3+0+1	4	25	5	70	100	3hrs.
	DCZO-202	Genetics and Evolution	3+0+1	4	25	5	70	100	3hrs.
	DCZO-203	Biochemistry	3+0+1	4	25	5	70	100	3hrs.
**Inter Disciplinary Course (Any One)	INDC-201	A-Biodiversity and conservation B-Chemical Technology and Society C- Mathematical Modelling D-NanoScience E- Wetland Conservation	1+1+0	2	10	5	35	50	2hrs.

SEMESTER I

EDFE-101: Evolution of Indian Education (EC)

Credits: 3L+1T+0P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	40
Internal Test (C2)	10+5	1hr	
External Examinations	70	3hr	
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)

C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

About the Course

The course seeks to develop an understanding among student teachers of the evolution of education in India that would allow student teachers to locate themselves within the larger system of education. The course aims at orienting student teachers to the historical perspective of Indian education including the development and features of education in ancient India such as the Gurukuls, post-Vedic period, during Mauryan and Gupta empires, during colonial era and post-independence period, and future perspectives about education development in India, and progression from Education 1.0 to Education 4.0 etc. This course also provides an overview of the contribution of Indian thinkers to evolve Indian Education system – Savitribai and Jyotiba Phule, Rabindranath Tagore, Gijubhai Badheka, Mahatma Gandhi, Dr. Bhima Rao Ambedkar and others.

Course Learning Outcomes

After completion of this course, student teachers will be able to:

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

UNIT - I

Ancient Indian Education: Vedic Period

- a) Vision, objectives and salient features of Vedic Education System.
- b) Teaching and Learning Process.
- c) Development of educational institutions: Finances and Management.
- d) Famous Educational institutions and Guru-Shishya.
- e) Education at the time of Epics: Ramayana and Mahabharata.

UNIT - II

Ancient Indian Education: Buddhist and Jain Period

- 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.

UNIT - III

Post-Gupta Period to Colonial Period

- 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.

UNIT - IV

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, Gijubhai Badheka, Mahatma Gandhi, Dr. Bhima Rao Ambedkar and 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

- Prepare a report highlighting educational reforms with special reference to school Education in the light of NEP 2020.
- Critically analyze the concept of good citizen from the perspective of education for Democratic citizenship.
- Compare vision, objectives, and salient features of education during different periods.
- 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.
- 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.
- Analyses of current educational strengths and weaknesses of one's own locality and work out a critical report.
- Visit to places of educational significance and value centers and develop a project report.
- 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 national-emotional integration or class to develop awareness, attitudes, skills, and participatory values, execute it in the class and report the details.

Suggestive Mode of Transaction

- The course content transaction will include the following:
 - Planned lectures infused with multimedia /power-point presentations.
 - Small group discussion, panel interactions, small theme-based seminars, group discussions, cooperative teaching and team teaching, selections from theoretical readings
 - case studies, analyses of educational statistics and personal field engagement with
 - educationally marginalized communities and groups, through focus group discussion

- Surveys, short term project work etc.
- Hands on experience of engaging with diverse communities, children, and schools.

Suggestive Mode of Assessment

The assessment will be based on the tests and assignments.

Suggestive Reading Materials

Teachers may suggest books/readings as per the need of the learners and learning content.

DCBO-101: Basic Concepts of Botany

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the Course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)

C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: By the end of this course, students will be able to –

- Know the microscopic structure of cell organelles.
- Distinguish the basic concepts of prokaryotic and eukaryotic cells and their functioning.
- Classify the different types of higher plants.
- Know the basics of plant physiology.

UNIT-I

Cell, difference between Prokaryotic and Eukaryotic cell; structure, chemical composition or protoplasm, cell wall, plasma membrane.

Characterization of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms

UNIT-II

Plant Kingdom, Classification; Bentham & Hooker, Engler & Prantle, John Hutchinson system of classification, Diagnostic features and economic importance of Brassicaceae & Poaceae.

Economic importance of cereals (Wheat), Millets (Pearl millet), oil (Mustard), Pulses, Fibres (Cotton) and medicinal plants.

UNIT-III

Diversity in plant forms: annual, biennial and perennial; convergence of evolution of tree habit in monocotyledons and di-cotyledons, trees-largest and longest plants.

Structure of flower

Angiosperms: Distinguishing characters, difference between monocotyledons and dicotyledons

UNIT-IV

Mendel's laws of Inheritance

Plant Physiology: elementary concept of transpiration, photosynthesis, respiration

Suggested readings

- Atherly, G., Garton, J. R. and McDonald, J. F. 1999. The Science of Genetics Saunders College Publishing, Fort Worth, USA.
- Gupta, P.K. 1999. A Textbook of Cell and Molecular Biology. Rastogi Publications, Meerut.
- Molecular Cell Biology. W.H. Freeman & Co. New York, USA.
- Russel, P. J. 1998. Enetics. The Benjamin/Cummings Publishing Co. Inc., USA.
- Powar C. B. Cell Biology Himalaya Publishing House, 1991
- Singh, V., Pandey, P.C. and Jain, D.K. 1998-99. Botany, Rastogi Publications, Meerut.

Practicals

DCBO-101: Basic Concepts of Botany

- Study of representative plants of Angiosperm families included in the syllabus.
- Anatomy of Primary growth in monocot and dicot plants by preparing temporary slides.
- Demonstrate the transpiration, aerobic and an aerobic respiration.
- To demonstrate the evolution of oxygen during Photosynthesis.
- To demonstrate the necessity of light, CO_2 for Photosynthesis.
- To compare the rates of Transpiration in different environmental conditions.
- To study the economic importance of Cereals (Rice, Wheat), Millets (Pearl Millet), Oil (Mustard), Fibres (Cotton, Jute) and Medicinal Plants.
- Maintenance & submission of a record of all the Laboratory activities.

DCBO-102: Diversity of Microbes-I (Virus, Bacteria and Algae)

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
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- Part-A will consist of 10 compulsory questions from all the units. These questions will be short

answered.

- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
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Distribution Marks for the course			
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Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)

C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: By the end of this course, students will be able to –

- Differentiate microscopic to macroscopic view of the plants.
- Distinguish the basic concepts of prokaryotic cell and eukaryotic cell and their functioning.
- Sailable features algae
- Differentiate algal members from different class of the kingdom Algae
- Know the basics of life cycle of different Cyanobacteria

UNIT-I

Viruses and Bacteria: Structure, Multiplication, transmission and disease symptoms of viruses; Structure of mycoplasma; Bacteria – structure, nutrition, reproduction and economic importance.

UNIT -II

Algae: General characters, occurrence, classification (Fritsch, 1935), Pigment constitution, fine structure of algal plastids, life-cycles, Origin and evolution of sex and thallus in algae. Economic importance of Algae.

UNIT-III

General account of Cyanophyceae and Chlorophyceae (Structure, reproduction).

Cyanophyceae: Life Cycle of Nostoc, Anabaena and Oscillatoria

Chlorophyceae: Chlamydomonas Volvox, Oedogonium

UNIT-IV

Structure, reproduction and evolutionary significance of following genera:

Xanthophyceae: Vaucheria,

Phaeophyceae: Ectocarpus, Sargassum

Rhodophyceae: Polysiphonia

Suggested Readings:

- Smith, GM. 1971. Cryptogamic Botany. Vol. 1 Algae & Fungi. TataMcGraw Hill Publishing Co, New Delhi.
- Sharma, O.P. 1992. Text Book of Thallophytes. McGraw Hill Pub. Co.
- Sharma. P.D. 1991. The Fungi. Rastogi & Co. Meerut.
- Clifton A. 1985. Introduction of the Bacteria. McGraw Hill & Co. New York.
- Singh, V., Pandey, P.C. and Jain, D.K. 1998-99. Botany, Rastogi Publications, Meerut.

Practicals
DCBO-102: Diversity of Microbes-I (Virus, Bacteria and Algae)

1. Study of the genera included in theory syllabus of Algae by making temporary micro preparations and observation of permanent slides.
2. Observation of disease symptoms in hosts infected by Bacteria, Viruses and Mycoplasma.
3. Section cutting of diseased material and identification of the pathogens as per the theory syllabus
4. To perform gram staining Techniques for identification of bacteria of the Curd sample.
5. Maintenance & submission of a record of all the Laboratory activities.

DCCH-101: General Chemistry-I

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

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Note: C1: Written Test as per schedule (at the end of 8th week)
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Course Learning Outcomes: By the end of this course, students will be able to –

- Explain the fundamental principles of atomic structure.
- Demonstrate knowledge of the periodic table
- Analyze the chemical behavior and reactivity of main group elements.
- Apply key concepts of chemical bonding.
- Identify and classify organic compounds
- Demonstrate skills for laboratory techniques

UNIT – I

Atomic Structure:

Concept of atom in ancient India, Bohr's theory & its limitations, atomic spectrum of hydrogen atom, de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Postulates of wave mechanics, Time independent Schrödinger's wave equation, well behaved wave function, significance of ψ and ψ^2 , Quantum mechanical treatment of H- atom, Quantum numbers and their significance, Normalized and orthogonal wave functions, Sign of wave functions, Radial and angular wave functions for hydrogen atom, Radial function plots, radial probability distribution plots, angular distribution curves, Shapes of s, p, and d orbitals.

UNIT – II

Periodicity of Elements:

s, p, d, f block elements, the long form of periodic table, Detailed discussion of the following properties of the elements, with reference to s & p-block, Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table, Atomic radii (van der Waals), Ionic and crystal radii, Covalent radii (octahedral and tetrahedral), Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy, Applications of ionization enthalpy, Electron gain enthalpy, trends of electron gain enthalpy, Electronegativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffé's electronegativity scales, Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity, Sanderson's electron density ratio.

UNIT – III

Chemistry of main group elements:

s-Block Elements: General characteristics, diagonal relationships and anomalous behavior of first member of each group, Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water, common features of hydrides, oxides, carbonates, nitrates, sulphates of alkali and alkaline earth metal compounds, complex formation tendency and solutions of alkali metals in liquid ammonia, Comparative study, diagonal relationship, salient features of hydrides, salvation and complexation tendencies including their function in bio-system and introduction to alkyls and aryls.

p-Block Elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energies, electron-affinity, electronegativity, allotropy, inert pair effect, catenation including diagonal relationship, Structure, bonding and properties of hydrides of group 13, oxides of phosphorus and sulphur, oxoacids of phosphorus, halides of silicon and phosphorus, borazine, silicates, silicones.

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

UNIT – IV

Basic Concepts of Organic Chemistry

Structure and Bonding: Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bonding, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyper conjugation, aromaticity, inductive and field effects, and hydrogen bonding. Mechanism of Organic Reactions: Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking, Types of reagents – electrophiles and nucleophiles, Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples), Assigning formal charges on intermediates and other ionic species, Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Suggested Readings:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).

- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.
- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

Practicals

DCCH-101: General Chemistry-I

1. Basic Laboratory techniques

- Calibration of Thermometer
Naphthalene (80-82°C), Acetanilide (113.5-114°C), Urea (132.5-133°C), Distilled Water (100°C)
- Distillation
Simple distillation of ethanol-water mixture using water condenser
Distillation of nitrobenzene and aniline using air condenser
- Crystallization
Concept of induction of crystallization
Phthalic acid from hot water (using fluted filter paper and stem less funnel)
Acetanilide from boiling water
Naphthalene from ethanol
Benzoic acid from water
- Decolourisation and crystallization using charcoal
Decolourisation of brown sugar (sucrose) with animal charcoal using gravity filtration
Crystallization and decolorization of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorizing carbon) using ethanol.
- Sublimation (simple and Vacuum)
Camphor, Naphthalene, phthalic acid and Succinic acid.
- Determination of melting point/ boiling points
- Determination of melting point: Naphthalene, Benzoic acid, Urea, Succinic acid, Cinnamic acid, Salicylic acid, Acetanilide, m-Dinitrobenzene p-Dichlorobenzene, Aspirin.
Determination of boiling points: Ethanol, Cyclohexane, Toluene, Aniline and Nitrobenzene.

2. Viva-Voce

3. Evaluation of record book of experiments performed in semester.

DCCH-102: Inorganic Chemistry-I

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

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Course Learning Outcomes: By the end of this course, students will be able to –

- Demonstrate an understanding of the periodic trends and properties of d-block elements.
- Reflect upon the principles of coordination chemistry.
- Utilise appropriate chemical nomenclature and notation to describe the composition and structure of inorganic compounds.
- Apply theoretical concepts to predict the behaviour of inorganic compounds in qualitative analysis.

UNIT-I

d- Block Elements-I:

Chemistry of the elements of the first transition series: electronic configuration and comparative study with respect to atom and ionic radii, oxidation states and ionization potential. Redox potential, oxidation state diagrams on the basis of redox potentials, binary compounds (hydrides, carbides & oxides) and complexes illustrating relative stability of their oxidation states, coordination number and geometry, metallic nature, magnetic properties, catalytic activity, colour and spectral properties of transition metal ions.

UNIT- II

d- Block Elements-II

Chemistry of the elements of second and third transition series: electronic configuration, general characteristics, comparative treatment with their 3d-analogues in respect of ionic radii, oxidation states, magnetic behavior, spectral properties and stereochemistry.

UNIT- III

Coordination Chemistry:

Introduction of coordination compounds, Werner's theory, nomenclature of coordination compounds, isomerism in coordination compounds, Stereochemistry of complexes with 4 and 6 coordination numbers, Chelate effect, polynuclear complexes, Labile and inert complexes, valence bond theory (inner and outer orbital complexes), electroneutrality principle and back bonding. Crystal field theory, measurement of CFSE, CFSE in weak and strong fields, pairing energies, factors affecting the magnitude of $10 Dq$ (Δ_o , Δ_t), Octahedral vs. tetrahedral coordination, tetragonal distortions from octahedral geometry Jahn-Teller theorem, square planar geometry, Qualitative aspect of Ligand field and MO Theory.

UNIT-IV

Oxidation reduction:

use of redox potential data analysis of redox cycle, redox stability in water-Frost Latimer and Pourbaix diagram, Principles involved in the extraction of the element.

Suggested Readings:

- Huheey, J. E.; Keiter, E.A. & Keiter, R.L. Inorganic Chemistry, Principles of Structure and Reactivity 4th Ed., HarperCollins 1993, Pearson, 2006.
- Sharpe, A.G. Inorganic Chemistry, 4th Indian Reprint (Pearson Education) 2005.

- Lee, J.D. Concise Inorganic Chemistry 5th Ed., John Wiley and sons 2008.
- Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications, 1962.
- Powell, P. Principles of Organometallic Chemistry, Chapman and Hall, 1988.
- Miessler, G. L. & Tarr, D.A. Inorganic Chemistry 4th Ed., Pearson, 2010.
- Crabtree, R. H., The Organometallic Chemistry of the Transition Metals, New York, NY: John Wiley, 2000
- Atkins, P.W. & Paula, J. Physical Chemistry, 10th Ed., Oxford University Press, 2014
- Svehla, G. *Vogel's Qualitative Inorganic Analysis*, Pearson Education, 2012.
- Mendham, J. *Vogel's Quantitative Chemical Analysis*, Pearson, 2009

Practicals DCCH-102: Inorganic Chemistry-I

1. Inorganic Chemistry

Inorganic qualitative analysis: Semi-micro qualitative analysis of given mixtures-not more than six ionic species having three anions and three cations (including interfering)) out of the following:

Cations: NH_4^+ , Pb^{2+} , Ag^+ , Bi^{3+} , Cu^{2+} , Cd^{2+} , Sn^{2+} , Fe^{3+} , Al^{3+} , Co^{2+} , Cr^{3+} , Ni^{2+} , Mn^{2+} , Zn^{2+} , Ba^{2+} , Sr^{2+} , Ca^{2+}

Anions: CO_3^{2-} , S^{2-} , SO_3^{2-} , $\text{S}_2\text{O}_3^{2-}$, NO_3^- , CH_3COO^- , Cl^- , Br^- , I^- , NO_2^- , SO_4^{2-} , PO_4^{3-} , BO_3^{3-} , $\text{C}_2\text{O}_4^{2-}$,
F (Spot tests should be carried out wherever feasible)

1. Viva-Voce
2. Evaluation of record book of experiments performed in semester.

DCMA-101: Calculus-I

Credits: 3L+1T+0P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	40
Internal Test (C2)	10+5	1hr	
External Examinations	70	3hr	
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: After completion of this course the student will be able to:

- Sketch curves in a plane using its mathematical properties in the different coordinate
 - Systems of reference.
- Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
- Compute curvature and may find the asymptotes by inspection
- Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

UNIT-I

Tangents and Normal's, Sub tangent and subnormal (Cartesian and polar forms), Derivative of curve (Cartesian and Polar form), polar curves, angle between the radius vector and tangent, Pedal equations, Curvature: Curvature of Circle, Radius of curvature formula for Cartesian, Parametric, Polar and Pedal forms, and problems.

UNIT-II

Partial differentiation: Definition, and examples of partial derivatives, Homogeneous function, Euler's theorem and its applications, Total differential coefficient, change of variables (Polar to Cartesian and vice-versa), maxima and minima of functions of two variables including the Lagrange's method of undetermined multipliers.

UNIT-III

Asymptotes: Asymptotes of the general algebraic curves, Asymptotes parallel to the axis, Oblique asymptotes, Asymptotes by inspection. Envelops and Evolutes.

UNIT-IV

Multiple points and curve tracing: Concavity and Convexity of a curve, Test of concavity, convexity and point of inflexion, multiple point, Necessary conditions for the existence of a double point, Procedure for tracing the curve in Cartesian, Parametric and Polar forms.

Suggested Readings:

- Thomas' Calculus: G.B. Thomas, 2018, Pearson
- Calculus Vol. 1 and 2, T.M. Apostol, 2007, Wiley.
- Calculus: M. Spivak, 2006, Cambridge.
- Calculus: J. Stewart, 2012, Cengage Learning.

DCMA-102: Real Analysis-I

Credits: 3L+1T+0P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	40
Internal Test (C2)	10+5	1hr	
External Examinations	70	3hr	
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: After completion of this course the student will be able to:

- Understand many properties of the real line and learn to define sequence in terms of functions from $\mathbb{N}$ to a subset of $\mathbb{R}$.
- Recognize bounded, convergent, divergent, Cauchy and monotonic sequences and to calculate their limit superior, limit inferior, and the limit of a bounded sequence.
- Apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.

UNIT-I

Real Number System: Set theory, Algebraic and order properties of $\mathbb{R}$, Absolute value of a real number its properties; Bounded above and bounded below sets, Bounded sets, Supremum and Infimum of a nonempty subset of $\mathbb{R}$.

UNIT-II

Properties of $\mathbb{R}$: The completeness property of $\mathbb{R}$, Archimedean property, Density of rational numbers and irrational numbers in $\mathbb{R}$, Definition and types of intervals, Neighborhood of a point in $\mathbb{R}$, Open and closed sets in $\mathbb{R}$, Nested intervals property.

UNIT-III

Sequences in $\mathbb{R}$: Sequences of real numbers, bounded sequences, limit of a sequence, convergent, divergent, and oscillatory sequences, algebra of convergent sequences, limit points of a sequence, Monotone sequence and its convergence theorem, Subsequences, Bolzano-Weierstrass theorem for sequences, Limit superior and limit inferior for bounded sequence, Cauchy sequence, Cauchy's convergence criterion.

UNIT-IV

Infinite Series: Convergence and divergence of infinite series of real numbers, Necessary condition for convergence, Cauchy criterion for convergence; Tests for convergence of positive term series: geometric series, P-series (harmonic series), comparison tests for positive term series, D'Alembert's ratio test, Raabe's test, Cauchy's root test and Cauchy's integral test, alternating series, Leibnitz's theorem, absolute convergence and conditional convergence of a series.

Suggested Readings:

- Bartle, Robert G., & Sherbert, Donald R. (2015), Introduction to Real Analysis (4th ed.). Wiley India Edition. New Delhi.
- Bilodeau, Gerald G., Thie, Paul R., & Keough, G. E. (2010). An Introduction to Analysis (2nd ed.). Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.
- Denlinger, Charles G. (2011). Elements of Real Analysis. Jones and Bartlett India Pvt. Ltd. Student Edition. Reprinted 2015.

DCPY-101: Mechanics

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	15	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
 C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: The student teachers will be able to:

- Acquaint with the key concepts of mechanics.
- Appreciate the applications of the concepts in real life situations.
- Solve the problems based on mechanics.
- Apply the theory in execution of practicals.

UNIT-I

Frames of Reference: Inertial and non-inertial frames, Galilean transformations, pseudo forces, transformations of displacement, velocity and acceleration in rotating frames, Coriolis force and its applications, Foucault's pendulum, Centre of mass and laboratory reference frames.

System of particles: centre of mass, equation of motion, system of variable mass, single stage and multistage rocket, energy and momentum conservation, concepts of elastic and inelastic collisions.

UNIT-II

Central forces: Motion under a central force, conservation of angular momentum, Kepler's laws, different types of orbits i.e. circular, elliptical, parabolic and hyperbolic orbits, Fields and potentials, gravitational field and potential due to spherical bodies, Gauss and Poisson equations for gravitational potential, gravitational self-energy.

UNIT-III

Rigid body dynamics: angular momentum, equations of rotational motion, conservation theorems for energy, momentum and angular momentum, rigid body, degrees of freedom, moment of inertia and their products, inertial coefficients, Euler's equations, principal moments and axes, product of inertia.

UNIT-IV

Elasticity: Young's modulus, bulk modulus and modulus of rigidity, Poisson's ratio, relation among elastic constants, Theory of bending of beams and cantilever, Torsion of a cylinder, Bending moments and Shearing forces, determination of Y by bending of beam method, Searle's two bar experiment, determination of modulus of rigidity by static and dynamic methods.

Suggested Readings:

- E.M. Purcell, Editor, Berkeley Physics Course, Vol. 1, Mechanics, McGraw Hill.
- R.P. Feynmann, R.B. Lighton, M. Sands, The Feynmann Lectures in Physics, Vol. 1. B.I. publications, Bombay, Delhi, Calcutta, Madras.
- Mechanics of particles, Rigid Bodies and Continuous Media (In Hindi) by Kalra, Bhandari and Kak
- Mechanics: J.C. Upadhyay
- Mechanics: R.K. Shukla and Anchal Srivastava.
- Concepts of Physics: A Beiser

Practicals**DCPY-101: Mechanics**

- To study the variation of power transfer to different loads by a DC source and verify maximum power transfer theorem. (Plotting of the graph).
- Conversion of a Galvanometer into an ammeter (Range 1A).
- Conversion of a Galvanometer into a Voltmeter (Range 1V).
- To determine dispersive power of prism.
- Study of bending of a cantilever or a beam.
- Study of torsion of a wire (static and dynamic methods.)
- Study of flow of liquids through capillaries.
- Determination of surface tension of a liquid by different methods.
- Study of viscosity of a fluid by different methods.
- To determine internal resistance of Leclanche Cell using a Potentiometer.
- To study the characteristics of a semiconductor junction diode and to determine forward and reverse resistances.
- To study the random decay and determine the decay constant by statistical method.
- To determine Poisson's ratio of rubber tube.
- To determine young's modulus by bending of beam.
- To determine Y , η and σ by Searle's method.
- To determine modulus of rigidity of material of wire using Maxwell's needle.
- To determine modulus of rigidity by statical vertical method.
- To determine modulus of rigidity by statical horizontal method.

Suggested Readings:

- Concept of Quantum Mechanics; Beiser (McGraw Hill)
- Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
- A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011, Kitab Mahal
- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- Laboratory Manual of Physics for undergraduate classes, D.P. Khandelwal 1985, Vani Publication.

DCPY-102: Mathematical Physics

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.

- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	15	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
 C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcome: Student teachers will be able to:

- Discuss the concepts of curvilinear coordinates.
- Explain the concept of tensor analysis.
- Identify different types of matrices.
- Apply the differential equation to solve the problem.
- Apply the concepts of special functions and Fourier analysis.

UNIT-I

Scalars and Vectors: dot products, triple vector product, gradient of scalar field and its geometrical interpretation, divergence and curl of a vector field, line, surface and volume integral, Flux of a vector field, Gauss divergence theorem, Green's theorem and Stokes theorem.

UNIT-II

Curvilinear Coordinates: Orthogonal curvilinear coordinates, Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems.

Tensor Analysis: Introduction to tensors, Transformation of Coordinates, covariant, contravariant and mixed tensors, Symmetric and Anti-symmetric Tensors, Quotient Law of Tensors, Sum, Difference and Product of Tensors.

UNIT-III

Differential Equations: Second Order Differential Equations and their Solution, Singular Points of Second Order Differential Equations and their Importance, Legendre, Bessel, Hermite and Laguerre Differential Equations. Special Functions: Legendre, Hermite and Laguerre Polynomials, Rodrigues' Formulae, Generating Functions, Recurrence Relations, Orthogonality, Series Expansion of a Function in terms of a complete set of Legendre Functions, Bessel Functions, Generating Function, Recurrence Formulas.

UNIT-IV

Fourier Series: Dirichlet Conditions, Kronecker's Method for Computation of Fourier Coefficients, Even and Odd Functions, Sine and Cosine Series, Fourier analysis of square wave, saw-tooth wave, half wave and full wave rectifier wave forms, Fourier theorem, Summing of Infinite Series, Term-by-Term Differentiation and Integration of a Fourier Series.

Suggested Readings:

- Mathematical Methods for Physicists: G.B. Arfken and H.J. Weber
- Mathematical Physics: A.K. Ghatak, I.C. Goyal and S.J. Chua
- Mathematical Physics: P. K. Chattopadhyay
- Applied Mathematics for Engineers and Physicists: L.A. Pipes and L.R. Harvill
- Advanced Engineering Mathematics: Erwin Kreyszig

- Theory and Problems of Vector Analysis (Schaum's Outline Series): M.R. Spiegel

Practicals
DCPY-102: Mathematical Physics

- To study the variation of power transfer to different loads by a DC source and verify maximum power transfer theorem (Plotting of the graph).
- Conversion of a Galvanometer into a ammeter (Range 1A).
- Conversion of a Galvanometer into a Voltmeter (Range 1V).
- Study of flow of liquids through capillaries.
- Determination of surface tension of a liquid by different methods.
- Study of viscosity of a fluid by different methods.
- To determine internal resistance of Lechlanche Cell using a Potentiometer.
- To study the characteristics of a semiconductor junction diode and to determine forward and reverse resistances.
- To study the random decay and determine the decay constant by statistical method.

DCZO-101: Biology of Non-Chordates

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcome: After successfully completing the course, the students will be able to:

- Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.

- Have hands on experience of materials demonstrating the diversity of protists and non-chordates.
- Know the process of physiological mechanisms are used in very diverse organisms

UNIT-I

- Outline classification of Protozoa up to order.
- Habit, habitat, structure, nutrition, osmoregulation and reproduction of *Paramecium*
- Locomotion in Protozoans: pseudopodial, ciliary and flagellar.
- Nutrition in Protozoa; Reproduction in Protozoa

UNIT-II

- Outline classification of Porifera and coelenterates up to order.
- Habit, habitat, morphology, internal structure, reproduction of *Sycon*, Canal system and skeleton in sponges
- Habit, habitat, morphology, internal structure, nutrition and reproduction of *Obelia*, Polymorphism in coelenterates, coral reefs
- Outline classification of Platyhelminthes and Nematelminthes up to order.
- Habit, habitat, morphology, internal structure, nutrition and reproduction and life cycle of *Fasciola*, Parasitic adaptations in Helminthes

UNIT- III

- Outline classification of Annelida and Arthropoda up to order
- Habit, habitat, morphology, internal structure, nutrition, respiration, circulation, excretion, nervous system and reproduction of *Hirudinaria*
- Habit, habitat, morphology, internal structure, nutrition, respiration, circulation, excretion, nervous system and reproduction of *Palaemon*
- Paripatus*: structure and affinities.

UNIT-IV

- Outline classification of Mollusca and Echinodermata up to order
- Habit, habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of *Pila*
- Habit, habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of *Asterias*

Suggested Readings:

- Modern Textbook of Zoology Invertebrates by R.L. Kotpal –(Rastogi Publication, Meerut 10th Revised Edition)
- Invertebrate Zoology series (Protozoa of Echinodermata) by R.L. Kotpal - – (Rastogi Publication , Meerut)
- Invertebrate Zoology by E.L. Jordan and P.S. Verma – S. Chand & Co., Delhi
- Invertebrate Zoology by J.K. Dhami and P.S. Dhami – S. Chand & Co., Delhi
- A textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad)
- Life of Invertebrate Zoology by Russel and Hunter – (Macmillan)
- Invertebrate Zoology by R.D. Barnes :- (W.B. Saunders, Philadelphia)
- A manual of Zoology Vol. I by Ekambernatha Ayyar (Vishwnathan, Madras)
- The invertebrate series of L.H. Hyman – (McGraw Hill)
- A student's textbook of Zoology by Adma Sedgwick Vol .I, II & III (Central Book Depot, Allahabad)
- A textbook of Zoology Vol. I by Parkar and Haswell – (Macmillan)
- Lower non chordate, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur
- Higher non Chordate, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur
- Animal taxonomy and evolution, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur

Practicals:
DCZO-101: Biology of Non-Chordates

- Study of museum specimens with respect to levels and patterns of organization biosystematics, biodiversity, adaptations, development stages, population dynamics, ecological implications:
- **Porifera:** *Sycon, Spongilla, Euplectella, Hylonema, Euspongia;*
- **Coelelerata:** *Hydra, Millepora, Physalia, Porpita, Vellela, Aurelia, Tubipora, Alcyonium, Metridium, Pennatula, Fungia, Gorgonia.*
- **Helminthes:** *Fasciola, Taenia solium, Planaria, Ascaris,*
- **Annelida:** *Nereis, Heteroneresis, Aphrodite, Chaetopterus, Pheretima, Hirudinaria*
- **Arthropoda:** *Eupagurus, Scolopendra, Apis*
- **Mollusca:** *Chiton, Aplysia, Helix, Dentalium, Mytilus, Pinctada, Unio, Sepia, Loligo Octopus:*
- **Echinodermata:** *Antedon, Holothuria, Cucumaria, Astropecten, Echinus*
- Study of Permanent slides *Paramecium, Paramecium* in Conjugation, *Paramecium* binary fission, *Euglena, Vorticella, Sycon* L.S., *Sycon* T.S., *Hydra* L.S., *Hydra* T.S, *Cercaria* larva, *Metacercaria*, *Miracidium* larva, *Sporocyst* larva, *Redia* larva, *Ascaris* male and female T.S., T.S. through pharynx region, Gizzard and intestinal region of Earthworm, T.S. through buccal cavity of *Hirudinaria*, *Zoea*, *Metazoea*, *Nauplius*, *Mysis*, T.S. of gill of *Unio*. T.S. of the shell & mantle of *Unio*, *Glochidium* larva of *Unio*.
- Dissections and / or its demonstration through Charts / Models / Video / CD / digital alternative etc and / or preparation of working models of the different systems of the following animals.
- Earthworm: Alimentary canal, Nervous system and Reproductive system.
- Leech Alimentary canal
- Cockroach : Mouthparts Digestive system, nervous system
- Prawn: Nervous system
- *Pila*: Nervous system
- Microscopic preparation or their observation of the following.
Paramecium, Euglena, Sponge spicules, gemmules, *Obelia, Hydra*, parapodium of *Nereis*, statocyst of Prawn, mouth parts of *Cockroach*, radula of *Pila*, gill of *Unio*.

Note:

- Use of animals for dissection is subject to the conditions that these are not banned under the Wildlife Protection Act or any other legislation.
- Students are required to submit the following during examination:
 - a. One assignment on the instrument/ technique about its principle, working, precautions and applications; and /or reagents / solutions preparation.
 - b. Report on study of animals from their natural habitat from their local surroundings etc.

DCZO-102: Animal Taxonomy and Biodiversity

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry

- remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
 C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcome: After successfully completing the course, the students will be able to:

- To know and appreciate non-chordate diversity
- Distinguish structural and functional diversity in non-chordates and their naming techniques
- Comprehend relationship amongst various non-chordate groups

UNIT-I

- Principles of Animal Taxonomy: Rules of nomenclature
- Principles of classification - Theories of biological classification and their history
- The concept of species, sub species, Polytypic species
- Intraspecific categories.
- Trends in Biosystematics-Chemotaxonomy, Cytotaxonomy and Molecular Taxonomy

UNIT-II

- Taxonomic characters – different kinds, origin of reproductive isolation
- Taxonomic keys-Different kinds of Taxonomic keys, their merits and demerits
- International Code of Zoological Nomenclature (ICZN): Formation of Scientific names of various Taxa.
- A study of the classification of invertebrates with distinguishing features and examples of various subdivisions

UNIT-III

- Biodiversity- Concept, principles and Types of biodiversity
- Major biodiversity areas of the world: Biodiversity hotspots
- Indian Biodiversity Areas : Zones of faunal distribution
- Major protected areas and their importance.
- Causes for the loss of biodiversity

UNIT-IV

- Biodiversity indices. Measuring -species richness, species evenness Simpson's diversity Index and Shannon's diversity index
- Biodiversity act of India, Biodiversity hot spots in India, Hope Spot Concept, UNESCO heritage sites (Kaziranga National Park etc.)
- IUCN Threatened Categories, Rare, endangered or threatened species and their Conservation strategies
- Biodiversity conservation methods (*Ex-situ* and *In-situ*)

Suggested Readings:

- R.C. Brusca & G.J. Brusca. Invertebrates. Sinauer Associates Inc. Publishers
- D.T. Anderson (Editor). Invertebrate Zoology. Oxford University Press.
- V.C. Kapoor. Theory and Practice of Animal Taxonomy and Biodiversity.
- D.N. Pandey. Animal Taxonomy.

- E. Mayer & Peter D. Ashlock. Principles of Systematic Zoology.
- E. Mayer. Elements of Taxonomy
- R.L. Kotpal. Textbook of Invertebrate Structure and Functions. Rastogi Publication
- Robert D. Barnes. Invertebrate Zoology: A Functional Evolutionary Approach
- E.J.W. Barrington. Invertebrate structure and Function
- T.C. Narendran. An Introduction to Taxonomy
- G.G. Simpson. Principles of Animal Taxonomy. Oxford IBH Publishing Company
- B.N.H.S. – The Preservation of Wild Life in India.
- B.N.H.S. - Wild Animals of India.
- B.K. Tikadar. Threatened animals of India
- Darwin. C. Origin of Species, Watts & Co. 5 and 6 Johnson's Courts, Fleet Street, E.C. 4, London.
- E.O. Wilson: Biodiversity, Academic press, Washington
- E.O. Wilson: The diversity of life (the college edition), W W Northern & co.
- M. Kato: The biology of diversity. Springer

Practicals

DCZO-102: Animal Taxonomy and Biodiversity

- Identification of insects using taxonomic keys
- Calculation of species diversity and frequency using quadrat method.
- Visit any National Park, Sanctuary, Forest area or nearby protected area to study biodiversity and live animals of the area. Also, to prepare and submit report of the field trip.
- Spotting: Photographs/Models of wild animals of Rajasthan (Amphibians, Reptiles, Aves and Mammals) to study their distinguishing features, classification, Habit & Habitat and conservation status.

Note:

Those Institutions which are already having Zoology Museums should not procure Museum Specimens now onwards and should use charts/slides/models/photographs and digital alternatives in case of need. Those new institutions which are not having Zoology Museum in their Department should provide learning related to zoological specimens with the help of charts/slides/models/photographs and digital alternatives and visit of students to already established museums

Disciplinary Specific Minor Courses

DCBO-101: Basic Concepts of Botany

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.

- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
 C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: By the end of this course, students will be able to –

- Distinguish microscopic to macroscopic view of the plants.
- Know the basic concepts of prokaryotic cell and eukaryotic cell and their functioning.
- Sailable features of algae
- Differentiate algal members from different class of the kingdom Algae
- know the basics of life cycle of different Cyanobacteria

UNIT-I

Cell, difference between Prokaryotic and Eukaryotic cell; structure, chemical composition or protoplasm, cell wall, plasma membrane.

Characterization of Algae, Fungi, Bryophytes, Pteridophytes and Gymnosperms

UNIT-II

Plant Kingdom, Classification; Bentham & Hooker, Engler & Prantle, John Hutchinson system of classification, Diagnostic features and economic importance of Brassicaceae & Poaceae.

Economic importance of cereals (Wheat), Millets (Pearl millet), oil (Mustard), Pulses, Fibres (Cotton) and medicinal plants.

UNIT-III

Diversity in plant forms: annual, biennial and perennial; convergence of evolution of tree habit in monocotyledons and di-cotyledons, trees-largest and longest plants.

Structure of flower

Angiosperms: Distinguishing characters, difference between monocotyledons and dicotyledons

UNIT-IV

Mendel's laws of Inheritance

Plant Physiology: elementary concept of transpiration, photosynthesis, respiration

Suggested readings

- Atherly, G., Girton, J. R. and McDonald, J. F. 1999. The Science of Genetics Saunders College Publishing, Fort Worth, USA.
- Gupta, P.K. 1999. A Textbook of Cell and Molecular Biology. Rastogi Publications, Meerut.
- Molecular Cell Biology. W.H. Freeman & Co. New York, USA.
- Russel, P. J. 1998. Genetics. The Benjamin/Cummings Publishing Co. Inc., USA.
- Powar C. B. Cell Biology Himalaya Publishing House, 1991
- Singh, V., Pandey, P.C. and Jain, D.K. 1998-99. Botany, Rastogi Publications, Meerut.

Practicals
DCBO-101: Basic Concepts of Botany

- Study of representative plants of Angiosperm families included in the syllabus.
- Anatomy of Primary growth in monocot and dicot plants by preparing temporary slides.
- Demonstrate the transpiration, aerobic and an aerobic respiration.
- To demonstrate the evolution of oxygen during Photosynthesis.
- To demonstrate the necessity of light, CO_2 for Photosynthesis.
- To compare the rates of Transpiration in different environmental conditions.
- To study the economic importance of Cereals (Rice, Wheat), Millets (Pearl Millet), Oil (Mustard), Fibres (Cotton, Jute) and Medicinal Plants.
- Maintenance & submission of a record of all the Laboratory activities.

DCCH-101: General Chemistry-I (Minor)

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: By the end of this course, students will be able to –

- Explain the fundamental principles of atomic structure.
- Demonstrate knowledge of the periodic table
- Analyze the chemical behavior and reactivity of main group elements.
- Apply key concepts of chemical bonding.
- Identify and classify organic compounds
- Demonstrate skills for laboratory techniques

UNIT – I

Atomic Structure:

Concept of atom in ancient India, Bohr's theory & its limitations, atomic spectrum of hydrogen atom, de Broglie equation, Heisenberg's Uncertainty Principle and its significance, Postulates of wave mechanics, Time independent Schrödinger's wave equation, well behaved wave function, significance of ψ and ψ^2 , Quantum mechanical treatment of H- atom, Quantum numbers and their significance, Normalized and orthogonal wave functions, Sign of wave functions, Radial and angular wave functions for hydrogen atom, Radial function plots, radial probability distribution plots, angular distribution curves, Shapes of s, p, and d orbitals.

UNIT – II

Periodicity of Elements:

s, p, d, f block elements, the long form of periodic table, Detailed discussion of the following properties of the elements, with reference to s & p-block, Effective nuclear charge, shielding or screening effect, Slater rules, variation of effective nuclear charge in periodic table, Atomic radii (van der Waals), Ionic and crystal radii, Covalent radii (octahedral and tetrahedral), Ionization enthalpy, Successive ionization enthalpies and factors affecting ionization energy, Applications of ionization enthalpy, Electron gain enthalpy, trends of electron gain enthalpy, Electronegativity, Pauling's/ Mulliken's/ Allred Rachow's/ and Mulliken-Jaffé's electronegativity scales, Variation of electronegativity with bond order, partial charge, hybridization, group electronegativity, Sanderson's electron density ratio.

UNIT – III

Chemistry of main group elements:

s-Block Elements: General characteristics, diagonal relationships and anomalous behavior of first member of each group, Reactions of alkali and alkaline earth metals with oxygen, hydrogen, nitrogen and water, common features of hydrides, oxides, carbonates, nitrates, sulphates of alkali and alkaline earth metal compounds, complex formation tendency and solutions of alkali metals in liquid ammonia, Comparative study, diagonal relationship, salient features of hydrides, solvation and complexation tendencies including their function in bio-system and introduction to alkyls and aryls.

p-Block Elements: Periodicity in properties of p-block elements with special reference to atomic and ionic radii, ionization energies, electron-affinity, electronegativity, allotropy, inert pair effect, catenation including diagonal relationship, Structure, bonding and properties of hydrides of group 13, oxides of phosphorus and sulphur, oxoacids of phosphorus, halides of silicon and phosphorus, borazine, silicates, silicones.

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

UNIT – IV

Basic Concepts of Organic Chemistry

Structure and Bonding: Hybridization, bond lengths and bond angles, bond energy, localized and delocalized chemical bonding, van der Waals interactions, inclusion compounds, clathrates, charge transfer complexes, resonance, hyper conjugation, aromaticity, inductive and field effects, and hydrogen bonding. Mechanism of Organic Reactions: Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking, Types of reagents – electrophiles and nucleophiles, Types of organic reactions, Energy considerations. Reactive intermediates – Carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples), Assigning formal charges on intermediates and other ionic species, Methods of determination of reaction mechanism (product analysis, intermediates, isotope effects, kinetic and stereochemical studies).

Suggested Readings:

- Lee, J.D. *Concise Inorganic Chemistry* ELBS, 1991.
- Cotton, F.A., Wilkinson, G. & Gaus, P.L. *Basic Inorganic Chemistry*, 3rd ed., Wiley.
- Douglas, B.E., McDaniel, D.H. & Alexander, J.J. *Concepts and Models in Inorganic Chemistry*, John Wiley & Sons.
- Huheey, J.E., Keiter, E.A., Keiter, R.L. & Medhi, O.K. *Inorganic Chemistry: Principles of Structure and Reactivity*, Pearson Education India, 2006.
- Graham Solomon, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, John Wiley & Sons (2014).
- McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning India Edition, 2013.

- Sykes, P. *A Guidebook to Mechanism in Organic Chemistry*, Orient Longman, New Delhi (1988).
- Finar, I.L. *Organic Chemistry* (Vol. I & II), E.L.B.S.
- Morrison, R.T. & Boyd, R.N. *Organic Chemistry*, Pearson, 2010.
- Bahl, A. & Bahl, B.S. *Advanced Organic Chemistry*, S. Chand, 2010.

Practicals

DCCH-101: General Chemistry-I (Minor)

1. Basic Laboratory techniques

- Calibration of Thermometer
Naphthalene (80-82°C), Acetanilide (113.5-114°C), Urea (132.5-133°C), Distilled Water (100°C)
- Distillation
Simple distillation of ethanol-water mixture using water condenser
Distillation of nitrobenzene and aniline using air condenser
- Crystallization
Concept of induction of crystallization
Phthalic acid from hot water (using fluted filter paper and stem less funnel)
Acetanilide from boiling water
Naphthalene from ethanol
Benzoic acid from water
- Decolourisation and crystallization using charcoal
Decolourisation of brown sugar (sucrose) with animal charcoal using gravity filtration
Crystallization and decolorization of impure naphthalene (100g of naphthalene mixed with 0.3g of Congo Red using 1g decolorizing carbon) using ethanol.
- Sublimation (simple and Vacuum)
Camphor, Naphthalene, phthalic acid and Succinic acid.
- Determination of melting point/ boiling points
- Determination of melting point: Naphthalene, Benzoic acid, Urea, Succinic acid, Cinnamic acid, Salicylic acid, Acetanilide, m-Dinitrobenzene p-Dichlorobenzene, Aspirin.
Determination of boiling points: Ethanol, Cyclohexane, Toluene, Aniline and Nitrobenzene.

2. Viva-Voce

3. Evaluation of record book of experiments performed in semester.

DCMA-101: Calculus-I (Minor)

Credits: 3L+1T+0P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	40
Internal Test (C2)	10+5	1hr	
External Examinations	70	3hr	
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: After completion of this course the student will be able to:

- Sketch curves in a plane using its mathematical properties in the different coordinate systems of reference.
 - Apply derivatives in Optimization, Social sciences, Physics and Life sciences etc.
 - Compute curvature and may find the asymptotes by inspection
- Compute area of surfaces of revolution and the volume of solids by integrating over cross-sectional areas.

UNIT-I

Tangents and Normal's, Sub tangent and subnormal (Cartesian and polar forms), Derivative of curve (Cartesian and Polar form), polar curves, angle between the radius vector and tangent, Pedal equations, Curvature: Curvature of Circle, Radius of curvature formula for Cartesian, Parametric, Polar and Pedal forms, and problems.

UNIT-II

Partial differentiation: Definition, and examples of partial derivatives, Homogeneous function, Euler's theorem and its applications, Total differential coefficient, change of variables (Polar to Cartesian and vice-versa), maxima and minima of functions of two variables including the Lagrange's method of undetermined multipliers.

UNIT-III

Asymptotes: Asymptotes of the general algebraic curves, Asymptotes parallel to the axis, Oblique asymptotes, Asymptotes by inspection. Envelops and Evolutes.

UNIT-IV

Multiple points and curve tracing: Concavity and Convexity of a curve, Test of concavity, convexity and point of inflexion, Multiple point, Necessary conditions for the existence of a double point, Procedure for tracing the curve in Cartesian, Parametric and Polar forms.

Suggested Readings:

- Thomas' Calculus: G.B. Thomas, 2018, Pearson
- Calculus Vol. 1 and 2, T.M. Apostol, 2007, Wiley.
- Calculus: M. Spivak, 2006, Cambridge.
- Calculus: J. Stewart, 2012, Cengage Learning.

DCPY-101: Mechanics

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt

one question from each unit.

- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	15	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)

C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcomes: The student teachers will be able to:

- Acquaint with the key concepts of mechanics.
- Appreciate the applications of the concepts in real life situations.
- Solve the problems based on mechanics.
- Apply the theory in execution of practicals.

UNIT-I

Frames of Reference: Inertial and non-inertial frames, Galilean transformations, pseudo forces, transformations of displacement, velocity and acceleration in rotating frames, Coriolis force and its applications, Foucault's pendulum, Centre of mass and laboratory reference frames.

System of particles: centre of mass, equation of motion, system of variable mass, single stage and multistage rocket, energy and momentum conservation, concepts of elastic and inelastic collisions.

UNIT-II

Central forces: Motion under a central force, conservation of angular momentum, Kepler's laws, different types of orbits i.e. circular, elliptical, parabolic and hyperbolic orbits, Fields and potentials, gravitational field and potential due to spherical bodies, Gauss and Poisson equations for gravitational potential, gravitational self-energy.

UNIT-III

Rigid body dynamics: angular momentum, equations of rotational motion, conservation theorems for energy, momentum and angular momentum, rigid body, degrees of freedom, moment of inertia and their products, inertial coefficients, Euler's equations, principal moments and axes, product of inertia.

UNIT-IV

Elasticity: Young's modulus, bulk modulus and modulus of rigidity, Poisson's ratio, relation among elastic constants, Theory of bending of beams and cantilever, Torsion of a cylinder, Bending moments and Shearing forces, determination of Y by bending of beam method, Searle's two bar experiment, determination of modulus of rigidity by static and dynamic methods.

Suggested Readings:

- E.M. Purcell, Editor, Berkeley Physics Course, Vol. 1, Mechanics, McGraw Hill.
- R.P. Feynmann, R.B. Lighton, M. Sands, The Feynmann Lectures in Physics, Vol. 1. B.I. publications, Bombay, Delhi, Calcutta, Madras.
- Mechanics of particles, Rigid Bodies and Continuous Media (In Hindi) by Kalra, Bhandari and Kak

- Mechanics: J.C. Upadhyay
- Mechanics: R.K.Shukla and Anchal Srivastava.
- Concepts of Physics: A Beiser

Practicals **DCPY-101: Mechanics**

- To study the variation of power transfer to different loads by a DC source and verify maximum power transfer theorem. (Plotting of the graph).
- Conversion of a Galvanometer into a ammeter (Range 1A).
- Conversion of a Galvanometer into a Voltmeter (Range 1V).
- To determine dispersive power of prism.
- Study of bending of a cantilever or a beam.
- Study of torsion of a wire (static and dynamic methods.)
- Study of flow of liquids through capillaries.
- Determination of surface tension of a liquid by different methods.
- Study of viscosity of a fluid by different methods.
- To determine internal resistance of Lechlanche Cell using a Potentiometer.
- To study the characteristics of a semiconductor junction diode and to determine forward and reverse resistances.
- To study the random decay and determine the decay constant by statistical method.
- To determine Poisson's ratio of rubber tube.
- To determine young's modules by bending of beam.
- To determine Y , η and σ by Searle's method.
- To determine modulus of rigidity of material of wire using Maxwell's needle.
- To determine modulus of rigidity by statical vertical method.
- To determine modulus of rigidity by statical horizontal method.

Suggested Readings:

- Concept of Quantum Mechanics; Beiser (McGraw Hill)
- Practical Physics, G.L. Squires, 2015, 4th Edition, Cambridge University Press.
- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Edn, 2011, Kitab Mahal
- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal1985, Vani Publication.

DCZO-101: Biology of Non-Chordates

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination:3hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry

remaining proportion of the maximum marks of the paper.

- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	28
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	40	3hr	
External Examinations: Practical	30	3 hr	12
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)

C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

Course Learning Outcome: After successfully completing the course, the students will be able to:

- Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.
- Familiarize with hands on experience of materials demonstrating the diversity of protists and non-chordates.
- Know the process of physiological mechanisms are used in very diverse organisms

UNIT-I

- Outline classification of Protozoa up to order, General structural organization of Amoeba, Euglena and Plasmodium
- Habit, habitat, structure, nutrition, osmoregulation and reproduction of Paramecium
- Locomotion in Protozoans: pseudopodial, ciliary and flagellar.
- Nutrition in Protozoa; Reproduction in Protozoa

UNIT-II

- Outline classification of Porifera and coelenterates up to order.
- Habit, habitat, morphology, internal structure, reproduction of *Sycon*, Canal system and skeleton in sponges
- Habit, habitat, morphology, internal structure, nutrition and reproduction of *Obelia*, Polymorphism in coelenterates, coral reefs
- Outline classification of Platyhelminthes and Nemetehelminthes up to order.
- Habit, habitat, morphology, internal structure, nutrition and reproduction and life cycle of *Fasciola* and *Ascaris*, Parasitic adaptations in Helminthes

UNIT- III

- Outline classification of Annelida and Arthropoda up to order
- Habit, habitat, morphology, internal structure, nutrition, respiration, circulation, excretion, nervous system and reproduction of *Hirudineria* and *Palaemon*
- Paripatus*: structure and affinities.
- Mouth parts and feeding habits of insects

UNIT-IV

- Outline classification of Mollusca and Echinodermata up to order
- Habit, habitat, structure, nutrition, respiration, blood vascular system, excretion, nervous system and reproduction of *Pila* and *Asterious*
- Torsion in Gastropoda.
- Larval forms of Echinodermata

Suggested Readings:

- Modern Textbook of Zoology Invertebrates by R.L. Kotpal –(Rastogi Publication, Meerut 10th Revised Edition)
- Invertebrate Zoology series (Protozoa of Echinodermata) by R.L. Kotpal - - (Rastogi Publication , Meerut)
- Invertebrate Zoology by E.L. Jordan and P.S. Verma – S. Chand & Co., Delhi
- Invertebrate Zoology by J.K. Dhami and P.S. Dhami – S. Chand & Co., Delhi
- A textbook of Invertebrate Zoology by S.N. Prasad – (Kitab Mahal, Allahabad)
- Life of Invertebrate Zoology by Russel and Hunter – (Macmillan)
- Invertebrate Zoology by R.D. Barnes :- (W.B. Saunders, Philadelphia)
- A manual of Zoology Vol. I by Ekambernatha Ayyar (Vishwnathan, Madras)
- The invertebrate series of L.H. Hyman – (McGraw Hill)
- A student's textbook of Zoology by Adma Sedgwick Vol. I, II & III (Central Book Depot, Allahabad)
- A textbook of Zoology Vol. I by Parkar and Haswell – (Macmillan)
- Lower non chordate, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur
- Higher non Chordate, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur
- Animal taxonomy and evolution, Dr VS Pawar, Hindi Edition, College book centre, Chaura Rasta, Jaipur

Practicals

DCZO-101: Biology of Non-Chordates

- Study of museum specimens with respect to levels and patterns of organization biosystematics, biodiversity, adaptations, development stages, population dynamics, ecological implications:
- **Porifera:** *Sycon, Spongilla, Euplectella, Leucosolenia, Hylonema, Hippospongia, Euspongia;*
- **Coelelerata:** *Hydra, Tubularia, Millepora, Physalia, Porpita, Vellela, Aurelia, Tubipora, Alcyonium, Metridium, Pennatula, Grantia, Fungia, Gorgonia.*
- **Helminthes:** *Fasciola, Taenia solium, Planaria, Ascaris, Ancylostoma;*
- **Annelida:** *Nereis, Heteroneresis, Aphrodite, Chaetopterus, Arenicola, Pheretima, Hirudinaria*
- **Arthropoda:** *Palaemon, Eupagurus, Scolopendra, Apis, Peripatus.*
- **Mollusca:** *Chiton, Pila, Aplysia, Helix, Dentalium, Mytilus, Pinctada, Unio, Sepia, Loligo Octopus:*
- **Echinodermata:** *Antedon, Holothuria, Cucumaria, Astropecten, Asterias, Echinus*
- Study of Permanent slides *Paramecium, Paramecium* in Conjugation, *Paramecium* binary fission, *Euglena, Vorticella, Sycon* L.S., *Sycon* T.S. , *Hydra* L.S., *Hydra* T.S, Cercaria larva, Metacercaria, Miracidium larva, Sporocyst larva, Redia larva, *Ascaris* male and female T.S., T.S. through pharynx region, Gizzard and intestinal region of Earthworm, T.S. through buccal cavity of *Hirudinaria*, Zoea, Metazoea, Nauplius, Mysis, T.S. of gill of *Unio*. T.S. of the shell & mantle of *Unio*, Glochidium larva of *Unio*.
- Dissections and / or its demonstration through Charts / Models / Video / CD / digital alternative etc and / or preparation of working models of the different systems of the following animals.
- Earthworm: Alimentary canal, Nervous system and Reproductive system.
- Leech Alimentary canal
- Cockroach : Mouthparts Digestive system, nervous system
- Prawn: Nervous system
- *Pila*: Nervous system
- Microscopic preparation or their observation of the following.
Paramecium, Euglena, Sponge spicules, gemmules, *Obelia, Hydra*, parapodium of *Nereis*, statocyst of Prawn, mouth parts of *Cockroach*, radula of *Pila*, gill of *Unio*.
- Culture of *Paramecium, Euglena* and *Amoeba*.

Note:

- Use of animals for dissection is subject to the conditions that these are not banned under the Wildlife Protection Act or any other legislation.

- Students are required to submit the following during examination:
 - One assignment on the instrument/ technique about its principle, working, precautions and applications; and /or reagents / solutions preparation.
 - Report on study of animals from their natural habitat from their local surroundings etc.

DCPE-101 - Foundations of Physical Education, Anatomy and Physiology

Credits: 3L+1T+0P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

Common Assessment Guidelines

To foster higher-order thinking, critical analysis, and application in physical education contexts:

- Question Paper Pattern:** Divided into Part A (compulsory, short answers) and Part B (long answers with choices).
 - Part A: 10 questions (2 marks each, total 20 marks) covering all units; short-answer type.
 - Part B: 4 questions (one per unit, 300-400 words each) with internal choices; each carries 12.5 marks (total 50 marks).
- Difficulty Level:** Easy (30%), Average (40%), Difficult (30%).

Distribution Marks for the course			
Paper	Max. Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1 hr	12
Internal Test (C2)	10+5	1 hr	
External Examinations	70	3hr	28
Total Marks	100		40

Note: C1 (Internal Test): Written Test as per schedule (at the end of 8th week)

C2 (Continuous Assessment): 10 marks (written/assignment/project/seminar/quiz) + 5 marks (presentation/report); end of 15th week.

Course Learning Outcomes

By course end, students will be able to:

- Analyze the philosophical, historical, and interdisciplinary foundations of physical education and their role in holistic student development (Analyze level).
- Evaluate the evolution of physical education in India and globally, including key events and awards, to inform inclusive teaching practices (Evaluate level).
- Explain the structure, functions, and interrelations of major body systems, applying this knowledge to safe physical activity design for diverse learners (Apply level).

- Integrate anatomical and physiological principles into educational strategies for promoting health and preventing injuries in school settings (Create level).

Course Content

Unit I: Philosophical and Interdisciplinary Foundations

- Meaning, definition, scope, aims, and objectives of physical education.
- Need and importance in modern contexts; misconceptions and relationship with humanities, sciences, and other disciplines.
- Philosophical bases: Idealism, pragmatism, naturalism, realism, and their implications for physical education.

Unit II: Historical Evolution of Physical Education

- Development in India: Vedic, early/late Hindu, medieval periods; pre- and post-independence eras.
- Global milestones: Ancient and modern Olympic Games; Asian, Commonwealth, and South Asian Games.
- National awards: Arjuna, Dronacharya, Major Dhyan Chand Khel Ratna, Rajiv Gandhi Khel Ratna.

Unit III: Fundamentals of Human Anatomy

- Importance of anatomy in physical education; basic concepts of cells, tissues, organs, and systems.
- Skeletal system: Bones, joints, muscle fibers (fast/slow twitch); movements around joints.
- Muscular system: Classification, structure, functions, properties, types, and contractions.

Unit IV: Key Physiological Systems

- Respiratory and circulatory systems: Structures, types, mechanisms.
 - Endocrine system: Major glands' locations and functions.
 - Digestive and excretory systems: Structures and functions.
 - Nervous system: Brain, spinal cord, neurons (structure and function).
- **Assessment Rubric:** Classroom tests (knowledge recall/application), projects/assignments (analysis/synthesis), presentations (communication/critical thinking).
- **Activities:** Lectures, projects, seminars, term papers, assignments, presentations, case studies.

Common Teaching-Learning Strategies

Courses employ blended approaches: lectures, demonstrations, seminars, discussions, videos, charts, and interactive methods. Virtual platforms include Google Classroom, Cisco Webex, OERs, Swayam (www.swayam.gov.in), Swayam Prabha (www.swayamprabha.gov.in), E-Yantra (www.e-yantra.org), Virtual Labs (www.vlabs.co.in), FOSSEE (www.fossee.in), Spoken Tutorials (www.spoken-tutorial.org), National Digital Library (www.ndl.iitkgp.ac.in), and e-journals (www.ess.infn.net.ac.in). DVD videos and e-textbooks/e-journals support current topics. Practical elements (e.g., movement analysis) use approved sites if needed.

Brain-based learning: Create stress-free environments with constant feedback, encouraging creative thinking and learning from errors. Breaks include recreational activities to boost cognition. Emphasize inclusivity (e.g., adaptive strategies for diverse learners) and technology for experiential learning.

Suggested References

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2. Appuseries. (2022). *How the Human Body Works* [Video series]. YouTube.
3. Bannister, L. H., et al. (2021). *Gray's Anatomy*. Churchill Livingstone.
4. Bhatia, K. K., & Narang, C. L. (2022). *Philosophical & Sociological Bases of Education*. Ludhiana: Prakash Bros.
5. Boone, T. (2023). *Exercise Physiology*. Jones & Bartlett Learning.
6. Bucher, C. A. (2021). *Foundations of Physical Education* (Updated ed.). St. Louis: Mosby.
7. Davidson, D. S., & Morgan, B. (2022). *Human Body Revealed*. Dorling Kindersley.
8. Dash, B. N. (2022). *Principles of Education*. Hyderabad: Neel Kamal.
9. Deshpande, S. H. (2020). *Physical Education in Ancient India*. Amravati: Degree College of Physical Education.
10. E-Learning for Kids. (2022). *Science: Body Parts* [Online]. <http://www.e-learningforkids.org>
11. Foss, M. L., et al. (2021). *Fox's Physiological Basis for Exercise and Sport*. McGraw-Hill.
12. Get Body Smart. (2023). *Human Anatomy and Physiology* [Online]. <http://www.getbodysmart.com>
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14. Kamlesh, M. L. (2023). *Sociological Foundations of Physical Education*. Delhi: Metropolitan Book Co.
15. Kapri, B. C. (2023). *Fundamentals of Physical Education*. Delhi: Friends Publication.
16. Pandey, R. S. (2021). *Philosophical & Sociological Foundations of Education*. Agra: Vinod Pustak Mandir.

AEVA-101: Language I (As per the 8th Schedule of Constitution of India)

Credits: 3L+0T+1P	Marks 100
Contact hours per week: 5	C1+C2=30
External Examination: 3 hours	C3=70

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	15	1hr	40
Internal Test (C2)	10+5	1hr	
External Examinations: Theory	70	3hr	
Total Marks	100		40

Note: C1: Written Test as per schedule (at the end of 8th week)
 C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc. (at the end of 15th Week).

About the Course:

Language has undeniable links with all kinds of learning. Language enables an individual to understand new concepts, exchange ideas and communicate thoughts with fellow beings. To appreciate fully the role of language in education, one must begin to develop a holistic perspective on language. Language needs to be examined in a multi-dimensional space, giving due importance to its structural, literary, sociological, cultural, psychological, and aesthetic aspects. The National Education Policy 2020 envisages imparting language skills as part of holistic education. It lays thrust on the need to enhance linguistic skills for better cognitive development and the development of a rounded personality of the learners. This course aims at enabling student teachers to enhance their ability to listen, speak, read, write and demonstrate linguistic skills in an effective manner. Linguistic skills - listening, speaking, reading, writing, speaking effectively - are fundamental to constructing knowledge in all academic disciplines, and, participating effectively in the world of work and creating sense in the everyday life. Through this course, the students will be able to enhance proficiency in reading with comprehension, understanding, thinking, and conceptualizing. The course seeks to enhance critical thinking abilities and effective communication skills of student teachers. The course involves hands-on activities and practical sessions that help student teachers develop and use linguistic skills in a variety of situations.

Course Learning Outcomes

After completing the course, the student teachers will be able to:

- Demonstrate knowledge and capacity for effective listening, speaking, reading, writing and critical thinking.
- Recognize the link between language and cognition and using linguistic knowledge and skills for effective communication of ideas and thoughts.
- Build inter-personal relationships and enhance social skills.

UNIT – I**Understanding Language, Communication and Cognition**

- a) Language, communication, and cognition; Definitions and functions of language. Types of communication, Language, culture and society, Bi-/Multilingualism in India, Language learning, translation, formal and informal communication, verbal and non- verbal communication, gestures language skills (listening, speaking, reading, & writing) and the new-age technologies. Language as a means of communication and language as a medium of cognition.
- b) Nature and process of communication: principles, Definition, and types; Language: Definition, characteristics, functions; Language and society: language variation, language and dialect, language policy and language planning, language standardization; Multilingualism in Indian context, Language as a means of communication and language as a medium of cognition.
- c) The process of communication, barriers to communication, written and oral communication, the story of human communication from early times to new age; Language variation, Multilingualism.
- d) Context of communication, the role of decoder, face to face interaction, turn taking, conversation, politeness principles, opening and closing, regional variation, social variation, the standard language.

UNIT – II**Understanding Grammar**

- a) Classification of speech sounds and letters, stress, pitch, tone, intonation and juncture, parts of speech, identification of morphemes, word formation processes, sentences-simple, complex, and compound, semantics and pragmatics, lexical semantics, speech acts.
- b) Production of speech sounds in languages; Suprasegmentals: stress, pitch, tone, intonation; Word formation processes; Sentence formation, semantics, and pragmatics.
- c) Identification of morphemes, word formation processes; Sentence formation, vocabulary formation; Pragmatics and speech acts.
- d) Sound production in the language; Coining new words, Speech acts.

UNIT - III**Reading Skills**

- a) Reading comprehension, types of reading, text, meaning and context, reading as an interactive process; strategies for making student's active readers and developing critical reading skills; Understanding denotative and connotative aspects of a text, Vocabulary development through reading.

- b) Features that make texts complex, reading as an interactive process; Strategies for making students active readers and developing critical reading skills; Understanding denotative and connotative aspects of a text, Vocabulary development through reading.
- c) Reading discipline-based texts; vocabulary development

Speaking skills

- a) Speaking to learn and learning to speak; situational conversations and role plays; tasks/activities for developing speaking (speech, elocution, discussion, debate, storytelling, illustrations).
- b) Activities for developing speaking, role play; the impact of culture on speaking.
- c) Presentation and speaking skills; Practicing narrative skills; Body language, voice, and pronunciation; Creating interest and establishing a relationship with the audience.

Writing Skills

- a) Speech versus writing; Types of writing; writing for specific purposes (essays, letters, and reports).
- b) Language and style of Writing; Dealing with New Words (Academic Vocabulary Building).
- c) Summarizing and Paraphrasing techniques.

UNIT - IV

Listening Skills

- a) Why listening is important; kinds of listening; Listening strategies.
- b) Need for modelling good listening behaviour; Listening across the curriculum, note taking.
- c) Listening Comprehensions and Recorded speeches/texts; Understanding of various accents.

Academic writing

- a) Academic writing components; development of academic language; Activities to develop academic writing skills.
- b) Developing Critical, analytical, and interpretive thinking skills.
- c) Learning to analyze.

Critical thinking

- a) Enhancing Critical thinking abilities; Critical Interpretation, Questioning and Challenging your Beliefs and Values; developing ideas and evaluating an argument.
- b) Observing a problem, describing the problem, framing the problem, comparing, and evaluating a problem.

Suggestive Practicum

- How do you interpret every day and reflect what you read? Prepare a report.
- Analyze a recorded video from the perspective of voice and pronunciation and write a report.
- Observing, describing and frame a problem and evaluating it.

Suggestive Mode of Transaction

Teaching this course will involve a mix of interactive lectures, tutorials, and practical involves such as discussion, role plays, projects, simulations, workshops, and language-awareness activities. The teaching intends deeper approaches to learning involving in- class room discussion, developing the critical thinking/ problem solving abilities among the students and will also focus on situations where in our daily lives the one would be performing tasks that involve a natural integration of language skills. The students are expected to read assigned chapters/ articles before the session and the course requires active participation from the students.

Suggestive Mode of Assessment

The assessment of the learner will be primarily based on the assessment of both linguistic and communicative skills using a battery of tests and test types, group work and projects.

Suggestive Reading Materials

Teachers may suggest books/readings as per the need of the learners and learning content.

AEVA-102 A: Art Education (Performing and Visual) and Creative Expressions
Exemplar 1 - Puppetry

Credits: 1L+0T+1P	Marks 50
Contact hours per week: 3	C1+C2=5+10
External Examination: 2 hours	C3=35

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	5	1hr	20
Internal Test (C2)	10	1hr	
External Examinations	35	2hr	
Total Marks	50		20

Note: C1: Written Test as per schedule (at the end of 8th week)

C2: Performance activities as per Suggestive Mode of Assessment (before End-Semester examination).

About the Course

Engagement with various forms of art as self-expression and need to develop sensibility to appreciate them has been an important concern in educational theory and practice. This concern is premised on the claim that forms of self-expression contribute immensely to the development of cognitive, affective, and psycho-motor dimensions among children, as well as that through one or another art form, children come to explore ways of expressing themselves. Further, it is also the case that critical appreciation of art enables children to form judgments of a very special kind, namely, aesthetic judgment. This enables students as they grow into adults to have focused attention on making sense of and appreciating cultural productions.

Children enjoy artwork a lot. They explore and find meaning in artwork. Their psycho-motor skills get developed through art. The huge element of socialization is acquired through different forms of art. They get to know each other and understand each other and make friends through art. They develop their peer group through getting involved in art forms. Learning to work with others is also achieved through art. It gives them space to think independently, create and reflect. It is one space where all the three are involved- hand, head, and heart.

Therefore, students will need to bring an element of art in practices that they engage in. To be able to do this, they need an appreciation of art in general, familiarity with one art form, and basic skills and capabilities to be creative and artful. Additionally, they should be familiar with some critical debates in art education, even if their work is in other subject areas.

To this end in the first semester students will do one course that aims to help them recognize and appreciate the importance of aesthetic judgment, develop familiarity with an art form and basic skills to be creative and artful in their expressions. Skills develop from practice, therefore hands-on training in doing art will be emphasized in this course. This course aims to help students develop a habit of performing skillful activities that are essentially aesthetic and artful which is expected to contribute to other educational practices that they develop in other courses in the programme. Therefore, this course will explicitly relate this skill to activities that practitioners of education

engage in, like teaching, development of teaching-learning material, and content of other subject areas wherever possible.

Puppetry

Puppetry is an integrated art form, which takes into its fold everything from fine arts to performance. Puppetry is one of the oldest forms of performing art. Puppetry has evolved over the years into a sophisticated form of art. The journey was very interesting with a lot of ups and downs. There are thousands of forms of puppetry from simple finger puppets to highly complex puppets played by more than 3 people.

In puppetry there are two main aspects. One the designing and creating of puppets and the other playing or performing puppetry. These two skills are different. Designing needs a lot of thinking, visualization, and technical skills while performance needs high level communication skills. Hence, together they make a consolidated a high range of skills. In this course, students are exposed to different forms of puppets and puppetry. There will be a discussion around the forms and the aesthetic sense of puppetry. Later the students are encouraged to prepare, design and create puppets. They then prepare script and play the puppets.

This creation of the puppets together in small groups with a lot of discussions and give and take helps the students develop working together skills and conceptual understanding.

Course Learning Outcomes

After completion of this course, student teachers will be able to:

- articulate the importance of aesthetics and art in secondary education,
- demonstrate their familiarity with and appreciation of puppetry,
- design puppets,
- practice and create a short puppetry show.

UNIT - I

Importance of Aesthetics and Art education

Basic idea of aesthetics and art, aesthetic dimensions manifested in human life. Examples of art, to engage students in identifying aesthetic aspects of daily life, develop aesthetic judgment and gain familiarity with the role of art in education. Introduction to three aspects of art in education: The value of art itself and its 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.

UNIT - II

Designing Puppets

Puppetry, its history in Indian perspective and specifically about how puppets work. Imagination for designing puppets, visualizing use of puppets and technicalities of designing puppets. These will be learnt by designing puppets. Learning and constructing finger puppets and move towards small shapes through papers, like Fish, birds, rat - Design masks, flat masks, and masks with dimensions. Designing puppets with old newspapers and colour papers. Decorate it and design it in such a way that it can be played, performed. Preparation of costumes and other accessories.

UNIT - III

Performing the puppets

Performance of puppetry and the level of communication skills for creating an engaging story and performing it with the help of puppets. Relating performance/activity in the educational context. Learning through performance of students with puppets individually, in pairs and into small groups based on skits developed. Consolidation and reflection on performance. Different aspects of puppet making and their use in class room processes. Adapting individual and group exercises in classroom situation.

Pedagogy

The Pedagogy is basically hand-on training. More emphasis is given to experiential learning. Students do things and through doing learn about art and its connection to education. The process takes them through different forms of art- fine arts, playing with colours, costume designing, facial make -up, script writing, music, and performance.

Suggestive Mode of Assessment as per following Table:

Mode of Assessment		
S.N.	Topics	Session flow
1	Aesthetics and art, art in everyday life	Based on their experience
2	Importance of art. Appreciation of art.	Discussion
3	Art for art sake. Art with social responsibility. Art for social change	Debate
4	The world of puppetry. Different forms of puppetry.	Presentations
5	History of puppetry	Lecture
6	Preparation- finger puppets	Hands on
7	Preparation of masks	Hands on
8	Preparing puppets	Hands on
9	Performing individually	Practice
10	Performing in pairs	Practice
11	Performing in groups – 3, 4, 5.	Practice
12	Assignments	Written

Suggestive Reading Materials

Teachers may suggest books/readings as per the need of the learners and learning content.

AEVA-103: Understanding India (Indian Ethos and Knowledge Systems)

Credits: 1L+1T+0P	Marks 50
Contact hours per week: 3	C1+C2=10+5
External Examination:2hours	C3=35

- Pattern of question paper aimed to examine higher order thinking, critical, thinking and analytical reasoning pertaining to the concerned subjects.
- Each question paper will be divided into two parts viz A and B. Questions of each section will cover all the units of the paper. Part A is compulsory and part B with internal choices and need to attempt one question from each unit.
- Part-A will consist of 10 compulsory questions from all the units. These questions will be short answered.
- Part B will consist of 2 questions of long answer type (300 words) from each unit with internal choices.
- Each question of part A will carry 2 marks with a total of 20 marks. Questions of part B will carry remaining proportion of the maximum marks of the paper.
- The overall question paper will have difficulty level as Easy 30%, Average: 40% and Difficult: 30%

Distribution Marks for the course			
Paper	Max.Marks	Duration	Min. Pass Marks
Internal Test (C1)	10	1hr	20
Internal Test (C2)	5	1hr	
External Examinations	35	2hr	
Total Marks	50		20

Note: C1: Written Test as per schedule (at the end of 8th week)
 C2: As per class schedule -Written test/Assignment/ Essay/ Presentation / Report/Project/ Seminar/ Quiz etc.(at the end of 15th Week).

About the Course

At a time when the world finds itself deep in dynamism, led by technological innovations and environmental changes, there is a need for an inward-looking approach to building the young minds of a country. By looking inwards, one not only finds a sociological belongingness but also a spiritual and intellectual rooting in these changing times. The course provides an overview of India's heritage and knowledge traditions across key themes of economy, society, polity, law, environment, culture, ethics, science & technology, and philosophy. It places special emphasis on the application of these knowledge traditions, helping students to not only know and appreciate India's heritage and knowledge traditions but also to independently evaluate them through a multidisciplinary lens. This evaluation would produce valuable lessons for obtaining transferable and 21st-century skills. The course requires no pre-requisite knowledge or understanding. Spread over two years, the course will establish foundational knowledge and build upon it. It will allow students to have a basic understanding of the traditions of India and how it has evolved over the years. The course is designed to enable student teachers to outline and interpret the processes and events of the formation & evolution of knowledge of India through a multidisciplinary lens; to evaluate the diverse traditions of India to distinguish its achievements and limitations, and to develop and articulate an ethics-based education rooted in Indian thought to their students in the classroom context.

Course Learning Outcomes

After the completion of the course, students will be able to:

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

UNIT - I

Introduction to the Knowledge of India and Culture - Art and Literature

- A. Definition & scope; Relevance of this knowledge.
- B. Need to revisit our ancient knowledge, traditions, and culture.
- C. Fine arts (traditional art forms, contemporary arts, arts & spirituality, arts and Identity, and art and globalization);
- D. Performing Arts (Indian dance systems, traditional Indian pieces of music, visual arts, folk arts, etc.).
- E. Literature (Sanskrit literature, religious literature, Indian poetry, folk literature, Indian fiction, Sangam literature etc.)

UNIT - II

Polity and Law

- A. Kingship & types of government (oligarchies, republics); Local administration (village administration);
- B. 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);

- A. Internal & external trade and commerce, including trade routes, Indo-roman contacts, and maritime trade of South India; Temple economy.
- B. Land ownership - land grants & property rights, land revenue systems.
- C. Understanding Arthashastra: Ideas & Criticism; Locating relevance of ancient Indian economic thought in modern-day Indian Economy.

UNIT - III

Environment & Health

- A. Understanding Equilibrium between Society & Environment: Society's perceptions of natural resources like forests, land, water, and animals.
- B. Sustainable architecture & urban planning; Solving today's environmental challenges (best practices from indigenous knowledge, community-led efforts, etc.).
- C. India's Health Tradition: Ayurveda, Siddha, Ashtavaidya, Unani, and other schools of thought; Lessons from Sushruta Samhita and Charaka Samhita;
- D. 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

The modes of curriculum transaction will include lectures, Tutorials, and Practicum.

- 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; 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 economy etc.

Suggestive Mode of Transaction

- Lectures will include learner-driven participatory sessions, and Guest lectures through experts and practitioners, such as fine arts and performing arts practitioners along with contemporary poets & writers of Indian literature.
- Tutorials will include Screening of documentaries and films followed by a discussion; Learner-driven discussions in the form of focus group discussions (FGDs), Socratic Discussions, etc.; Debate/discussion can be organized to explain India's Vedic tradition; discuss on how some of the ancient methods of teaching are relevant in today's time; discussions that help Identify ethical dilemmas in daily lives and understanding the importance of ancient ethics and values to resolve them.

Suggestive Mode of Assessment

The approaches to learning assessment will include, for example:

- Supporting the curiosity and interest of student teachers in the selected themes through a multi-modal approach, including regular assessments and actionable feedback that enable learners to outline and interpret the processes and events of the formation & evolution of knowledge of India through a multidisciplinary lens.
- Enabling the student teachers to demonstrate critical analysis and independent thinking of the processes and events in the formulation & evolution of different traditions that help student teachers evaluate the diverse traditions of India to distinguish its achievements and limitations.
- Use of first-hand or second-hand experiences that enable student-teachers to develop and articulate an ethics-based education rooted in Indian thought to their students in the classroom context.

Suggestive Reading Materials

Teachers may suggest books/readings as per the need of the learners and learning content.