College of Basic Sciences & Humanities

College of Basic Sciences & Humanities
Dean: Prof. Santosh Dhillon

College of Basic Sciences & Humanities does not have its own graduation programme but this college has important contribution for teaching of B.Sc. (Hons.) Agriculture, B.Tech. (Agricultural Engineering) and B.Sc. (Hons.) Home Science.

Bridge Courses for 6-Year Programme of B. Sc. (Hons.) Agriculture and B. Sc. (Hons.) Home Science: Department-wise

Course No.	Course Title	Credits	Semester
	Biology		
BIO 1	Biology-I (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	I
BIO 2	Biology-II (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	II
BIO 21	Biology-III (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	III
BIO 22	Biology-IV (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	IV
	Total Credits	**12 (8+4)**	
	Chemistry & Physics		
	Chemistry		
CHEM 1	Principles of Chemistry–I	4 (3+1)	I
CHEM 2	Principles of Chemistry–II	4 (3+1)	II
CHEM 21	Principles of Chemistry–III	4 (3+1)	III
CHEM 22	Principles of Chemistry–IV	4 (3+1)	IV
	Total Credits	**16 (12+4)**	
	Physics		
PHY 1	Principles of Physics–I	4 (3+1)	I
PHY 2	Principles of Physics–II	4 (3+1)	II
PHY 21	Principles of Physics–III	4 (3+1)	III
PHY 22	Principles of Physics–IV	4 (3+1)	IV
	Total Credits	**16 (12+4)**	
	Computer		
COMP 1	Computer Techniques–I	2 (0+2)	I
COMP 2	Computer Techniques–II	3 (0+3)	II
COMP 21	Computer Techniques–III	2 (0+2)	III
COMP 22	Computer Techniques–IV	3 (0+3)	IV
	Total Credits	**10 (0+10)**	
	English (Languages & Haryanavi Culture)		
ENG 1	Composition and Elementary Grammar	3 (2+1)	I
ENG 2	Applied Grammar and Comprehension	3 (2+1)	II

ENG 21	English Composition and Comprehension	3 (2+1)	III
ENG 22	Functional English	3 (2+1)	IV
	Total Credits	**12 (8+4)**	
Mathematics (Mathematics & Statistics)			
MATH 1	Algebra and Trigonometry	3 (3+0)	I
MATH 2	Coordinate Geometry, Calculus and Elementary Statistics	3 (3+0)	II
MATH 21	Matrices, Determinants, Differential Calculus and Probability	3 (3+0)	III
MATH 22	Integral Calculus, Vectors and 3D Geometry	3 (3+0)	IV
	Total Credits	**12 (12+0)**	

Core Courses for B. Sc. (Hons.) Agriculture
4-Year programme/ 6-Year Programme: Department-wise

Biochemistry			
BIOCHEM 101	Biochemistry	3 (2+1)	II/VI
	Total Credits	**3 (2+1)**	
Botany and Plant Physiology			
BOT 101	Elementary Botany (For students from Math stream)	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	
Computer			
COMP 101	Introduction to Computer Applications	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	
English (Languages & Haryanavi Culture)			
ENG 101	Comprehension and Communication Skills in English	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	
Mathematics & Statiscs			
Mathematics			
MATH 101	Mathematical Methods in Agriculture (For students from Bio stream)	4 (3+1)	I/V
	Total Credits	**4 (3+1)**	
Statistics			
STAT 101	Introduction to Statistical Methods	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	
Microbiology			
MICRO 101	Elementary Microbiology	3 (2+1)	II/VI
	Total Credits	**3 (2+1)**	
Sociology			
SOC 101	Fundamentals of Rural Sociology and Educational Psychology	2 (2+0)	I/V
	Total Credits	**2 (2+0)**	
Zoology			
ZOO 101	Elementary Zoology (For students from Math stream)	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	

Elective Courses (Experiential Learning) for B. Sc. (Hons.) Agriculture 4-Year/6-Year Programme: Department-wise

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Bioinformatics			
BIOINFO 417	Bioinformatics	3 (1+2)	VII/XI
	Total Credits	**3 (1+2)**	
Microbiology			
MICRO 418	Production Technology of Bio-fertilizers	1 (0+1)	VII/XI
	Total Credits	**1 (0+1)**	
Molecular Biology & Biotechnology			
MBB 411	Essentials of Molecular Biology	2 (1+1)	VII/XI
MBB 412	Recombinant DNA Technology	3 (1+2)	VII/XI
MBB 413	Plant Tissue Culture and Genetic Transformation	4 (2+2)	VII/XI
MBB 414	Molecular Breeding	2 (1+1)	VII/XI
MBB 415	Microbial and Environmental Biotechnology	3 (1+2)	VII/XI
MBB 416	Molecular Diagnostics	2 (1+1)	VII/XI
	Total Credits	**16 (7+9)**	
Sociology			
SOC 401	Government Policies and Programmes of Agricultural and Rural Development	3 (1+2)	VII/XI
SOC 402	Behavioural Skills	3 (1+2)	VII/XI
	Total Credits	**6 (2+4)**	

Core Courses for B. Tech. (Agricultural Engineering) programme: Department-wise

Course No.	Course Title	Credits	Semester
Chemistry & Physics			
Chemistry			
CHEM 101	Engineering Chemistry	3 (2+1)	I
	Total Credits	**3 (2+1)**	
Physics			
PHY 101	Engineering Physics	3 (2+1)	I
	Total Credits	**3 (2+1)**	
English (Langugages and Haryanavi Culture)			
ENG 201	Technical Writing and Communication Skills	2 (1+1)	IV
	Total Credits	**2 (1+1)**	
Mathematics (Mathematics & Statistics)			
MATH 104	Engineering Mathematics-I	3 (2+1)	I
MATH 105	Engineering Mathematics-II	3 (2+1)	II
MATH 201	Engineering Mathematics-III	3 (2+1)	III
	Total Credits	**9 (6+3)**	

Core Courses for B. Sc. (Hons.) Home Science 4-Year/6-Year Programme: Department-wise

Biochemistry			
BIOCHEM 100	Introductory Biochemistry	3 (2+1)	III/VII
	Total Credits	**3 (2+1)**	
Botany & Plant Physiology			
BOT 101	Elementary Botany (For students from Arts and Math streams)	2 (1+1)	II/VI
	Total Credits	**2 (1+1)**	
Chemistry & Physics			
Chemistry			
CHEM 100	Introductory Chemistry (For students from Arts stream)	4 (3+1)	I
	Total Credits	**4 (3+1)**	
Physics			
PHY 100	Introductory Physics (For students from Arts stream)	4 (3+1)	III
	Total Credits	**4 (3+1)**	
Computer			
COMP 100	Basics of Computer Applications	2 (0+2)	II/VI
	Total Credits	**2 (0+2)**	
English (Languages & Haryanvi Culture)			
ENG 100	English and Technical Writing	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	
Mathematics & Statistics			
Mathematics			
MATH 100	Elementary Mathematics (For students from Arts and Bio streams)	2 (2+0)	II/VI
	Total Credits	**2 (2+0)**	
Statistics			
STAT 100	Elementary Statistics	2 (1+1)	VIII
	Total Credits	**2 (1+1)**	
Microbiology			
MICRO 100	Introductory Microbiology	2 (1+1)	V/IX
	Total Credits	**2 (1+1)**	
Sociology			
SOC 100	Rural Sociology and Human Psychology	2 (2+0)	VI/X
	Total Credits	**2 (2+0)**	
Zoology			
ZOO 101	Elementary Zoology (For students from Arts and Math streams)	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	

COURSE CONTENTS: DEPARTMENT-WISE

BIOCHEMISTRY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Core Courses for B. Sc. (Hons.) Home Science			
BIOCHEM 100	Introductory Biochemistry	3 (2+1)	III/VII
	Total Credits	**3 (2+1)**	
Core courses for B. Sc. (Hons.) Agriculture			
BIOCHEM 101	Biochemistry	3 (2+1)	II/VI
	Total Credits	**3 (2+1)**	

BIOCHEM 100 INTRODUCTORY BIOCHEMISTRY SEM III/VII
3 (2+1)

Theory

Introduction to biochemistry: its importance and relationship to food and nutrition; carbohydrates: definition, classification, general reactions; metabolism; lipid: definition, classification, saturated, unsaturated and essential fatty acids, oxidation, rancidity; proteins: definition, classification, colloidal nature of proteins; amino acids: classification, chemical properties; enzymes: chemical nature, mechanism of enzyme action, specificity of enzymes, conditions for enzymes activities, coenzymes and prosthetic groups; vitamins: classification, structure and functions of vitamins; hormones involved in regulation of metabolism; acid base equilibrium.

Practical

Qualitative and quantitative tests for carbohydrates, lipid, proteins, amino acids and vitamin-C; determination of pH, analysis of proximate constituents in food.

BIOCHEM 101 BIOCHEMISTRY SEM II
3 (2+1)

Theory

Biochemistry: introduction and importance to agriculture, plant cell, biomolecules; carbohydrates: definition, functions and classification, biologically important monosaccharides, chiral carbon, stereoisomerism, optical activity, mutarotation, reactions of monosaccharides, structure and functions of important oligosaccharides and polysaccharides, brief aspects of glycolysis, TCA cycle, oxidative phosphorylation, HMP, glyoxalate pathway and gluconeogenesis; lipids: saponifiable and non saponifiable lipids, structure and properties of saturated, unsaturated and OH-fatty acids, triacylglycerol, characterization of fats, rancidity, waxes, phospholipids, glycolipids, reactions of β-oxidation; proteins: general functions, classification, structure and functions of aminoacids, peptide bond, structural organization of proteins, general reactions of amino acid degradation, urea cycle; enzymes: classification, factors affecting enzyme activity, coenzymes, prosthetic group, energy of activation, enzyme specificity; nucleic acids: structure and functions of bases, nucleosides, nucleotides, RNA and DNA,

preliminary aspects of replication, transcription, translation, photosynthesis, photorespiration, NO_3^- and ammonia assimilation and symbiotic n_2 fixation; plant hormones and secondary metabolites - their role.

Practical

Preparation of solutions and buffers, use of pH meter, colour reactions of carbohydrates, proteins, amino acids and lipids, quantitative determination of sugars and proteins; qualitative separation of sugars and amino acids by paper chromatography; separation of lipids and photosynthesis pigments by TLC, protein denaturation by heat and pH; simple enzyme assays.

BIOINFORMATICS

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Elective Courses/Experiential Learning for B. Sc. (Hons.) Agriculture			
BIOINFO 417	Bioinformatics	3 (1+2)	VII/XI
	Total Credits	**3 (1+2)**	

BIOINFO 417 **BIOINFORMATICS** **SEM VII/XI**
3 (1+2)

Theory

Overview and scope; introduction to database systems:-relation and distributed database systems; SQL and reports; multimedia database; biological databanks and analysis; data warehousing; capture and analysis; sequence database; gene bank; EMBL nucleoside sequence database; pairwise alignment; PDB and CSD; prediction of RNA secondary & higher level structures; design of PCR primers and ePCR; computer networking: basic concepts; LAN, WAN, WWW, Ethernet, TCP/IP, client source concept; biomolecue structure and dynamics; automation for biologists.

Practical

Use of INTERNET and W.W.W., searches on MEDLINE, CD-ROM; bibliographic databases; R AS M OL, M OLM O L, M X, VR M L etc; use of molecular model packages and visualization tools.

BOTANY & PLANT PHYSIOLOGY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Bridge Courses			
BIO 1	Biology-I (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	-/I
BIO 2	Biology-II (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	-/II
BIO 21	Biology-III (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	-/III
BIO 22	Biology-IV (To be taught jointly by Botany & Plant Physiology and Zoology)	3 (2+1)	-/IV
	Total Credits	**12 (8+4)**	
Core courses for B. Sc. (Hons.) Agriculture and B. Sc. (Hons.) Home Science			
BOT 101	Elementary Botany (For students from Math stream)	2 (1+1)	Agri.: I/V H.Sc.: II/VI
	Total Credits	**2 (1+1)**	

BIO 1 **BIOLOGY-I** **SEM I**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Living organisms: diversity and classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom); systematics and binomial system of nomenclature; plant diversity: salient features of plants (major groups); classification of angiosperms up to subclass, botanical gardens, herbaria; animal diversity: salient features of animals (non-chordates up to phylum level and chordates up to class level); zoological parks and museums; tissues in animals; morphology, anatomy and functions of different systems of earthworm, cockroach and frog; human physiology: digestion and absorption, breathing and respiration, body fluids and circulation, excretory products and elimination, locomotion and movement, control and coordination.

Practical

To study the parts of a dissecting and compound microscope; study of specimens and identification with reasons: bacteria, *Oscillatoria, Spirogyra, Rhizopus,* mushroom, yeast, liverwort, moss, fern, pines, one monocotyledon and one dicotyledon and one Lichen; diversity in shape and size of cells in different plant and animal tissues *(e.g.* parenchyma, palisade, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibres and mammalian blood smear through temporary/permanent slides); study of specimens and identification: Amoeba, Hydra, Liverfluke, Ascaris, leech, earthworm, prawn, silkworm, honey bee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit; observation of the following spots: human skeleton and different types of joints; morphology of earthworm, cockroach and frog through models/preserved specimens.

BIO 2 **Biology-II** **SEM II**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Plant kingdom: morphology and functions of different parts of flowering plants- root, stem, leaf, inflorescence, flower, fruit and seed; plant anatomy: tissue, tissue systems and anatomy of root, stem and leaf of dicotyledonous plants and comparison with monocotyledonous plants; plant physiology: plants and water relations, movement of water, food, nutrients and gases; mineral nutrition, respiration, photosynthesis; plant growth and development; structural organization in animals, cell as a unit of life: discovery of the cell, origin of prokaryotic and eukaryotic cells, cell theory, animal cell structure - cell wall, cell membrane; brief outline of structure and function of cell organelles: mitochondria, nucleus, ER, golgi apparatus, dictyosomes, plastids, lysosomes, ribosomes, vacuoles, centrioles, cytoskeleton, chromosomes, microbodies and nuclear organization; cell division: mitosis, meiosis, cell cycle; biomolecules: basic chemical constituents of living bodies, structure and functions of carbohydrates, proteins, lipids and nucleic acids; enzymes: types, properties and function.

Practical

Study and description of locally available common flowering plants one each from (Solanaceae, Fabaceae and Liliaceae); types of root (tap or adventitious), stem (herbaceous/woody), leaf arrangement/shapes/ venation, simple or compound; preparation and study of T.S. of dicot and monocot root and stem (primary); study of osmosis by potato osmometer; plasmolysis in epidermal peels *(e.g., rhoeo* leaves); study of distribution of stomata in the upper and lower surface of leaves, stomatal index; comparative study of the rates of transpiration in the upper and lower surface of leave; test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials *(e.g.,* wheat, potato, groundnut, milk or other such suitable material); separation of chlorophyll pigments through paper chromatography; study of rate of respiration in flower buds and germinating seed; effect of salivary amylase on starch; testing the presence of urea, sugar, albumin and bile salts in urine sample (simulated sampled may be used); observation of the following spots - study of mitosis in onion root tip cells, different modifications in root, stem and leaves; identification and comments on different types of inflorescences; imbibition in seeds/raisins; observations and comments on the experimental set up on: anaerobic respiration, phototropism, apical bud removal, suction due to transpiration.

BIO 21 **Biology-III** **SEM III**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Reproduction in flowering plants: vegetative reproduction, flowers, pre fertilization structure and events, apomixis and polyembryony, development of seeds and fruit; ecology: concept of species, population and community; ecological adaptations; pollution and deforestation, global warming, ozone layer depletion, underground water level and threat to biodiversity, conservation of biodiversity; national parks and sanctuaries; human reproduction: male reproductive system, female reproductive system, gametogenesis, menstrual cycle, fertilization and implantation, pregnancy and embryonic development, parturition and lactation; reproductive health problem and strategies, population explosion

and birth control, medical termination of pregnancy, STD, infertility; organism and environment: ecosystem - biotic and abiotic components, food chain, trophic levels, food webs, ecological pyramids, ecosystems components, types and energy flow; biotic community: intraspecific and interspecific relationships, commensalism, predation, scavenging, parasitism, symbiosis, biotic stability and biotic succession.

Practical

Dissection of flower and display of different whorls; dissection of anther and ovary to show number of chambers; study of pollen germination on a slide; collect and study of soil from at least two different sites for texture, moisture content, pH and water holding capacity; correlation with the kinds of plants found in them; collect water from two different water bodies in your locality and study the samples for ph, clarity and presence of any living organisms; study the presence of suspended particulate matter in air at the two widely different sites; plant population density by quadrat method; observations on the following spots - study of flowers adapted to pollination by different agencies (wind, insect); pollen germination on stigma through a permanent slide; study and identify stages of gamete development *i.e.,* T.S. testis and T.S. ovary through permanent slides (from any mammal); meiosis in onion bud cell or grasshopper testis and T.S. of blastula through permanent slides; study two plants and two animals found in xeric conditions and comment upon their adaptations/ morphological features; plants and animals found in aquatic conditions and comment upon their adaptations/morphological features.

BIO 22 **Biology-IV** **SEM IV**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Health, agriculture and industry: recombinant DNA technology and application in health, agriculture and industry, genetically modified (GM) organisms, bio-safety issues; plant breeding, tissue culture, food production, microbes in house hold processing, industrial production; sewage treatment and energy generation; *Bt* cotton; genetics and evolution: Mendelian inheritance, chromosome theory of inheritance, deviations from Mendelian ratio; gene interaction: epistasis, incomplete dominance, co-dominance, complementary genes, multiple alleles, sex determination in human beings; linkage and crossing over; inheritance pattern of haemophilia, blood groups in human beings; DNA and applied zoology: DNA replication, transcription, translation; genetic code, gene expression and regulation; DNA fingerprinting, recombinant DNA technology and its applications; basic concepts of immunology and vaccines: pathogens, parasites; cancer and AIDS; adolescence and drug/ alcohol abuse; animal husbandry, bee keeping and fisheries; evolution: theories and evidences.

Practical

Prepration of a temporary mount of onion root tip to study mitosis; study of effect of the different temperatures and three different pH on the activity of salivary amylase on starch; observations on the following spots: study Mendelian inheritance using seeds of different colour/size of any plant; preparation of pedigree charts of genetic traits such as rolling of tongue, blood groups, widow's peak, colour blindness; exercise on controlled pollination - emasculation, tagging and bagging; identification of the common disease causing organisms like *ascaris, entamoeba, plasmodium*, ringworm through permanent slides or specimens and symptoms of diseases caused by them.

BOT 101 **ELEMENTARY BOTANY** **SEM Agri.: I/V**
H.Sc.: II/VI
2 (1+1)

(For B.Sc. (Hons.) Agriculture from Math stream and for B.Sc. (Hons.) Home Science from Arts and Math stream)

Theory

Morphological features of anglosperms; pollination, fertilization, seed and fruit development; tissue: structure and functions, internal structure of dicot and monocot stem, root and leaf; plant systematics and its utility, binomial nomenclature, general classification; concept of water potential with respect to plant cell, absorption and translocation of water/sap; basic concepts of plant growth and development, respiration and photosynthesis.

Practical

Morphology of various vegetative and reproductase parts in plants, study of slides and specimens pertaining to above topics; demonstration, experiments of diffusion, imbibition, osmosis, ascent of sap; extraction of plant pigments; measurement of plant growth.

CHEMISTRY & PHYSICS

Course Code	Course Title	Credits	Semester (4-yr/6-yr)
Chemistry			
Bridge Courses			
CHEM 1	Principles of Chemistry-I	4 (3+1)	-/I
CHEM 2	Principles of Chemistry-II	4 (3+1)	-/II
CHEM 21	Principles of Chemistry-III	4 (3+1)	-/III
CHEM 22	Principles of Chemistry-IV	4 (3+1)	-/IV
	Total Credits	**16(12+4)**	
Core Courses for B. Sc. (Hons.) Home Science			
CHEM 100	Introductory Chemistry (For students from Arts stream)	4 (3+1)	I/-
	Total Credits	**4 (3+1)**	
Core Courses for B. Tech. (Agricultural Engineering)			
CHEM 101	Engineering Chemistry	3 (2+1)	I
	Total Credits	**3 (2+1)**	
Physics			
Bridge Courses			
PHY 1	Principles of Physics-I	4 (3+1)	-/I
PHY 2	Principles of Physics-II	4 (3+1)	-/II
PHY 21	Principles of Physics-III	4 (3+1)	-/III
PHY 22	Principles of Physics-IV	4 (3+1)	-/IV
	Total Credits	**16 (12+4)**	
Core Courses for B. Sc. (Hons.) Home Science			
PHY 100	Introductory Physics (For students from Arts stream)	4 (3+1)	III/-
	Total Credits	**4 (3+1)**	
Core Courses for B. Tech. (Agricultural Engineering)			
PHY 101	Engineering Physics	3 (2+1)	I
	Total Credits	**3 (2+1)**	

CHEM 1 PRINCIPLES OF CHEMISTRY-I SEM I
4 (3+1)

Theory

Some basic concepts of chemistry: general introduction, importance and scope of chemistry; historical approach to particulate nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules; atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry; properties of matter and their measurements, uncertainity in measurement.

Structure of atom: atomic number, isotopes and isobars, Thomson's model and its limitations, Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de broglie's relationship, heisenberg uncertainty principle, concept of orbitals, quantum numbers, shape of s,p and d orbitals, rules for filling electrons in orbitals – Aufbau principle, Pauli's exclusion principle

and hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals, bohr's model for hydrogen atom.

Classification of elements and periodicity in properties: significance of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements –atomic radii, ionic radii, ionization enthalpy, electron gain enthalpy, electro negativity, valency.

Chemical bonding and molecular structure: valence electrons, ionic bond, covalent bond: bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbital and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

States of matter: gases and liquids- three states of matter, intermolecular interactions, thermal energy, types of interaction, boyle's law, Charles law, Gay Lussac's law, Avogadro's law, ideal behaviour, empirical derivation of gas equation, Avogadro's number, ideal gas equation; deviation from ideal behaviour; liquid state- vapour pressure, viscosity and surface tension (qualitative idea only), kinetic theory of gases.

Thermodynamics: system and types of system, surrounding, work, heat, energy, extensive and intensive properties, state functions; first law of thermodynamics -internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH, calorimetry, Hess's law of constant heat summation, enthalpies of bond dissociation, combustion, formation atomization, sublimation, phase transformation, ionization and solution; introduction of entropy as a state function, free energy change for spontaneous and non - spontaneous process criteria for equilibrium.

Equilibrium: Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium - Le Chatelier's principle, ionic equilibrium-ionization of acids and bases, strong and weak electrolytes, degree of ionization, concept of pH, hydrolysis of salts (elementary idea), buffer solution, solubility product, common ion effect (with illustrative examples).

Practical

Basic laboratory techniques: cutting glass tube and glass rod, bending a glass tube, drawing out a glass jet, boring a cork; experiments based on pH: any one of the following experiments- determination of pH of some solutions obtained from fruit juices, varied concentrations of acids, bases and salts using pH paper or universal indicator, comparing the pH of solutions of strong and weak acids of same concentration; chemical Equilibrium: one of the following experiments- study the shift in equilibrium between ferric ions and thiocyanate ions by increasing/ decreasing the concentration of either ions; study the shift in equilibrium between $[Co(H_2O)_6]^{2+}$ and chloride ions by changing the concentration of either of the ions; thermochemistry: any one of the following experiments- enthalpy of dissolutions of copper sulpahte or potassium nitrate, enthalpy of neutralization of strong acid (HC1) and strong base (NaOH), determination of enthalpy change during interaction (hydrogen bond formation) between acetone and chloroforms; quantitative estimation: using a chemical balance, preparation of standard solution of oxalic acid, determination of strength of a given solution of sodium hydroxide by titrating it against standard solution of oxalic acid, preparation of standard solution of sodium carbonate, determination of strength of a given solution of hydrochloric acid by titrating it against standard sodium carbonate solution.

Note: Any other investigatory project, which involves about 10 periods of work, can be chosen with the approval of the teacher.

CHEM 2 PRINCIPLES OF CHEMISTRY-II SEM II
4 (3+1)

Theory

Redox reactions: concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, application of redox reactions; hydrogen: position of hydrogen in periodic table, occurrence, isotopes, preparation, properties and uses of hydrogen, physical and chemical properties of water, heavy water, hydrogen peroxide - preparation, properties and structure, hydrogen as a fuel, hydrides – ionic, covalent and interstitial.

Group 1 and group 2 elements (alkali and alkaline earth metals): general introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens, uses; preparation and properties of some important compounds: sodium chloride, sodium hydroxide and biological importance of sodium and potassium; calcium oxide and calcium carbonate and industrial uses of lime and limestone, biological importance of magnesium and calcium.

General introduction to p- block elements: group 13 elements- general introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group, boron - physical and chemical properties, some important compounds, boron hydrides, borax, boric acid, aluminium- reactions with acids and alkalies, uses; group 14 elements: general introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first elements of the group, carbon - catenation, allotropic forms, physical and chemical properties, important compounds of silicon and their uses- silicates and zeolites, silicones.

Organic chemistry: some basic principles and technique- general introduction, methods of qualitative and quantitative analysis, classification and iupac nomenclature of organic compounds; electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyperconjugation; homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles.

Classification of hydrocarbons: alkanes- nomenclature, isomerism, conformation (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis; Alkenes: nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions- addition of hydrogen, halogen, water, hydrogen halides (markonikov's addition and peroxide effect), ozonolysis, mechanism of electrophilic addition; Alkynes: nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction with - hydrogen, halogens, hydrogen halides and water; aromatic hydrocarbons: introduction, IUPAC nomenclature, benzene- resonance, aromaticity, chemical reactions- nitration sulphonation, halogenation, friedel craft's alkylation and acylation, mechanism of electrophilic substitution; directive influence of a substituted in mono- substituted benzene, carcinogenicity and toxicity.

Environmental chemistry: environmental pollution - air, water and soil pollution, chemical reactions in atmosphere, smog, major atmospheric pollutions, acid rain, ozone and its

reactions, depletion of ozone layer and its effect, greenhouse effect and global warming-pollution due to industrial wastes, green chemistry as an alternative tool for reducing pollution, strategy for control of environment pollution.

Practical

Characterization and purification of chemical substances: crystallization of an impure sample of any one of the following: alum, copper sulphate, benzoic acid; qualitative analysis: determination of one anion and one cation in a given salt- Cations - Pb^{2+}, Cu^{2+}, As^{3+}, $A1^{3+,}$ $Fe^{3+,}$ Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+}, Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+, Anions – CO_3^{2-}, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO_2^-, NO_3^-, Cl^-, Br^-, I^-, PO_4^{3-}, $C_2O_4^{2-}$, CH_3COO^-, (Note: Insoluble salts excluded); extra elements -nitrogen, sulphur, chlorine, bromine and iodine (Periods 10) in an organic compound; project: scientific investigations involving laboratory testing and collecting information from other sources.

A Few suggested Projects:

Checking the bacterial contamination in drinking water by testing sulphide ion; study of the methods of purification of water; testing the hardness, presence of iron, fluoride, chloride etc. Depending upon the regional variation in drinking water and study of causes of presences of these ions above permissible limit (if any); investigation of the foaming capacity of different washing soaps and the effect of addition of sodium carbonate on it; study the acidity of different samples of tea leaves; determination of the rate of evaporation of different liquids; study the effect of acids and bases on the tensile strength of fibers; study of acidity of fruit and vegetable juices.

CHEM 21 PRINCIPLES OF CHEMISTRY-III SEM III
4 (3+1)

Theory

Solid state: general characteristics of solids, amorphous and crystalline solids, classification of solids based on different binding forces: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), crystal lattices and unit cells, calculation of density of unit cell, packing in solids, voids, number of atoms per unit cell in a cubic unit cell, imperfection in solids, electrical and magnetic properties.

Solutions: types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solubility, colligative properties - relative lowering of vapour pressure, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass, vapour pressure of liquids, ideal and non-ideal solutions.

Electrochemistry: electrochemical cells, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's law, electrolysis and law of electrolysis (elementary idea), dry cell -electrolytic cells and galvanic cells, lead accumulator, EMF of a cell, standard electrode potential, nernst equation and its application to chemical cells, fuel cells, corrosion.

Chemical kinetics: rate of a reaction (average and instantaneous), factors affecting rate of reaction- concentration, temperature, catalyst order and molecularity of a reaction, rate law and specific rate constant, integrated rate equation and half life (only for zero and first order reactions), collision theory (elementary idea, no mathematical treatment).

Surface chemistry: adsorption - physisorption and chemisorption, factors affecting adsorption of gases on solids, colloids distinction between true solutions, colloids and suspension, lyophilic , lyophobic, multimolecular and macromolecular colloids; properties

of colloids; Tyndall effect, brownian movement, electrophoresis, coagulation, emulsion - types of emulsions, catalysis.

General principles and processes of isolation of elements: occurrence of metals, concentration of ores, principles and methods of extracting - concentration, oxidation, reduction - electrolytic method and refining, occurrence and principles of extraction of aluminium, copper, zinc and iron and uses of aluminium, copper, zinc and iron.

P-block elements: group 15 elements- general introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; compounds of nitrogen- preparation and properties of ammonia and nitric acid, phosphorous - allotropic forms, compounds of phosphorous: preparation and properties of phosphine, halides (pci_3, pci_5) and oxoacids (elementary idea only); group 16 elements: general introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties, simple oxides, ozone, sulphur allotropic forms; compounds of sulphur: sulphuric acid- industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only); group17elements: general introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens, hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only); group 18 elements: general introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

Practical

Surface Chemistry: preparation of one lyophilic and one lyophobic sol-lyophilic sol - starch, egg albumin and gum; lyophobic sol - aluminium hydroxide, ferric hydroxide, arsenous sulphide; study of the role of emulsifying agents in stabilizing the emulsion of different oils; chemical kinetics: effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid; study of reaction rates of any one of the following- reaction of iodide ion with hydrogen peroxide at room temperature using different concentration of iodide ions, reaction between potassium iodate, (KIO_3) and sodium sulphite: (Na_2SO_3) using starch solution as indicator (clock reaction); electrochemistry: variation of cell potential in $Zn/Zn^{2+}||$ Cu^{2+}/Cu with change in concentration of electrolytes ($CuSO_4$ or $ZnSO_4$) at room temperature; preparation of inorganic compounds: preparation of double salt of ferrous ammonium sulphate or potash alum, preparation of potassium ferric oxalate; preparation of organic compounds: preparation of any two of the following compounds: Acetanilide, Di -benzal acetone, p-Nitroacetanilide, Aniline yellow or 2- Naphthol aniline dye, lodoform; determination of concentration/ molarity of $KMnO_4$ solution by titrating it against a standard solution of: Oxalic acid, Ferrous ammonium sulphate (Students will be required to prepare standard solutions by weighing themselves).

CHEM 22 PRINCIPLES OF CHEMISTRY-IV SEM IV
4 (3+1)

Theory

d and *f* Block Elements :-general introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals - metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$; Lanthanoids: electronic configuration, oxidation states and lanthanoid contraction; Actinoids: electronic configuration, oxidation states; coordination compounds: introduction, ligands, coordination number, colour, magnetic

properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, bonding and isomerism in coordination compounds, importance and applications of coordination compounds (in qualitative analysis, extraction of metals and biological system), Werner's theory of coordination compounds, bonding in metal carbonyls, stability of coordination compounds.

Haloalkanes and Haloarenes: Haloalkane classification, nomenclature, nature of C -X bond, physical and chemical properties, mechanism of substitution reactions.

Haloarenes: nature of C -X bond, substitution reactions (directive influence of halogen in monosubstituted compounds only), uses and environmental effects of - trichloromethane, tetrachloromethane, iodoform.

Alcohols, Phenols and Ethers: alcohols classification, nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary and tertiary alcohols, mechanism of dehydration, uses of methanol and ethanol; Phenols: nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols; Ethers-nomenclature, methods of preparation, physical and chemical properties; uses.

Aldehydes, ketones and carboxylic acids: aldehydes and ketones- nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophillic addition, reactivity of alpha hydrogen in aldehydes, uses; carboxylic acids-nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses. Organic compounds containing nitrogen: amines- nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines; Cyanides and isocyanides - will be mentioned at relevant places in context; Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Biomolecules: carbohydrates- classification (aldoses and ketoses), monosaccahrides (glucose and fructose), oligosaccharides (sucrose, lactose, maltose), importance; proteins: elementary idea of ά - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins and renaturation of proteins; Vitamins: classification and functions; Nucleic Acids: - DNA and RNA.

Polymers: classification natural and synthetic, semi-synthetic, methods/types of polymerization (addition and condensation), copolymerization, some important polymers-natural and synthetic like polythene, nylon polyesters, bakelite, rubber, biodegradable polymers, commercial importance of polymers; chemistry in everyday life: chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines; chemicals in food: preservations, artificial sweetening agents; cleansing agents: soaps and detergents, cleansing action; drugs and their classification- drug-target interaction, therapeutic action of Drugs.

Practical

Chromatography: separation of pigments from extracts of leaves and flowers by paper chromatography and determination of R_f values, separation of constituents present in an inorganic mixture containing two cations only (constituents having large difference in R_f values to be provided); tests for the functional groups present in organic compounds: unsaturation, alcoholic, phenolic, aldehydic, ketone, carboxylic and amino (Primary) groups; characteristic tests of carbohydrates, fats and proteins in pure samples and their detection in given food stuffs; qualitative analysis: determination of one anion and one cation in a given salt- Cations - Pb^{2+}, Cu^{2+}, As^{3+}, $A1^{3+}$, Fe^{3+} ,Mn^{2+}, Ni^{2+}, Zn^{2+}, Co^{2+}, Ca^{2+},

Sr^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+ , Anions – CO_3^{2-}, S^{2-}, SO_3^{2-}, SO_4^{2-}, NO_2^-, NO_3^-, Cl^-, Br^-, I^-, PO_4^{3-}, $C_2O_4^{2-}$, CH_3COO^-, (Note: Insoluble salts excluded)

Project: scientific investigations involving laboratory testing and collecting information from other sources.

A few suggested projects: study of the presence of oxalate ions in guava fruit at different stages of ripening; study of quantity of casein present in different samples of milk; preparation of soybean milk and its comparison with the natural milk with respect to curd formation, effect of temperature, etc.; study of the effect of potassium bisulphate as food preservative under various conditions (temperature, concentration, time etc.); study of digestion of starch by salivary amylase and effect of pH and temperature on it; comparative study of the rate of fermentation of following materials: wheat flour, gram flour, potato juice, carrot juice etc.; extraction of essential oils present in Saunf (aniseed), Ajwain (carum), Illaichi (cardamom); study of common food adulterants in fat, oil, butter, sugar, turmeric powder, chilli powder and pepper.

CHEM 100 INTRODUCTORY CHEMISTRY SEM I
4 (3+1)

(For B.Sc. (Hons.) Home Science from Arts stream)

Theory

Atoms, molecules, mole concept, states of matter, atomic structure; periodic classification of elements; chemical bonding, transition metals co-ordination compounds; basic concepts of organic chemistry; classification and nomenclature of organic compounds, isomerism-structural and stereoisomerism, petroleum-sources of organic compounds; some important methods of preparation and properties of methane/ethane, ethylene, acetylene, benzene, ethylalcohol, phenol, acetone, acetic acid, benzoic acid, protein and aminoacids, introduction of biomolecules: glucose, fructose, sucrose, lipids, vitamins and dyes.

Practical

Acid-base titration; identification of acid radicals; detections of elements (N,S,X) and functional groups, any two preparations: iodoform, asprin, orange dye; removal of colour stains from clothes.

CHEM 101 ENGINEERING CHEMISTRY SEM I
3 (2+1)

Theory

Phase rule and its applications to one and two component systems; classification and calorific value of fuels; classification and properties of colloids; causes, types and methods of prevention of corrosion; temporary and permanent hardness of water, disadvantages of hard water, scale and sludge formation in boilers and boiler corrosion; analytical methods like thermogravimetric analysis, polarographic analysis, nuclear radiation detectors and analytical applications of radioactive materials; enzymes and their use in the manufacturing of ethanol and acetic acid by fermentation methods; principles of food chemistry, introduction to lipids, proteins, carbohydrates, vitamins, food preservators, colouring and flavoring reagents of food; properties, mechanism, classification and tests of lubricants; types, properties, uses of polymerization and methods for the determination of molecular weight of polymers; introduction to infra red spectroscopy.

Practical

Determination of temporary and permanent hardness of water by EDTA method, estimation of chloride, dissolved oxygen, BOD and COD in water sample, available chlorine in bleaching powder, viscosity of oil, activity of water sample, carbonate and non-carbonate hardness by soda reagent, coagulation of water and chloride ion content, specific rotation of an optically active compound, λ_{max} and verification of Lambert's beer law, calorific value of fuel, identification of functional groups (alcohol, aldehyde, ketone, carboxylic acid and amide) by infrared spectroscopy, chromatographic analysis, molar refraction of organic compounds.

PHY 1 PRINCIPLES OF PHYSICS-I SEM I
4 (3+1)

Theory

Physical world and measurements: scope and excitement of physics, nature of physical laws, physics, technology and society, need for measurement, units of measurement, systems of units, SI units, fundamental and derived units, length, mass and time measurements, accuracy and precision of measuring instruments, significant figures, dimensions of physical quantities, dimensional analysis and its applications; kinematics: frame of reference, motion in a straight line-position-time graph, speed and velocity; uniform and non-uniform motion; speed and velocity: average and instantaneous; uniformly accelerated motion, velocity-time graph and position-time graph, equations for uniformly accelerated motion - graphical treatment only; simple introduction to elementary concepts of differentiation and integration for describing motion; scalar and vector quantities: vectors, notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors; position and displacement vectors, relative velocity, unit vector; resolution of a vector in a plane: rectangular components, motion in a plane; projectile motion, circular motion; laws of motion: Aristotle's fallacy, the law of inertia, Newton's first law of motion, Newton's second law of motion, Newton's third law of motion; conservation of momentum; equilibrium of particle; common forces of mechanics; circular motion; solving problems in mechanics; work, energy and power: definition of work and kinetic energy, work-energy theorem, work done by a constant force and a variable force; kinetic energy, concept of potential energy, potential energy of a spring, conservative forces- conservation of mechanical energy-kinetic and potential energies; non-conservative forces: elastic collisions and elementary idea of inelastic collisions; system of particles and rotational motion: centre of mass; motion of centre of mass; linear momentum of a system of particles; vector product of two vectors; angular velocity and its relation with linear velocity; torque and angular momentum; equilibrium of rigid body; moment of inertia; theorems of perpendicular and parallel axes; kinematics of rotational motion about a fixed axis; dynamics of rotational motion about a fixed axis; angular momentum in case of rotations about a fixed axis.

Practical

The use of Vernier callipers: to measure diameter of a small spherical/cylindrical body, to measure dimensions of a given regular body of known mass and hence find its density, to measure internal diameter and depth of a given beaker/calorimeter and hence find its volume; use of screw gauge to measure diameter of a given wire and to measure thickness of a given sheet; to determine radius of curvature of a given spherical surface by a spherometer; to find the weight of a given body using parallelogram law of vectors; using a simple pendulum, plot L-T and L-T^2 graphs: to find the effective length of second's pendulum using appropriate graph, to find acceleration due to gravity; to study the

relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and a horizontal surface.

Activities on: to make a paper scale of given least count, e.g. 0.2cm, 0.5cm.; to determine mass of a given body using a metre scale by principle of moments; to plot a graph for a given set of data, with proper choice of scales and error bars; to measure the force of limiting friction for rolling of a roller on a horizontal plane; to study the variation in range of a jet of water with angle of projection; to study the conservation of energy of a ball rolling down on inclined plane using a double inclined plane.

PHY 2 PRINCIPLES OF PHYSICS-II SEM II
4 (3+1)

Theory

Gravitation: Kepler's laws of planetary motion, the universal law of gravitation, acceleration due to gravity and its variation with altitude and depth, gravitational potential energy, gravitational potential, escape speed; earth satellite, energy of orbital satellite; geostationary satellites, weightlessness, mechanical properties of solids, fluid and matter: elastic behaviour of solids, stress-strain; Hooke's law; stress strain curve, elastic moduli, applications of elastic behaviour of materials; pressure; streamline flow; Bernoulli's principle, viscosity; Reynolds number; surface tension; heat temperature, thermal expansion, specific heat capacity – calorimetry, change of state – latent heat, heat transfer, conduction, convection and radiation; thermal conductivity, newton's law of cooling; thermodynamics: thermal equilibrium and definition of temperature- zeroth law of thermodynamics; heat, work and internal energy; first law of thermodynamics; second law of thermodynamics: reversible and irreversible processes; heat engines and refrigerators; kinetic theory and behavior of perfect gas: molecular nature of matter, behaviour of gases; kinetic theory of an ideal gas; law of equipartition of energy; specific heat capacity; mean free path; oscillations and waves: periodic and oscillatory motions; simple harmonic motion and uniform circular motion; velocity and acceleration in simple harmonic motion; force law for simple harmonic motion; energy in simple harmonic motion; some systems executing simple harmonic motion; damped simple harmonic motion; forced oscillations and resonance; transverse and longitudinal waves; displacement relations in a progressive wave; speed of a traveling wave; principle of superposition of waves; reflection of waves; beats; Doppler effect.

Practical

To determine Young's modulus of elasticity of the material of a given wire; to find the force constant of a helical spring by plotting graph between load and extension; to study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and I/V; to determine the surface tension of water by capillary rise method; to determine the coefficient of viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body; to study the relationship between the temperature of a hot body and time by plotting a cooling curve; to study the relation between frequency and length of a given wire under constant tension and the relation between the length of a given wire and tension for constant frequency using sonometer; to find the speed of sound in air at room temperature using a resonance tube by two resonance positions; to determine specific heat capacity of a given solid, liquid, by method of mixtures.

Activities: to observe change of state and plot a cooling curve for molten wax; to observe and explain the effect of heating on a bi-metallic strip; to note the change in level of liquid

in a container on heating and interpret the observations; to study the effect of detergent on surface tension by observing capillary rise; to study the factors affecting the rate of loss of heat of a liquid; to study the effect of load on depression of a suitably clamped metre scale loaded at its end in the middle.

PHY 21 PRINCIPLES OF PHYSICS-III SEM III
4 (3+1)

Theory

Electrostatics: electric charges, conductors and insulators, charging by induction, basic properties of electric charge, coulomb's law, forces between multiple charges, electric field, electric field lines, electric flux, electric dipole, dipole in a uniform external field; continuous charge distribution, gauss's law, application of gauss's law; electrostatic potential; potential due to a point charge; potential due to an electric dipole; potential due to a system of charges; equipotential surfaces; potential energy of a system of charges; potential energy in an external field; electrostatics of conductors; dielectrics and polarization; capacitors and capacitance; parallel plate capacitor; effect of dielectric on capacitance; combination of capacitors; energy stored in a capacitor; van de graaff generator.

Current electricity: electric current; electric currents in conductors; ohm's law; limitations of ohm's law; drift of electrons and the origin of resistivity; resistivity of various materials; temperature dependence of resistivity; electrical energy, power; combination of resistors-series and parallel; cells, emf, internal resistance, cells in series and in parallel; kirchhoffs laws; wheatstone bridge; meter bridge; potentiometer; magnetic effects of current: magnetic force; motion in a magnetic field; motion in combined electric and magnetic fields; magnetic field due to a current element, Biot-Savart law; magnetic field on the axis of a circular current loop; Ampere's circuital law; solenoid and toroid; force between two parallel currents, the ampere; torque on current loop, magnetic dipole; moving coil galvanometer; bar magnet; magnetism and gauss's law; earth's magnetism; magnetization and magnetic intensity; magnetic properties of materials; permanent magnets and electromagnets; electromagnetic induction and alternating currents: experiments of Faraday and Henry; magnetic flux; Faraday's law of induction; Lenz's law and conservation of energy; motional electromotive force; energy consideration - a quantitative study; eddy currents; inductance, AC generator, AC voltage applied to a resistor, representation of AC current and voltage by rotating vectors – phasors, AC voltage applied to an inductor, AC voltage applied to a capacitor, AC voltage applied to a series LCR circuit, power in ac circuit - power factor; LC oscillations; transformers.

Practical

To determine resistance per cm of a given wire by plotting a graph of potential difference versus current; to find resistance of a given wire using metre bridge and hence determine the specific resistance of its material; to verify the laws of combination of resistances - series/parallel using a metre bridge; to compare the emf of two given primary cells using potentiometer; to determine the internal resistance of given primary cell using potentiometer; to determine resistance of a galvanometer by half-deflection method and to find its figure of merit; to convert the given galvanometer of known resistance and figure of merit into an ammeter and voltmeter of desired range and to verify the same; to find the frequency of the a.c. mains with a sonometer.

Activities on: to measure the resistance and impedance of an inductor with or without iron core; to measure resistance, voltage (AC/DC), current (AC) and check continuity of a

given circuit using multimeter; to assemble a household circuit comprising three bulbs, three (on/off) switches, a fuse and a power source; to assemble the components of a given electrical circuit; to study the variation in potential drop with length of a wire for a steady current; to draw the diagram of a given open circuit comprising at least a battery, resistor/rheostat, key, ammeter and voltmeter; mark the components that are not connected in proper order and correct the circuit and also draw the circuit diagram.

PHY 22 PRINCIPLES OF PHYSICS-IV SEM IV
4 (3+1)

Theory

Electromagnetic waves: displacement current; electromagnetic waves and their qualitative characteristics; transverse nature of electromagnetic waves, electromagnetic spectrum; radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays including elementary facts about their uses.

Optics: reflection of light by spherical mirrors, total internal reflection; refraction; refraction at spherical surfaces and by lenses; refraction through a prism; dispersion by a prism; some natural phenomena due to sunlight; optical instruments; Huygens principle; refraction and reflection of plane waves using Huygens principle, coherent and incoherent addition of waves, interference of light waves and young's experiment; diffraction; polarization; dual nature of matter and radiation: dual nature of radiation; photoelectric effect, experimental observation and their significance, hertz and lenard's observations; Einstein's photoelectric equation- particle nature of light – photon; wave nature of matter, Davisson-Germer experiment; atoms and nuclei: alpha-particle scattering experiment; Rutherford's model of atom; Bohr model; energy levels, hydrogen spectrum; composition and size of nucleus, atomic masses, isotopes, isobars; isotones; radioactivity alpha, beta and gamma particles/rays and their properties, radioactive decay law, mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission, nuclear reactor, nuclear fusion; electronic devices: classification of metals, conductors and semiconductors; intrinsic semiconductor, extrinsic semiconductor; semiconductor diode; p-n junction; application of junction diode as a rectifier, special purpose p-n junction diodes, junction transistor; digital electronics and logic gates; integrated circuits; communication devices: elements and basic terminology used in communication system, bandwidth of signals, bandwidth of transmission medium, propagation of electromagnetic waves; need for modulation; production and detection of an amplitude-modulated wave.

Practical

To find the value of v for different values of u in case of a concave mirror and to find the focal length; to find the focal length of a convex lens by plotting graphs between u and v or between l/u and l/v; to find the focal length of a convex mirror, using a convex lens; to find the focal length of a concave lens, using a concave lens; to determine angle of minimum deviation for a given prism by plotting a graph between angle of incidence and angle of deviation; to determine refractive index of a glass slab using a traveling microscope; to find refractive index of a liquid by using a convex lens and plane mirror; to draw the I-V characteristic curve of a p-n junction in forward bias and reverse bias; to draw the characteristic curve of a zener diode and to determine its reverse break down voltage; to study the characteristics of a common - emitter npn or pnp transistor and to find out the values of current and voltage gains.

Activities on: to study effect of intensity of light by varying distance of the source on an

L.D.R.; to identify a diode, an LED, a transistor, and IC, a resistor and a capacitor from mixed collection of such items; use of multimeter to identify base of transistor, distinguish between npn and pnp type transistors, see the unidirectional flow of current in case of a diode and an LED; check whether a given electronic component (e.g. diode, transistor or IC) is in working order; to observe refraction and lateral deviation of a beam of light incident obliquely on a glass slab; to observe polarization of light using two polaroids; to observe diffraction of light due to a thin slit; to study the nature and size of the image formed by convex lens and concave mirror on a screen by using a candle and a screen for different distances of the candle from the lens/ mirror; to obtain a lens combination with the specified focal length by using two lenses from the given set of lenses.

PHY 100 INTRODUCTORY PHYSICS SEM III
4 (3+1)

(For B.Sc. (Hons.) Home Science from Arts stream)

Theory

Units, dimensions and measurements; motion in one dimension, equations of motion: position time graph, velocity time graphs; vectors, composition and resolutions, force and inertia, first law of motion, momentum, second law of motion, third law of motion and friction; kinetic and potential energies, conservation of energy, mass energy equivalence and law of conservation of energy; gravity, gravitation, Newton's laws of gravitation, variation of 'g' with altitude, depth; satellites and their applications; fundamentals of heat flow and measurement of temperature, refrigerators, solar cooker; reflection of light, refraction of light, dispersion, optical instruments: microscope, telescope; electric current; elementary idea of magnetic effect of current, electromagnetic induction: AC generator, DC motor, transformer, household wiring, fuse, heater, geyser, vacuum cleaner; washing machine and thermostat.

Practical

Use of vernier caliper; 'g' by simple pendulum; refraction through slab, refraction through prism; focal length of concave mirror and convex lens; Ohm's law.

PHY 101 ENGINEERING PHYSICS SEM I
3 (2+1)

Theory

Dia, Para and ferromagnetism-classification, Langevin theory of dia and paramagnetism, Adiabatic demagnetization, Weiss molecular field theory of ferromagnetism, Curie Weiss law; wave particle duality, de-Broglie concept, uncertainty principle, Schrodinger wave equations, Zeeman effect, Stark effect, Paschanback effects and Raman spectroscopy, Bloch's function, velocity of Bloch's electron and effective mass, intrinsic and extrinsic semiconductors, superconductivity, critical magnetic field, Meissner effect, isotope effect, type-I and type-II, superconductors, Josephson's effect; spontaneous and stimulated emission, Einstein's coefficients, population inversion, three and four level laser systems ammonia maser, introduction to holography, optical fiber and applications, illumination.

Practical

Frequency of A.C. mains, Carey foster bridge, De-sauty's bridge, e/m by helical method, study of induced electromotive force, hysteresis loss and magnetic constants, variation of magnetic field with distance, energy gap in semiconductor, velocity of ultrasonic waves in liquids, fibre optics, laser, Planck's constant; susceptibility of solids.

COMPUTER

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Bridge Courses			
COMP 1	Computer Techniques-I	2 (0+2)	-/I
COMP 2	Computer Techniques- II	3 (0+3)	-/II
COMP 21	Computer Techniques-III	2 (0+2)	-/III
COMP 22	Computer Techniques-IV	3 (0+3)	-/IV
	Total Credits	**10 (0+10)**	
Core Courses for B. Sc. (Hons.) Home Science			
COMP 100	Basics of Computer Applications	2 (0+2)	II/VI
		2 (0+2)	
Core courses for B. Sc. (Hons.) Agriculture			
COMP 101	Introduction to Computer Applications	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	

COMP 1 **COMPUTER TECHNIQUES-I** **SEM I**
2 (0+2)

Practical

Computer: definition, characteristics, limitations and uses; structures of computer showing its different units (I/P,O/P,CPU), various I/O devices (keyboard, mouse, scanner, OMR, MICR, bar code reader, MIC, monitor, printer - DMP, laser, plotter; concept of memory: primary memory (RAM, ROM, PROM, EPROM, EEPROM), secondary memory (floppy, disk, hard disk, CD/DVD, flash drives); WINDOWS- desktop, main group, application group, accessories group, startup group and other miscellaneous applications and features; MS Word: introduction to word processor, features of MS Word –file menu, edit menu, view, menu, format menu; data representation: number system -decimal, octal, binary, hexadecimal, conversion of a number system to other, representation of integers- (sign and magnitude, 1's complement 2's complement); computer architecture- motherboard cache memory, parts (serial, parallel, USB), SMPS, MS Excel: introduction to spreadsheet, define cell, cell address, cell pointer, row, column, worksheet, workbook etc.; types of data in a cell (text, number, date and formula),built in function- SUM, AVG, COUNT, MAX, MIN., cell referencing- absolute, relative mixed; project work: designing result sheet of a class, designing salary slip of an employee of organization.

COMP 2 **COMPUTER TECHNIQUES-II** **SEM II**
3 (0+3)

Practical

MS-Access: data base management: data base, examples, records, fields, field types; getting started: starting access, creating a database, creating a table; listing a table: viewing records, record-numbers, displaying all records, closing the database; creating database: planning the structure, creating the structure, modifying the structure, delete, insert and rearranging fields in a table; entering and deleting data: appending records, saving the database, editing records, moving to the ends, deleting records, using data sheet; form: creating a form, view the records in a form, add and save the records with a form, print, save and close a form; querying a database: creating a query, modifying a query; database

structure: fields, record data types, RDBMS, field structures and relations; SQL: using SQL in microsoft access, using SQL to view and modify quarries, creating tables with access SQL, writing select queries in SQL using SQL; aggregate functions: select, FROMWHERE, ORDERBY, AS, GROUP BY, HAVING CLAUSE.

COMP 21 COMPUTER TECHNIQUES-III SEM III
2 (0+2)

Practical

HTML fundamental: HTML building blocks, writing HTML - the rules, HTML, tags attributes, nesting tags, HTML and white space, the structure of a page, working with the browser and text editor; getting started - viewing your webpages, viewing the source code of a page; creating webpage using text editor and browser together, working with attributes; text formatting- using a default text size, changing the font face, making text bold and italic, changing the text size, choosing a default color, changing individual text color; inserting special character subscript and superscripts, underline and monospace font, adding comments; page layout: using of background color, using background image, centering alignment on the page- A next trick, indenting on both the left and right, working with preformatted text, using pixel shims, line break, keeping line together and discovery line break; using images: inserting images, aligning images with text, wrapping text around and image, stopping text wrap, adding space around an image, specifying and changing the size of an image, adding alternate text to an image, adding horizontal rule, competing the page; text hyperlinks - about hyperlinks, creating hyperlinks to page in the same folder and in the different folder creating a navigation line, creating a hyperlinks to send an email message; other type of hyperlinks; URL formats for different services and types of resources on the web, Using different tools to help create webpages, putting information on the WWW; working with lists - creating a simple ordered list, setting the type attribute for list, setting a start value for the list, list and line breaks; list and indenting, setting the type attribute for an individual list item, setting a start value for an individual list item.

COMP 22 COMPUTER TECHNIQUES-IV SEM IV
2 (0+2)

Practical

System analysis and design introduction: need for system analysis and design, steps and techniques system analysis; role of system analysis, system development life cycle (SDLC) data flow diagrams, documentation; financial accounting package: theory and practical introduction to accounting, objectives, use of tally package and its functions-introduction to various features and functions available in the software package, solving small live financial problems of company/university departments using the available features and function in Tally, security measures- implementing the various security issues using internal security measures available; company creation; accounting heads; voucher entry, balance sheet, display trial balance.

COMP 100 BASICS OF COMPUTER APPLICATIONS SEM II/VI
2 (0+2)

Practical

Introduction to system and application softwares; fundamental concepts of operating systems and disk operating system (DOS) with internal and external commands, file and

directory creation and management; windows operating system: elements, explorer, working with files and folders, various bars- title, task, tool, scroll and start, display and system properties and other important components of window; application softwares: Word Processing and MS-Word creating, editing, formatting and saving a document in Word, exposure to spell-check, insert objects/ pictures, tables, mail merge and import/export features; electronic spreadsheet and MS-Excel: creating, editing, formatting and saving spreadsheets in Excel, formulas, inbuilt functions, statistical functions, graph preparation, matrix inversion, correlation, regression; preparation of slides in MS-Power Point for presentation; internet: access, search, download and upload; electronic mail.

COMP 101 INTRODUCTION TO COMPUTER APPLICATIONS SEM I/V 2 (1+1)

Theory

Introduction to computers, anatomy of computers, input and output devices, units of memory, hardware, software and classification of computers, personal computers, types of processors, booting of computer, warm and cold booting, computer viruses, worms and vaccines; operating system: DOS and WINDOWS, disk operating system (DOS); Some fundamental DOS commands, FORMAT, DIR, COPY, PATH, LABEL, VOL, MD, CD and DELTREE, rules for naming files in DOS and types of files; WINDOWS; GUI, Desktop and its elements, WINDOWS Explorer, working with files and folders; setting time and date, starting and shutting down of WINDOWS; anatomy of a WINDOW, title bar, minimum, maximum and close buttons, scroll bars, menus and tool bars; applications – MS Word: word, processing and units of document, features of word-processing packages; creating, editing, formatting and saving a document in MS Word; MS Excel; electronic spreadsheets, concept, packages, creating, editing and saving a spreadsheet with MS Excel; use of in-built statistical and other functions and writing expressions; use of data analysis tools, correlation and regression, t-test for two samples and ANOVA with one-way classification; creating graphs, MS Power Point; features of power point package; principles of programming; flow charts and algorithms, illustration through examples; internet: world wide web (WWW), concepts, web browsing and electronic mail.

Practical

Study of computer components; booting of computer and its shut down; practice of some fundamental DOS commands, TIME, DATE, DIR, COPY, FORMAT, VOL, LABEL, PATH; Practicing WINDOWS Operating System, use of mouse, Title Bar, Minimum, Maximum and Close Buttons, Scroll Bars, Menus and Tool Bars; WINDOWS Explorer, Creating Folders, COPY and PASTE functions; MS Word: Creating a Document, Saving and Editing; MS Word, Use of options from Tool Bards, Format, Insert and Tools (Spelling and Grammar) Alignment of text; MS Word, Creating a Table, Merging of Cells, Column and Row width; MS Excel: Creating a Spreadsheet, Alignment of rows, columns and cells using Format Tool bar; MS Excel: Entering Expressions through the formula tool bar and use of inbuilt functions, SUM, AVERAGE, STDEV; MS Excel: Data Analysis using inbuilt Tool Packs, Correlation & Regression; MS Excel: Creating Graphs and Saving with and without data; MS Power Point: Preparation of slides on Power Point; Transforming the data of Word, Excel and Access to other formats; Internet Browsing; Browsing a Web Page and Creating of E-Mail ID.

ENGLISH (LANGUAGES & HARYANVI CULTURE)

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Bridge Courses			
ENG 1	Composition and Elementary Grammar	3 (2+1)	-/I
ENG 2	Applied Grammar and Comprehension	3 (2+1)	-/II
ENG 21	English Composition and Comprehension	3 (2+1)	-/III
ENG 22	Functional English	3 (2+1)	-/IV
	Total Credits	**12 (8+4)**	
Core Courses for B. Sc. (Hons.) Home Science			
ENG 100	English and Technical Writing	2 (1+1)	I/V
		2 (1+1)	
Core courses for B. Sc. (Hons.) Agriculture			
ENG 101	Comprehension and Communication Skills in English	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	
Core Courses for B. Tech. (Agricultural Engineering)			
ENG 201	Technical Writing and Communication Skills	2 (1+1)	IV
	Total Credits	**2 (1+1)**	

ENG 1 **COMPOSITION AND ELEMENTARY GRAMMAR** **SEM I 3 (2+1)**

Theory

Prose: The Portrait of a Lady, We're Not Afraid to Die- if We Can All Be Together, Discovering Tut: the Saga Continues, Landscape of the Soul, The Summer of Beautiful White Horse, The Address, Ranga's Marriage, Albert Einstein at School; Poetry: A Photograph, The Laburnum Top.

Practical

Grammar: determiners; tenses: present tense, past tense, future tense; clauses: adjective clause, adverb clause, noun clause; modals.

ENG 2 **APPLIED GRAMMAR AND COMPREHENSION** **SEM II 3 (2+1)**

Theory

Prose: The Ailing Planet the Green, Movement's Role, The Browning Version, The Adventure, Silk Road, Mother's Day, The Ghat of the Only World, Birth, The Tale of Melon City; Poetry: The Voice of the Rain, Childhood, Father to Son.

Practical

Grammar: determiners; tenses: present tense, past tense, future tense; clauses: noun clause, adjective clause, adverb clause; modals.

ENG 21 **ENGLISH COMPOSITION AND COMPREHENSION** **SEM III 3 (2+1)**

Theory

Prose: The Last Lesson, Lost Spring, Deep Water, The Rattrap, The Third Level, The Tiger King, Journey to the End of Earth, The Enemy; Poetry: My Mother at Sixty Six, An Elementary School Classroom in a Slum, Keeping Quiet.

Practical

Grammar: tense (correct form of the verb); paragraph writing; comprehension passages (unseen); letter writing: formal and informal; narration.

ENG 22 **FUNCTIONAL ENGLISH** **SEM IV 3 (2+1)**

Theory

Prose: Indigo, Poets and Pancakes, The Interview Part-I and Part-II, Going Places, Should Wizard Hit Mommy, On the Face of it, Evans Tries an O- Level, Memories of Childhood – The Cutting of My Long Hair, We Too are Human Beings; Poetry: A Thing of Beauty, Road Side Stand, Aunt Jennifer's Tiger.

Practical

Grammar: voice: active and passive voice; use of articles; modals; comprehension passages (unseen); notices.

ENG 100 **ENGLISH AND TECHNICAL WRITING** **SEM I/V 2 (1+1)**

Theory

Tenses, agreement of subject and verb; passive voice; basic sentence patterns; prepositions; phrasal verbs; common grammatical errors; use of articles; punctuation; Modals; Gerund; participles; infinitive; word formation: affixes, prefixes, suffixes, synonyms, antonyms; idioms; synthesis and transformation of sentences; sentence linkers.

Practical

Introduction to sounds: vowels, diphthongs, consonants, phonetic transcription; word stress and exercises on pronunciation; group discussion on current topics; presentation of technical reports.

ENG 101 **COMPREHENSION AND COMMUNICATION SKILLS IN ENGLISH** **SEM I/V 2 (1+1)**

Theory

Text for comprehension entitled (i) The Pointed Vision edited by Usha Bande and Krishan Gopal, Oxford University Press (ii) Current English for Colleges by N. Krishnaswamy and T. Sriraman, Macmillan India Ltd. Madras, 1995. (a) reading comprehension (b) vocabulary- synonyms, antonyms, words often confused (c) exercises to help the students in the enrichment of vocabulary based on TOEFL and GRE and other competitive examinations; language study: functional grammar, agreement of verb with subject; writing skills: mechanics of good letter writing, effective business correspondence, personal correspondence; preparation of curriculum vitae and job applications; the style and

importance of professional writing: choice of words and phrases, precision, conciseness, clichés, redundancy, jargon, foreign words; precis writing and synopsis writing; interviews: types of interviews, purpose, different settings as interviewer and interviewee, physical make up and manners, appearance, poise, speech, self reliance, evaluation process; review or feedback.

Practical

Listening comprehension: listening to short talks, lectures, speeches (scientific, commercial and general in nature); listening to at least two tape recorded conversations aimed at testing the listening comprehension of students; communication: spoken English, oral communication, importance of stress and intonation; spoken english practice by using audio-visual aids, the essentials of good conversation, oral exercises in conversation practice (at the doctor, at the restaurant, at the market yard); using dictionary: introduction of phonetic symbols and transcription; reading skills: rapid reading, intensive reading, improving reading skills; meetings: purpose, procedure of participation, chairmanship, physical arrangements, recording minutes of meeting etc.

ENG 201	**TECHNICAL WRITING AND COMMUNICATION SKILLS**	**SEM IV 2 (1+1)**

Theory

Verbal communication, listening and note taking, writing skills, oral presentation skills, foot note and bibliographic procedures, reading comprehension of general and technical articles, precis writing, summarizing and abstracting, individual and group presentation, public speaking, group discussion, organizing seminar and conferences.

Practical

Listening and note taking, writing skills, oral presentation skills, footnote and bibliographic procedures, reading and comprehension of general and technical articles, précis writing, summarizing abstracting; individual and group presentations, facing an Interview, dictionary, phonetic symbols and transcription, importance of stress in English, weak forms.

MATHEMATICS & STATISTICS

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Mathematics			
Bridge Courses			
MATH 1	Algebra and Trigonometry	3 (3+0)	-/I
MATH 2	Coordinate Geometry, Calculus and Elementary Statistics	3 (3+0)	-/II
MATH 21	Matrices, Determinants, Differential Calculus and Probability	3 (3+0)	-/III
MATH 22	Integral Calculus, Vectors and 3D Geometry	3 (3+0)	-/IV
	Total Credits	**12 (12+0)**	
Core Courses for B. Sc. (Hons.) Home Science			
MATH 100	Elementary Mathematics (For students from Arts and Bio stream)	2 (2+0)	II/VI
	Total Credits	**2 (2+0)**	
Core courses for B. Sc. (Hons.) Agriculture			
MATH 101	Mathematical Methods in Agriculture (For students from Biology stream)	4 (3+1)	I/V
	Total Credits	**4 (3+1)**	
Core Courses for B. Tech. (Agricultural Engineering)			
MATH 104	Engineering Mathematics-I	3 (2+1)	I
MATH 105	Engineering Mathematics-II	3 (2+1)	II
MATH 201	Engineering Mathematics-III	3 (2+1)	III
	Total Credits	**9 (6+3)**	
Statistics			
Core Courses for B. Sc. (Hons.) Home Science			
STAT 100	Elementary Statistics	2 (1+1)	IV/VIII
	Total Credits	**2 (1+1)**	
Core courses for B. Sc. (Hons.) Agriculture			
STAT 101	Introduction to Statistical Methods	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	

MATH 1 ALGEBRA AND TRIGONOMETRY SEM I
3 (3+0)

Theory

Sets-introduction and their representation; types of sets: empty set, finite set, infinite sets, equal sets; subsets; power set, universal set, complement of a set, Venn diagrams; operations on sets, practical problems on union and intersection of two sets; relations and functions: introduction, cartesian product of sets; relations; functions; trigonometric functions: introduction, angles, trigonometric functions; trigonometric function of sum and difference of two angles; trigonometric equations; principle of mathematical induction: introduction, motivation, principle of mathematical induction; complex numbers and quadratic equations- introduction, complex numbers; algebra of complex numbers, modulus and the conjugate of a complex number; Argand plane and polar representation; quadratic equations; linear inequalities- introduction, inequalities,

algebraic solutions of linear inequalities in one variable and their graphical representation, graphical solution of linear inequalities in two variables, solution of system of linear inequalities in two variables; permutation and combinations: introduction, fundamental principle of counting, factorial n, permutation, combination; binomial theorem: introduction, binomial theorem for positive integral indices, general and middle term in binomial expansion, simple applications.

MATH 2 COORDINATE GEOMETRY, CALCULUS AND ELEMENTARY STATISTICS **SEM II**
SEM - 3 (3+0)

Theory

Sequences and series: introduction, sequences, series, arithmetic progression (A.P); geometric progression (G.P.), relation between A.M. and G.M, sum to n terms of the special series; straight lines: introduction, slope of a line, various forms of the equation of a line, general equation of a line; distance of a point from a line, conic section: introduction, sections of a cone, circle, parabola, ellipse, hyperbola; three dimensional geometry: introduction, coordinate axes and coordinate planes in three dimensional space, coordinates of a point in space, distance between two points, section formula; limits and derivatives: introduction, intutive idea of derivatives, limits, limits of trigonometric functions, derivatives; mathematical reasoning: introduction, statements, new statements from old, special words phrases, implications ,validating statements; statistics: introduction, measure of dispersion, range, mean deviation, variance and standard deviation analysis of frequency distributions; probability: introduction, random experiments, events, axiomatic approach to probability.

MATH 21 MATRICES, DETERMINANTS, DIFFERENTIAL CALCULUS AND PROBABILITY **SEM III**
3 (3+0)

Theory

Relations and functions: introduction, types of relations, types of functions, composition of functions, invertible functions, binary operations; inverse trigonometric functions: introduction, basic concepts, properties of inverse trigonometric functions; matrices: introduction, matrix, types of matrices, operations on matrices, transpose of a matrix, symmetric and skew symmetric matrices, elementary (operations) transformations, invertible matrices; determinants: introduction, applications of determinant, properties of determinants; area of a triangle, minors and cofactors; adjoint and inverse of ants and matrices; continuity and differentiability: introduction, continuity, differentiability; continuity of exponential and logarithmic functions, logarithmic differentiations, derivative of functions in parametric forms, second order derivative; mean value theorem; probability: introduction, conditional probability, multiplication theorem on probability; independent events, Baye's theorem, random variable and its probability distributions; Bernouli trials and binomial distribution.

MATH 22 INTEGRAL CALCULUS, VECTORS AND 3D GEOMETRY **SEM IV**
3 (3+0)

Theory

Application of derivatives-introduction, rate of change of quantities; increasing and decreasing functions, tangents and normal, approximations, maxima and minima; integrals: integration as inverse process of differentiation, methods of integration,

integrals of some particular functions, integration by partial fractions, integration by parts, definite integrals, fundamental theorem of calculus, evaluation of definite integrals by substitution, some properties of definite integrals; application of integrals: introduction, area under simple curves, area between two curves; differential equations: introduction, basic concepts, general and particular solutions of a differential equation; formation of a differential equation whose general solution is given, methods of solving first order, first degree differential equations; vector algebra: introduction, some basic concepts, types of vectors, addition of vectors, multiplication of a vector by a scalar, product of two vectors; three dimensional geometry: introduction, direction cosines and direction ratios of a line, equation of a line in space; angle between two lines, shortest distance between two lines, plane, coplanirity of two lines, angle between two planes, distance of a point from a plane, angle between a line and a plane; linear programming: introduction, linear programming problem and its mathematical formulation; different type of linear programming problems.

MATH 100 ELEMENTARY MATHEMATICS SEM II/VI
2 (2+0)

(For B.Sc. (Hons.) Home Science from Arts and Bio stream)

Theory

Algebra: arithmetic Series, geometric series and problems based on these, permutations of n different things, permutation of n things when some or all of them are alike, circular permutation, combinations, binomial theorem, matrices and their properties, determinants, adjoint of matrix, inverse of a matrix, solution of linear equations by matrices and determinants; co-ordinate geometry: distance between two points, section-formulae, area of a triangle, straight line, various forms of the equation of a line, angle between two lines, distance of a point from a line; Trigonometry: T-ratios of five standard angles, heights and distances, allied angles, addition and subtraction formulae, sum and product formulae; differential calculus: limit, continuity and differentiation of function, maxima and minima of functions of single variable; integral calculus: elementary integration, integration by substitution and by parts.

MATH 101 MATHEMATICAL METHODS IN AGRICULTURE SEM I/V
4 (3+1)

Theory

Algebra: arithmetic and geometric series; permutation and combination; binomial theorem; determinants; matrices and their properties, inverse of a matrix; solution of linear equations; co-ordinate geometry- distance between two points, section-formulae; straight line, slope of a line, various forms of the equation of a line, angle between two lines, distance of a point from a line; trigonometry: trigonometric ratios of five standard angles; allied angles, addition and subtraction formulae, sum and product formulae; t-ratios of multiple and sub-multiple angles; differential calculus: function, limit, continuity and differentiation of function; maxima and minima of function of single variable; Rolle's theorem and mean value theorem; integral calculus- elementary integration, integration by substitution and by parts; definite integrals, evaluation of definite integrals; properties of definite integrals; area under simple curves; function of two variables, evaluation of partial derivatives; differential equations; vector algebra- basic concept, types of vectors, multiplication of a vector by a scalar; cross and dot product of two vectors.

Practical

Problems based on A.P and G.P; permutations of n things when some or all of them are

alike, circular permutations and combination; problems on addition, multiplication, transpose and inverse of the matrix; problems based on solution of system of equations; problems based on applications of trigonometry to solve simple problems of finding heights and distances; problems based on application of derivatives to find maxima and minima of functions; problems of finding partial derivatives of simple functions; application of integration to solve differential equations of first order and first degree; problems based on vector algebra.

MATH 104 ENGINEERING MATHEMATICS-I SEM I
3(2+1)

Theory

Differential calculus: Taylor's and Maclaurin's expansions, indeterminate form, curvature, asymptotes, tracing of curves, function of two or more independent variables, partial differentiation, homogeneous functions and Euler's theorem, composite functions, total derivatives, derivative of an implicit function, change of variables, Jacobians, error evaluation, maxima and minima; integral calculus: reduction formulae, rectification of standard curves, volumes and surfaces of revolution of curves; double and triple integrals, change of order of integration, Gamma and Beta functions, application of double and triple integrals to find area and volume; vector calculus: differentiation of vectors, scalar and vecto point functions, vector differential operator del, gradient of a scalar point function, divergence and curl of a vector point function and their physical interpretations, identities involving del, second order differential operator, line, surface and volume integrals, Stoke's, divergence and Green's theorems (without proofs).

Practical

Tutorials on Taylor's and Maclaurin's expansion, indeterminate forms, curvature, tracing of curves, partial differentiation, Jacobians, maxima and minima, error evaluation, reduction formulae, rectification of standard curves, volume and surface of revolution, multiple integrals, Beta and Gamma functions, differentiation of vectors, gradient, divergence and curl of a vector point function, line, surface and volume integrals, Stoke's, divergence and Green's theorems.

MATH 105 ENGINEERING MATHEMATICS-II SEM II
3 (2+1)

Theory

Matrices: elementary transformations, rank of a matrix, reduction to normal form, Gauss-Jordon method to find inverse of a matrix, solution of linear equations, eigen values and eigen vectors, Cayley-Hamilton theorem, linear and orthogonal transformations, diagonalisation of matrices, bilinear and quadratic forms; ordinary differential equations: exact and Bernoulli's differential equations, equations reducible to exact form by integrating factors, equations of first order and higher degree, Clairaut's equation; differential equations of higher orders, methods to find complementary functions and particular integrals, method of variation of parameters, Cauchy's and Legendre's linear equations, simultaneous linear differential equations with constant coefficients, application of differential equations to L-C-R circuits, series solution techniques, Bessel's and Legendre's differential equations; infinite series and its convergence; periodic functions, Fourier series, Euler's formulae, Dirichlet's conditions, functions having arbitrary period, even and odd functions, half range series, harmonic analysis.

Practical

Tutorials on rank of a matrix, reduction to normal form, consistency and solution of linear equations, eigen values and eigen vectors, Cayley-Hamilton theorem, diagonalisation of matrices, bilinear and quadratic forms, solution of ordinary differential equations of first and higher orders, application of differential equations, series solutions of differential equations, Bessel's and Legendre's differential equations, convergence of infinite series, Fourier series, harmonic analysis.

MATH 201 ENGINEERING MATHEMATICS-III SEM III
3 (2+1)

Theory

Numerical analysis: finite differences, various difference operators and their relationships, factorial notation, interpolation with equal intervals, Newton's forward and backward interpolation formulae, Bessel's and Stirling's central difference interpolation formulae, interpolation with unequal intervals, Newton's divided difference formula, Lagrange's interpolation formula; numerical differentiation; numerical integration; difference equations and their solutions; numerical solution of ordinary differential equations by Picard's, Taylor's series , Euler's and modified Euler's methods, Runge-Kutta method; Laplace transformation and its applications to the solutions of ordinary and simultaneous differential equations; functions of a Complex variable: limit, continuity and derivative of complex functions, analytic function, Cauchy-Reimann equations, conjugate functions, harmonic functions; partial differential equations: formation and solution of partial differential equations, Charpit's method, application of partial differential equations (one dimensional wave and heat flow equations, two dimensional steady state heat flow equation (Laplace equation).

Practical

Tutorials on interpolation, numerical differentiation, numerical integration, solutions of difference equations, numerical solutions of ordinary differential equations of first order and first degree, Laplace and inverse Laplace transformations and their application to solution of ordinary and simultaneous differential equations, analytical functions, C-R equations, harmonic functions, solutions partial differential equations, application of partial differential equations.

STAT 100 ELEMENTARY STATISTICS SEM IV/VIII
2 (1+1)

Theory

Measures of central tendency and dispersion, skew ness and Kurtosis; correlation and simple linear regression; test of significance: null and alternate hypotheses, two types of error, level of significance, critical region, degrees of freedom standard normal deviate, test for single mean and difference between two means; students t-test for single mean and difference between two means, paired t-test; chi-square test for testing goodness of fit and independence of attributes in 2x2 contingency table, Yate's correction.

Practical

Computation of A.M., median and mode for raw data and frequency distribution; computation of S.D. and C.V. for raw data and frequency distribution; computation of simple correlation coefficient; estimation of regression lines; S.N.D. test for single mean and difference between two means, t-test for single mean, t-test for difference of two

means, paired t-test; test of significance of correlation and regression coefficients; chi-square test for goodness of fit and independence of attributes in 2x2 contingency table.

STAT 101 INTRODUCTION TO STATISTICAL METHODS SEM I/V 2 (1+1)

Theory

Statstics: introduction, definition and its use and limitations; frequency distribution and frequency curves; measures of central tendency; characteristics of ideal average, arithmetic mean; median, mode, merits and demerits of arithmetic mean; measures of dispersions; standard deviation, variance and coefficient of variation; probability; definition and concept of probability; normal distribution and its properties; introduction to sampling; random sampling; the concept of standard error; tests of significance: types of errors, null hypothesis, level of significance and degrees of freedom, steps involved in testing of hypothesis; large sample test-SND test for means, single sample and two samples (all types); small sample test for means, student's t-test for single sample; two samples and paired t-test, F test; Ch-Square test in 2 X 2 contingency table, Yates correction for continuity; correlation; types of correlation and identification through scatter diagram, computation of correlation coefficient 'r' and its testing; linear regression of Y on X and X on y; inter-relation between 'r' and the regression coefficients, fitting of regression equations; experimental designs: basic designs, completely randomized design (CRD), layout and analysis with equal and unequal number of observations, randomized block design (RBD), layout and analysis, latin square design (LSD), layout and analysis.

Practical

Construction of frequency distribution tables and frequency curves; computation of arithmetic mean, median mode, standard deviation, variance and coefficient of variation for un-grouped and grouped data; SND test for means, single sample; SND test for means two samples; student's t-test for single sample; student's t-test for two samples; paired t-test and F test; Chi-Square Test in 2 x 2 contingency table, Yates' correction for continuity; computation of correlation coefficient 'r' and its testing; fitting of regression equations-Y on X and X on Y; analysis of completely randomized design (CRD): analysis of randomized block design (RBD); analysis of latin square design (LSD).

MICROBIOLOGY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Core Courses for B. Sc. (Hons.) Home Science			
MICRO 100	Introductory Microbiology	2 (1+1)	V/IX
	Total Credits	**2 (1+1)**	
Core courses for B. Sc. (Hons.) Agriculture			
MICRO 101	Elementary Microbiology	3 (2+1)	II/VI
	Total Credits	**3 (2+1)**	
Elective Courses/Experiential Learning for B. Sc. (Hons.) Agriculture			
MICRO 418	Production Technology of Bio-fertilizers	1 (0+1)	VII/XI
	Total Credits	**1 (0+1)**	

MICRO 100 INTRODUCTORY MICROBIOLOGY SEM V/IX
2 (1+1)

Theory

Introduction to Microbiology, structure of Prokaryotic and Eukaryotic cell; brief discussion on bacteria, fungi and viruses; nutrition and growth of micro organisms; microbiology of air, water and soil; micro organisms associated with foods, food preservation and food poisoning.

Practical

Study of microscope and other laboratory equipments; examination of bacteria, yeasts and molds; preparation of culture media and Sterilization techniques; demonstration of ubiquitous nature of micro organisms.

MICRO 101 ELEMENTARY MICROBIOLOGY SEM II/VI
3 (2+1)

Theory

History of microbiology: spontaneous generation theory, role of microbes in agriculture and fermentation, germ theory of disease, protection against infections; applied areas of microbiology; metabolism in bacteria: ATP generation, chemoautotrophy, photoautotrophy, respiration and fermentation; classification of prokaryotes criteria used for classification of prokaryotes, general properties of different divisions of prokaryotes: gracilicutes, firmicutes, tenericutes and mendosicutes; bacteriophages: structure and properties of bacterial viruses – lytic and lysogenic cycles, viroids and prions; soil microbiology: microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur; biodegradation of cellulose, hemicelluose and lignin; biological nitrogen fixation, mycorrhiza; microflora of rhizosphere and phyllosphere; microbes in composting; role of microorganisms in industry; microbiology of food: microbial food spoilage and principles of food preservation; microbiology of water and water purification; beneficial microorganisms in agriculture: biofertilizer (bacterial cyanobacterial and fungal), microbial insecticides, microbial agents for control of plant diseases, biodegradation of pesticides, biogas production, biodegradable plastics; plant-microbe interactions and use of genetically modified organisms for crop improvement.

Practical

General instructions: familiarization with instruments, materials and glasswares used in a microbiology laboratory; study of components of microscope; microscopic examination of algae and fungi by use of low and medium power objectives in compound microscope; microscopic examination of bacteria and actinomycetes using oil immersion objective; examination of bacteria by simple and differential staining: gram staining, spore staining, negative staining and capsule staining of bacteria; methods for preparation of microbiological media: nutrient agar medium, nutrient broth and slants; sterilization of medium and glassware using different techniques of sterilization such as moist heat (autoclave), hot air oven and filteration sterilization; plating methods for isolation and purification of bacteria: pour plate method and streak plate technique; isolation of spore-forming bacteria by enrichment culture technique; isolation of *rhizobium* from legume nodules by streak plate method; preparation of biofertilizers inoculant (demonstration) and seed inoculation with biofertilizers; isolation of microorganisms from air: ubiquitous presence of microbes; demonstration of waste utilization: composting and biogas production

MICRO 418 PRODUCTION TECHNOLOGY OF BIO-FERTILIZERS SEM VII/XI 1 (0+1)

Practical

General instructions to be followed in a microbiology laboratory; parts and use of a microscope; preparation of different media; various techniques of sterilization of glassware, vitamins, antibiotics, media etc. ubiquitous nature of micro-organisms; purification and maintenance of bacterial culture: simple staining; gram staining; isolation of *Azotobacter* from soil; isolation of *Azospirillum* from rhizoplane; isolation of *Rhizobium* from nodules; multiplication of diazotrophic bacteria; preparation of biofertilizer; monitoring of viable count in biofertilizer; techniques of biofertilizer application in field.

MOLECULAR BIOLOGY & BIOTECHNOLOGY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Elective Courses/Experiential Learning for B. Sc. (Hons.) Agriculture			
MBB 411	Essentials of Molecular Biology	2 (1+1)	VII/XI
MBB 412	Recombinant DNA Technology	3 (1+2)	VII/XI
MBB 413	Plant Tissue Culture and Genetic Transformation	4 (2+2)	VII/XI
MBB 414	Molecular Breeding	2 (1+1)	VII/XI
MBB 415	Microbial and Environmental Biotechnology	3 (1+2)	VII/XI
MBB 416	Molecular Diagnostics	2 (1+1)	VII/XI
	Total Credits	**16 (7+9)**	

MBB 411 ESSENTIALS OF MOLECULAR BIOLOGY SEM VII/XI
2 (1+1)

Theory

History of molecular biology; nucleic acids as hereditary material, structure of DNA; chromatin, rRNA, tRNA and mRNA; nucleases; nucleic acid sequencing; DNA replication; transcription, reverse transcriptase, translation; genetic code; operon, positive and negative control of gene expression; attenuation; molecular mechanism of mutation; structure of genomes; RNA processing and alternate splicing; developmental regulation.

Practical

Laboratory set-up, preparation of buffers and reagents; estimation of proteins; RNA and DNA; SDS-PAGE of proteins; DNA isolation, purification and characterization; DNA restriction analysis; polymerase chain reaction.

MBB 412 RECOMBINANT DNA TECHNOLOGY SEM VII/XI
3 (1+2)

Theory

Structure of DNA; enzymes used in recombinant DNA research; vectors for cloning DNA; gene cloning: recombinant DNA construction, transformation and selection of transformants; PCR and optimization of factors affecting PCR; gene identification, isolation and development of gene libraries; host specific transfer/transformation of cloned DNA, gene mapping and DNA sequencing; site directed DNA alterations and protein engineering.

Practical

Good lab practices; growth of bacterial culture and preparation of growth media; gel electrophoresis- agarose and PAGE (nucleic acids and proteins); isolation of plasmid DNA from bacteria; recombinant DNA construction.

MBB 413 PLANT TISSUE CULTURE AND GENETIC TRANSFORMATION SEM VII/XI 4 (2+2)

Theory

History of plant cell and tissue culture; culture media; various types of cultures: callus, cell suspension, meristem, etc.; *in vitro* differentiation: organogenesis and somatic embryogenesis; plant growth regulators: mode of action, effects on *in vitro* culture and regeneration; micropropagation; anther and microspore culture; somaclonal variation; *in vitro* fertilization; *in vitro* germplasm conservation; embryo rescue and wide hybridization; methods of plant transformation; vectors for plant transformation; genetic and molecular analyses of transgenics; biosafety issues of transgenic crops.

Practical

Preparation of nutrient media; handling and sterilization of plant material; inoculation, subculturing and plant regeneration; anther and pollen culture; embryo rescue; protoplast isolation, and culture; gene transfer and selection of transformed tissues/plants.

MBB 414 MOLECULAR BREEDING SEM VII/XI 2 (1+1)

Theory

Principles of plant improvement; aspects of molecular breeding; development of sequence based molecular markers: RFLP, RAPD and SSRs; advanced methods of genotyping; mapping genes for qualitative and quantitative traits; QTL mapping, association mapping, fine mapping of genes/QTL and development of gene tags; map based gene/QTL isolation and transgenic breeding; marker assisted selection (MAS); use of markers in plant breeding.

Practical

Isolation of plasmid DNA from bacteria; gel electrophoresis- agarose, PAGE (nucleic acids and proteins); restriction digestion; isolation of high molecular weight DNA; RAPD and PCR-RFLP analysis.

MBB 415 MICROBIAL AND ENVIRONMENTAL BIOTECHNOLOGY SEM VII/XI 3 (1+2)

Theory

Introduction, scope and historical developments; isolation, screening and genetic improvement of industrially important organisms; types of environmental pollutions; problems arising from high-input agriculture; types of fermentation systems, bioreactor designs and operations; production of primary and secondary metabolites e.g. alcohol, organic acids, methodology of environment management; air and water pollution; microbiology and use of micro-organisms in waste treatment; biodegradation of pesticides and toxic chemicals; aerobic and anaerobic processes: renewable and non-renewable resources of energy; biogas; guidelines for research involving genetically modified organisms (GMOs); biodiversity gene banks; intellectual property rights (IPR).

Practical

Sterilization methods and aseptic environment; growth requirements of micro organisms; preparation of buffers and reagents; preparation of growth media; quantitation of

microbial growth; staining and visualization of microbes; estimation of load of micro organisms in diverse environments.

MBB 416 MOLECULAR DIAGNOSTICS SEM VII/XI
2 (1+1)

Theory

History and scope of immunology; immunoglobulin structure and functions; molecular organization of immunoglobulins and classes of antibodies; application of immunology, immunological techniques; principles of ELISA and its applications; monoclonal antibodies and their uses; introduction to the basic principles of molecular technology and techniques used for pathogen detection; basics and procedures of PCR, PCR based and hybridization based methods of detection, QPCR/RTPCR multiplexing etc; detection of soil borne and seed born infections; transgene detection in seed, planting material and processed food; molecular detection of varietal impurities and seed admixtures in commercial consignments.

Practical

Preparation of buffers and reagents; immunoassays including ELISA; western blotting, and fluorescent antibody test; recombinant protein antigen- production and immunization of laboratory animals; extraction of DNA/RNA from pathogenic microorganisms and PCR.

SOCIOLOGY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Core Courses for B. Sc. (Hons.) Home Science			
SOC 100	Rural Sociology and Human Psychology	2 (2+0)	VI/X
	Total Credits		
Core courses for B. Sc. (Hons.) Agriculture			
SOC 101	Fundamentals of Rural Sociology and Educational Psychology	2 (2+0)	I/V
	Total Credits	**2 (2+0)**	
Elective Courses/ Experiential Learning for B. Sc. (Hons.) Agriculture			
SOC 401	Government Policies and Programmes of Agricultural and Rural Development	3 (1+2)	VII/XI
SOC 402	Behavioural Skills	3 (1+2)	VII/XI
	Total Credits	**6 (2+4)**	

SOC 100 RURAL SOCIOLOGY AND HUMAN PSYCHOLOGY SEM VI/X 2 (2+0)

Theory

Sociology and Rural Sociology: meaning, nature, relationship of rural sociology with Home Science; understanding basic sociological concepts; society, community, association, institution, group and culture; family, rural urban differences, social change, social stratification and social control; human psychology: origin of psychology, meaning and nature of psychology; branches and methods of psychology, biological basis of behaviour, basic concepts of perception, memory, learning and personality.

SOC 101 FUNDAMENTALS OF RURAL SOCIOLOGY AND EDUCATIONAL PSYCHOLOGY SEM I 2 (2+0)

Theory

Sociology and rural sociology: meaning, definition, scope, importance of rural sociology in agricultural extension; differences and relationship between rural and urban communities; social groups: meaning, definition, classification; role of social groups in agricultural extension; social stratification: meaning, definition, forms, characteristics and differences between class and caste system; types and role of social values; social institutions: meaning, definition, major institutions in rural society, functions and their role in agricultural extension; social control: meaning, definition, need and means; social change: meaning, definition, nature, factors of social change; psychology and educational psychology: origin, meaning, nature and scope of psychology and educational psychology in agricultural extension; intelligence: meaning, definition, types and factors affecting intelligence; personality: meaning and nature of personality, factors affecting personality development, role of personality in agricultural extension; leadership: meaning, definition, classification, role of a leader agricultural extension; attitude: meaning and definition; learning: meaning and nature of learning, factors responsible for learning, importance of learning in educational process, principles of learning and their implications; teaching-learning process: meaning and definition and its role in agricultural extension.

SOC 401 **GOVERNMENT POLICIES AND PROGRAMMES OF AGRICULTURE AND RURAL DEVELOPMENT** **SEM VII/XI 3 (1+2)**

Theory

Changing scenario of Indian agriculture: green revolution and post-green revolution; regional disparities in Indian agriculture; five year plans and agriculture; national agricultural policy and its impact on agriculture; impact of WTC privatization and a globalization on Indian agriculture; constraints in implementing policies related to agriculture and rural development; problems related to Indian agriculture: decreasing size of landholdings and poverty, unemployment, natural calamities, indebtedness, risk in agriculture and agrarian unres; rural development; concept, indicators and determinants; government policies and rural development programmes related to farmers' employment and poverty eradication.

Practical

Field study-cum-institutional visits, preparation of field projects for analyzing the problems of agriculture and rural society, theme based group assignments.

SOC 402 **BEHAVIOURAL SKILLS** **SEM VII/XI 3 (1+2)**

Theory

Key issues of human resource management in organization; promoting self-understanding and building positive attitude; interpersonal communication skills; conflict management: nature and scope; motivation: meaning, definition and types; organizational development; stress management: meaning, factors and methods of stress management, yoga, meditation and other exercises for healthy life style; time management and behavioral skills; management of change and behavioral skills; leadership skills: concept of leadership, leadership styles, characteristics of leaders, pattern of leadership and group relations; group behavior : concept of group, features of group, elements of group, forms of interaction in group; decision making: definition, process and elements of decision making, type of decision makers, and art of making decision, decision making and problem solving technique.

Practical

Course is based on participatory process with the teacher playing the role of facilitators; the leaner-centered approach adopted by the teacher includes activities designed as interactive and experimental with the resulting emphasis on learning by doing the exercises such as: group discussions, case study, exercises/games, self-analysis by students about their styles and behaviour, role play and participants' presentations.

ZOOLOGY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Bridge Courses			
BIO 1	Biology-I (To be taught jointly by Botany & Plant Physiology and Zoology)	3(2+1)	-/I
BIO 2	Biology-II (To be taught jointly by Botany & Plant Physiology and Zoology)	3(2+1)	-/II
BIO 21	Biology-III (To be taught jointly by Botany & Plant Physiology and Zoology)	3(2+1)	-/III
BIO 22	Biology-IV (To be taught jointly by Botany & Plant Physiology and Zoology)	3(2+1)	-/IV
	Total Credits	**12(8+4)**	
Core courses for B. Sc. (Hons.) Agriculture and B. Sc. (Hons.) Home Science			
ZOO 101	Elementary Zoology (For students from Arts and Math streams)	2 (1+1)	I/V
	Total Credits	**2 (1+1)**	

BIO 1 **BIOLOGY-I** **SEM I**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Living organisms: diversity and classification of the living organisms (five kingdom classification, major groups and principles of classification within each kingdom); systematics and binomial system of nomenclature; plant diversity: salient features of plants (major groups); classification of angiosperms up to subclass, botanical gardens, herbaria; animal diversity: salient features of animals (non-chordates up to phylum level and chordates up to class level); zoological parks and museums; tissues in animals; morphology, anatomy and functions of different systems of earthworm, cockroach and frog; human physiology: digestion and absorption, breathing and respiration, body fluids and circulation, excretory products and elimination, locomotion and movement, control and coordination.

Practical

To study the parts of a dissecting and compound microscope; study of specimens and identification with reasons: bacteria, *Oscillatoria, Spirogyra, Rhizopus,* mushroom, yeast, liverwort, moss, fern, pines, one monocotyledon and one dicotyledon and one Lichen; diversity in shape and size of cells in different plant and animal tissues *(e.g.* parenchyma, palisade, collenchyma, sclerenchyma, xylem, phloem, squamous epithelium, muscle fibres and mammalian blood smear through temporary/permanent slides); study of specimens and identification: Amoeba, Hydra, Liverfluke, Ascaris, leech, earthworm, prawn, silkworm, honey bee, snail, starfish, shark, rohu, frog, lizard, pigeon and rabbit;

observation of the following spots: human skeleton and different types of joints; morphology of earthworm, cockroach and frog through models/preserved specimens.

BIO 2 **BIOLOGY-II** **SEM II**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Plant kingdom: morphology and functions of different parts of flowering plants- root, stem, leaf, inflorescence, flower, fruit and seed; plant anatomy: tissue, tissue systems and anatomy of root, stem and leaf of dicotyledonous plants and comparison with monocotyledonous plants; plant physiology: plants and water relations, movement of water, food, nutrients and gases; mineral nutrition, respiration, photosynthesis; plant growth and development; structural organization in animals, cell as a unit of life: discovery of the cell, origin of prokaryotic and eukaryotic cells, cell theory, animal cell structure - cell wall, cell membrane; brief outline of structure and function of cell organelles: mitochondria, nucleus, ER, golgi apparatus, dictyosomes, plastids, lysosomes, ribosomes, vacuoles, centrioles, cytoskeleton, chromosomes, microbodies and nuclear organization; cell division: mitosis, meiosis, cell cycle; biomolecules: basic chemical constituents of living bodies, structure and functions of carbohydrates, proteins, lipids and nucleic acids; enzymes: types, properties and function.

Practical

Study and description of locally available common flowering plants one each from (Solanaceae, Fabaceae and Liliaceae); types of root (tap or adventitious), stem (herbaceous/woody), leaf arrangement/shapes/ venation, simple or compound; preparation and study of T.S. of dicot and monocot root and stem (primary); study of osmosis by potato osmometer; plasmolysis in epidermal peels *(e.g., rhoeo* leaves); study of distribution of stomata in the upper and lower surface of leaves, stomatal index; comparative study of the rates of transpiration in the upper and lower surface of leave; test for the presence of sugar, starch, proteins and fats in suitable plant and animal materials *(e.g.,* wheat, potato, groundnut, milk or other such suitable material); separation of chlorophyll pigments through paper chromatography; study of rate of respiration in flower buds and germinating seed; effect of salivary amylase on starch; testing the presence of urea, sugar, albumin and bile salts in urine sample (simulated sampled may be used); observation of the following spots - study of mitosis in onion root tip cells, different modifications in root, stem and leaves; identification and comments on different types of inflorescences; imbibition in seeds/raisins; observations and comments on the experimental set up on: anaerobic respiration, phototropism, apical bud removal, suction due to transpiration.

BIO 21 **BIOLOGY-III** **SEM III**
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Reproduction in flowering plants: vegetative reproduction, flowers, pre fertilization structure and events, apomixis and polyembryony, development of seeds and fruit; ecology: concept of species, population and community; ecological adaptations; pollution

and deforestation, global warming, ozone layer depletion, underground water level and threat to biodiversity, conservation of biodiversity; national parks and sanctuaries; human reproduction: male reproductive system, female reproductive system, gametogenesis, menstrual cycle, fertilization and implantation, pregnancy and embryonic development, parturition and lactation; reproductive health problem and strategies, population explosion and birth control, medical termination of pregnancy, STD, infertility; organism and environment: ecosystem - biotic and abiotic components, food chain, trophic levels, food webs, ecological pyramids, ecosystems components, types and energy flow; biotic community: intraspecific and interspecific relationships, commensalism, predation, scavenging, parasitism, symbiosis, biotic stability and biotic succession.

Practical

Dissection of flower and display of different whorls; dissection of anther and ovary to show number of chambers; study of pollen germination on a slide; collect and study of soil from at least two different sites for texture, moisture content, pH and water holding capacity; correlation with the kinds of plants found in them; collect water from two different water bodies in your locality and study the samples for ph, clarity and presence of any living organisms; study the presence of suspended particulate matter in air at the two widely different sites; plant population density by quadrat method; observations on the following spots - study of flowers adapted to pollination by different agencies (wind, insect); pollen germination on stigma through a permanent slide; study and identify stages of gamete development *i.e.,* T.S. testis and T.S. ovary through permanent slides (from any mammal); meiosis in onion bud cell or grasshopper testis and T.S. of blastula through permanent slides; study two plants and two animals found in xeric conditions and comment upon their adaptations/ morphological features; plants and animals found in aquatic conditions and comment upon their adaptations/morphological features.

BIO 22 BIOLOGY-IV SEM IV
3 (2+1)

(To be taught jointly by Botany & Plant Physiology and Zoology)

Theory

Health, agriculture and industry: recombinant DNA technology and application in health, agriculture and industry, genetically modified (GM) organisms, bio-safety issues; plant breeding, tissue culture, food production, microbes in house hold processing, industrial production; sewage treatment and energy generation; *Bt* cotton; genetics and evolution: Mendelian inheritance, chromosome theory of inheritance, deviations from Mendelian ratio; gene interaction: epistasis, incomplete dominance, co-dominance, complementary genes, multiple alleles, sex determination in human beings; linkage and crossing over; inheritance pattern of haemophilia, blood groups in human beings; DNA and applied zoology: DNA replication, transcription, translation; genetic code, gene expression and regulation; DNA fingerprinting, recombinant DNA technology and its applications; basic concepts of immunology and vaccines: pathogens, parasites; cancer and AIDS; adolescence and drug/ alcohol abuse; animal husbandry, bee keeping and fisheries; evolution: theories and evidences.

Practical

Prepration of a temporary mount of onion root tip to study mitosis; study of effect of the different temperatures and three different pH on the activity of salivary amylase on starch; observations on the following spots: study Mendelian inheritance using seeds of different

colour/size of any plant; preparation of pedigree charts of genetic traits such as rolling of tongue, blood groups, widow's peak, colour blindness; exercise on controlled pollination - emasculation, tagging and bagging; identification of the common disease causing organisms like *ascaris, entamoeba, plasmodium*, ringworm through permanent slides or specimens and symptoms of diseases caused by them.

ZOO 101 ELEMENTARY ZOOLOGY SEM I/V
3 (2+1)

(For B.Sc. (Hons.) Agriculture from Math stream and for B.Sc. (Hons.) Home Science from Arts and Math streams)

Theory

Nature and scope of Zoology; taxonomic classification of animal kingdom; animal life: structure and function- tissues and other body systems; applications of biology: communicable diseases, immune responses, inherited and sex linked diseases; cancer, human population growth.

Practical

Classification and general features of different animal types, microscopic structure of mammalian tissues; study of some physiological functions.

CENTRE FOR FOOD SCIENCE & TECHNOLOGY

Course No.	Course Title	Credits	Semester (4-yr/6-yr)
Elective Courses/ Experiential Learning for B. Sc. (Hons.) Agriculture			
FST 401	Unit Operations in Processing and Development of New products	4 (1+3)	VII/XI
FST 402	Integrated Storage Management of Fruits and Vegetables	3 (1+2)	VII/XI
FST 403	Processing of Cereals, Pulses and Oilseed Crops including Millets	3 (1+2)	VII/XI
	Total Credits	**10 (3+7)**	

FST 401 UNIT OPERATIONS IN PROCESSING AND DEVELOPMENT OF NEW PRODUCTS SEM VII/XI 4 (1+3)

Theory

General principles and methods involved in fruit processing; unit operations in canning, freezing and dehydration of fruits and vegetables; establishment of processing unit, F.P.O.; specifications of various products; preparation and preservation of fruits and vegetables products.

Practical

Preparation of fruit beverages (fermented and non-fermented), jam, jellies, marmalades, cheese, fruit bar and toffees, candies and preserves, pickles and chutneys; canning and dehydration of important fruits and vegetables; visit to a commercial scale processing factory.

FST 402 INTEGRATED STORAGE MANAGEMENT OF FRUITS AND VEGETABLES SEM VII/XI 3 (1+2)

Theory

Short term and long term storage; factors affecting storage behaviour; storage losses; storage structures for potato and onion; evaporative cool chambers; cold storage, modified atmosphere storage, controlled atmosphere storage; storage compatibility of mixed crops; storage disorders; cold chain management.

Practical

Storage studies under ambient and modified atmosphere conditions; study of evaporative cool chambers and their efficiency under different seasons; use of pre and post-harvest treatments like growth regulators, waxes and edible coatings to enhance shelf life; study of storage disorders of onion, potato and available fruits and vegetables; visit to cold storage.

FST 403 PROCESSING OF CEREALS, PULSES AND OILSEED CROPS INCLUDING MILLETS SEM VII/XI 3 (1+2)

Theory

Status of production and utilization of food grains in Haryana, India and the world; cereal varieties and their suitability for processing; milling of wheat, rice and corn; processing of

cereals to prepare different products, baked, extruded, breakfast cereals, ready to cook and ready to eat products; importance of oilseeds; processing of oilseeds and oil extraction.

Practical

Study of various types of equipments used for processing of cereal, pulses and oilseeds; quality evaluation of grains, milling of wheat and rice; evaluation of flour quality, preparation of baked products: biscuits, cake, bread etc; preparation of extruded products: noodles, pasta and ready to eat extruded products; evaluation and grading of rice, cooking quality of rice; milling of rice, parboiling of paddy; milling of pulses and preparation of value added products, evaluation of quality of oilseed and oils; visits to flour, dhal and oil mills.