INVERTIS
UNIVERSITY BAREILLY

SEMESTER - III

BASICS OF INORGANIC CHEMISTRY II	
Course Code: BEB306	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Chemistry of p-block elements

- Introduction and general characteristics; (Except Metallurgy)
- Group IIIA: B, Al, Ga, In, Tl;
- Group IV A: C, Si, Ge, Sn, Pb;
- Group V A: N, P, As, Sb, Bi;
- Group VI A: O, S, Se, Te, Po;
- Group VII A: F, Cl, Br, I, At (Halogens).

Unit II: Chemistry of d-block elements

- General Chemistry of 1st row d-block elements,
- Electronic configuration, ionization potential, oxidation states,
- Chemistry of Ti and V complexes, Chemistry of Cr and Mn complexes,
- Types of magnetic behaviour shown by transition elements

Unit III: Coordination Compounds

- Idea about double salts and complex salts, Werner's theory,
- Various definitions, types of ligands: classical ligands, non-classical ligands, The Chelate and Macrocyclic effects, Multidentate ligands,
- Stereochemistry and various coordination numbers, isomerism in coordination compounds,
- Nomenclature, stability of coordination compounds,
- Valence bond theory for bonding in coordination compounds, strength and weaknesses of valence bond approach.

Unit IV: Crystal Field Theory

- The splitting of d-orbitals in different fields (octahedral, tetrahedral, tetragonally distorted octahedral, square planar, trigonal bipyramidal). CFSE calculation.
- Jahn Teller effect in octahedral complexes.

Unit V: Radioactivity

- Atomic nucleus – nuclear stability, n/p ratio and different modes of decay, mass defect, packing fraction and nuclear binding energy.
- Nuclear forces: Meson exchange theory, elementary idea of nuclear shell model and magic numbers.
- Nuclear Fission & Nuclear Fusion.
- Radioactivity, Nature of radiations from Radioactive elements.
- Decay kinetics (decay constant, half-life, mean life period).
- Applications of radio-isotopes in: determination of structures, and radio-carbon dating,
- Artificial Radio activity.

Suggested Reading:

1. Cotton, F. A. (n.d.). Advanced Inorganic Chemistry. John Wiley.
2. Huheey, J. E., Keiter, E. A., Keiter, R., & Medhi, O. K. (n.d.). Inorganic Chemistry: Principles of Structure & Reactivity. Pearson Publications.
3. Lee, J. D. (n.d.). Concise Inorganic Chemistry. Blackwell.
4. Mingos, D. M. P. (1998). Essential Trends in Inorganic Chemistry. Oxford University Press.
5. Prakash, S., Tuli, G. D., Basu, S. K., & Madan, R. D. (n.d.). Advanced Inorganic Chemistry (Vol. I & II). S. Chand & Sons.

STATICS AND DYNAMICS	
Course Code: BEB307	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Statics

- Analytic condition of equilibrium for coplanar forces
- Equation of the resultant force
- Common catenary
- Centre of gravity
- Principle of virtual work
- Wrenches
- Null line and null plane

Unit II: Dynamics - Kinematics

- Rotation of a vector in a plane
- Radial and transverse velocity and acceleration
- Tangential and normal velocity and acceleration
- Simple harmonic motion

Unit III: Dynamics - Kinetics

- Motion under various laws of forces
- Earth's attraction
- Motion in a resisting medium

Unit IV: Advanced Dynamics

- Central orbits and Motion of a particle in three dimensions
- Kepler's laws of planetary motion

Suggested Reading:

1. Chorlton, F. (2004). Textbook of dynamics. CBS Publishers & Distributors Pvt. Ltd.
2. Loney, S. L. (n.d.). An elementary treatise on the dynamics of a particle and of rigid bodies. Kalyani Publishers.
3. Loney, S. L. (2016). An elementary treatise on statics. Read Books Ltd.
4. Loney, S. L. (2016). The elements of statics and dynamics Part-II dynamics. Read Books Ltd.
5. Sinha, H. C. (2004). Statics and dynamics. Ram Prasad & Sons.
6. Synge, J. L., & Griffith, B. A. (1959). Principles of mechanics. Tata McGraw-Hill.
7. Verma, R. S. (1984). A textbook on statics. Pothishala Pvt. Ltd.

BASIC ELECTRONICS AND CIRCUIT FUNDAMENTALS	
Course Code: BEB308	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Semiconductor diodes

- Intrinsic and Extrinsic Semiconductor, p and n type semiconductors, Energy level diagrams, Variation of resistivity with temperature, Fermi level, p-n junction diode, Depletion layer, Current flow mechanisms in forward and reverse biased diode, V-I characteristics, Static and Dynamic resistance, Zener diode and its applications.

Unit II: Rectifier

- Introduction to Rectifier, Half-wave rectifier, Full-wave rectifier (Centre-tapped and bridge), Calculation of ripple factor and rectification efficiency, Qualitative idea of C, L and π-filters

Unit III: Bipolar Junction Transistors

- n-p-n and p-n-p transistors, Physical mechanism of current flow, Active, Cut off and saturation regions characteristics of CB, CE and CC configurations, Current gains α, β and γ and relations between them.
- Load line analysis of transistors, DC load line and Q-point, transistor as 2-port Network, h-parameter equivalent circuit, Analysis of a single-stage CE amplifier using Hybrid Model. Transistor as an amplifier

Unit IV: Network Theorems

- Introduction to steady current and current density, Active and passive components, Kirchhoff's laws, Application of Kirchhoff's laws, Thevenin's theorem, Norton's Theorem, Superposition theorem and Maximum power transfer theorem.

Unit V: A C Bridges

- Introduction to AC Bridges, Maxwell's bridge, Schering Bridge, Wein's Bridge, de-Sauty's Bridge

Suggested Reading:

Text Books:

1. Boylestad, R., & Nashelsky, L. (2004). Electronic devices and circuit theory (8th ed.). Pearson Education.
2. Thareja, B. L., & Sedha, R. S. (n.d.). Principles of electronic devices and circuits. S. Chand & Company Ltd.

Reference Books:

1. Bhargava, N. N., Kulshreshtha, D. C., & Gupta, S. C. (2006). Basic electronics & linear circuits. Tata McGraw-Hill.
2. Malvino, A. P. (1993). Electronic principles. Glencoe.
3. Mehta, V. K. (2010). Principles of electronics. S. Chand & Co.
4. Morris, J. Analog electronics.
5. Mottershead, A. (1997). Electronic circuits and devices. PHI.

CHORDATA, COMPARATIVE ANATOMY AND HISTOLOGY	
Course Code: BEB309	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Lower Chordates or Protochordates

- General Features and Phylogeny of Hemichordata, Urochordata and Cephalochordata

Unit II: Higher Chordates or Vertebrates

- Cyclostomata: General features and classification of cyclostomes up to orders; Affinities of cyclostomata
- Pisces: General features and Classification up to orders; comparative morphology of Chondrichthyes & Osteoicthyes.
- Amphibia: General features and Classification up to orders; Parental care
- Reptilia: General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes
- Aves: General features and Classification up to orders; Flight adaptations in birds
- Mammals: Classification up to orders; Origin of mammals

Unit III: Anatomy of Integumentary, Digestive and Respiratory System

- Integument and its derivatives, endoskeleton - axial skeleton & appendicular skeleton
- Digestive system – Alimentary canal and associated glands
- Respiratory system – cutaneous respiration, Gills and lungs, Air sacs in birds

Unit IV: Anatomy of Circulatory, Excretory and Nervous System

- Circulatory system – Evolution of heart and aortic arches, portal systems
- Excretory system – Types of kidneys and its ducts,
- Nervous system – Comparative anatomy of Vertebrate brain

Unit V: Histological Techniques

- Principle and functioning of manual microtome, automated microtome, ultra-microtome and cryostat
- Microtomy: Sample preparation, reagents, fixatives, processing of fixed samples, dehydration, embedding, block making, staining and mounting.

Suggested Reading:

1. Young, J.Z. (2004). The life of vertebrates. III Edition. Oxford university press.
2. Kardong, K.V. (2005) Vertebrates Comparative Anatomy, Function and evolution. IV Edition. McGraw-Hill Higher Education.
3. Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
4. Young, J.Z. (2004). The life of Vertebrates. III Edition. Oxford University Press.
5. Weichert, C.K. (1970). Anatomy of Chordate. McGraw Hill.

PHYSIOLOGY, MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY	
Course Code: BEB310	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Plant Water Relations

- Diffusion, osmosis and imbibition
- Elementary idea of chemical, water and osmotic potential
- Absorption of water by cell and root, ascent of sap
- Transpiration and its significance, mechanism of stomatal movement

Unit II: Mineral Absorption and Translocation of Food

- Essential elements, macro and micronutrients
- Role of essential elements
- Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps
- Composition of phloem sap, girdling experiment; Pressure flow model
- Phloem loading and unloading.

Unit III: Photosynthesis and Plant Hormones

- Photosynthetic Pigments (Chl a, b, xanthophylls, carotene);
- Photosystem I and II, reaction center, antenna molecules;
- Electron transport and mechanism of ATP synthesis;
- C3, C4 and CAM pathways of carbon fixation
- Photorespiration: mechanism and significance
- Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene

Unit IV: Plant Biotechnology

- Introduction of Genetic engineering and Biotechnology
- Tools and techniques of recombinant DNA technology
- Plant tissue culture: Micropropagation, haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture with their applications

Suggested Reading:

1. Hopkins, W. G. (1995). Introduction to plant physiology. John Wiley & Sons, Inc.
2. Kumar, H. D. (n.d.). Molecular biology (2nd ed.). Vikas Publishing House.
3. Mohr, H., & Schopfer, P. (1995). Plant physiology. Springer-Verlag.
4. Old, R. W., & Primrose, S. B. (1989). Principles of gene manipulation. Blackwell Scientific Publications.
5. Taiz, L., & Zeiger, E. (2010). Plant physiology (5th ed.). Sinauer Associates Inc.

CHEMISTRY LAB III	
Course Code: BEB351	**Credit:** 01 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 25 (Int.: 10 + Ext.: 15)

LIST OF EXPERIMENTS

- Estimation of Ca(II) and Mg(II) in a mixture
- Determination of the amount of calcium carbonate in chalk.
- Determination of available chlorine in bleaching powder.
- Estimation of Hardness of water

Inorganic Preparation :

- Potassium tris(oxalato)chromate(III) trihydrate
- Potassiumbis(oxalato)cuprate(II) dehydrate

Note: Experiments may be added/ deleted subject to availability of time and facilities

Suggested Reading:

1. Mendham, J. (2009). Vogel's quantitative chemical analysis (6th ed.). Pearson.
2. Nad, A. K., Mahapatra, B., & Ghoshal, A. (n.d.). An advanced course in practical chemistry. New Central Book Agency (P) Ltd.

PHYSICS LAB III	
Course Code: BEB352	**Credit:** 01 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 25 (Int.: 10 + Ext.: 15)

LIST OF EXPERIMENTS

List of experiments (Perform Any Eight)

1. To determine the frequency of an electrically maintained tuning fork using Melde's experiment.
2. To determine the frequency of the AC mains using a sonometer.
3. To study the response curve of a series LCR circuit and determine:
   (a) Resonant frequency
   (b) Impedance at resonance
   (c) Quality factor (Q)
   (d) Bandwidth
4. To study the response curve of a parallel LCR circuit and determine:
   (a) Anti-resonant frequency
   (b) Quality factor (Q)
5. To determine the specific resistance of a given wire using Carey Foster's bridge.
6. To determine a low resistance using a potentiometer.
7. To calibrate a given ammeter and voltmeter using a potentiometer.
8. To draw the hysteresis curve of a given sample of ferromagnetic material and determine:
   (a) Magnetic susceptibility
   (b) Magnetic permeability
9. To determine the ballistic constant of a ballistic galvanometer.
10. To study the variation of the magnetic field along the axis of a current-carrying circular coil and estimate the radius of the coil.
11. To determine the self-inductance of a coil using Anderson's bridge with AC

Note: Experiments may be added/deleted subject to availability of time and facilities

Suggested Reading:

1. GeetaSanon. (2007). BSc practical physics (1st ed.). R. Chand & Co.
2. Indu Prakash, & Ramakrishna. A text book of practical physics (Vol. 1 & Vol. 2). Kitab Mahal.
3. Khandelwal, D. P. (n.d.). A laboratory manual of physics for undergraduate classes. Vani Publication House.
4. Worsnop, B. L., & Flint, H. T. Advanced practical physics. Asia Publishing House.

LIFE SCIENCE LAB III	
Course Code: BEB353	**Credit:** 01 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 25 (Int.: 10 + Ext.: 15)

LIST OF PRACTICALS

Practicals (Zoology):

1. **Study of the following specimens:**
   a. *Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis*, Any six common birds from different orders, *Sorex*, Bat, *Funambulus, Loris*
2. **Identification of the prepared histological slides with reasons:**
   a. TS of mammalian small intestine, TS of mammalian pancreas, TS of mammalian liver, TS of mammalian lung, Long bone, TS of vein, Mammalian kidney.
3. **Identification of vertebrae and limb bones with reasons:**
   - Atlas, Urostyle, Humerus, Radio-ulna, Femur, Tibiofibula of *Bufo sp.*
   - Atlas, Axis, Cervical vertebra, Synsacrum, Pygostyle, Humerus, Radio-ulna, Femur, Tibiotarsus and fibula of *Columba sp.*
   - Atlas, Axis, Cervical vertebra, anterior thoracic vertebra, Posterior thoracic vertebra, Sacrum, Humerus, Radio-ulna, Femur, Tibia and fibula of *Cavia sp*.

Practicals (Botany):

1. Respirometer.
2. Osmosis by using goat bladder/parchment paper.
3. Process of endo-osmosis/exo-osmosis.
4. Imbibition by using gram seeds.
5. Transpiration by using Ganong's photometer.
6. Photosynthesis by inverted funnel method.
7. Ascent of sap water moves through xylem raising the solution.
8. Four leaf method.
9. Bell Jar experiment.

Suggested Reading:

1. Bajracharya, D. (1999). Experiments in plant physiology: A laboratory manual. Narosa Publishing House.
2. Hall, B. K., & Hallgrimsson, B. (2008). Strickberger's evolution.
3. Pough, H. (n.d.). Vertebrate TO!. (8th ed.). Pearson International.
4. Practical Botany, Vol. I, II, III by H. N. Srivastava. (n.d.). Pradeep Publications.
5. Young, J. Z. (2004). The life of vertebrates (3rd ed.). Oxford University Press.

INDIAN EDUCATION SYSTEM	
Course Code: BED301	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Contemporary Indian Education System

- Structure of Indian Education: Pre-primary, Primary, Secondary, and Higher Education.
- Key reforms of education system according to NEP 2020
- Role of Education in National Development
- Multidisciplinary and Holistic Education

Unit II: Secondary Education System according to NEP 2020

- Reforms in Secondary Education: Structure, Curriculum, and Pedagogy
- Integration of Vocational Education and Life Skills
- Assessment and Examination Reforms
- Role of Technology and Digital Initiatives

Unit III: Structure and Management of Secondary Education

- Organizational structure of secondary education in India at different levels:
  - Central
  - State
  - District
  - Local
- Administration and Management of secondary education
- Role of central and state governments in secondary education
- Examination Boards and Evaluation Systems

Unit IV: Contemporary Issues and Challenges in Indian Education

- Universalization of secondary education
- Quality and access issues in secondary education
- Inclusive education and education for marginalized groups
- Role of technology in education
- Teacher education and professional development

Suggested Reading:

1. Aggarwal, J. C. (2010). Landmarks in the History of Modern Indian Education. Vikas Publishing House.
2. Agrawal, J. C., & Agrawal, S. P. (1992). Role of UNESCO in education. Delhi: Vikas Publishing House.
3. Agarwal, P. (2020). A Half Century of Indian Higher Education: Essays by Philip G Altbach. New Delhi: Sage Publications.
4. Bhatnagar, S. S., & Gupta, P. K. (2012). Educational Administration and Management. R. Lall Book Depot.
5. Chowdhry, N. K. (2009). Indian constitution and education. Delhi: Shipra Publications.
6. De, A., Khera, R., Samson, M., & Shiva Kumar, A. K. (2011). PROBE revisited: A report on elementary education in India. New Delhi: Oxford University Press.
7. Dewey, J. (2004). Democracy and education. Courier Dover Publications.
8. Government of India. (1966). Report of the education commission: Education and national development. New Delhi: Ministry of Education.
9. Government of India. (1986). National policy of education. Government of India.
10. Kaul, V. (2019). Early Childhood Education in India: A Historical and Contemporary Perspective. Springer.
11. Kochhar, S. K. (1993). Pivotal issues in Indian education. Sterling Publishers Pvt. Ltd.
12. Kumar, K. (2020). NEP 2020: A Transformational Approach to Education. Rupa Publications India.
13. Ministry of Education. (2020). National Education Policy 2020. Government of India.
14. Ministry of Human Resource Development. (2012). National policy on information and communication technology (ICT) in school education. MHRD, Government of India.
15. Mishra, S. (2022). Digital Learning and the Future of Education in India. New Delhi: Atlantic Publishers.
16. Mukherji, S. M. (1996). History of education in India. Baroda: Acharya Book Depot.
17. National Council of Educational Research and Training. (2005). National curriculum framework.
18. National Council of Educational Research and Training. (2006d). Position paper-National focus group on teaching of Indian language (NCF 2005).
19. Rajput, J. S. (2002). Educational Reforms in India for the 21st Century. Sterling Publishers.
20. Sharma, R. C., & Bhardwaj, A. (2021). Teacher Education in the Context of NEP 2020: Emerging Challenges and Innovations. New Delhi: Shipra Publications.

FUNDAMENTALS OF TEACHING	
Course Code: BED302	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Introduction to Teaching

- Concept, Nature, and Scope of Teaching
- Teaching as a Profession
- Roles and Responsibilities of a Teacher
- Teacher as a Facilitator, Guide, and Mentor
- Teaching Competencies and Skills

Unit II: Phases, Levels and Models of Teaching

- Maxims of Teaching
- Phases of Teaching
- Levels of Teaching
- Models of Teaching: Definition and Characteristics
- Families of Models of Teaching
- Models of Teaching: Concept Attainment, Inquiry Training, Advance Organizer

Unit III: Theories of Teaching

- Definitions, Importance and Historical Evolution of Teaching Theories
- Types of Theories of Teaching
    - Formal Theories of Teaching
    - Descriptive Theories of Teaching
    - Normative Theories of Teaching
- Behaviorist Theories of Teaching (Skinner and Watson)
- Cognitivist Theories of Teaching (Piaget and Bruner)
- Constructivist Theories of Teaching (Vygotsky and Dewey)

Unit IV: Assessment and Evaluation in Teaching

- Concept and Types of Assessment: Formative, Summative, and Diagnostic
- Principles of Effective Assessment
- Tools and Techniques of Evaluation: Tests, Observations, Portfolios, and Rubrics
- Continuous and Comprehensive Evaluation (CCE)
- Feedback and Reporting

Suggested Reading:

1. Aggarwal, J. C. (2009). Essentials of Educational Technology: Innovations in Teaching-Learning. Vikas Publishing House.
2. Aggarwal, Y. P. (2012). Essentials of Examination System: Evaluation, Tests, and Measurement. Vikas Publishing House.
3. Bigge, M. L., & Shermis, S. S. (1998). Learning Theories for Teachers. Allyn & Bacon.
4. Chauhan, S. S. (2007). Advanced Educational Psychology. Vikas Publishing House.
5. Kochhar, S. K. (1985). Methods and Techniques of Teaching. Sterling Publishers.
6. Mangal, S. K. (2002). Advanced Educational Psychology. Prentice Hall India.
7. Ornstein, A. C., & Hunkins, F. P. (2017). Curriculum: Foundations, Principles, and Issues. Pearson India.
8. Rao, V. K. (2003). Educational Technology. APH Publishing Corporation.
9. Sharma, S. P. (2013). Teacher Education: Principles, Theories, and Practices. Kanishka Publishers.
10. Singh, P. (2004). Educational Evaluation and Assessment. APH Publishing Corporation.

TECHNOLOGY AND EDUCATION	
Course Code: BED303	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Concept of Educational Technology and Communication

- Meaning, Scope and Significance of Educational Technology
- Types of Educational Technology
- Technology in Education and Technology of Education
- Hardware Approach and Software Approach
- Communication: Concept and Process

Unit II: Integration of Technology in Teaching and Learning

- Multimedia and Interactive Tools: Use of multimedia in education, interactive whiteboards, and digital storytelling
- Learning Management Systems (LMS): Features, benefits, and examples of LMS (e.g., Moodle, Google Classroom).
- Educational Software and Apps: Types of educational software and their applications
- Emerging Technologies: Virtual reality, augmented reality, and artificial intelligence in education
- Pedagogical Approaches: Blended learning, flipped classroom, and personalized learning
- Digital Literacy: Developing digital literacy skills among teachers and students

Unit III: Designing Instructional System

- Formulation of instructional objectives
- Meaning of Instructional Design
- Principles of instructional design and technology integration.
- Models of Development of Instructional Design (ADDIE, ASSURE, Dick and Carey Model)
- Gagne's Nine Events of Instruction and Five E's of Constructivism
- Nine Elements of Constructivist Instructional Design
- Application of Computers in Education: CAI, CAL, CBT, CML
- Process of preparing Open and Distance Learning Material (ODLM)

Unit IV: E-Learning

- Concept of e-learning
- Approaches to e-learning (Offline, Online, Synchronous, Asynchronous)
- Emerging Trends in e learning: Social learning (concept, use of web 2.0 tools for learning, social networking sites, blogs, chats, video conferencing, discussion forum)
- Open Education Resources (Creative Common, Massive Open Online Courses)
- Application of Assistive technology in E learning

Suggested Reading:

1. Aggarwal, J. C. (2014). Essentials of educational technology. Vikas Publishing House Pvt. Ltd.
2. Agarwal, J. P. (2010). Modern educational technology. Black Prints Publications.
3. Semenov, A. (2005). Information and communication technologies in schools: A handbook for teachers. UNESCO.
4. Balasubramanian, K., & Clarke-Okah, W. (Eds.). (2006). ICTs for higher education: Background paper Commonwealth of Learning. Commonwealth of Learning.
5. Conrad, K. (2001). Instructional design for web-based training. HRD Press.
6. Das, R. C. (1993). Educational technology: A basic text. Sterling Publishers.
7. Evaut, M. (Ed.). (n.d.). The international encyclopedia of educational technology.
8. Graeme, K. (1969). Blackboard to computers: A guide to educational aids. Ward Lock.
9. Belson, S. I. (2003). Technology for exceptional learners. Houghton Mifflin.
10. Haas, K. B., & Packer, H. Q. (1990). Preparation and use of audio-visual aids (3rd ed.). Prentice Hall, Inc.
11. Kulkarni, S. S. (1986). Introduction to educational technology. Oxford-IBH Publishing Co.
12. Mangal, S. K., & Mangal, U. (2019). Essentials of educational technology. PHI Learning Pvt. Ltd.
13. Mishra, S., & Sharma, R. C. (2005). Interactive multimedia in education and training. Idea Group Publishing.
14. Mayer, R. E. (2001). Multimedia learning. Cambridge University Press.
15. Naidu, S. (2006). E-learning: A guidebook of principles, procedures and practices. Commonwealth Educational Media Center for Asia.
16. National Council of Educational Research and Training. (2005). Position paper on educational technology by national focus group. NCERT.
17. Reddy, Y. M. (2016). Educational technology: Integrating technology into teaching-learning process. Neelkamal Publications.
18. Sallis, E., & Jones, G. (2002). Knowledge management in education. Kogan Page Ltd.
19. Sampath, K., Panneerselvam, A., & Santhanam, S. (1981). Introduction to educational technology. Sterling Publishers Pvt. Ltd.
20. Sharma, R. A. (2001). Technological foundations of education. R. Lal Book Depot.
21. Sharma, K. D., & Sharma, D. V. (1993). Open learning system in India. Allied Publishers Ltd.
22. Singh, L. C. (Ed.). (2012). Educational technology for teaching and learning. Dhanpat Rai Publishing Company.
23. Venkataiah, N. (1996). Educational technology. APH Publishing Corporation.
24. Written, W. A., & Schuller, C. F. (n.d.). Instructional technology: Its nature and use of A.V. materials (5th ed.). Harper and Row Publishers.

EDUCATIONAL EXCURSION	
Course Code: BED351	**Credit:** 02 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

The practical course on educational excursion aims to provide students with hands-on experience in planning, organizing, and evaluating educational trips. These excursions are designed to enhance experiential learning, promote interdisciplinary understanding, and develop organizational and observational skills.

Course Outline

- **Planning and Preparation**
  - Importance and objectives of educational excursions in curriculum.
  - Identifying suitable destinations (historical sites, museums, nature parks, etc.).
  - Developing itineraries and schedules.
  - Arranging logistics (transportation, accommodation, meals).
  - Risk assessment and safety measures.
  - Obtaining permissions and preparing necessary documentation.

  Activities:
  - Group discussions on potential excursion destinations.
  - Group wise preparation of a detailed excursion plan and itinerary.
  - Creating a checklist for logistics and safety measures.

- **Implementation and Conducting the Excursion**
  - Roles and responsibilities of organizers and participants.
  - Effective communication and coordination during the excursion.
  - Engaging students through interactive activities and observations.
  - Managing unforeseen situations and ensuring safety.

  Activities:
  - Role-playing scenarios to handle emergencies and unexpected situations.
  - Leading students on actual educational trips.

- **Observation and Data Collection**
  - Recording and documenting observations (field notes, photography, video recording).
  - Collecting feedback from participants and stakeholders.
  - Analyzing and interpreting collected data.

  Activities:
  - Writing and presenting a detailed excursion report.
  - Peer review and group discussions on the outcomes of different excursions.
  - Reflective essays on personal experiences and learnings.

- **Planning and Conducting a Virtual Excursion**
  - Selecting suitable virtual museums and observatories
  - Preparing students for the virtual excursion
  - Conducting the virtual excursion
  - Post-excursion activities: Discussions, reflections, and assessments

Evaluation Methods:

- **Preparation and Planning (20%):** Assessment based on the quality and comprehensiveness of the excursion plan and itinerary.
- **Implementation (30%):** Evaluation of the actual conduct of the excursion, including leadership, coordination, and handling of situations.
- **Observation and Data Collection (20%):** Assessment of the thoroughness and accuracy of observations and data collected during the excursion.
- **Reporting and Reflection (30%):** Evaluation based on the final excursion report / presentations / reflective essays / Viva – voce.

Course Essentials:

The course will have three components:

1. Participation in all activities of Educational Excursion (as mentioned in the course outline)
2. Report writing for Educational Excursion with participation details.
3. Participation in Viva voce at the End of Semester.

Note: For successful completion of the course, all three components are compulsory.

INVERTIS
UNIVERSITY BAREILLY

SEMESTER - IV

BASICS OF ORGANIC CHEMISTRY II	
Course Code: BEB406	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Functional Groups

- Nomenclature and Classification, structure and bonding, methods of formation, physical properties and chemical reactions of Alcohols, Phenols, Ethers, Aldehydes, Ketones, Halides, Nitro compounds and Carboxylic acids.
- Mechanisms of reactions.

Unit II: Organometallic Compounds

- Organomagnesium compounds: The Grignard reagents-formation, structure and chemical reactions
- Organozinc compounds: formation and chemical reactions
- Organolithium compounds: formation and chemical reactions

Unit III: Heterocyclic Compounds

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

Unit IV: Polynuclear aromatic compounds

- Criterion of Aromaticity: Huckel's rule and its application to homonuclear and heteronuclear compounds.
- Polynuclear Aromatic Compounds: Preparation and properties of the following compounds: naphthalene (including structure elucidation), anthracene and phenanthrene.

Unit V: Organic Synthesis via Enolates

- Organic Synthesis via Enolates Acidity of of □-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate by Claisen condensation,
- Keto-enoltautomerism of ethyl acetoacetate, Synthetic applications of acetoacetic ester, Alkylation of 1.3-dithianes. Alkylation and acylation of enamines

Suggested Reading:

1. Bahl, A., & Bahl, B. S. (Year). Organic Chemistry. S. Chand & Co.
2. Finar, I. L. (Year). Organic Chemistry (Vol. 1). Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Morrison, R. T., & Boyd, R. N. (Year). Organic Chemistry. Prentice Hall of India Pvt. Ltd.
4. Mukherji, S. M., Singh, S. P., & Kapoor, R. P. (Year). Organic Chemistry (Vols. I, II, & III).
5. Solomons, T. W. G., & Fryhle, C. B. (Year). Fundamentals of Organic Chemistry. John Wiley & Sons.
6. Wade, L. G., Jr. (Year). Organic Chemistry. Prentice Hall.

ALGEBRA AND TRIGONOMETRY	
Course Code: BEB407	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Group Theory Basics

- Definition and Examples of Groups: Fundamental definition of a group with various examples and simple properties.
- Subgroups and Cyclic Groups: Concepts of subgroups, generation of groups, cyclic groups, and coset decomposition.
- Lagrange's Theorem: Statement, proof, and consequences of Lagrange's theorem.
- Homomorphism and Isomorphism: Basic concepts of group homomorphisms and isomorphisms.

Unit II: Advanced Group Theory

- Permutation Groups and Cayley's Theorem: Definition of permutation groups and introduction to Cayley's theorem.
- Normal Subgroups and Quotient Groups: Definition, examples, and properties of normal subgroups and quotient groups.
- Fundamental Theorem of Homomorphism: Statement and applications of the fundamental theorem.
- Isomorphism Theorems for Groups: Detailed study of the first, second, and third isomorphism theorems.
- Introduction to Ring and Field: Basic definitions and examples of rings and fields.

Unit III: Complex Functions

- Complex Functions and Their Properties: Understanding complex functions and their separation into real and imaginary parts.

Unit IV: Trigonometric, Hyperbolic, and Logarithmic Functions

- Exponential and Trigonometric Functions: Study of direct and inverse trigonometric and hyperbolic functions.
- Logarithmic Functions: Definition and properties of the logarithmic function.
- Gregory's Series and Summation of Series: Introduction to Gregory's series and techniques for summation of series.

Suggested Reading:

1. Bhattacharya, P. B., Jain, S. K., & Nagpaul, S. R. (1995). Basic Abstract Algebra (2nd ed.). Cambridge University Press India Pvt. Ltd.
2. Grewal, B. S. (2017). Higher Engineering Mathematics (44th ed.). Khanna Publishers.
3. Khanna, V. K., & Bhambri, S. K. (2013). A Course in Abstract Algebra. Vikas Publishing House.
4. Malik, D. S., & Sen, M. K. (1992). Abstract Algebra. McGraw Hill Education India.
5. Narayan, S., & Mittal, P. K. (2005). A Textbook of Matrices. S. Chand & Com. Ltd.
6. Raisinghania, M. D. (2009). Advanced Differential Calculus. S. Chand & Com. Ltd.

SOLID STATE PHYSICS AND MODERN PHYSICS	
Course Code: BEB408	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Crystal Structure

- Lattice and Basis: Definition, unit cell, types of lattices, coordination number.
- Atomic Packing Fraction and Separation Between Lattice Planes: Calculation of packing fraction, relation with lattice spacing.
- Simple Crystal Structures: Structures of SC (Simple Cubic), BCC (Body-Centered Cubic), FCC (Face-Centered Cubic), Diamond, and HCP (Hexagonal Close-Packed).
- Miller Indices: Index notation, crystallographic planes, and directions.
- X-ray Diffraction and Bragg's Law: Diffraction by crystals, Bragg's Law, and Bragg's spectrometer.

Unit II: Dielectric and Magnetic Properties of Materials

- Dielectric Properties: Dielectric constant, electric susceptibility, and polarizability, Clausius-Mossotti Relation.
- Magnetic Properties of Materials: Types of magnetism (diamagnetic, paramagnetic, ferromagnetic, ferrimagnetic, and antiferromagnetic materials).
- Magnetic Hysteresis: B-H curve, hysteresis loop, and energy loss.
- Langevin's Theory: Concepts of diamagnetism and paramagnetism.

Unit III: Superconductivity

- Temperature Dependence of Resistivity: Characteristics of superconducting materials with temperature variations.
- Meissner Effect: Behavior of superconductors in magnetic fields, Type I and Type II superconductors.
- Critical Field: Temperature dependence of the critical magnetic field in superconductors.
- Introduction to BCS Theory: Qualitative understanding of the BCS (Bardeen-Cooper-Schrieffer) theory.

Unit IV: Relativity

- Frames of Reference and Galilean Transformations: Concept of reference frames and transformations.
- Concept of Ether and Michelson-Morley Experiment: Historical context and significance of the experiment.
- Special Theory of Relativity: Postulates, Lorentz transformations, length contraction, and time dilation.
- Relativistic Mechanics: Velocity addition theorem, variation of mass with velocity, mass-energy equivalence, and the energy-momentum relationship.

Unit V: Lasers and Their Applications

- Basic Concepts of Lasers: Coherence, absorption, spontaneous and stimulated emissions.
- Einstein's Coefficients and Population Inversion: Relationship between A and B coefficients, achieving population inversion, and pumping mechanisms.
- Principle of Laser Action and Types of Lasers: Main components, principles of laser operation, and types (Ruby Laser, He-Ne Laser, CO_2 Laser).
- Applications of Lasers: Practical applications in various fields.

Suggested Reading:

- Textbooks

1. Beiser, A. (2011). Concepts of Modern Physics. TMH Publication.
2. Dekkar, A. J. (2000). Solid State Physics. Macmillan India Limited.
3. Kittel, C. (2004). Introduction to Solid State Physics (7th ed.). John Wiley & Sons.

- Reference Books

1. Blackmore, J. S. (n.d.). Solid State Physics. Cambridge University Press.
2. Ghatak, A. K. (n.d.). Physical Optics. Tata McGraw Hill.
3. Laud, B. B. (n.d.). Lasers. New Age Publication.
4. Mani, H. S., & Mehta, G. K. (n.d.). Modern Physics. East-West Press Pvt. Ltd.
5. Murugeshan, R. (2012). Modern Physics. S. Chand Publication.
6. Puri, S., & Babbar, R. (n.d.). Solid State Physics. S. Chand.

BIOCHEMISTRY, ENDOCRINOLOGY AND ANIMAL BEHAVIOUR	
Course Code: BEB409	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Biochemistry

- Classification of amino acids; Compositional and biological classification of protein, functions of proteins.
- Classification of carbohydrate, structure and functions of monosaccharide, disaccharide and polysaccharides.
- Classification and properties of fatty acids. Structure and functions of triglycerols, membrane phospholipid, cholesterols, steroid hormones.
- Classification and properties of enzymes. Mechanism of enzyme action and enzyme kinetics (elementary idea only).

Unit II: Introduction of Endocrinology

- Definition, classification and characteristics of chemical messengers (hormones, neurohormones, neurotransmitters)
- Hormone delivery: Endocrine, paracrine and autocrine modes
- Hormone feedback mechanisms

Unit III: Endocrine Glands

- Structure and major functions of :
  - Pituitary and Pineal
  - Thyroid and parathyroid
  - Enodcrine pancreas
  - Adrenal gland
  - Testis and ovary

Unit IV: Animal Behaviour

- Introduction to animal behaviour
- Elementary idea of foraging behaviour, territorial behaviour, mate selection and courtship behaviour, parental care, defensive behaviour, allelomimetic and maladaptive (abnormal) behaviour,
- Patterns of Innate behaviour : instinct and motivation,
- Learning (Learnt) behavior: habituation, imprinting, conditioned reflex, trial and error learning, latent learning, insight learning.
- Social behaviour: aggregation, group selection, kin selection, altruism.

Suggested Reading:

1. Davies, N. B., Krebs, J. R., & West, S. A. (2012). An introduction to behavioral ecology (4th ed.). Wiley-Blackwell.
2. Hadley, M. E. (1992). Endocrinology (3rd ed.). Prentice Hall.
3. Lehninger, A. L. (2001). Principles of biochemistry. Godfin Press.
4. Mathur, R. (n.d.). Animal behaviour (Ethology). [Publisher details not provided].
5. Stryer, L. (2004). Fundamentals of biochemistry (4th ed.). Lambert Press.
6. Wilson, J. D., & Foster, D. W. (1992). William's textbook of endocrinology (8th ed.). W.B. Saunders Company.

ECONOMIC BOTANY AND PLANT ANATOMY	
Course Code: BEB410	**Credit:** 04 (L-3, T-1, P-0)
Contact Hours: 60	**MM:** 100 (Int.: 30 + Ext.: 70)

Course Outline

Unit I: Economic Botany

- Concept of centres of origin, their importance with reference to Vavilov's work
- Cereals: wheat, origin, morphology, uses.
- Legumes: general account with special reference to gram and soya bean.
- Spices: general account with special reference to clove and black pepper (botanical name, family, part used, morphology and uses).
- Beverages: tea and coffee (morphology, processing, uses).
- Oils and fats: general description with special reference to groundnut.
- Fibre yielding plants: general description with special reference to cotton (botanical name, family, part used, morphology and uses).

Unit II: Plant Tissues and Organs

- Root and shoot apical meristems, Simple and complex tissues.
- Structure of dicot and monocot root, stern and leaf.

Unit III: Secondary Growth

- Vascular cambium — structure and function, seasonal activity
- Secondary growth in root and stem,
- Wood (heartwood and sapwood).

Unit IV: Adaptive and Protective Systems

- Epidermis, cuticle, stomata
- General account of adaptations in xerophytes and hydrophytes

Suggested Reading:

1. Kocchar, S. L. (1998). Economic Botany in the Tropics (2nd ed.). MacMillan India Ltd.
2. Mauseth, J. D. (1988). Plant Anatomy. The Benjamin/Cummings Publishing Company.
3. Pandey, S. N., & Chadha, A. Plant Anatomy (1st ed.). Vikas Publishing House.
4. Simpson, B. B., & Conner-Ogorzaly, M. (1986). Economic Botany: Plants in Our World. McGraw-Hill.

CHEMISTRY LAB IV	
Course Code: BEB451	**Credit:** 01 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 25 (Int.: 10 + Ext.: 15)

LIST OF EXPERIMENTS

(i) To determine normality and strength of HCl using (0.1N) NaOH Solution Conductometrically.

(ii) To determine normality and strength of acetic acid using (0.1N) NaOH solution Conductometrically

(iii) To determine normality and strength of HCI using (0.1N) NaOH solution by pH-metrically.

(iv) To Verify Lambert-Beers Law using $KMnO_4$ solution.

(v) To estimate the amount of Sugar using Polarimeter.

(vi) To determine refractive index of ethanol water system.

(vii) To determine indicator constant of indicator colorimetrically.

Organic Derivatives:- Preparation, Crystallization and Physical Constant:-

(i) Acetyl Derivatives: (a) Aniline (b) Salicylic Acid.

(ii) Benzoyl Derivatives: (a) Aniline (b) B-naphthol.

(iii) Hydrolysis Derivatives: (a) Ethyl Benzoate (b) Aspirin

(iv) Bromo-Derivatives: (a) Phenol (b) Cinnamic Acid

(v) Reduction Derivatives: (a) m-dinitrobenzene.

vi) Osazone Derivatives: (a) Sucrose (b) Glucose

Organic Estimations: -

(i) Estimation of nitro group by reduction.

(ii) Estimate the amount of glucose present in a solution.

Note: Experiments may be added/ deleted subject to availability of time and facilities

Suggested Reading:

1. An Advanced Course in Practical Chemistry by A. K. Nad, B. Mahapatra and A. Ghoshal, New Central Book Agency (P) Ltd.
2. Mann, F. G. & Saunders, B. C. Practical Organic Chemistry, Pearson Education (2009).
3. Furniss, B. S., Hannaford, A.J., Smith, P. W. G., Tatchell, A. R. Practical Organic Chemistry, 5th Ed., Pearson (2012).

PHYSICS LAB IV	
Course Code: BEB452	**Credit:** 01 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 25 (Int.: 10 + Ext.: 15)

LIST OF EXPERIMENTS

List of experiments (Perform Any Eight)

1. To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode.
2. To determine the value of Planck_s constant by using a Photoelectric Cell.
3. To determine the resolving power of the given grating.
4. To study spectra of different elements with a diffraction grating.
5. To determine High Resistance by Leakage of a Capacitor.
6. To determine the capacitance of a capacitor with Wein_s series resistance bridge for capacity measurement. 7. To determine the self-inductance of a given coil by Maxwell_s inductance Bridge.
8. To draw the characteristic curves of a photo cell and to find the maximum velocity of the emitted electrons.
9. To determine the value of Plank_s constant and work function of the material of the cathode of a photo electric cell.
10. To determine high resistance by leakage method.

Note: Experiments may be added/deleted subject to availability of time and facilities

Suggested Reading:

1. Geeta Sanon. (2007). BSc practical physics (1st ed.). R. Chand & Co.
2. Indu Prakash, & Ramakrishna. A text book of practical physics (Vol. 1 & Vol. 2). Kitab Mahal.
3. Khandelwal, D. P. (n.d.). A laboratory manual of physics for undergraduate classes. Vani Publication House.
4. Worsnop, B. L., & Flint, H. T. Advanced practical physics. Asia Publishing House.

LIFE SCIENCE LAB IV	
Course Code: BEB453	**Credit:** 01 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 25 (Int.: 10 + Ext.: 15)

LIST OF PRACTICALS

Practicals (Zoology):

1. Qualitative tests for Carbohydrate, Protein and fat (Tests to be performed – Biuret test, Millon's test, Iodine test, Benedict's test, Barfoed test).
2. Estimation of total protein in given solutions by Lowry's method.
3. Study of activity of salivary amylase under optimum conditions.
4. Study of identifying features of endocrine glands through permanent slides/ charts.
5. General discussion on Ethology and Psychobiology.
6. Study of patterns of behavior (taxes, reflexes, instinct and motivation).
7. Biorhythms; learning and memory imprinting their role.

Practicals (Botany):

1. Study of economically important plants : Wheat, Rice, Gram, Soybean, Black pepper, Clove, Tea, Cotton, Groundnut through specimens, sections and microchemical tests.
2. Stem of Boerhaavia, Bignonia, Bougainvellia, Dracena,Leptadenia, Nyctanthes, Salvadora.
3. Herbarium preparation of plants belong to the family Graminae, Poaceae, Leguminosae, Fabaceae.

Suggested Reading:

1. Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W. (2009). Harper' Illustrated Biochemistry. XXVIII Edition. Lange Medical Books/Mc GrawHill
2. Mac E Hadley, 1992 Endocrinology, Third edition, prentice Hall, New Jersey
3. Nicholas B. Davies, John R. Krebs, Stuart A. West 2012. An Introduction to behavioral.
4. Mauseth, J.D. (1988). Plant Anatomy. The Benjamin/Cummings Publisher, USA.
5. Kochhar, (2011). Economic Botany in the Tropics, MacMillan Publishers India
6. Ltd., New Delhi. 4th edition.

GENDER, SCHOOL AND SOCIETY	
Course Code: BED401	**Credit:** 02 (L-2, T-0, P-0)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

Course Outline

Unit I: Gender Issues: Key Concepts

- Understanding Key Concepts: Definitions and contexts of gender, sex, sexuality, patriarchy, masculinity, and feminism.
- Gender Bias and Stereotyping: Analysis of gender bias, stereotypes, and empowerment.
- Equity and Equality: Examination of equity and equality concerning caste, class, religion, disability, and region.

Unit II: Gender Studies: Paradigm Shifts

- Transition to Gender Studies: Evolution from women's studies to gender studies.
- Historical Context: Key social reform movements of the 19th and 20th centuries with a focus on women's educational experiences.
- Contemporary Developments: Review of recent policy initiatives, commissions, committees, schemes, programs, and plans related to gender issues.

Unit III: Gender, Sexual Harassment, and Abuse

- Reproductive vs. Sexual Rights: Exploring the linkages and differences between reproductive rights and sexual rights.
- Sexuality Development: Influences on sexuality, including gender, body image, and role models; social and emotional conflict sites.
- Addressing Sexual Harassment: Importance of addressing sexual harassment in various settings (family, neighborhood, institutions) and the role of redressal mechanisms.
- Perpetuators of Violence: Analysis of agencies perpetuating violence, including family, schools, workplaces, and media (print and electronic).

Suggested Reading:

1. Basu, A. (1995). The challenges of social change: Women, the state, and the politics of reform. In Women, gender, and development (pp. 59-73). Oxford University Press.
2. Chakravarti, U. (2003). Gendering Caste: Through a Feminist Lens. Stree.
3. Crenshaw, K. (1991). Mapping the margins: Intersectionality, identity politics, and violence against women of color. Stanford Law Review, 43(6), 1241-1299.
4. Faludi, S. (1991). Backlash: The undeclared war against women. Crown Publishing Group.
5. Narayan, U. (2000). The project of feminist epistemology: Perspectives from a non-western feminist. In M. A. McClintock, A. M. Muñoz, & L. E. Schoonover (Eds.), Feminist epistemologies (pp. 39-64). Routledge.
6. Scott, J. W. (1986). Gender: A useful category of historical analysis. American Historical Review, 91(5), 1053-1075.
7. Sivaramakrishnan, K. C. (2008). Reconstructing Gender: Gender Relations and Women's Rights in India. Orient BlackSwan.

EDUCATION FOR SUSTAINABLE DEVELOPMENT	
Course Code: BED402	**Credit:** 02 (L-2, T-0, P-0)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

Course Outline

Unit I: Introduction to Sustainable Development

- Concept and Principles of Sustainable Development: Definitions, history, and evolution of the concept
- Global Challenges and Sustainable Development Goals (SDGs): Overview of the 17 SDGs and their significance
- Sustainability and the Environment: Understanding environmental sustainability, natural resource management, and biodiversity conservation
- Case Studies: Examples of sustainable development initiatives from around the world

Unit II: Education for Sustainable Development (ESD)

- Role of Education in Sustainable Development: Importance of ESD in achieving the SDGs
- Curriculum and Pedagogy for ESD: Integrating sustainability into the curriculum, interdisciplinary approaches, and experiential learning
- Teaching and Learning Methods: Innovative and participatory teaching methods for ESD
- Assessment and Evaluation: Methods to assess learning outcomes related to ESD

Unit III: Practical Implementation of ESD

- Developing ESD Projects: Planning and implementing school-based and community projects
- Community Engagement and Participation: Strategies to involve community members in sustainable development initiatives
- Policy and Advocacy for ESD: Understanding policies supporting ESD and advocating for sustainability in education
- Challenges and Opportunities: Addressing barriers to implementing ESD and exploring opportunities for improvement

Suggested Reading:

1. Filho, W. L., & Pace, P. (Eds.). (2019). Teaching education for sustainable development at university level. Springer.
2. Mehta, S. R. (2010). Education for sustainability. New Delhi: Rajat Publications.
3. Sengupta, R. (2001). Ecology and economics: An approach to sustainable development. Oxford University Press.
4. Sharma, R.A. (2017). Environmental studies and ethics. Meerut: R.Lall Book Depot.
5. Sterling, S., & Huckle, J. (Eds.). (2014). Education for sustainability. Earthscan.
6. Tilbury, D. (2011). Education for sustainable development: An expert review of processes and learning. Paris: UNESCO.
7. UNESCO. (2014). Shaping the future we want: UN Decade of education for sustainable development (2005-2014) final report. Paris: UNESCO.
8. United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development. UN General Assembly.

HEALTH EDUCATION AND YOGA	
Course Code: BED403	**Credit:** 02 (L-2, T-0, P-0)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

Course Outline

Unit I: Health Education and Hygiene

- Concept and Importance of Health Education: Definition, Objectives, and Scope
- Dimensions of Health: Physical, Mental, Social, Emotional Health
- Determinants of Health: Biological, Environmental, Socio-economic, Behavioral Factors
- Health and Hygiene: Personal Hygiene, School Hygiene, and Sanitation
- Role in Health Education: Role of School, Teachers, Community, and Parents in Promoting Health Education

Unit II: Physical Fitness, Nutrition, and Mental Health

- Physical Fitness: Components (Strength, Endurance, Flexibility, Coordination), Importance, Implementing Fitness Programs in Schools
- Nutrition: Basic Nutrients and Functions, Balanced Diet, Malnutrition, Nutritional Requirements for Different Age Groups, Promoting Healthy Eating Habits
- Mental Health: Definition, Importance and Strategies for Promoting Mental Health
- Causes and Effects of Stress; Stress Management
- Role of teachers in identifying and addressing mental health issues

Unit III: Introduction to Yoga

- Philosophy and History of Yoga
- Major Schools of Yoga
- Types of Yoga: Hatha Yoga, Ashtanga Yoga, Kundalini Yoga, Other Forms
- Basic Asanas and Benefits for Beginners
- Importance of Pranayama
- Basic Pranayama Techniques

Suggested Reading:

1. Bucher, C. A., & Wuest, D. A. (2016). Foundation of Physical Education, Exercise Science, and Sport. McGraw-Hill Education.
2. Greenberg, J. S. (2017). Comprehensive Stress Management (14th ed.). McGraw-Hill Education.
3. Iyengar, B. K. S. (2005). Light on Yoga. Thorsons.
4. Iyengar, B. K. S. (2006). Light on Yoga: The Classic Guide to Yoga by the World's Foremost Authority. Thorsons.
5. Jain, D. (2012). Physical Education and Health (2nd ed.). Sports Publications.
6. Kapur, M. (2011). Mental Health of Children in India. Sage Publications.
7. Kumar, K. (2019). Health and Physical Education. Khel Sahitya Kendra.
8. Nagendra, H. R., & Nagarathna, R. (2011). Yoga for Promotion of Positive Health. Swami Vivekananda Yoga Prakashana.
9. Park, K. (2015). Park's Textbook of Preventive and Social Medicine. Banarsidas Bhanot Publishers.
10. Park, K. (2021). Textbook of Preventive and Social Medicine (26th ed.). Banarsidas Bhanot.
11. Saraswati, S. (2008). Asana Pranayama Mudra Bandha (4th ed.). Bihar School of Yoga.
12. Sharma, R. (2013). Health Education: Principles and Practices. Rupa Publications.
13. Sivananda, S. (2008). The Science of Pranayama. The Divine Life Society.
14. Srilakshmi, B. (2018). Nutrition Science (6th ed.). New Age International Publishers.
15. Telles, S., & Nagendra, H. R. (2010). Yoga for Health and Personality (1st ed.). Swami Vivekananda Yoga Prakashana.
16. Tiwari, O. P. (2006). Asana: Why and How?. Kaivalyadhama Ashram.

CLASSROOM MANAGEMENT	
Course Code: BED404	**Credit:** 02 (L-2, T-0, P-0)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

Course Outline

Unit I: Classroom Management

- Classroom Management: Meaning and Definitions
- Relationship between Classroom Organization and Classroom Management
- Models of Classroom Management: Non-Interventionist Model, Interventionist Model, Interactivist Model, Glaser's Model of Choice Theory
- Approaches of Classroom Management: Exploratory Approach, Permissive Approach, Authoritative Approach, Behaviourist Approach, Collaborative Approach, Anticipatory Approach
- Significance of Classroom Management
- Factors affecting Classroom Management
- Role of students and teachers in classroom management

Unit II: Classroom Communication

- Classroom Communication: Concept and Elements
- Barriers to Classroom Communication
- Measures to overcome barriers to Classroom Communication
- Classroom Interaction Analysis (Flander's Interaction Analysis Category System)

Unit III: Classroom Environment and Managing Diversity

- Meaning and significance of classroom discipline
- Inappropriate Behaviour Management in Class: Causes of Pupil Misbehavior
- Managing indiscipline / inappropriate behavior in the classroom: Preventive and Corrective measures
- Concept of Positive Discipline
- Managing Children's behaviour through positive discipline (Skinner's Model)
- Meaning and Concept of Classroom Environment
- Promoting self-esteem among students
- Classroom rules and procedures
- Concept of Classroom Dynamics and its implications

Suggested Reading:

1. Aggarwal, D. D. (2001). Modern methods of teaching biology. Sarup Teaching Series Sarup & Sons.
2. Aggarwal, J. C. (2002). School organization, administration and management. Doaba Homes, Kanishka Publishers.
3. Aggarwal, J. C., & Gupta, S. (2009). School management. Neha Publishers and Distributors.
4. Bhatnagar, R. P. (2005). Educational technology and management. International Publishing House.
5. Bush, T., et al. (1980). Approaches to school management. Harper & Row.
6. Christian, J. A. (1991). Managing classrooms: An instructional perspective. The Indian Publishers.
7. Dash, M., & Dash, N. (2008). School management. Atlantic Publications.
8. Doyle, W. (1986). Classroom organization and management. In Wittrock (Ed.), Handbook of research on teaching (pp. 392-431). Macmillan.
9. Singh, A. (2006). Classroom management: A reflective perspective. Kanishka Publishers and Distributors.
10. Wrigley, T. (2011). Changing schools: Alternative ways to make a world of difference. Routledge Publications.

SCHOOL MANAGEMENT	
Course Code: BED405	**Credit:** 02 (L-2, T-0, P-0)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

Course Outline

Unit I: Fundamentals of School Management

- Meaning and Concept of School Management
- Objectives and goals of School Management
- Meaning and Concept of School Administration and Organization
- Differences among School Management, Administration, and Organization

Unit II: Management of Resources in School

- Physical Resources: Building, Office, Library, Laboratory, Playground, and Staffroom
- Classroom Management: Seating Arrangement, Furniture, Display Area, Chalkboard, OHP, and Multimedia Facilities
- School Climate: Creating a Conducive, Learner-Friendly, Inclusive, and Vibrant Environment
- School Records: Importance, Types, and Maintenance

Unit III: Human Resources and Functional Aspects

- Headmaster: Qualities, Roles, and Responsibilities
- Teacher: Qualities, Roles, Responsibilities, Accountability, and Evaluation
- Discipline: Concept, Importance, Techniques, and Legal Implications
- Time-Table: Importance, Types, and Principles of Construction
- Supervision: Concept, Types, Importance, and Techniques
- Co-Curricular Activities: Concept, Importance, Types, and Organization
- School Guidance Services: Concept, Importance, and Organization

Suggested Reading:

1. Aggarwal, J. C. (2002). School organization, administration and management. New Delhi: Kanishka Publishers.
2. Aggarwal, J. C., & Gupta, S. (2009). School management. New Delhi: Neha Publishers and Distributors.
3. Bhatnagar, R. P. (2005). Educational technology and management. Meerut: International Publishing House.
4. Bush, T., et al. (1980). Approaches to school management. London: Harper & Row.
5. Dash, M., & Dash, N. (2008). School management. New Delhi: Atlantic Publications.
6. Doyle, W. (1986). Classroom organization and management. In Wittrock (Ed.), Handbook of research on teaching (pp. 392-431). New York: Macmillan.
7. Singh, A. (2006). Classroom management: A reflective perspective. New Delhi: Kanishka Publishers and Distributors.

CULTURAL ACTIVITIS, SPORTS AND YOGA	
Course Code: BED451	**Credit:** 02 (L-0, T-0, P-2)
Contact Hours: 30	**MM:** 50 (Int.: 15 + Ext.: 35)

The practical course is designed to provide the pupil-teachers with hands-on experience in cultural activities, sports, and yoga. It aims to foster a holistic approach to education by integrating physical, mental, and cultural development. The pupil-teachers will engage in various activities that promote health, teamwork, creativity, and cultural appreciation.

Course Outline

- **Cultural Activities**
  - Understanding the importance of cultural activities in holistic education
  - Planning and organizing cultural events in the department
    - Activity 1: Traditional Dance and Music
      - Learning and performing a traditional dance form (e.g., folk dance, classical dance)
    - Activity 2: Art and Craft
      - Engaging in art and craft activities such as painting, sculpture, and origami
      - Organizing an art exhibition to showcase student work

- **Sports**
  - Understanding the role of sports in physical and mental development
  - Organizing sports events and competitions
    - Activity 1: Team Sports
      - Participation in team sports such as basketball, football, or volleyball
      - Understanding rules, techniques, and team strategies
    - Activity 2: Individual Sports
      - Participation in individual sports such as athletics, badminton, or tennis
      - Techniques for improving personal performance
    - Activity 3: Physical Fitness
      - Engaging in fitness activities such as aerobics, gymnastics, or circuit training
      - Understanding the importance of regular physical exercise

- **Yoga**
  - Understanding the philosophy and benefits of yoga for physical and mental health
  - Basic principles of yoga practice
    - Activity 1: Asanas
      - Learning and practicing basic yoga postures (asanas)
      - Focus on alignment, balance, and flexibility
    - Activity 2: Pranayama
      - Introduction to breathing techniques (pranayama)
      - Practice of different pranayama techniques such as Anulom-Vilom, Kapalbhati, and Bhramari
    - Activity 3: Meditation and Relaxation
      - Techniques for meditation and mindfulness
      - Guided relaxation practices for stress management

Assessment

- **Participation and Performance**
  - Active participation in all activities
  - Performance in cultural events, sports, and yoga sessions
- **Reflective Journal**
  - Maintaining a reflective journal documenting experiences, learnings, and personal growth through the course
- **Practical Demonstration**
  - Demonstration of skills learned in a final practical assessment, including cultural performance, sports activity, and yoga practice

Course Outline:
It will have three components:

1. Participation in various cultural, sports and yoga activities mentioned in the course outline.
2. Report writing of each activity organized by the department with participation details.
3. Viva-voce at the end of semester.

Note: For successful completion of the course, all three components are compulsory.

SCHOOL OBSERVATION I	
Course Code: BED471	**Credit:** 02 (L-0, T-0, P-0)
Contact Hours: Two Weeks	**MM:** 50 (Int.: 15 + Ext.: 35)

The practical course is designed for pupil-teachers to gain first-hand experience and understanding of the school environment, teaching practices, and classroom dynamics. Through structured observation, students will develop critical insights into the functioning of schools and the practical aspects of teaching.

Course Outline

- **Pre-Observation Preparation**
  - Orientation
    - Introduction to the course objectives and expectations
    - Overview of observation techniques and tools
    - Developing an observation checklist

- **School Observation**
  - Classroom Observation
    - Observing different classes across various grades
    - Focus on teaching methods, classroom management, and student interactions
  - Observation of Teacher Roles and Responsibilities
    - Observing teacher-student interactions
    - Understanding lesson planning and execution
    - Analyzing assessment and feedback methods
  - Observing School Culture and Environment
    - Observing school routines and activities
    - Understanding the role of administrative staff
    - Participation in extracurricular activities

- **Post-Observation Analysis**
  - Reflection and Reporting
    - Writing detailed observation reports
    - Reflecting on key observations and learning outcomes
  - Discussions and Feedback Session
    - Sharing experiences with peers upon returning from school observation
    - Discussing challenges and best practices observed
    - Receiving feedback from faculty supervisors
    - Discussing ways to improve observation and analysis skills

Assessment

- **Observation Reports**
  - Detailed reports on classroom and school observations (50%)
- **Reflection Essays**
  - Written reflections on key learnings and personal growth (30%)
- **Participation and Engagement**
  - Active participation in discussions and feedback sessions (20%)

Course Outline:

1. Participation in all activities of School Observation (Pre-observation Preparation, During Observation and Post-observation Analysis) as mentioned in course outline.
2. Recording of minimum 20 lessons (10 for each teaching subject).
3. Maintenance of record of school observation (Observation Reports and Reflective Essays) with brief report about school.
4. Viva-voce at the end of semester.

Note: For successful completion of the course, Participation in all activities of School Observation is compulsory.