SUNRISE UNIVERSITY ALWAR
COURSE CURRICULUM FOR
BACHELOR OF SCIENCE
(CBZ)

B. Sc Semester I, II (2025-26)

B. Sc Semester III, IV (2026-27)

B. Sc Semester V and VI(2027-28)

Program Outcomes (POs)

On successfully completing the program the student will be able to:

1. Acquire the essential knowledge on the successful prospects of business.
2. Understand the practical issues and challenges that the trade world encounters.
3. Apply concepts, principles and procedure sin transacting business effectively.
4. Gainanalyticalskillinundertakingcommercialventuresandevaluatetheprosandcons of embarking on trade and trade related activities based on their in-depth knowledge.
5. Pursue CA, CMA, ACS, CFA, M.Com, MBA and other career-oriented programme.
6. Be employable, exhibit entre penury a drive and bimodal of principled and ethically sound business professionals

Program Specific Outcomes (PSOs)

1. Understand the concepts, principles and practices involved in undertaking business ventures.
2. Develop financial, cost, auditing, entrepreneurial, marketing and managerial skills. 3. Understand the legal guidelines relating to the business activities.
4. Gain expertise and exhibit professionalism in Business Accounting,
5. Income Tax assessment and GST calculations.
6. Acquire and apply ICT skills in business operations.
7. Be an expert in business correspondence and effective in communication.

ZBC Semester Wise Course Details

Semester I										
Paper Code	Paper Name	Code	L	T	P	Total Credits	Internal	External	Practical	Total Marks
BSCBOT101T	CELL BIOLOGY AND DIVERSITY OF PLANTS KINGDOM-I	MJR	4	0	0	4	40	60	0	100
BSCBOT101P	BOTANY LAB–I		0	0	0	2	20	30	2	50
BSCCH102T	STRUCTURE BONDING MATHEMATICAL CONCEPT & STAE OF MATTER	MJR	4	0	0	4	40	60	0	100
BSCCH102P	CHEMISTRY LAB-I		0	0	0	2	20	30	2	50
BSCZO103T	DIVERSITY & BIOLOGY OF NOW CHORDATES	MIN	2	0	0	4	40	60	0	100
BSCZO103P	ZOOLOGYLAB–I		0	0	0	2	20	30	2	50
MDC104T	GENERAL ENGLISH	MDC	2	0	0	2	20	30	0	50
SEC105T	COMPUTER FUNDAMENTAL	SEC	2	0	0	2	20	30	0	50
VAC106T	WOMEN EMPOWERMENT	VAC	2	0	0	2	20	30	0	50
AEC107T	MAKING EFFECTIVE COMMUNICATION	AEC	2	0	0	2	20	30	0	50
						26	260	390	4	650

BSCBOT101T:- Cell Biology and Diversity of Plant Kingdom–I

UNIT–I: Cell Biology

- Discovery of cell – Robert Hooke
- Cell theory – Matthias Schneider and Theodor Schwann
- Prokaryotic and Eukaryotic cells
- Structure and function of:
  - Cell wall
  - Plasma membrane
  - Nucleus
  - Mitochondria
  - Chloroplast
  - Endoplasmic reticulum
  - Golgi body
  - Ribosome's
- Cell division – Mitosis & Meiosis

UNIT–II: Diversity of Plant Kingdom–I

- Classification systems (Artificial, Natural, Phylogenetic)
- Algae – General characters & examples
- Fungi – General characters & examples
- Lichens – Structure & economic importance
- Bryophytes – General characters & life cycle

BSCBOT101P:- BOTANY LAB–I

- Microscope handling
- Study of plant cell structure
- Temporary slide preparation
- Study of algae, fungi & bryophytes specimens
- Identification of plant materials

BSCCH102T:- Structure, Bonding, Mathematical Concepts & State of Matter

UNIT–I: Atomic Structure

- Structure of atom
- Atomic number & mass number
- Quantum numbers
- Electronic configuration

UNIT–II: Chemical Bonding

- Ionic bond
- Covalent bond
- Hydrogen bond
- Hybridization
- VSEPR theory

UNIT–III: Mathematical Concepts

- Mole concept
- Molarities & Normality
- Percentage composition
- Stoichiometry

UNIT–IV: States of Matter

- Gaseous state & Gas laws
- Liquid state
- Solid state (types of solids)

BSCCH102P:- Chemistry Lab–I

- Preparation of standard solution
- Acid–base titration
- Determination of strength of solution
- Basic laboratory techniques & safety

BSCZO103T:- Diversity & Biology of Non-Chordates

UNIT–I

- Basis of classification
- Symmetry & coelom

UNIT–II: Phylum Study

- Porifera
- Coelenterata (Cnidaria)
- Platyhelminthes
- Nematoda
- Annelida
- Arthropoda
- Mollusca
- Echinodermata

BSCZO103P:- Zoology Lab–I

- Study of museum specimens
- Identification of non-chordates
- Permanent slide study
- Classification exercises

MDC104T:- GENERAL ENGLISH

- Parts of speech
- Tenses
- Articles & Prepositions
- Comprehension passage
- Essay writing
- Letter writing
- Vocabulary development

SEC105T:- COMPUTER FUNDAMENTALS

- Introduction to computers
- Components of computer
- Input & Output devices
- MS Word, Excel, PowerPoint
- Internet & Email basics
- Basics of Operating System

VAC106T:- WOMEN EMPOWERMENT

- Meaning & concept
- Women's rights in India
- Constitutional provisions
- Government schemes for women
- Gender equality & social issues

AEC107T:- MAKING EFFECTIVE COMMUNICATION

- Types of communication
- Verbal & Non-verbal communication
- Barriers to communication
- Public speaking skills
- Presentation techniques

Semester II										
Paper Code	Paper Name	Code	L	T	P	Total Credits	Internal	External	Practical	Total Marks
BSCBOT201T	MOLECULAR BIOLOGY GENETICS AND DIVERSITY OF PLANT KINGDOM-II	MJR	4	0	0	4	40	60	0	100
BSCBOT201P	BOTANY LAB–II		0	0	0	2	20	30	2	50
BSCCH202T	REACTION MECHANISM STEREOCHEMISTRY AROMATIC HYDROCARBON & CHEMICAL	MJR	4	0	0	4	40	60	0	100
BSCCH202P	CHEMISTRY LAB-II		0	0	0	2	20	30	2	50
BSCZO203T	DIVERSITY OF CHORDATES & DEVELOPMENTAL BIOLOGY OF VERTEBRATES	MIN	2	0	0	4	40	60	0	100
BSCZO203P	ZOOLOGYLAB–II		0	0	0	2	20	30	2	50
MDC204T	GENERAL HINDI	MDC	2	0	0	2	20	30	0	50
SEC205T	SCIENTIFIC WRITING AND COMMUNICATION	SEC	2	0	0	2	20	30	0	50
VAC206T	SWACHH BHARAT	VAC	2	0	0	2	20	30	0	50
AEC207T	ORGANIC FARMING	AEC	2	0	0	2	20	30	0	50
						26	260	390	4	650

BSCBOT201T:-Molecular Biology, Genetics and Diversity of Plant Kingdom – II

Unit I: Molecular Biology

- DNA replication, transcription, translation
- Gene regulation (Prokaryotes & Eukaryotes)
- Genetic code and protein synthesis
- Recombinant DNA technology basics

Unit II: Genetics

- Mendelian genetics & extensions
- Linkage and crossing over
- Mutation and chromosomal aberrations
- Population genetics basics

Unit III: Diversity of Plant Kingdom – II

- Gymnosperms: General characters & life cycles
- Angiosperms: Classification systems
- Plant taxonomy & herbarium techniques
- Economic importance of plants

BSCBOT201P:-Practical (Lab II)

- DNA isolation (demonstration)
- Study of mitosis & meiosis slides
- Identification of plant specimens
- Study of plant families

BSCCH202T:- Reaction Mechanism, Stereochemistry & Aromatic Hydrocarbons

Unit I: Reaction Mechanism

- Types of organic reactions (Substitution, Addition, Elimination)
- SN1, SN2, E1, E2 mechanisms
- Carbocations, Carbanions & Free radicals
- Reaction intermediates

Unit II: Stereochemistry

- Optical isomerism
- Chirality & enantiomers
- R/S configuration
- Geometrical isomerism (E/Z)

Unit III: Aromatic Hydrocarbons

- Structure of benzene
- Huckel's rule
- Electrophilic aromatic substitution
- Directive effects

BSCCH202P:-Practical (Chemistry Lab-II)

- Organic compound identification
- Functional group tests
- Preparation of organic compounds
- Chromatography basics

BSCZO203T:-Diversity of Chordates & Developmental Biology of Vertebrates

Unit I: Diversity of Chordates

- General characteristics of chordates
- Protochordates
- Cyclostomes
- Pisces, Amphibia, Reptilia, Aves, Mammalia
- Comparative anatomy

Unit II: Developmental Biology

- Gametogenesis
- Fertilization
- Cleavage & Gastrulation
- Organogenesis
- Extra embryonic membranes

BSCZO203P:-Practical (Zoology Lab-II)

- Study of chordate specimens
- Dissection (where applicable)
- Study of developmental stages slides
- Identification of bones

MDC204T:- GENERAL HINDI

- Essay writing
- Letter writing
- Grammar
- Comprehension
- Translation

SEC205T:- SCIENTIFIC WRITING AND COMMUNICATION

- Structure of research paper
- Abstract writing
- Citation & referencing
- Presentation skills
- Poster preparation
- Ethics in research

VAC206T:- SWACHH BHARAT

- Cleanliness awareness
- Waste management
- Environmental hygiene
- Sustainable development goals
- Community participation

AEC207T:- ORGANIC FARMING

- Principles of organic farming
- Biofertilizers & biopesticides
- Composting & vermiculture
- Crop rotation
- Sustainable agriculture practices

Sunrise University Alwar

Semester III									
Paper Code	Paper Name	Code	L	T	P	Total Credits	Internal	External	Total Marks
BSCBOT301T	MICROBIOLOGY AND PLANT PATHOLOGY	MJR	4	0	0	4	40	60	100
BSCBOT301P	BOTANY LAB–III		0	0	0	2	20	30	50
BSCCH302T	CHEMISTRY OF S,P-BLOCK ELEMENTS AND NOBLEGASES,NON-AQUEOUSSOLVENTNUCLEARCHEMISTRY,HYDROCSRHONS ANDALKYLHALIDE,FUNDAMENTALSOF THERMODYNAMICS, SOLUTIONS AND THEIR COLLIGATIVEPROPERTIES.	MJR	4	0	0	4	40	60	100
BSCCH302P	CHEMISTRY LAB-III		0	0	0	2	20	30	50
BSCZO303T	ECONOMIC ZOOLOGY & ETHOLOGY	MIN	2	0	0	4	40	60	100
BSCZO303P	ZOOLOGY LAB–III		0	0	0	2	20	30	50
MDC304T	ENVIRONMENT STUDIES	MDC	2	0	0	2	20	30	50
SEC305T	RADIATION SAFETY	SEC	2	0	0	2	20	30	50
VAC306T	FINANCIAL LITERACY AND BANKING	VAC	2	0	0	2	20	30	50
AEC307T	ELEMENTARY COMPUTER	AEC	2	0	0	2	20	30	50
						26	260	390	650

BSCBOT301T: - MICROBIOLOGY AND PLANT PATHOLOGY

	Unit—I
Microbiology	**Introduction tomicrobial word: History and Development in the fieldofmicro biology, SystemicpositionofMicro-organism(R.H. Whittaker's five kingdom concept, Carl Woese's Domain System),OriginofLife,contribution ofLouisPasteurandRobert Koch, Germ theory of disease.**
Virus	**Discovery, General account, structure with special reference to TMV, Pox virus, Bacteriophage; Replication ofT4 phage (Lytic and Lysogenic).**
Mycoplasma	**General Characteristics,MorphologyandReproduction.**
Bacteria	
Applied Microbiology	**Unit—II** **General Characteristics ,Classification, Cell structure, end spore formation, Reproduction-asexual and recombination (Conjugation, Transformation and Transduction).**
Phyto-pathology	**Economic importance of viruses, Economic importance of Bacteria with reference to their role in agriculture and food industry, Biofilms**
	Unit—III
Diseases	**Terminology and basic concepts (Primary and Secondary inoculum; infection, Pathogenicity, Pathogenesis, Disease Cycle);Bioticandabiotic diseases,Generalsymptomscausedby Viruses, Bacteria, Fungi, Mycoplasma, Nematodes, Insects (smut,rust,mildews,canker,mosaic,veinclearing,spots,lesion, knot, galls).**
Fungal Diseases	**Viral, Mycoplasmal and Bacterial diseases: Brief account, Symptomology and control of the following plant diseases:-TobaccoMosaic,LittleleafofBrinjal,Citruscankerand Angular leaf spot of Cotton.**
	Unit-IV
	Symptomology, diseasecycleandcontrol ofthefollowing plant diseases with special reference to Rajasthan: White rust of crucifers,Downymildew/green eardiseaseofBajra,Black/stem

Diseases
Rust of Wheat ,Loose and covered mutt of Barley, Early blight of
Potato
Disease caused by insects and nematodes: General account of diseases caused by in sectsandnematodes,Briefaccountand histopathologyofrootknotofvegetables,leafgallof*Pongamia.*

SuggestedBooksand References—

1. Pelzer, M.J.(2001)Microbiology,5thedition.NewDelhi,Delhi:TataMc-Graw-HillCo.
2. Prescott,L.M.,HarleyJ.P.,KleinD.A.(2005).Microbiology, 6thedition:McGrawHill, New Delhi.
3. AgriosG.N.(2004)PlantPathology,5th Edition,AcademicPress
4. PandeyB.P.(2001)PlantPathology(PathogenandPlantDisease),S.ChandPublishing
5. MehrotraRSandAggarwalA.(2003)PlantPathology, 2nd Edition.Delhi:TataMc-Graw- Hill Co.
6. SharmaP.D.(2013).*Plantpathology*.DeepandDeepPublications.

BSCBOT301P -202 BOTANY PRACTICAL-III

I Microscopictechniques-handling oflight microscope,generalidea ofSEMand TEM.
Write majorcontributionofleadingscientistsofMicrobiology
StudyofTMV,BacteriophageandPoxvirus,Mycorrhiza(Photographs/3D Models)

II StudyofBacteria byGram Staining and Negative staining PreparationofLiquidandsolid mediaforculturing microbes
Pureculturetechniques- pour plate,spread plate, streaking

III Studyofsymptomsofplantdiseases(specimen/permanentslide)- Downy mildew/green ear disease ofBajra,
Tobacco Mosaic, Citrus canker, Little leafofBrinjal, Studyofspores*ofAlternaria*fromEarlyblightofPotato

IV Study and identification of spores from temporary slide preparation from infected plantmaterial:- whiterustofcrucifers(conidiastage),Black/stem rust of Wheat (all stages).
Studyofhistopathologyusingtemporary slide prepration ofinfected partofroot knot of tomato, Leaf gall of *Pongamia*

BSCCH302T:-CHEMISTRY OF S,P-BLOCK ELEMENTS AND NOBLEGASES,NON-AQUEOUSSOLVENTNUCLEARCHEMISTRY,HYDROCSRHONSANDALKYLHALIDE,FUNDAMENTALSOF THERMODYNAMICS, SOLUTIONS AND THEIR COLLIGATIVEPROPERTIES

Unit 1: s-Block Elements

- General characteristics of alkali & alkaline earth metals
- Anomalous behaviour of Li and Be
- Diagonal relationship
- Hydrides, oxides, hydroxides

Unit 2: p-Block Elements (Groups 13–18)

- Electronic configuration
- Oxidation states & trends
- Acid–base behaviour of oxides
- Allotropy (C, P, S)
- Oxyacids of N, P, S, Cl

Unit 3: Noble Gases

- Occurrence & isolation
- Compounds of Xenon
- Structure & bonding in XeF_2, XeF_4, XeF_6

Books:

- J.D. Lee – *Concise Inorganic Chemistry*
- Huheey & Keiter – *Inorganic Chemistry*
- Shriver & Atkins – *Inorganic Chemistry*

Part A: Non-Aqueous Solvents

- Classification (protogenic, protophilic, aprotic)
- Liquid ammonia
- Liquid SO_2
- HF as solvent

- Autoprotolysis

Part B: Nuclear Chemistry

- Radioactivity (α, β, γ decay)
- Half-life & decay law
- Nuclear reactions
- Nuclear fission & fusion
- Applications in medicine & agriculture

Books:

- K.K. Rohatgi-Mukherjee – *Fundamentals of Physical Chemistry*
- Satya Prakash – *Nuclear Chemistry*
- Glasstone – *Sourcebook on Atomic Energy*

Unit 1: Hydrocarbons

Alkanes

- Nomenclature, isomerism
- Free radical substitution

Alkenes

- Electrophilic addition
- Markovnikov & Anti-Markovnikov rule

Alkynes

- Acidity of alkynes
- Addition reactions

Aromatic Hydrocarbons

- Benzene structure
- Electrophilic substitution

Thalidomide

- Structure & chirality
- Optical isomerism
- Biological effects
- Drug tragedy (1960s)
- Importance of stereochemistry in pharmaceuticals

Books:

- Morrison & Boyd – *Organic Chemistry*
- I.L. Finar – *Organic Chemistry*
- Bahl & Bahl – *Advanced Organic Chemistry*

- First Law of Thermodynamics
- Internal energy & enthalpy
- Hess's Law
- Heat capacity
- Second Law of Thermodynamics
- Entropy
- Gibbs free energy
- Spontaneity & equilibrium

Books:

- P.W. Atkins – *Physical Chemistry*
- K.L. Kapoor – *Physical Chemistry*
- Castellan – *Physical Chemistry*

- Types of solutions
- Raoult's law
- Ideal & non-ideal solutions
- Vapour pressure lowering
- Boiling point elevation
- Freezing point depression
- Osmotic pressure
- Abnormal molecular mass
- van't Hoff factor

Books:

- Puri, Sharma & Pathania – *Physical Chemistry*
- Atkins – *Physical Chemistry*

BSCCH302P:- CHEMISTRY LAB–III

- Estimation of sodium carbonate & sodium bicarbonate mixture
- Determination of partition coefficient
- Determination of enthalpy change
- Preparation of organic compounds
- Qualitative inorganic analysis

Practical Book:

- Vogel – *Quantitative Chemical Analysis*
- University Practical Manual

BSCZO303T:- ECONOMIC ZOOLOGY & ETHOLOGY

Part A: Economic Zoology

- Sericulture
- Apiculture
- Lac culture
- Fisheries
- Poultry farming
- Vermiculture

Part B: Ethnology

- Definition & history
- Types of animal behaviour
- Learning behaviour
- Social behaviour
- Animal communication
- Biological rhythms

Key contributors:

- **Conrad Lorenz**
- **Nikko Tinbergen**
- **Karl von Frisch**

Books:

- Shula & Upadhyay – *Economic Zoology*
- V.K. Agarwal – *Animal Behaviour*

BSCZO303P:- ZOOLOGY LAB–III

- Study of honey bee & silk moth life cycle
- Fish anatomy (Rohu)
- Mounting of mouth parts of insects
- Study of animal behaviour experiments
- Identification of economically important species

Practical Book:

- P.S. Verma – *Practical Zoology*

MDC304T:- ENVIRONMENT STUDIES

- Ecosystem structure
- Biodiversity
- Environmental pollution
- Climate change
- Sustainable development
- Environmental laws
- Environmental impact assessment

Books:

- Erich Barouche – *Environmental Studies*
- Cunningham – *Environmental Science*

SEC305T:- RADIATION SAFETY

- Types of radiation
- Units (Gray, Sever)
- Biological effects
- Radiation detection (GM counter)
- Shielding methods
- Radiation safety guidelines
- Atomic Energy Regulatory Board (India) guidelines

Books:

- AERB Radiation Protection Manual
- Knoll – *Radiation Detection and Measurement*

VAC306T:- FINANCIAL LITERACY & BANKING

- RBI functions
- Commercial banking
- Loans & interest
- Digital payments
- Insurance & mutual funds
- Budgeting

Books:

- RBI Financial Literacy Guide
- SEBI Investor Education Material

AEC307T:- ELEMENTARY COMPUTER

- Basics of computer hardware
- MS Word, Excel, PowerPoint

- Internet & email
- File management
- Introduction to HTML
- Cyber security basics

Books:

- V. Rajaraman – *Fundamentals of Computers*
- Peter Norton – *Introduction to Computers*

If you tell me your **B.Sc. semester and university**, I can now prepare:

- ✅Unit-wise important questions
- ✅Previous year question trends
- ✅Short notes for quick revision
- ✅Marks distribution pattern
- ✅One-month exam preparation plan

Just tell me your semester.

Code

Semester IV										
Paper Code	Paper Name	Code	L	T	P	Total Credits	Internal	External	Practical	Total Marks
BSCBOT401T	PLANTTAXONOMYANDECONOMICBOTANY	MJR	4	0	0	4	40	60	0	100
BSCBOT401P	BOTANY LAB–IV		0	0	0	2	20	30	2	50
BSCCH402T	CHEMISTRYOFD&FBLOCKELEMENTS,CHEMISTRY OF OXYGEN/ NITROGEN-CONTAININGFUNCTIONALGROUPSANDCHEMICAL AND IONICEQUILIBRIUM,	MJR	4	0	0	4	40	60	0	100
BSCCH402P	CHEMISTRY LAB-IV		0	0	0	2	20	30	2	50
BSCZO403T	CELLBIOLOGY,GENETICS&BIOTECHNOLOGY	MIN	2	0	0	4	40	60	0	100
BSCZO403P	ZOOLOGY LAB–IV		0	0	0	2	20	30	2	50
MDC404T	DIGITAL EMPOWERMENT	MDC	2	0	0	2	20	30	0	50
SEC405T	APTITUDE AND REASONING	SEC	2	0	0	2	20	30	0	50
VAC406T	FINANCIAL LITERACY AND BANKING	VAC	2	0	0	2	20	30	0	50
AEC407T	ELEMENTARY COMPUTER LAB	AEC	2	0	0	2	20	30	0	50
						26	260	390	4	650

BSCBOT401T:- PLANT TAXONOMY ECONOMIC BOTANY

Unit 1: Principles of Taxonomy

- Introduction to taxonomy and systematics
- Aims and importance of plant taxonomy
- Taxonomic hierarchy (species, genus, family, etc.)
- Botanical nomenclature (ICN rules)
- Herbarium techniques and botanical gardens

Unit 2: Systems of Classification

- Artificial system – **Carolus Linnaeus**
- Natural system – **George Bentham** & **Joseph Dalton Hooker**
- Phylogenetic system – **Adolf Engler** & **Karl Prantl**
- Modern APG system (Angiosperm Phylogeny Group)

Unit 3: Botanical Nomenclature

- Binomial nomenclature
- Principle of priority
- Typification
- Valid publication

Unit 4: Taxonomic Evidence

- Morphological evidence
- Anatomical evidence
- Cytological evidence
- Palynology
- Chemotaxonomy
- Molecular taxonomy

Unit 5: Study of Important Plant Families

(With special reference to morphology, floral formula & economic importance)

- Ranunculaceae
- Brassicaceae
- Fabaceae
- Solanaceae
- Lamiaceae

- Asteraceae
- Poaceae
- Liliaceae

 Book References (Plant Taxonomy)

- B.P. Pandey – *Plant Taxonomy*
- V.N. Naik – *Taxonomy of Angiosperms*
- O.P. Sharma – *Plant Taxonomy*
- Singh – *Plant Systematics*

ECONOMIC BOTANY

Unit 1: Introduction

- Scope and importance of economic botany
- Centers of origin – **Nikolai Vavilov**
- Germplasm conservation

Unit 2: Cereals & Millets

- Rice (Oryza sativa)
- Wheat (Triticum aestivum)
- Maize (Zea mays)

Unit 3: Pulses

- Gram (Cicer arietinum)

- Pea (Pisum sativum)

Unit 4: Oil Yielding Plants

- Mustard
- Groundnut
- Coconut

Unit 5: Fibre Yielding Plants

- Cotton
- Jute

Unit 6: Spices & Beverages

- Tea
- Coffee
- Turmeric
- Cardamom

Unit 7: Medicinal Plants

- Cinchona
- Neem
- Tulsi

Book References (Economic Botany)

- B.P. Pandey – *Economic Botany*
- S.L. Kochhar – *Economic Botany in the Tropics*

- A.F. Hill – *Economic Botany*

BSCBOT401P:- BOTANY LAB–IV

Practical Work (Plant Taxonomy)

- Description of plant specimens using morphological characters
- Identification up to family level using keys
- Study of floral formula & floral diagrams
- Herbarium sheet preparation
- Study of local flora

Practical Work (Economic Botany)

- Identification of economically important plant products (cereals, fibres, oils, spices)
- Study of plant drugs
- Microscopic study of starch grains and fibres
- Field visit / Botanical garden visit

Practical Book References

- B.P. Pandey – *Plant Taxonomy Practical Manual*
- P.C. Vashishta – *Botany Practical Manual*
- University-prescribed practical notebook

BSCCH402T:- CHEMISTRY OF D & F BLOCK ELEMENTS CHEMISTRY OF OXYGEN & NITROGEN CONTAINING FUNCTIONAL GROUPS CHEMICAL & IONIC EQUILIBRIUM

Unit 1: Transition Elements (d-Block)

- General characteristics of transition elements
- Electronic configuration
- Atomic & ionic radii
- Ionization enthalpy
- Oxidation states
- Magnetic properties
- Colour of transition metal ions
- Complex formation tendency
- Catalytic properties

Unit 2: Chemistry of First Row Transition Series

- Properties of Sc to Zn
- Oxidation states & stability
- Lanthanide contraction

Unit 3: f-Block Elements

- Lanthanides: electronic configuration, oxidation states
- Lanthanide contraction
- Actinides: general properties, oxidation states

- Comparison between lanthanides & actinides

Book References:

- J.D. Lee – *Concise Inorganic Chemistry*
- Huheey, Keiter & Keiter – *Inorganic Chemistry*
- Cotton & Wilkinson – *Advanced Inorganic Chemistry*

CHEMISTRY OF OXYGEN & NITROGEN CONTAINING FUNCTIONAL GROUPS

Unit 1: Alcohols, Phenols & Ethers

- Structure & classification
- Preparation methods
- Physical & chemical properties
- Reactions (oxidation, substitution, dehydration)

Unit 2: Aldehydes & Ketones

- Nucleophilic addition reactions
- Aldol condensation
- Cannizzaro reaction
- Haloform reaction

Unit 3: Carboxylic Acids & Derivatives

- Acidity & structure
- Acid derivatives (acid chlorides, esters, amides)

- Decarboxylation

Unit 4: Nitrogen Containing Compounds

- Amines (basicity, reactions)
- Diazonium salts
- Nitro compounds

 Book References:

- Morrison & Boyd – *Organic Chemistry*
- I.L. Finar – *Organic Chemistry* (Vol I & II)
- Bahl & Bahl – *Advanced Organic Chemistry*

CHEMICAL & IONIC EQUILIBRIUM

Unit 1: Chemical Equilibrium

- Law of mass action
- Equilibrium constant (Kc, Kp)
- Le Chatelier's principle
- Applications

Unit 2: Ionic Equilibrium

- Acid–base theories (Arrhenius, Bronsted–Lowry, Lewis)
- pH, pKa, buffers
- Hydrolysis of salts
- Solubility product (Ksp)
- Common ion effect

 Book References:

- P.W. Atkins – *Physical Chemistry*
- K.L. Kapoor – *Physical Chemistry*
- Glasstone – *Textbook of Physical Chemistry*

BSCCH402P:- CHEMISTRY LAB–IV

- Estimation of metal ions by complexometric titration
- Determination of hardness of water
- Conductometric titration
- pH metric titration
- Preparation of inorganic complexes
- Organic compound functional group analysis

 Lab Manual:

- Vogel's *Quantitative Chemical Analysis*
- University prescribed Practical Manual

BSCZO403T:- CELL BIOLOGY, GENETICS & BIOTECHNOLOGY

Unit 1: Cell Biology

- Cell structure (Prokaryotic & Eukaryotic)
- Cell organelles & functions
- Cell cycle & regulation

- Mitosis & Meiosis

Unit 2: Genetics

- Mendelian genetics
- Linkage & crossing over
- DNA replication
- Transcription & translation
- Mutation

Unit 3: Biotechnology

- Recombinant DNA technology
- PCR
- Cloning vectors
- Genetic engineering
- Applications in agriculture & medicine

Book References:

- Alberts – *Molecular Biology of the Cell*
- Karp – *Cell and Molecular Biology*
- Watson – *Molecular Biology of the Gene*
- B.D. Singh – *Genetics*

BSCZO403P:- ZOOLOGY LAB–IV

- Study of mitosis & meiosis slides
- Blood smear preparation
- Study of genetic crosses (Drosophila models)

- Identification of developmental stages
- Biochemical tests (proteins, carbohydrates)

Lab Reference:

- P.S. Verma – *Practical Zoology*
- University practical manual

MDC404T:- DIGITAL EMPOWERMENT

- Digital literacy basics
- Cyber security & digital safety
- Digital payments (UPI, net banking)
- Data privacy
- E-governance services
- Cloud storage

Book Reference:

- Government of India – Digital Literacy Course Material (PMGDISHA)
- NCERT Computer Studies Textbook

SEC405T:- APTITUDE & REASONING

- Number system
- Percentage, Profit & Loss
- Time & Work
- Ratio & Proportion

- Logical reasoning
- Blood relations
- Coding–Decoding
- Data interpretation

Book Reference:

- R.S. Aggarwal – *Quantitative Aptitude*
- M.K. Pandey – *Analytical Reasoning*

VAC406T:- FINANCIAL LITERACY & BANKING

- Basics of banking
- Types of bank accounts
- RBI functions
- Loans & interest calculation
- Insurance
- Mutual funds
- Digital banking

Book Reference:

- RBI Financial Education Booklets
- SEBI Investor Awareness Material

AEC407T:- ELEMENTARY COMPUTER LAB

- MS Word (formatting, mail merge)
- MS Excel (formulas, charts, pivot tables)
- MS PowerPoint
- Internet & email usage
- Basic HTML
- File management

Book Reference:

- V. Rajaraman – *Fundamentals of Computers*
- Peter Norton – *Introduction to Computers*

Semester V										
Paper Code	Paper Name	Code	L	T	P	Total Credits	Internal	External	Practical	Total Marks
BSCBOT501T	PLANTTAXONOMY	MJR	4	0	0	4	40	60	0	100
BSCBOT501P	BOTANY LAB–V		0	0	0	2	20	30	2	50
BSCCH502T	INORGANICCHEMISTRY ORGANICCHEMISTRY PHYSICALCHEMISTRY	MJR	4	0	0	4	40	60	0	100
BSCCH502P	CHEMISTRY LAB-V		0	0	0	2	20	30	2	50
BSCZO503T	CHORDATES DEVELOPMENTALBIOLOGY	MIN	2	0	0	4	40	60	0	100
BSCZO503P	ZOOLOGY LAB–V		0	0	0	2	20	30	2	50
MDC504T	COMMUNICATION SKILLS	MDC	2	0	0	2	60	40	0	100
SEC505T	MODERN OFFICE MANAGEMENT	SEC	2	0	0	2	20	30	0	50
AEC506T	PROJECT-I(MINOR)	AEC	2	0	0	2	20	30	0	50
						24	280	370	4	650

BSCBOT501T:- PLANT TAXONOMY

Unit 1: Advanced Principles of Taxonomy

- Taxonomy vs Systematics
- Taxonomic hierarchy
- Species concept (Biological, Morphological, Phylogenetic)
- Botanical nomenclature (ICN rules)
- Typification & priority

Unit 2: Systems of Classification

- Artificial system – **Carolus Linnaeus**
- Natural system – **George Bentham** & **Joseph Dalton Hooker**
- Phylogenetic system – **Adolf Engler**
- Modern APG classification

Unit 3: Biosystematics

- Cytotaxonomy
- Chemotaxonomy
- Numerical taxonomy
- Molecular taxonomy

Unit 4: Study of Important Families

- Magnoliaceae
- Brassicaceae

- Fabaceae
- Solanaceae
- Asteraceae
- Liliaceae

(Floral formula, floral diagram, economic importance)

 Books:

- O.P. Sharma – *Plant Taxonomy*
- V.N. Naik – *Taxonomy of Angiosperms*
- Singh – *Plant Systematics*

BSCBOT501P:- BOTANY LAB–V

- Description of plant specimens
- Identification using taxonomic keys
- Preparation of floral diagrams
- Herbarium techniques
- Field survey & report writing
- Study of plant families (spotting)

 Practical Manual:

- B.P. Pandey – *Plant Taxonomy Practical*
- University Practical Notebook

BSCCH502T:- INORGANIC CHEMISTRY

Unit 1: Coordination Chemistry

- Werner’s theory – **Alfred Werner**
- Ligands & nomenclature
- Isomerism (geometrical, optical)
- Valence bond theory
- Crystal field theory
- Magnetic properties

Unit 2: Organometallic Compounds

- Definition & classification
- Metal carbonyls
- 18-electron rule

Unit 3: Bioinorganic Chemistry

- Hemoglobin
- Chlorophyll
- Role of trace elements

 Books:

- J.D. Lee – *Concise Inorganic Chemistry*
- Shriver & Atkins – *Inorganic Chemistry*
- Cotton & Wilkinson – *Advanced Inorganic Chemistry*

ORGANIC CHEMISTRY

Unit 1: Aromatic Compounds

- Electrophilic substitution
- Orientation effects

Unit 2: Heterocyclic Compounds

- Pyrrole
- Furan
- Thiophene
- Pyridine

Unit 3: Spectroscopy

- UV spectroscopy
- IR spectroscopy
- NMR basics

Unit 4: Stereochemistry

- Optical isomerism
- R/S configuration
- Conformations

 Books:

- Morrison & Boyd – *Organic Chemistry*
- I.L. Finar – *Organic Chemistry*
- Clayden – *Organic Chemistry*

PHYSICAL CHEMISTRY

Unit 1: Electrochemistry

- Galvanic cells
- Nernst equation
- EMF & thermodynamics

Unit 2: Chemical Kinetics

- Rate laws
- Order of reaction
- Arrhenius equation

Unit 3: Surface Chemistry

- Adsorption
- Freundlich & Langmuir isotherms
- Colloids

 Books:

- P.W. Atkins – *Physical Chemistry*
- K.L. Kapoor – *Physical Chemistry*
- Castellan – *Physical Chemistry*

BSCCH502P:- CHEMISTRY LAB–V

- Synthesis of coordination complexes
- Conductometric titration
- Potentiometric titration
- Kinetics experiment
- Organic compound preparation & purification
- Spectroscopic analysis (if available)

 Practical:

- Vogel – *Quantitative Chemical Analysis*
- University Lab Manual

BSCZO503T:- CHORDATES & DEVELOPMENTAL BIOLOGY

Part A: Chordates

- Origin & classification of chordates
- Protochordates
- Pisces, Amphibia, Reptilia, Aves, Mammalia
- Comparative anatomy (heart, brain, kidney)

Part B: Developmental Biology

- Gametogenesis
- Fertilization
- Cleavage
- Gastrulation
- Organogenesis
- Placenta types

 Books:

- P.S. Verma & V.K. Agarwal – *Chordate Zoology*
- Gilbert – *Developmental Biology*
- Balinsky – *An Introduction to Embryology*

BSCZO503P:- ZOOLOGY LAB–V

- Study of chordate specimens
- Comparative anatomy (heart/brain models)
- Frog/Rat dissection (where permitted)
- Study of developmental stages (frog/chick embryo)
- Permanent slide identification

 Practical:

- P.S. Verma – *Practical Zoology*

MDC504T:- COMMUNICATION SKILLS

- Verbal & non-verbal communication
- Presentation skills
- Group discussion
- Interview skills
- Report writing
- Email etiquette

 Books:

- K.K. Sinha – *Business Communication*
- Raymond Murphy – *Essential English Grammar*

SEC505T:- MODERN OFFICE MANAGEMENT

- Office organization
- File management
- E-office system
- Office correspondence
- Record keeping
- Time management
- Basics of HR

 Books:

- B.N. Tandon – *Office Management*
- Office Procedure Manuals (Government of India)

AEC506T:- PROJECT–I (MINOR)

- Selection of topic (Botany/Chemistry/Zoology)
- Literature review
- Methodology
- Data collection
- Result & discussion
- Report writing
- Viva-voce

 Reference:

- C.R. Kothari – *Research Methodology*
- University project guidelines

Semester VI										
Paper Code	Paper Name	Code	L	T	P	Total Credits	Internal	External	Practical	Total Marks
BSCBOT601T	MOLECULARBIOLOGYANDPLANTBIOTECHNOLOGY	MJR	4	0	0	4	40	60	0	100
BSCBOT601P	BOTANY LAB–VI		0	0	0	2	20	30	2	50
BSCCH602T	INORGANICCHEMISTRY ORGANICCHEMISTRY PHYSICALCHEMISTRY	MJR	4	0	0	4	40	60	0	100
BSCCH602P	CHEMISTRY LAB-VI		0	0	0	2	20	30	2	50
BSCZO603T	EVOLUTIONAND ETHOLOGY ECOLOGYANDBIOSTATISTICS	MIN	2	0	0	4	40	60	0	100
BSCZO603P	ZOOLOGY LAB–VI		0	0	0	2	20	30	2	50
MDC604T	INTELLECTUAL PROPERTY RIGHT AND DEVELOPMENT	MDC	2	0	0	2	60	40	0	100
SEC605T	MODERN OFFICE MANAGEMENT	SEC	2	0	0	2	20	30	0	50
AEC606T	PROJECT-II (MAJOR)	AEC	2	0	0	2	20	30	0	50
						24	280	370	4	650

BSCBOT601T:- MOLECULAR BIOLOGY AND PLANT BIOTECHNOLOGY

Part A: Molecular Biology

Unit 1: Structure of Genetic Material

- DNA structure – **James Watson** & **Francis Crick** model
- Types of RNA
- DNA replication (prokaryotes & eukaryotes)

Unit 2: Gene Expression

- Transcription
- Genetic code
- Translation
- Operon concept (Lac operon)

Unit 3: Gene Regulation

- Regulation in prokaryotes & eukaryotes
- Mutation & DNA repair

Part B: Plant Biotechnology

Unit 4: Plant Tissue Culture

- Totipotency
- Media preparation (MS medium)

- Callus culture
- Micropropagation

Unit 5: Genetic Engineering

- Recombinant DNA technology
- Agrobacterium-mediated transformation
- Transgenic plants
- CRISPR basics

Unit 6: Applications

- GM crops
- Biofertilizers
- Secondary metabolite production

□ Books:

- Alberts – *Molecular Biology of the Cell*
- B.D. Singh – *Plant Biotechnology*
- Karp – *Cell and Molecular Biology*

BSCBOT601P:- BOTANY LAB–VI

- DNA isolation (demonstration)
- Study of mitosis/meiosis slides
- Media preparation for tissue culture
- Study of GM crop specimens
- Microtechnique & staining
- Project work related practical

 Practical Manual:

- B.P. Pandey – Practical Botany
- University Practical Guidelines

BSCCH602T:- INORGANIC CHEMISTRY

Unit 1: Advanced Coordination Chemistry

- Crystal Field Theory (CFSE calculations)
- Jahn–Teller distortion
- Stability constants

Unit 2: Organometallic Chemistry

- Metal carbonyls
- Ferrocene
- 18-electron rule

Unit 3: Bioinorganic Chemistry

- Metalloproteins
- Nitrogen fixation
- Role of metal ions in biology

 Books:

- J.D. Lee – *Concise Inorganic Chemistry*
- Shriver & Atkins – *Inorganic Chemistry*
- Cotton & Wilkinson – *Advanced Inorganic Chemistry*

ORGANIC CHEMISTRY

Unit 1: Reaction Mechanisms

- Substitution (SN1, SN2)
- Elimination (E1, E2)
- Rearrangements

Unit 2: Carbonyl Compounds

- Aldol condensation
- Claisen condensation
- Perkin reaction

Unit 3: Spectroscopy

- UV
- IR
- NMR (basic interpretation)

Unit 4: Biomolecules

- Carbohydrates
- Amino acids
- Proteins

 Books:

- Morrison & Boyd – *Organic Chemistry*

- Clayden – *Organic Chemistry*
- I.L. Finar – *Organic Chemistry*

PHYSICAL CHEMISTRY

Unit 1: Thermodynamics

- Third law
- Maxwell relations

Unit 2: Quantum Chemistry

- Black body radiation
- Photoelectric effect
- Schrödinger equation (basic concept)
- Particle in a box

Unit 3: Electrochemistry

- EMF & free energy
- Conductance
- Debye–Hückel theory

 Books:

- P.W. Atkins – *Physical Chemistry*
- K.L. Kapoor – *Physical Chemistry*

BSCCH602P:- CHEMISTRY LAB–VI

- Synthesis of organic compounds
- Spectroscopic identification
- Conductometric titration
- Potentiometric titration
- Kinetics experiment
- Inorganic complex preparation

 Practical:

- Vogel – *Quantitative Chemical Analysis*
- University Lab Manual

BSCZO603T:- EVOLUTION AND ETHOLOGY

Part A: Evolution

- Origin of life
- Theories of evolution – **Charles Darwin**
- Natural selection
- Speciation
- Hardy–Weinberg equilibrium
- Human evolution

Part B: Ethnology

- Animal behaviour
- Learning behaviour

- Imprinting – **Conrad Lorenz**
- Social behaviour
- Communication

 Books:

- Ridley – *Evolution*
- V.K. Agarwal – *Animal Behaviour*

ECOLOGY AND BIOSTATISTICS

Part A: Ecology

- Population ecology
- Ecosystem structure
- Energy flow
- Biogeochemical cycles
- Biodiversity conservation

Part B: Biostatistics

- Mean, median, mode
- Standard deviation
- Probability
- Chi-square test
- t-test

 Books:

- Odum – *Fundamentals of Ecology*

- Sokal & Rohlf – *Biometry*

BSCZO603P:- ZOOLOGY LAB–VI

- Study of adaptive radiations
- Hardy–Weinberg calculation problems
- Statistical calculations
- Behavioural experiments
- Ecological field survey

 Practical:

- P.S. Verma – Practical Zoology
- Biostatistics Manual

MDC604T:- INTELLECTUAL PROPERTY RIGHTS (IPR) & DEVELOPMENT

- Introduction to IPR
- Types: Patent, Copyright, Trademark, GI
- Patent filing process
- WTO & TRIPS
- IPR in biotechnology
- Technology transfer

 Books:

- P. Narayanan – *Intellectual Property Law*
- WIPO Learning Materials

SEC605T:- MODERN OFFICE MANAGEMENT

- E-office systems
- Digital file management
- Office communication
- Leadership & teamwork
- Record management
- Office automation

 Books:

- B.N. Tandon – *Office Management*

AEC606T:- PROJECT–II (MAJOR)

- Research proposal
- Literature review
- Methodology design
- Data collection & analysis
- Statistical tools
- Dissertation writing
- Presentation & viva

 Reference:

- C.R. Kothari – *Research Methodology*
- University Dissertation Guidelines