CHOICE BASED CREDIT SYSTEM SCHEME & SYLLABUS

B.Sc. Medical



Department of Life Sciences and Allied Health Sciences
University Institute of Science & Humanities (UISH)

Sant Baba Bhag Singh University 2019

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3.	ZOO101	Animal Biodiversity		4-5
4.	ENG101	General English-I	1	5-6
5.	PBI101	General Punjabi-I	-n ol-	6-8
6.	CHM103	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons Practical	1	8-9
7.	HCP101	History and Culture of Punjab-I		9-10
8.	BOT103	Plant Biodiversity Practical	1	10-11
9.	ZOO103	Animal Biodiversity Practical	1	11-12
10.	BOT102	Plant Ecology and Taxonomy	2	13-14
11.	CHM102	Chemical Energetics, Equilibria & Functional Groups Organic Chemistry-I	2	14-16
12.	ZOO102	Comparative Anatomy and Developmental Biology of Vertebrates	2	16-17
13.	ENG102	General English-II	2	17-18
14.	PBI102	General Punjabi-II	2	18
15.	HCP102	History and Culture of Punjab-I	2	19-20
16.	BOT104	Plant Ecology and Taxonomy Practical	2	20-22
17.	CHM104	Chemical Energetics, Equilibrium & Functional Group Organic Chemistry-I Lab	2	22-23
18.	ZOO104	Comparative Anatomy and Developmental Biology of Vertebrates Practical	2	23-24
19.	BOT201	Anatomy and Embryology of Angiosperms	3	25-26

20.	CHM201	Solutions, Phase equilibrium, Conductance, Electrochemistry& Functional Group Organic Chemistry-II	3	26-28
21.	ZOO201	Animal Physiology and Biochemistry	3	28-29
22.	EVS101	Environmental Science	3	29-30
23.	BOT203	Anatomy and Embryology of Angiosperms Practical	3	30-31
24.	CHM203	Solutions, Phase equilibrium, Conductance, Electrochemistry & Functional Group Organic y-II Lab	3	32-33
25.	ZOO203	Animal Physiology and Biochemistry Practical	3	33-34
26.	BOT202	Plant Physiology and Metabolism	4	35-36
27.	CHM202	Coordination Chemistry, States of Matter & Chemical Kinetics	4	36-38
28.	ZOO202	Genetics and Evolutionary Biology	4	38-39
29.	ВОТ204	Plant Physiology and Metabolism Practical	4	39-40
30.	CHM204	Coordination Chemistry, States of Matter & Chemical Kinetics Lab	(AB)	40-41
31.	ZOO204	Genetics and Evolutionary Biology Practical	4	42

Skill Enhancement Courses

S.N.	Subject Name	Subject Code	Semester	Page Num.
1.	Medicinal Botany	BOT 205	Semester-III	43-44

2.	Medical Diagnostics	ZOO205	Semester-III	44-45
3.	Basic Analytical Chemistry	CHM 209	Semester-III	45-47
4.	Floriculture	BOT 206	Semester-IV	47-48
5.	Green Methods in Chemistry	CHM 210	Semester-IV	48-49
6.	Ethnob <mark>o</mark> tany	BOT 206	Semester-IV	49-50
7.	Apiculture & Sericulture	ZOO315	Semester-V	50-51
8.	Aqua <mark>ti</mark> c Biolo <mark>gy</mark>	ZOO 317	Semester-V	51-52
9.	Fuel <mark>C</mark> hemist <mark>ry</mark>	CHM 313	Semester-V	52-54
10.	Mushroom Culture Technology	BOT 310	Semester-VI	54-55
11.	Aquarium Fish Keeping	ZOO 314	Semester-VI	55-56
12.	Pharmaceutical Chemistry	CHM 318	Semester-VI	56-57

Discipline Elective Courses (Semester- V-VI) Any two of each subject in both semesters

MALA, DISTT. JALANDHAR (PUNJAD)

S.N.	Subject Name	Subject Code	Semester	Page Num.
1.	Cell and Molecular Biology	BOT301	Semester-V	58-59
2.	Cell and Molecular Biology Practical	ВОТ303	Semester-V	59

3.	Analytical Techniques in Plant Sciences	BOT305	Semester-V	60
4.	Analytical Techniques in Plant Sciences Practical	ВОТ307	Semester-V	60-61
5.	Cell Biology, Biotechnology, and Reproductive biology	ZOO301	Semester-V	62-63
6.	Cell Biology, Biotechnology, and Reproductive biology Practical	ZOO303	Semester-V	63
7.	Applied Zoology	ZOO305	Semester-V	64
8.	Applied Zoology Practical	ZOO307	Semester-V	65
9.	Aquatic Biology	ZOO309	Semester-V	65-66
10.	Aquatic Biology Practical	ZOO311	Semester-V	66-67
11.	Organometallics, bioinorganic chemistry, polynuclear hydrocarbons and uv, ir spectroscop	CHM305	Semester-V	67-69
12.	Organometallics, bioinorganic chemistry, polynuclear hydrocarbons and uv, ir spectroscopy Practical	CHM307	Semester-V	69-70
13.	Industrial chemical and environment	CHM309	Semester-V	70-72
14.	Industrial chemical and environment practical	CHM311	Semester-V	72-73
15.	Green Chemistry	CHM310	Semester-VI	74-75
16.	Green Chemistry Practical	CHM312	Semester-VI	76-77

17.	Analytical Methods in Chemistry	CHM314	Semester-VI	77-79
18.	Analytical Methods in Chemistry Practical	CHM316	Semester-VI	79-81
19.	Chemistry of main group element, theories of acids and bases	CHM306	Semester-VI	81-82
20.	Chemistry of main group element, theories of acids and bases practical	CHM308	Semester-VI	82-83
21.	Economic Botany and Biotechnology	ВОТ302	Semester-VI	83-84
22.	Economic Botany and Biotechnology Practical	BOT304	Semester-VI	84-85
23.	Bioinformatics	BOT 306	Semester-VI	85-86
24.	Bioinformatics Practical	BOT 308	Semester-VI	86-87
25.	Immunology and Biostatics	ZOO302	Semester-VI	87-88
26.	Immunology and Biostatics practical	ZOO304	Semester-VI	88
27.	Reproductive Biology	ZOO306	Semester-VI	88-89
28.	Reproductive Biology Practical	ZOO308	Semester-VI	89-90
29.	Insect, Vector and Diseases	ZOO310	Semester-VI	90-91
30.	Insect, Vector and Diseases Practical	ZOO312	Semester-VI	91-92
31.	Instrumental methods of chemical analysis	CHM326	Semester-VI	92-93
32.	Instrumental methods of chemical analysis practical	CHM328	Semester-VI	93-95

Course Scheme, B.Sc Medical

SEMESTER I

I. Theory Subjects

S. No.	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT101	Plant Biodiversity	4:0:0	4:0:0	4	4	CC
2	CHM101	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons	4:0:0	4:0:0	4	4	CC
3	ZOO101	Animal Biodiversity	4:0:0	4:0:0	4	4	CC
4	ENG101	Ge <mark>nera</mark> l English-I	3:0:0	3:0:0	3	3	AECC
5	PBI101/ HCP101	General Punjabi-I/History and Culture of Punjab	3:0:0	3:0:0	3	3	AECC

II. Practical Subjects

S. No	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT103	Plant Biodiversity Practical	0:0:4	0:0:2	4	2	CC
2	CHM103	Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons Lab	0:0:4	0:0:2 R	4	2	CC
3	ZOO103	Animal Biodiversity Practical	0:0:4	0:0:2	4	2	CC
4	PT101/PT10 3/PT105	Physical Training (NSO/NCC/NSS)	0:0:2	Non- credit	2	NC	

CC: Core courses

AECC: Ability Enhancement Core Course Total Contact hrs: 32

SEMESTER II

I. Theory Subjects

S. No.	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT102	Plant Ecology and Taxonomy	4:0:0	4:0:0	4	4	CC
2	CHM102	Chemical Energetics, Equilibria & Functional Groups Organic Chemistry-I	4:0:0	4:0:0	4	4	CC
3	ZOO102	Comparative Anatomy and Developmental Biology of Vertebrates	4:0:0	4:0:0	4	4	CC
4	ENG102	General English-II	3:0:0	3:0:0	3	3	AECC
5	PBI102 / HCP102	General Punjabi-II/History and Culture of Punjab-II	3:0:0	3:0:0	3	3	AECC

II. Practical Subjects

S. No	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT104	Plant Ecology and	0:0:4	0:0:2	4	2	CC
		Taxonomy Practical	गांतरो सिंग	1		The same of the sa	
2	CHM104	Chemical Energetics, Equilibrium & Functional Group Organic Chemistry-I Lab	0:0:4	0:0:2	4	2	CC
3	ZOO104	Comparative Anatomy and Dev. Bio of Vertebrates Practical	0:0:4	0:0:2	4	2	CC
4	PT102/PT104	Physical Training	0:0:2	Non-	2	NC	AECC
	/PT106	(NSO/NCC/NSS)		credit			

CC: Core courses

AECC: Ability Enhancement Core Course

Total Contact hrs: 32 Total Credit Hours: 24

SEMESTER III

I. Theory Subjects

S. No.	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT201	Anatomy and Embryology of Angiosperms	4:0:0	4:0:0	4	4	CC
2	CHM201	Solutions, Phase equilibrium, Conductance, Electrochemistry& Functional Group Organic Chemistry-II	4:0:0	4:0:0	4	4	CC
3	ZOO201	Animal Physiology and Biochemistry	4:0:0	4:0:0	4	4	CC
4	EVS101	Environmental Science	3:0:0	3:0:0	3	3	AECC
5		Elective subject (Skill Enhancement)-I	2:0:0	2:0:0	2	2	SEC

II. Practical Subjects

S. No	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1		Anatomy and	Hit				CC
	Constitution in	Embryology of	0:0:4	0:0:2	4	2	
	BOT203	Angiosperms Practical					
2	- 1	Solutions, Phase		MITTEL	PR)		CC
	- L	equilibrium,	INANIDAYA	H (Loss			
		Conductance,	0:0:4	0:0:2	4	2	
		Electrochemistry &	0.0	0.0.2		_	
	CHM202	Functional Group					
	CHM203	Organic y-II Lab					
3		Animal Physiology					CC
	ZOO203	and Biochemistry	0:0:4	0:0:2	4	2	
		Practical					

CC: Core courses Total Contact hrs: 29

AECC: Ability Enhancement Core Course Total Credit Hours: 23

SEC: Skill Enhancement Course

SEMESTER IV

I. Theory Subjects

S. No.	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT202	Plant Physiology and Metabolism	4:0:0	4:0:0	4	4	CC
2	CHM202	Coordination Chemistry, States of Matter & Chemical Kinetics	4:0:0	4:0:0	4	4	CC
3	ZOO202	Genetics and Evolutionary Biology	4:0:0	4:0:0	4	4	CC
4	1	Elective subject (Skill Enhancement)-II	2:0:0	2:0:0	2	2	SEC

II. Practical Subjects

S. No	Subject Code	Subject Name	100	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT204	Plant Physiology and Metabolism Practical	0:0:4	0:0:2	4	2	CC
2	CHM204	Coordination Chemistry, States of Matter & Chemical Kinetics Lab	0:0:4	0:0:2	4	2	CC
3	ZOO204	Genetics and Evolutionary Biology Practical	0:0:4	0:0:2	4	2	CC

Total Credit Hours: 20 CC: Core courses **AECC:** Ability Enhancement Core Course **SEC:** Skill Enhancement Course **Total Contact hrs: 26**

SEMESTER V

I. Theory Subjects

S. No.	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT	Discipline Specific Elective-I	4:0:0	4:0:0	4	4	DSE
2	СНМ	Discipline Specific Elective -I	4:0:0	4:0:0	4	4	DSE
3	ZOO	Discipline Specific Elective-I	4:0:0	4:0:0	4	4	DSE
4	3	Elective subject (Skill Enhancement)-III	2:0:0	2:0:0	2	2	SEC

II. Practical Subjects

S. No	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of cour se
1	ВОТ	Discipline Specific Elective-I Practical	0:0:4	0:0:2	4	2	DSE
2	СНМ	Elective Subject(Discipline)Lab-I	0:0:4	0:0:2	4	2	DSE
3	ZOO	Discipline Specific Elective-I Practical	0:0:4	0:0:2	4	2	DSE

DSE: Discipline Specific Elective SEC: Skill Enhancement Courses

Total Contact hrs: 26 Total Credit Hours: 20

SEMESTER VI

I. Theory Subjects

S. No.	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	ВОТ	Discipline Specific Elective-II	4:0:0	4:0:0	4	4	DSE
2	СНМ	Elective Subject(Discipline)-II	4:0:0	4:0:0	4	4	DSE
3	ZOO	Discipline Specific Elective-II	4:0:0	4:0:0	4	4	DSE
4		Elective Subject (Skill Enhancement)-IV	2:0:0	2:0:0	2	2	SEC

II. Practical Subjects

S. No	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Type of course
1	BOT	Discipline Specific Elective-II Practical	0:0:4	0:0:2	4	2	DSE
2	СНМ	Elective Subject(Discipline) lab- II	0:0:4	0:0:2	4	2	DSE
3	ZOO	Discipline Specific Elective-II Practical	0:0:4	0:0:2	4	2	DSE

DSE: Discipline Specific Elective SEC: Skill Enhancement Courses

Total Contact hrs: 26 Total Credit Hours: 20

Course Scheme Summary

Sem	L	T	P	Contact hrs/wk	Credits	CC	AEC	SEC	DSE
1	18	0	14	32	24	18	6		
2	18	0	14	32	24	18	6		
3	17	0	12	29	23	18	3	2	
4	14	0	12	26	20	18	H	2	
5	14	0	12	26	20	1		2	18
6	14	0	12	26	20			2	18
Total	95	0	76	171	131	72	15	8	36

KHIALA, DISTT. JALANDHAR (PUNJAB)



PLANT BIODIVERSITY

Course Code	BOT101
Course Title	Plant Biodiversity
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical
Course Objective	To make students aware about biodiversity among different groups of
(CO)	plants, characteristic features of each group and to give preliminary
111	knowledge of microbes

UNIT-I

Microbes: Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.

Algae: General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: *Nostoc*, *Chlamydomonas*, *Oedogonium*, *Vaucheria*, *Fucus*, *Polysiphonia*. Economic importance of algae UNIT-II

Fungi: Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi-General characteristics, ecology and significance, life cycle of *Rhizopus* (Zygomycota) *Penicillium, Alternaria* (Ascomycota), *Puccinia, Agaricus* (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance

UNIT-III

Introduction to Archegoniate: Unifying features of archegoniates, Transition to land habit, Alternation of generations.

Bryophytes: General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of *Marchantia* and *Funaria*. (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of *Sphagnum*.

UNIT-IV

Pteridophytes:General characteristics, classification, Early land plants (*Cooksonia* and *Rhynia*). Classification (up to family), morphology, anatomy and reproduction of *Selaginella*, *Equisetum* and *Pteris*. (Developmental details not to be included). Heterospory and seed habit, stelar evolution. Ecological and economical importance of Pteridophytes.

Gymnosperms: General characteristics, classification. Classification (up to family), morphology, anatomy and reproduction of *Cycas* and *Pinus*. (Developmental details not to be included). Ecological and economical importance.

Text and Reference books:

Sr	Book Title	Author	Publisher
No.			
1	Diversity of Microbes and Cryptogams	H.N.Srivastava	Pradeep Publisher
2	Text Book of Thallophytes	O.P.Sharma	McGraw Hill Publishing Co.
3	Text Book of Pteridophyta	O.P.Sharma	McMillan India Ltd
4	Cryptogamic Botany, Vol. II, Bryophytes & Pteridophytes	G.M Smith	Tata McGraw Publisher
5	Botany for degree students B.Sc 1st Year	V K Aggarwal	S.Chand Publishing
6	A Text book of Botany-I	S.P. Jain	Rastogi Publishers
7	Univ <mark>er</mark> sity Bota <mark>ny-I</mark> , Algae, Fung <mark>i,</mark> Bryophyta & Pteridophyta	S.M.Reddy	New Age International Publisher

Atomic Structure, Bonding, General Organic Chemistry & Aliphatic Hydrocarbons

Course Code	CHM101
Course Title	Atomic structures, bonding, general organic and chemistry and aliphatic hydrocarbons
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Non Medical or Medical
Course Objective	The aim of the subject is to enhance the knowledge of students about
	Stereochemistry of organic compounds, basic concepts and reactions of
	organic chemistry.

Unit-I

Atomic Structure: Review of: Bohr's theory and its limitations, dual behavior of matter and radiation, de Broglie's relation, Heisenberg Uncertainty principle. Hydrogen atom spectra. Need of a new approach to Atomic structure. What is Quantum mechanics? Time independent Schrodinger equation and meaning of various terms in it. Significance of ψ and ψ^2 , Schrödinger equation for hydrogen atom. Radial and angular parts of the hydogenic wavefunctions (atomic orbitals) and their variations for 1s, 2s, 2p, 3s, 3p and 3d orbitals (Only graphical representation). Radial and angular nodes and their significance. Radial distribution functions and the concept of the most probable distance with special reference to 1s and 2s atomic orbitals. Significance of

quantum numbers, orbital angular momentum and quantum numbers ml and ms . Shapes of s, p and d atomic orbitals, nodal planes. Discovery of spin, spin quantum number (s) and magnetic spin quantum number (ms). Rules for filling electrons in various orbitals, Electronic configurations of the atoms. Stability of half-filled and completely filled orbitals, concept of exchange energy. Energies of atomic orbitals, Anomalous electronic configurations.

Unit-II

Chemical Bonding and Molecular Structure Ionic Bonding: General characteristics of ionic bonding. Energy considerations in ionic bonding, lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds. Statement of Born-Landé equation for calculation of lattice energy, Born-Haber cycle and its applications, polarizing power and polarizability. Fajan's rules, ionic character in covalent compounds, bond moment, dipole moment and percentage ionic character.

Covalent bonding: VB Approach: Shapes of some inorganic molecules and ions on the basis of VSEPR and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Concept of resonance and resonating structures in various inorganic and organic compounds.

MO Approach: Rules for the LCAO method, bonding and antibonding MOs and their characteristics for s-s, s-p and p-p combinations of atomic orbitals, nonbonding combination of orbitals, MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including idea of s-p mixing) and heteronuclear diatomic molecules such as CO, NO and NO⁺. Comparison of VB and MO approach

Unit-III

Fundamentals of Organic Chemistry: Physical Effects, Electronic Displacements: Inductive Effect, Electromeric Effect, Resonance and Hyper-conjugation. Cleavage of Bonds: Homolysis and Heterolysis. Structure, shape and reactivity of organic molecules: Nucleophiles and electrophiles. Reactive Intermediates: Carbocations, Carbanions and free radicals. Strength of organic acids and bases: Comparative study with emphasis on factors affecting pK values. Aromaticity: Benzenoids and Hückel's rule.

Stereochemistry: Conformations with respect to ethane, butane and cyclohexane. Interconversion of Wedge Formula, Newmann, Sawhorse and Fischer representations. Concept of chirality (upto two carbon atoms). Configuration: Geometrical and Optical isomerism; Enantiomerism, Diastereomerism and Meso compounds). Threo and erythro; D and L; cis - trans nomenclature; CIP Rules: R/S (for upto 2 chiral carbon atoms) and E/Z Nomenclature (for upto two C=C systems).

Unit-IV

Aliphatic Hydrocarbons Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Alkanes: (Upto 5 Carbons). Preparation: Catalytic hydrogenation, Wurtz reaction, Kolbe's synthesis, from Grignard reagent. Reactions: Free radical Substitution: Halogenation. Alkenes: (Upto 5 Carbons) Preparation: Elimination reactions: Dehydration of alkenes and dehydrohalogenation of alkyl halides (Saytzeff's rule); cis alkenes (Partial catalytic hydrogenation) and trans alkenes (Birch reduction). Reactions: cis-addition (alk. KMnO₄) and trans-addition (bromine), Addition of HX (Markownikoff's and anti-Markownikoff's addition), Hydration, Ozonolysis, oxymecuration-

demercuration, Hydroboration-oxidation Alkynes: (Upto 5 Carbons) Preparation: Acetylene from CaC₂ and conversion into higher alkynes; by dehalogenation of tetra halides and dehydrohalogenation of vicinal-dihalides. Reactions: formation of metal acetylides, addition of bromine and alkaline KMnO4, ozonolysis and oxidation with hot alk. KMnO₄.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Concise Inorganic Chemistry	1.D. Lee	ELBS
2	Inorganic Chemistry	A.G. Sharpe	ELBS
3	Organic Chemistry	Morrison and Boyd	Prentice Hall
4	Fundamentals of Organic Chemistry	Solomons	John Wiley
5	Stereochemistry	P.S. Kalsi	New age International
6	Organic reaction mechanism	Singh and Mukharje	New age International

Course Code	ZOO101
Course Title	Animal Biodiversity
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical
Course Objective	
(CO)	of invertebrate species and to impart knowledge about co-existence of
	different forms of living organisms ranging from acelluar to
	multicellular animals. Classification and general characters of the
	following phyla up to classes.
Constitution in	

ANIMAL BIODIVERSITY

UNIT-I

Kingdom Protista: General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa

Phylum Porifera: General characters and classification up to classes; Canal System in *Sycon*

Phylum Cnidaria: General characters and classification up to classes; Polymorphism in Hydrozoa

Phylum Platyhelminthes: General characters and classification up to classes; Life history of *Taenia solium*

UNIT-II

Phylum Nemathelminthes: General characters and classification up to classes; Life history of *Ascaris lumbricoides* and its parasitic adaptations

Phylum Annelida: General characters and classification up to classes; Metamerism in Annelida

Phylum Arthropoda: General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects

Phylum Mollusca: General characters and classification up to classes; Torsion in gastropods

UNIT-III

Phylum Echinodermata: General characters and classification up to classes; Water-vascular system in Asteroidea

Protochordates: General features and Phylogeny of Protochordata

Agnatha: General features of Agnatha and classification of cyclostomes up to classes Pisces: General features and Classification up to orders; Osmoregulation in Fishes

UNIT-IV

Amphibia: General features and Classification up to orders; Parental care

Reptiles: General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes

Aves: General features and Classification up to orders; Flight adaptations in birds

Mammals: Classification up to orders; Origin of mammals.

Text and Reference Books:

S. No.	Title	Author(s)	Publisher
1	Invertebrate Zoology	P.S. Dhami	R Chand and Company
2	Cell Biology	V K Aggarwal	S.Chand Publishing
3	A Text Book of Invertebrate	Gurcharn Singh	Cam <mark>pus</mark> Books
	Zoology		Inte <mark>rn</mark> ational
4	Cell Biology	C B Pawar	Himalaya Publishing
			House
5	Modern's Zoology (Vol-I)	Ashok Sabharwal and Dr.	Modern Publisher
- 1		S K Malhotra	
6	Modern Text Book of	Prof. R. L. Kotpal	Rastogi Publisher
	Zoology Invertebrates	Market Miles	(8)
7	Zoology	P S Dhami	Pradeep Publishers

GENERAL ENGLISH-I

Course Code	ENG101				
Course Title General English-I					
Type Course	Theory				
LTP	3 0 0				
Credits	3				
Course Pre-requisite	10+2 any stream				
Course Objective	1. The students will critically read and analyze the prescribed texts.				
(CO)	2. The students will demonstrate effective word choice,				

vocabulary, idioms, grammar and sentence structure allowing							
accurate communication of meaning in written work.							
The stud			\mathcal{C}			usage	of
present/pa	st/future 1	tenses in	context	ualized s	speech.		

UNIT-I

Tales of Life:

- a. The Umbrella (Henry Rene Albert Guy de Maupassant)
- b. The Story Teller (H.H. Munro Saki)
- c. The Lament (Anton Pavlovich Chakhov)

Prose for Young Learners:

- a. Universal Declaration Of Human Rights (U.N. Charter)
- b. Symptoms (Jerome K. Jerome)

Exploring Tenses in English:

- a. Present and Past
- b. Present Perfect and Past

UNIT-II

Tales of Life:

- a. The Luncheon (William Somerset Maugham)
- b. The Shroud (Prem Chand)

Prose for Young Learners:

- a. On Spendthrifts(A.G.Gardinar)
- b. The Power of Women(Richard Gardon)
- c. A Dialogue On Democracy (Albert Sydney Horby)

Exploring Tenses in English:

a. Future

Text and Reference Books:

S.No	Author(S)	Title	Publisher
1	Singh, S	Tales of Life	Press and Publication Department, Guru Nanak Dev University, Amritsar.
2	Tewari, A. K, Midha,V.K, Sharma, R.K	Prose For Young Learners	Publication Bureau, Guru Nanak Dev University, Amritsar
3	Murphy, R	English Grammar in Use	Cambridge University Press

GENERAL PUNJABI-I

Cours	se Code		PBI101			
Cours	se Title		General Punjabi-I			
Type	of Cours	e	Theory			
L	T	P	3 0 0			

Credits	3
Course	10+2 in any stream
Prerequisite	
Course	1. ividAwrQI AwDuink pMjwbI kvIAW dI jIvnI qoN jwxU hoxgy[
Objectives	2. ividAwrQIAW nUM AwDuink pMjwbI kivqw dI ivSYgq jwxkwrI ho
	jwvygI[
	3. ividAwrQIAW iv'c ryKw ic'qrW dw Alocnwqmk AiDAYn krn dw
	hunr auqpMn hovygw[

iekweI- a

- 1. AwDuink pMjwbI kivqw: BweI vIr isMG (rauN ru^, smW, ie`Cw bl qy fUMGIAW SwmW), DnI rwm cwiqRk(rwDw sMdyS, isdkW vwilAW dy byVy pwr ny), pRo. pUrn isMG(purwxy pMjwb nUM AwvwzW), &IrozdIn Sr&(kurbwnI, ^Yr pMjwbI dI), pRo. mohn isMG(Awau n`cIey, nvW kOqk), nMd lwl nUrpurI(cuMm cuMm r`Ko, mzdUr), AMimRqw pRIqm(bwrW mwh, sMXog ivXog), fw. hrBjn isMG(qyry hzUr myrI hwizrI dI dwsqW), iSv kumwr btwlvI(ibrhoN dI rVHk, z^m), surjIq pwqr(cONk ShIdW 'c ausdw Awi^rI BwSx, Zzl)
- 2. pMjwb dy mhwn klwkwr(lyK): ky. AY~l. sihgl, bVy gulwm All KW, soBw isMG, ipRQvIrwj kpUr, BweI smuMd isMG[

iekweI- A

- 1. pMjwbI DunI ivauNq : aucwrn AMg, aucwrn sQwn qy ivDIAW, svr, ivAMjn[
- 2. BwSw vMngIAW: BwSw dw tkswlI rUp, BwSw Aqy aup- BwSw dw AMqr, pMjwbI aupBwSwvW dy pCwx icMnH[

pusqk sUcI

pwT- pusqkW

P P P			
lyKk	swl	Pusqk	pbilSr
sMpwdk, iF`loN;	2014	do rMg	pblIkySn ibaUro,
h.s. Aqy srgoDIAw;	A Draw-		gurUu nwnk dyv
p.s.	4. UNT	LIALANDHAR (T	XUnIvristI, AMimRqsr
gwrgI; b.	1995	pMjwb dy mhwn	pblIkySn ibaUro,
		klwkwr	gurUu nwnk dyv
			XUnIvristI, AMimRqsr

sMbMiDq pusqkW

lyKk		swl	Pusqk		pbilSr		
					pMjwbI	XU	nIvristI,
isMG; h.		1966	pMjwbI bwry		pitAwlw		
					AY~s.	jΙ.	pbilSrz,
isMG; qIrQ	(fw.)	2014	pMjwbI AiDA	wpn	jlMDr		
syKoN;	suKivMdr	2015	pMjwbI BwSw	dw	kilAwxI		pbilSrz,

isMG	(fw.)	Aqy	AiDAwpn	luiDAwxw
syKoN;	mndIp	kOr		

ATOMIC STRUCTURES, BONDING, GENERAL ORGANIC AND CHEMISTRY AND ALIPHATIC HYDROCARBONS PRACTICAL

Course Code	CHM 103			
Course Title	Atomic structures, bonding, general organic and chemistry and			
	aliphatic hydrocarbons			
Type of course	PRACTICAL			
LTP	0:0:4			
Credits	2			
Course prerequisite	10+2 with chemistry as core subject			
Course Objective	The aim of this course is to impart practical knowledge to the students			
	about the separation of organic molecules and estimation of inorganic			
21-	salt and metal ions.			

LIST OF EXPERIMENTS

Volumetric Analysis

- 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture.
- 2. Estimation of oxalic acid by titrating it with KMnO₄.
- 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO₄.
- 4. Estimation of Fe (II) ions by titrating it with K₂Cr₂O₇ using internal indicator.
- 5. Estimation of Cu (II) ions iodometrically using Na₂S₂O₃.

Organic Chemistry Detection of extra elements (N, S, Cl, Br, I) in organic compounds

(containing upto two extra elements)

- 1. Separation of mixtures by Chromatography: Measure the Rf value in each case (combination of two compounds to be given)
- (a) Identify and separate the components of a given mixture of two amino acids (glycine, aspartic acid, glutamic acid, tyrosine or any other amino acid) by paper chromatography
- (b) Identify and separate the sugars present in the given mixture by paper chromatography.

Text and Reference Books:

S. No	Name		Author(S)	Publisher
1	Vogel's Qualitative	Inorganic	G Svehla	Prentice Hall
	Analysis (7 th Edition).			

2	Laboratory Manual in Organic	R.K. Bansal,	Wiley Eastern
	Chemistry		
3	Advanced Experimental	Physical, J.N. Gurtu and	S. Chand & CO.
	Chemistry. Vol. I	R. Kapoor	
4	Vogel's Qualitative Inorganic	Svehla	Orient Longman
	Analysis		
5	Vogel's Textbook of Quantitative	J. Basseff, R.C.	ELBS
	Inorganic Analysis (revised),	Dennery, G.H. Jeffery	
		and J. Mendham	
6	Advanced Practical Physical	J.B. Yadav	KRISHNA Prakashan
	Chemistry	Man Clare	Media (P) Ltd,

HISTORY AND CULTURE OF PUNJAB -I

Course code	HCP101	
Course title	History and Culture of Punjab -I	
Type of course	Theory	
LTP	3:0:0	
Credits		
Course	Students who have not studied Punjabi in 10/12 th class	
prerequisite		
Course objectives	1. The Student will acquire the knowledge about Punjab and its	
(CO) Historical Resources.		
	2. The Student will understand the Harppan Culture and different	
	Vedic Periods.	
The same of the sa	3. The Students will analyze the Alexander's invasions.	

UNIT I

Ancient Punjab: Physical features, Political, Social, Economic, Geographical, Religious impact on History, Historical Sources: Literacy, Archaeological, Harappan Culture: Extent and Town Planning.

UNIT II

Harppan Culture: Social, Economic and Religious life; Causes and Disappearance, Rig Vedic Age: The rise of Indo Aryans, Main features of the life in Early Vedic Age, Later Vedic Age: Political, Economic, Social, and Religious life of Later Vedic Aryans.

UNIT III

Caste system: Origin and Evolution, The Epics: Historical importance of Ramayan and Mahabharat, Political condition on eve Alexander's Invasion.

UNIT IV

Impact of Alexander's Invasion on Social and Culture Life., Position of Women: Harppan, Early Vedic and Later Vedic Age.

Important Historical places of Punjab: Mohenjodaro, Harappa, kotla Nihang khan, Sanghol, Banawali, Taxila, Hastinapur,Indraprastha,Srinagar, Sakala,Purusapura

Text and References Books:

S.NO.	Author's	Title	Publisher
1	Sukhdev	History And Culture Of Punjab	New Academic Publisher
	Sharma		
2	Romila	A History of India, Vol. I	Penguin Books
	Thapar		_

PLANT BIODIVERSITY PRACTICAL

Course Code	BOT103	
Course Title	Plant Biodiversity Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite 10+2 Medical		
Course Objective To make students aware about biodiversity among different group		
(CO)	plants, characteristic features of each group and to give preliminary	
	knowledge of microbes	

LIST OF EXPERIMENTS

- 1. EMs/Models of viruses T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle.
- 2. Types of Bacteria from temporary/permanent slides/photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule.
- 3. Gram staining
- 4. Study of vegetative and reproductive structures of *Nostoc, Chlamydomonas* (electron micrographs), *Oedogonium*, *Vaucheria*, *Fucus* and Polysiphonia* through temporary preparations and permanent slides. (* *Fucus* Specimen and permanent slides)
- 5. *Rhizopus and Penicillium*: Asexual stage from temporary mounts and sexual structures through permanent slides.
- 6. Alternaria: Specimens; photographs and tease mounts.
- 7. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts.
- 8. *Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus*.
- 9. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
- 10. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)
- 11. *Marchantia* morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides).

- 12. *Funaria* morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema. *Selaginella* morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide).
- 13. *Equisetum* morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide).
- 14. *Pteris* morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores (temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide).
- 15. *Cycas* morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide).
- 16. *Pinus* morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).

Text and Reference Books:

Sr	Book Title	Author	Pub <mark>l</mark> isher Publisher
No.		TEIDY NO	
1	Diversity of Microbes and	H.N.Srivastava	Pradeep Publisher
	Cryptogams	0 200	
2	Text Book of Thallophytes	O.P.Sharma	Tata McGraw Hill
3	Text Book of Pteridophyta	O.P.Sharma	McMillan India Ltd
4	The Fungi	P.D. Sharma	Rastogi Publisher
5	Cryptogamic Botany, Vol. II,	G.M Smith	Tata McGraw Hill
	Bryophytes & Pteridophytes	1-56	
6	Biology	P H Raven, G B	Tata McGraw Hill
		Johnson, SIR R Singer	
7	Gymnosperms	SP Bhatnagar and A	S Chand
	ATILALA DICT	Moitra	MADI

ANIMAL BIODIVERSITY PRACTICAL

Course Code	ZOO103	
Course Title	Animal Biodiversity Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite	10+2 Medical	
Course Objective	Classification up to orders and study of the specimens mentioned	
	against each phylum with ecological note	

LIST OF SUGGESTED LAB EXERCISES:

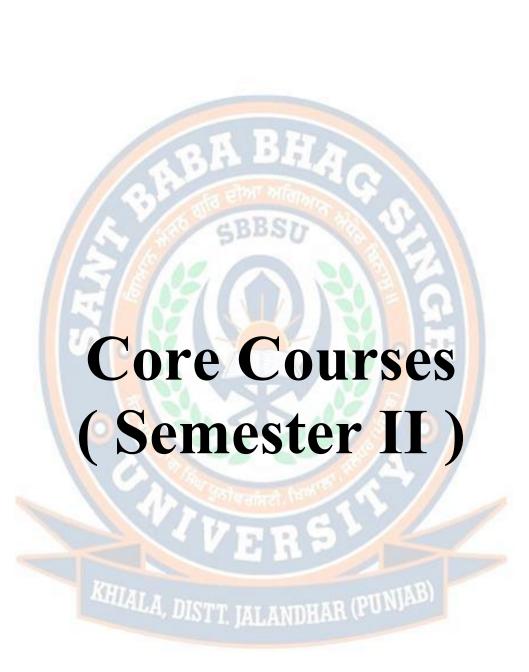
1. Study of the following specimens:

Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taenia solium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Pentaceros, Ophiura, Echinus, Cucumaria and Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders, Sorex, Bat, Funambulus, Loris

- **2.** Study of the following permanent slides:
- T.S. and L.S. of Sycon, Study of life history stages of Taenia, T.S. of Male and female Ascaris
- 3. Key for Identification of poisonous and non-poisonous snakes
 An "animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.

Text and Reference Books:

S. No.	Title	Author(s)	Publisher
1	Invertebrate Zoology	P.S. Dhami	R Chand and Company
2	Cell Bi <mark>ol</mark> ogy	V K Aggarwal	S.Chand Publishing
3	A Text Book of Invertebrate Zoology	Gurcharn Singh	Campus Books International
4	Cell Biology	C B Pawar	Himalaya Publishing Hous <mark>e</mark>



PLANT ECOLOGY AND TAXONOMY

Course Code	BOT102
Course Title	Plant Ecology and Taxonomy
Type of course	Theory
LTP	4 0 0
Credits	2
Course prerequisite	10+2 Medical
Course Objective To make student understand basics of ecosyatem, its working a	
(CO)	components also diversity in angiosperm families.

UNIT-I

Introduction to Ecology: History of Ecology; Basic concepts in Ecology; Subdivisions of Ecology; Terminology related to Ecology; Scope of Ecology

Ecological factors: Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes.

Plant communities: Characters; Ecotone and edge effect; Succession; Processes and types.

UNIT-II

Ecosystem: Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Biogeochemical cycling; Cycling of carbon, nitrogen and phosphorous.

Phytogeography: Principle biogeographical zones; Endemism

UNIT-III

Introduction to plant taxonomy: Identification, Classification, Nomenclature. Identification Functions of Herbarium, important herbaria and botanical gardens of the world and India, Documentation: Flora, Keys: single access and multi-access, Taxonomic evidences from palynology, cytology, phytochemistry and molecular data

Taxonomic hierarchy: Ranks, categories and taxonomic groups UNIT-IV

Botanical nomenclature: Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.

Classification: Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).

Biometrics, numerical taxonomy and cladistics: Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).

General characters Angiosperms: Important angiosperm families- habit, habitat, characters, important plants, economic importance. (Brassicaceae, Malvaceae, Fabaceae, Rosaceae Umbelliferae, Rutaceae, Asteraceae, Asclepiadaceae, Solanaceae, Euphorbiaceae, Lamiaceae, Liliaceae, Gramineae)

Text and Reference Books:

S. No.	Title	Author	Publisher
1	Concepts of Ecology	Kormondy, E.J	Prentice Hall, U.S.A.
			4th edition.
2	Ecology and Environment	Sharma, P.D	Rastogi Publications,
	11		Meerut, India. 8thed
3	Plant Systematics	Simpson, M.G.	Academic Press, San
	E C	M. MIGDIN	Diego, CA, U.S.A.
4	Plant Systematics: Theory and	Singh, G.	Oxford & IBH Pvt.
	Practice.	DDSU	Ltd., New
			Delhi. 3rd edition.
5	An Introduction to Plant	Jeffrey, C.	Cambridge University
	Taxonomy		Press, London
6	Fundamental of Plant Systematics	Radford, A.E.,	Harper and Row, New
			York
7	Principles of Angiosperm	Davis, P.H. and Heywood,	Oliver and
	Taxonomy	V.H	Boyd, London.

Chemical Energetic, Equilibrium and Functional Group Organic chemistry –

Course Code	CHM102	
Course Title	Chemical Energetic, Equilibrium and Functional Group Organic	
	chemistry – I	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	10+2 Medical	
Course Objective	The aim of this course is to impart basic knowledge about properties	
(CO)	and importance of natural bio-macromolecules.	

Unit-I

Chemical Energetics: Review of thermodynamics and the Laws of Thermodynamics. Important principles and definitions of thermo-chemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution. Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data. Variation of enthalpy of a reaction with temperature – Kirchhoff's equation. Statement of Third Law of thermodynamics and calculation of absolute entropies of substances.

Unit-II

Chemical Equilibrium: Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between G and G° , Le Chatelier's principle. Relationships between Kp, Kc and Kx for reactions involving ideal gases.

Ionic Equilibria:Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis-calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle.

Unit-III

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Aromatic hydrocarbons Preparation (Case benzene): from phenol, by decarboxylation, from acetylene, from benzene sulphonic acid. Reactions: (Case benzene): Electrophilic substitution: nitration, halogenation and sulphonation. Friedel-Craft's reaction (alkylation and acylation) (upto 4 carbons on benzene). Side chain oxidation of alkyl benzenes (upto 4 carbons on benzene).

Alkyl and Aryl Halides, Alkyl Halides (Upto 5 Carbons) Types of Nucleophilic Substitution (SN1, SN2 and SNi) reactions Preparation: from alkenes and alcohols. Reactions: hydrolysis, nitrite & nitro formation, nitrile & isonitrile formation. Williamson's ether synthesis: Elimination vs substitution. Aryl Halides Preparation: (Chloro, bromo and iodo-benzene case): from phenol, Sandmeyer & Gattermann reactions. Reactions (Chlorobenzene): Aromatic nucleophilic substitution (replacement by –OH group) and effect of nitro substituent. Benzyne Mechanism: KNH₂/NH₃ (or NaNH₂/NH₃).Reactivity and Relative strength of C-Halogen bond in alkyl, allyl, benzyl, vinyl and aryl halides.

Unit-IV

Alcohols, Phenols and Ethers (Up to 5 Carbons) Alcohols: Preparation: Preparation of 1°, 2° and 3° alcohols: using Grignard reagent, Ester hydrolysis, Reduction of aldehydes, ketones, carboxylic acid and esters. Reactions: With sodium, HX (Lucas test), esterification, oxidation (with PCC, alk.KMnO4, acidic dichromate, conc. HNO3). Oppeneauer oxidation Diols: (Upto 6 Carbons) oxidation of diols. Pinacol-Pinacolone rearrangement.

Phenols: (Phenol case) Preparation: Cumene hydroperoxide method, from diazonium salts. Reactions: Electrophilic substitution: Nitration, halogenation and sulphonation. Reimer-Tiemann Reaction, Gattermann-Koch Reaction, Houben–Hoesch Condensation, Schotten – Baumann Reaction.

Ethers (aliphatic and aromatic): Cleavage of ethers with HI.

Aldehydes and ketones (aliphatic and aromatic): (Formaldehyde, acetaldehyde, acetone and benzaldehyde)Preparation: from acid chlorides and from nitriles. Reactions – Reaction with HCN, ROH, NaHSO₃, NH₂-G derivatives. Iodoform test. Aldol Condensation, Cannizzaro's reaction, Wittig reaction, Benzoin condensation. Clemensen reduction and Wolff Kishner reduction. Meerwein-Pondorff Verley reduction.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Organic reaction mechanism, 3 rd	V. K. Ahluwalia	Narosa publishing house,
	ed. Latest edition		New Dehli
2	Organic Chemistry	Morrison and Boyd	Prentice Hall
3	Fundamentals of Organic	Solomons	John Wiley
	Chemistry	A IS H A	
4	The Elements of Physical	P.w. Aikins	Oxford
	Chemistry	stort orfan	
5	Physical Chemistry	R.A. Alberty	Wiley Eastern Ltd

COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES

Course Code	ZOO102	
Course Title	Comparative Anatomy and Developmental Biology of	
94 (Vertebrates	
Type of course	Theory	
LTP	4 0 0	
Credits	edits 4	
Course prerequisite	10+2 Medical	
Course Objective	To enable the students to draw a comparative account of the	
(CO)	morphology, general anatomy and physiology of the vertebrates	

UNIT-I

Integumentary System: Derivatives of integument w.r.t. glands and digital tips

Digestive System: Brief account of alimentary canal and digestive glands **Respiratory System:** Brief account of Gills, lungs, air sacs and swim bladder

Circulatory System: Evolution of heart

UNIT-II

Nervous System: Comparative account of brain

Sense Organs: Types of receptors

Urinogenital System: Succession of kidney, Evolution of urinogenital ducts

UNIT-III

Early Embryonic Development: Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds; Fertilization: external (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to formation of gastrula);types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.

UNIT-IV

Late Embryonic Development: Implantation of embryo in humans, Formation of human placenta and functions, other types of placenta on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.

Control of Development: Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death.

Text and Reference Books:

Sr	Title	Author(s)	Publisher
No.		120	
1	Vertebrates' Comparative	K.V Kardong	McGraw-Hill
	Anatomy, Function and	A CHILD A SO	
	Evoluti <mark>o</mark> n. IV Edition.		
2	Comparative Anatomy of	G.C. Kent and R.K Carr	<mark>Mc</mark> Graw-Hil <mark>l</mark>
	the Vertebrates. IX Edition		
3	Analysis of Vertebrate	M. Hilderbrand and G.E.	John Wiley <mark>an</mark> d Sons
	Structure	Gaslow	
4	Biology of Vertebrates	H.E. Walter and L.P. Sayles	Khosla Publishing House

GENERAL ENGLISH-II

Course Code	ENG102
Course Title	General English-II
Type Course	Theory
LTP	3 0 0
Credits	3
Course Pre-requisite	10+2
Course Objective	To develop understanding of the significance of English as a subject in
(CO)	the present context, to feel pleasure and to develop the understanding of
	the significance of basic competencies in language acquisition. This
	course will enable students to understand the foreign language as well
	as the use of language and to enable students to acquire language skills
	such as listening, speaking, reading, and writing and integrate them for
	communicative purposes.

1. Tales of Life

- a. The Doll's House(Katherine Mansfield)
- b. Eveline (James Joyce)
- c. Toba Tek Singh (Saadat Hassan Manto)
- d. The Taboo (Victor Astafyev)
- e. A Strand of Cotton (Suneet Chopra)
- 2. Prose for Young Learners
 - a. Beauty And The Beast(R.K.Narayan)
 - b. With A Song On Their Lips (Hugh & Colleen Gantzer)
 - c. My Financial Careers (Stephen Leacock)
 - d. The School For Sympathy (E.V. Lucas)
 - e. AIDS (U.N.Report)
- 3. Exploring Grammar
 - a. Modals
 - b. Passive
 - c. Reported Speech
 - d. Questions and Auxiliary verbs

Text and Reference Books:

S.No.	Author(S)	Year	Title	Publisher
1	Singh, S	2008	Tales of Life	Press and Publication Department, Guru Nanak Dev University, Amritsar.
2	Tewari, A. K, Midha,V.K, Sharma, R.K	2011	Prose For Young Learners	Publication Bureau, Guru Nanak Dev University, Amritsar
3	Murphy, R	2015	English Grammar in Use	Cambridge University Press

GENERAL PUNJABI-II

Course Code	PBI102
Course Title	General Punjabi-II
Type of Course	Theory
L T P	3 0 0
Credits	3
Course	10+2
Prerequisite	
Course Objective	1. ividAwrQI AwDuink pMjwbI khwxIkwrW dI jIvnI qoN jwxU hoxgy[
	2.ividAwrQIAW nUM AwDuink pMjwbI khwxI dI ivSYgq jwxkwrI ho jwvygI[

3	3. ividAwrQIAW iv`c ryKw ic`qrW dw Alocnwqmk AiDAYn
	krn dw hunr auqpMn hovygw[
4	ł.ividAwrQI muhwvry, AKwxW dI Fu`kvIN vrqoN krnW
	is`K iwxav

iekweI- a

- 1. pMjwbI in`kI khwxI: BUAw (nwnk isMG), bwZI dI DI (gurmuK
 isMG muswi&r), pymI dy inAwxy(sMq isMG syKoN), bwgW dw
 rwKw(sujwn isMG), qYN kI drd nw AwieAw(krqwr isMG du`gl),
 DrqI hyTlw bOlD(kulvMq isMG ivrk), dUjI vwr jyb k`tI
 geI(nvqyj isMG), lCmI(pRym pRkwS), bu`q iSkn(AjIq kOr), b`s
 kMfktr(dlIp kOr itvwxw)[
- 2. pMjwb dy mhwn klwkwr (lyK): sqIS gujrwl, gurcrn isMG, Twkur isMG,blrwj swhnI, suirMdr kOr[

iekweI- A

- 1. Sbd bxqr Aqy Sbd rcnw: pirBwSw Aqy mu`Fly sMklp
- 2. (a) pYrHw rcnw, muhwvry Aqy AKwx[
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HISTORY AND CULTURE OF PUNJAB -II

Course ode	HCP102
Course title	History And Culture Of Punjab –II
Type of course	Theory
LTP	3:0:0

Credits	3	
Course	Students who have not studied Punjabi in 10/12 th class	
prerequisite		
Course objectives	1. The Student will acquire the knowledge Of Mauryan Empire.	
(CO)	2. The Student will understand the impact of Buddhism & Jainism	
	on Punjab.	
	3. To aware the learners Depiction of Punjab in the accounts of	
	Chinese travelers.	

UNIT-I

The Mauryan Empire: Social, Economic and Religious life, Buddhism and Jainism: Impact on Punjab with special reference to 4th Buddhist Council., The Kushanas: Impact of Kanishka's rule on Punjab.

UNIT-II

Gandhara School of Art: Salient features, The Guptas: Cultural and Scientific Developments. Position of Women: Under the Mauryas, the Guptas and the Vardhanas.

UNIT-III

Depiction of Punjab in the accounts of Chinese travelers. Fahien and Hwen Tsang. Main developments in literature, Education: Significant Developments: Taxila.

UNIT IV

Society and Culture on the eve of the Turkish invasion of Punjab, Punjab in the Kitab-ul-Hind of Alberuni, Important Historical places: Lahore, Multan Bathinda, Uchh, Jalandhar, Thanesar, Kangra, Taxila, Kundalvana, Pehowa, Thatta.

Text and References Books:

S.NO.	Author's	Title	Publisher
1	Sukhdev	History And Culture Of Punjab	New Academic Publisher
	Sharma	Russ	art R
2	Romila	A History of India, Vol. I	Penguin Books
	Thapar	JOINT I. JALANDHAY	
3		History and Culture of the Punjab,	Punjabi University, Patiala
	L.M.Joshi	Vol. I	

PLANT ECOLOGY AND TAXONOMY PRACTICAL

Course Code	BOT104
Course Title	Plant Ecology and Taxonomy Practical
Type of course	Practical

LTP	0 0 4	
Credits	2	
Course prerequisite 10+2 Medical		
Course Objective	To give practical knowledge about Ecosystem components and floral	
(CO)	description of important angiosperm families.	

LIST OF EXPERIMENTS

- 1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.
- 2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.
- 3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.
- 4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (*Cuscuta*), Root parasite (*Orobanche*), Epiphytes, Predation (Insectivorous plants)
- 5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)
- 6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law
- 7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):

Brassicaceae – Brassica/Alyssum / Iberis

Asteraceae – Tagetes erecta/Ageratum conyzoides

Solanaceae – Solanum tuberosum, Withania

Fabaceae-Pisum sativum/Cassia fistula/Acacia nilotica

Lamiaceae -Salvia, Ocimum

Liliaceae - Asphodelus / Lilium / Allium.

Gramineae-Triticum

Rosaceae-Rosa indica

Malvaceae-Hibiscus Rosa sinensis

Umbelliferae- Coriandrum

Asclepiadaceae- Calotropis

Euphorbiaceae- Euphorbia

8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).

Text and Reference Books:

S. No.	Title	Author	Publisher
1	Concepts of Ecology	Kormondy, E.J	Prentice Hall, U.S.A.
			4th edition.
2	Ecology and Environment	Sharma, P.D	Rastogi Publications, Meerut, India. 8thed
3	Plant Systematics	Simpson, M.G.	Academic Press, San

			Diego, CA, U.S.A.
4	Plant Systematics: Theory and	Singh, G.	Oxford & IBH Pvt.
	Practice.		Ltd., New
			Delhi. 3rd edition.
5	An Introduction to Plant	Jeffrey, C.	Cambridge University
	Taxonomy		Press, London
6	Fundamental of Plant Systematics	Radford, A.E.,	Harper and Row, New
	7.		York
7	Principles of Angiosperm	Davis, P.H. and Heywood,	Oliver and
	Taxonomy	V.H	Boyd, London.

Chemical energetic, Chemical Equilibrium and Functional Group organic chemistry

	v .		
Course Code	CHM104		
Course Title	Chemical energetic, Chemical Equilibrium and Functional Group organic chemistry-I		
Type of course	Practical Practi		
LTP	0 0 4		
Credits	2		
Course prerequisite	Course prerequisite 10+2 Medical		
Course Objective	To enable the students practical knowledge about separation,		
(CO)	purification, extraction of natural products and biomolecules.		

Thermochemistry

- 1. Determination of heat capacity of calorimeter for different volumes.
- 2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide.
- 3. Determination of enthalpy of ionization of acetic acid.
- 4. Determination of integral enthalpy of solution of salts (KNO₃, NH₄Cl).
- 5. Determination of enthalpy of hydration of copper sulphate.

Ionic equilibria

- a) Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.
- b) Preparation of buffer solutions:
 - (i) Sodium acetate-acetic acid
 - (ii) Ammonium chloride-ammonium hydroxide

Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

- 1. Purification of organic compounds by crystallization (from water and alcohol) and distillation.
- 2 Criteria of Purity: Determination of melting and boiling points.
- 3 Preparations: Mechanism of various reactions involved to be discussed. Recrystallisation, determination of melting point and calculation of quantitative yields to be done.

- (a) Bromination of Phenol/Aniline
- (b) Benzoylation of amines/phenols
- (c) Oxime and 2,4-dinitrophenylhydrazone of aldehyde/ketone

Text and Reference Books

S.	Name	Author(S)	Publisher
No			
1	Electrochemical methods,	A.J. Bard, L.R. Faulkner,	Wiley, 1980.
	Fundamentals and Methods	L. L.	
2	Experimental Physical Chemistry	C. Das, B. Behera	Tata McGraw Hill
		C.	Publishing Company
	C C	BBSII	Limited.
3	Vogel's Textbook of Practical	A.I. Vogel, A.R. Tatchell,	Pearson
	Organic Chemistry (5th Edition)	B.S. Furnis , A.J.	
	2003	Hannaford, P.W.G. Smith	

COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATES PRACTICAL

Course Code	ZOO104		
Course Title	Comparative anatomy and developmental biology of vertebrates practical		
Type of course	Practical		
LTP	0 0 4		
Credits	2		
Course prerequisite	10+2 Medical		
Course Objective	Study of skeletons of different vertebrates, different types of		
KHI	developmental stages of frog and reproductive organs of mammals.		

LIST OF EXPERIMENTS

1. Osteology:

- a) Disarticulated skeleton of fowl and rabbit
- b) Carapace and plastron of turtle /tortoise
- c) Mammalian skulls: One herbivorous and one carnivorous animal.
- 2. Study of developmental stages of frogs, metamorphosis from tadpole to adult though permanent slides.
- 3. Study of the different types of placenta-

Histological sections through permanent slides or photomicrographs.

- 4. Study of placental development in humans by ultrasound scans.
- 5. Examination of gametes frog/rat

Sperm and ova through permanent slides or photomicrographs.

Study of histological section of testis and ovary through permanent slides. **Text and Reference Books:**

Sr	Title	Author(s)	Publisher
No.			
1	Vertebrates' Comparative Anatomy, Function and	K.V Kardong	McGraw-Hill
	Evolution. IV Edition.	OR REI	
2	Comparative Anatomy of	G.C. Kent and R.K Carr	McGraw-Hill
	the Vertebrates. IX Edition	Thurs and	
3	Analysis of Vertebrate	M. Hilderbrand and G.E.	John Wiley and Sons
	Structure	Gaslow	4 1/4
4	Biology of Vertebrates	H.E. Walter and L.P. Sayles	Khosla Publishing House
5	Developmental Biology,	S.F. Gilbert	Sinauer Associates, Inc.,
	VIII Edi <mark>ti</mark> on		Publishers, Sunderland,
			Massachusetts, USA.
6	An introduction to	B.I. Balinsky	International Thomson
	Embryology		Computer Press
7	Patten's Foundations of Embryology	Carlson, Bruce M	McGraw Hill, Inc





ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Course Code	BOT201
Course Title	Anatomy and Embryology of Angiosperms
Type of course	Theory
LTP	4 0 0
Credits	4
Course Objective	i. To study basic body plan of flowering plant, various tissue systems
	in higher plants, their structure, development and function.
	ii. To study structure, development and function of reproductive
	structures in flowering plants.

UNIT-I

The basic body plan of a flowering plant-modular type of growth.

The Shoot System: The shoot apical meristem and its histological organization; meristematic and permanent tissue, formation of internodes, branching pattern; monopodial and sympodial growth; canopy architecture; cambium and its functions; formation of secondary xylem; a general account of wood structure in relation to conduction of water and minerals; characteristics of growth rings, sapwood and heart wood; role of woody skeleton; secondary phloem-structurefunction relationships; periderm.

UNIT-II

Diversity in plant form in annuals, biennials and perennials; trees-largest and longest-lived.

Leaf: Origin, development, arrangement and diversity in size and shape; internal structure in relation to photosynthesis and water loss; adaptations to water stress; senescence and abscission.

UNIT-III

The Root System: The root apical meristem; differentiation of primary and secondary tissues and their roles; structural modification for storage, respiration, reproduction and for interaction with microbes.

Vegetative Reproduction: Various methods of vegetative propagation. Detailed study and types of grafting and budding, economic aspects.

UNIT-IV

Flower: A modified shoot; structure, development and varieties of flower; functions; structure of anther and pistil; the male and female gametophytes; types of pollination; attractions and reward for pollinators; (sucking and foraging types); pollen-pistil interaction self incompatibility; double fertilization: formation of seed endosperm and embryo: fruit development and maturation.

Significance of Seed: Suspended animation; ecological adaptation; unit of genetic recombination with reference to reshuffling of genes and replenishment; dispersal strategies.

Text and reference books:

Sr	Title	Author	Publisher
No.			
1	The Embryology of	S S Bhojwani and S P	Vikas Publishing
	Angiosperms	Bhatnagar	House, Delhi
2	Plant Propagation:	H E Hartman and D E Kestler	Prentice Hall of India
	Principles and Practices	TO THE PARTY	Pvt. Ltd., New Delhi
3	Plant Anatomy	J D Mauseth	Benjamin/Cummings
			Publishing Company
		KE EIM MIGHA	Inc., California, USA
4	Anatomy of Seed Plants	K Peau	John Wiley & Sons,
		Spoon -	New York

Solutions, Phase Equilibrium, conductance, electrochemistry and functional group organic chemistry-II

Course Code	CHM 201
Course Title	Solutions, Phase Equilibrium, conductance, electrochemistry and
	functional group organic chemistry-II
Type of course	CORE
LTP	4:0:0
Credits	4
Course prerequisite	BSc. 1st with chemistry as core subject
Course Objective	The aim of this course is to impart knowledge to the students about
	basic of solution chemistry, phase equilibia, Electrochemistry and
Constitution has	organic chemistry and natural polymers.

Unit-I

Solutions: Thermodynamics of ideal solutions: Ideal solutions and Raoult's law, deviations from Raoult's law – non-ideal solutions. Vapour pressure-composition and temperature-composition curves of ideal and non-ideal solutions. Distillation of solutions. Lever rule. Azeotropes. Partial miscibility of liquids: Critical solution temperature; effect of impurity on partial miscibility of liquids. Immiscibility of liquids- Principle of steam distillation. Nernst distribution law and its applications, solvent extraction.

Phase Equilibrium: Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, FeCl₃-H2O and Na-K only).

Unit-II

Conductance: Conductivity, equivalent and molar conductivity and their variation with dilution for weak and strong electrolytes. Kohlrausch law of independent migration of ions Transference number and its experimental determination using Hittorf and Moving boundary methods. Ionic mobility. Applications of conductance measurements: determination of degree of ionization of weak electrolyte, solubility and solubility products of sparingly soluble salts, ionic product of water, hydrolysis constant of a salt. Conductometric titrations (only acid-base).

Electrochemistry: Reversible and irreversible cells. Concept of EMF of a cell. Measurement of EMF of a cell. Nernst equation and its importance. Types of electrodes. Standard electrode potential. Electrochemical series. Thermodynamics of a reversible cell, calculation of thermodynamic properties: G, H and S from EMF data. Calculation of equilibrium constant from EMF data. Concentration cells with transference and without transference. Liquid junction potential and salt bridge. pH determination using hydrogen electrode and quinhydrone electrode. Potentiometric titrations -qualitative treatment (acid-base and oxidation-reduction only).

Unit-III

Functional group approach for the following reactions (preparations & reactions) to be studied in context to their structure. Carboxylic acids and their derivatives Carboxylic acids (aliphatic and aromatic) Preparation: Acidic and Alkaline hydrolysis of esters. Reactions: Hell – Vohlard - Zelinsky Reaction. Carboxylic acid derivatives (aliphatic): (Upto 5 carbons) Preparation: Acid chlorides, Anhydrides, Esters and Amides from acids and their interconversion. Reactions: Comparative study of nucleophilicity of acyl derivatives. Reformatsky Reaction, Perkin condensation. Amines and Diazonium Salts Amines (Aliphatic and Aromatic): (Upto 5 carbons)Preparation: from alkyl halides, Gabriel's Phthalimide synthesis, Hofmann Bromamide reaction. Reactions: Hofmann vs. Saytzeff elimination, Carbylamine test, Hinsberg test, with HNO₂, Schotten – Baumann Reaction. Electrophilic substitution (case aniline): nitration, bromination, sulphonation. Diazonium salts: Preparation: from aromatic amines. Reactions: conversion to benzene, phenol, dyes.

Unit-IV

Amino Acids, Peptides and Proteins: Preparation of Amino Acids: Strecker synthesis using Gabriel's phthalimide synthesis. Zwitterion, Isoelectric point and Electrophoresis Reactions of Amino acids: ester of –COOH group, acetylation of –NH2 group, complexation with Cu²⁺ ions, ninhydrin test. Overview of Primary, Secondary, Tertiary and Quaternary Structure of proteins. Determination of Primary structure of Peptides by degradation Edmann degradation (N-terminal) and C-terminal (thiohydantoin and with carboxypeptidase enzyme). Carbohydrates: Classification, and General Properties, Glucose and Fructose (open chain and cyclic structure), Determination of configuration of monosaccharides, absolute configuration of Glucose and Fructose, Mutarotation, ascending and descending in mono-saccharides. Structure of disaccharides (sucrose, cellobiose, maltose, lactose) and polysaccharides (starch and cellulose) excluding their structure elucidation.

Text and Reference Books

S. No	Name	Author(S)	Publis	sher
1	Natural Products: Chemistry and	Mann, J.; David	dson,	Longman, Esse
	Biological Significance,	R.S.; Hobbs,	J.B.;	
		Banthrope, I	D.V.;	
		Harborne, J.B.		

2	Organic reaction mechanism, 3rd	V. K. Ahluwalia	Narosa publishing
	ed. Latest edition		house, New Dehli
3	Organic Chemistry	Morrison and Boyd	Prentice Hall
4	Fundamentals of Organic Chemistry	Solomons	John Wiley
5	The Elements of Physical Chemistry	P.w. Aikins	Oxford
6	Physical Chemistry	R.A. Alberty	Wiley Eastern Ltd
7	Physical Electrochemistry-	Eliezer Gileadi,	Wiley-VCH
	Fundamentals, Techniques and	BBSI	
	Applications		

ANIMAL PHYSIOLOGY AND BIOCHEMISTRY

Course Code	ZOO-201
Type of course	CORE
LTP	4:0:0
Credits	
Course prerequisite	BSc. 1st with chemistry as core subject
Course Objective	The aim of this course is to impart knowledge to the students about
basic of solution chemistry, phase equilibia, Electrochemistry and	
	organic chemistry and natural polymers.

UNIT-I

Nerve and muscle: Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, Ultra-structure of skeletal muscle, Molecular and chemical basis of muscle contraction

UNIT-II

Digestion: Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids

Respiration: Pulmonary ventilation, Respiratory volumes and capacities, Transport of Oxygen and carbon dioxide in blood

Excretion: Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism

Cardiovascular system: Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle

UNIT-III

Reproduction and Endocrine Glands :Physiology of male reproduction: hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle. Structure and function of pituitary, thyroid, Parathyroid, pancreas and adrenal

UNIT -IV

Carbohydrate Metabolism: Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain

Protein metabolism: Transamination, Deamination and Urea Cycle

Enzymes: Introduction, Mechanism of action, Enzyme Kinetics, Inhibition and Regulation Text and reference books:

S.No	Title	Author	Publisher
1	Principles of Anatomy and	Tortora, G.J. and Derrickson,	John Wiley & Sons
	Physiology 8 th edition	B.H.	A A
2	Vand <mark>er</mark> 's Human	Widmaier, E.P., Raff, H. and	McGraw Hill
	Physiology,11 th edition	Strang, K.T.	
3	Textbook of Medical	Guyton, A.C. and Hall, J.E	Harcourt Asia Pvt.
	Phy <mark>si</mark> ology, 12 th edition		Ltd/ W.B. Saunders
	CA 6 30	300	Company
4	Biochemistry, 6 th edition	Berg, J. M., Tymoczko, J. L.	W.H
	100	and Stryer, L	Freeman and Co.
5	Principles of Biochemistry,	Nelson, D. L., Cox, M. M. and	W.H. Freeman and
	6 th edition	Lehninger, A.L	Co.

ENVIRONMENTAL SCIENCE

Course Code	EVS101
Course Title	Environmental Science
Type of course	Theory
LTP	3 0 0
Credits	2 / 1/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/2/
Course prerequisite	NA
Course Objective (CO)	To make students aware about environment and need of maintaining
	it with best possible knowledge.

UNIT-I

Introduction to Environment and Ecosystem: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness, Concept of Ecosystem, Structure, interrelationship, producers, Consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity.

UNIT-II

Environmental Pollution & Natural Resources: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution,

Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management: Floods, earthquake, cyclone and landslides, Natural Resources and associated problems, use and over exploitation, case studies of forest mresources and water resources.

UNIT-III

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation

UNIT-IV

Human Population and the Environment & Field Work: Population growth, variation among nations. Population explosion –Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies

Visit to a local area to document environemntal assetsriver/forest/grassland/hill/mountain; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems-pond, river, hill slopes, etc.

Text and reference books:

S. No	Title	Author(S)	Publisher
1	A Textbook for Environmental	Erach Bharucha	
	Studies		
2	Environmental Biology,	Agarwal, K.C. 2001	Nidi Publ. Ltd.
			Bikaner.
3	Environmental Science,	Miller T.G. Jr.	Wadsworth

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS PRACTICAL

Course Code	BOT203
Course Title	Anatomy and Embryology of Angiosperms Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	B.Sc Ist year
Course Objective	To study plant anatomy and embryology through slides and
	specimens.

LIST OF EXPERIMENTS

- 1. Study of any commonly occurring dicotyledonous plant (for example Solanum nigrum or Kalanchoe) to the body plan, organography and modular type of growth.
- 2. Life forms exhibited by flowering plants (by a visit to a forest or a garden, Study of tree-like habit in cycads, bamboo, banana, traveller's tree (*Revenala madagascariensis*) and yucca and comparison with true trees as exemplified by conifers and dicotyledons.
- 3. L.S. Shoot tip to study the cytohistological zonation and origion of leaf primordia.
- 4. Monopodial and sympodial types of branching in stems (especially rhizomes).
- 5. Anatomy of primary and secondary growth in monocots and dicots using free hand razor technique (Solanum, Boerhavia Helianthus, Mirabilis, Nyctanthus, Draceana, Maize) hand sections (or prepared slides). Structure of secondary phloem and xylem. Growth rings in wood, Microscopic study of wood in T.S., T.L.S. and R.L.S.
- 6. Field study of diversity in leaf shape, size, thickness, surface properties. Internal structure of leaf. Structure and development of stomata (using epidermal peels of leaf.
- 7. Anatomy of the root. Primary and secondary structure.
- 8. Examination of a wide range of flowers available in the locality and methods of their pollination.
- 9. Structure of anther, microsperogenesis (using slides) and pollen grains (using whole mounts). Pollen viability using in vitro pollen germination.
- 10. Structure of ovule and embryo sac development using serial sections) from permanent slides.
- 11. Nuclear and cellular endosperm. Embryo development in monocots and dicots (using permanent slides/dissections).
- 12. Simple experiments to show vegetative propagation (leaf cuttings in Bryophyllum. Sansevieria, Begonia; stem cuttings in rose, salix, money plant, Sugarcane and Bougainvillea).
- 13. Germination of non-dormant and dormant seeds.

Text and reference books:

Sr	Title	Author	Publisher
No.			
1	The Embryology of	S S Bhojwani and S P	Vikas Publishing House,
	Angiosperms	Bhatnagar	Delhi
2	Plant Propagation:	H E Hartman and D E Kestler	Prentice Hall of India Pvt.
	Principles and Practices	all JALANDHAR	Ltd., New Delhi
3	Plant Anatomy	J D Mauseth	Benjamin/Cummings
			Publishing Company Inc.,
			California, USA
4	Anatomy of Seed Plants	K Peau	John Wiley & Sons, New
			York
5	The Principles of	K Pegeri and Vander Pijl	Pergamon Press, Oxford
	Pollination Biology		
6	Biology of Plants	P H Raven, R F Evert and S E	W.H.Freeman and Co.,
		Eichhorn	New York.
7	Trees: Their Natural	P Thomas	Cambridge University
	History		Press, Cambridge

Est Elmi Mianh

Solutions, phase equilibrium, conductance, electrochemistry and functional organic chemistry-II PRACTICAL

Course Code	CHM 203
Course Title	Solutions, phase equilibrium, conductance, electrochemistry and
	functional organic chemistry-II
Type of course	Practical
LTP	0:0:4
Credits	2
Course prerequisite	10+2 with chemistry as core subject
Course Objective	To provide practical knowledge about conductometry, potentiometry
	and qualitative organic analysis.

Distribution: Study of the equilibrium of one of the following reactions by the distribution method:

 $I2(aq) + I^{-}(aq)I3^{-}(aq)Cu^{2+}(aq) + xNH2(aq) [Cu(NH3)x]^{2+}$

Phase equilibria

Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.

Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.

Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.

Conductance Determination of cell constant

Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid.

Perform the following conductometric titrations:

i. Strong acid vs. strong base

ii. Weak acid vs. strong base

Potentiometry

Perform the following potentiometric titrations:

- i. Strong acid vs. strong base
- ii. Weak acid vs. strong base
- iii. Potassium dichromate vs. Mohr's salt

Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

Separation of amino acids by paper chromatography.

Determination of the concentration of glycine solution by formylation method.

- 1. Titration curve of glycine
- 2. Action of salivary amylase on starch
- 3. Effect of temperature on the action of salivary amylase on starch.
- 4. Differentiation between a reducing and a non reducing sugar.

Text and Reference Books

S. No	Name	Author(S)	Publi <mark>sh</mark> er
01	Vogel's Qualitative Inorganic Analysis	Svehla	Orient Longman
02	Laboratory Experiments on Organic	R. Edemas, J.R.	The Macmillan Limited,
	Chemistry	Johnson and C.F.	London,
		Wilcox	
	Laboratory Manual in Organic	R.K. Bansal,	Wiley Eastern
	Chemistry		(XR)
03	Experimental Physical Chemistry	C. Das, B.	Tata McGraw Hill
	-will jali	Behera	Publishing Company
			Limited.

ANIMAL PHYSIOLOGY AND BIOCHEMISTRY PRACTICAL

Course Code	ZOO203
Course Title	Physiology and Biochemistry Practical
Type of course	Practical
LTP	0 0 4
Credits	2

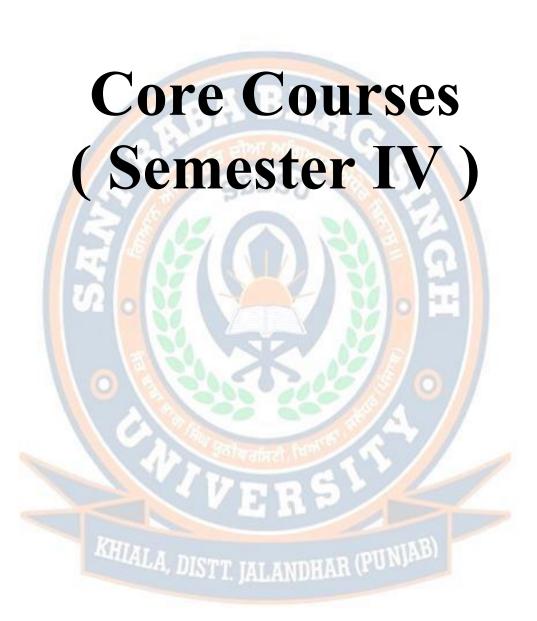
Course prerequisite	B.Sc Ist year
Course Objective	To study plant anatomy and embryology through slides and
	specimens.

LIST OF EXPERIMENTS

- 1. Preparation of hemin and hemochromogen crystals
- 2. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland.
- 3. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage
- 4. Qualitative tests to identify functional groups of carbohydrates (Glucose, Fructose, Sucrose, Lactose), aminoacids and proteins and lipids in given sample.
- 5. Estimation of total carbohydrates by Dubois/anthrone method and total proteins by Lowry's method.
- 6. Study of activity of salivary amylase under optimum conditions.
- 7. Determination coagulation and bleeding time of blood in man/rat/rabbit.
- 8. Determination of blood groups of human blood sample.
- 9. Recording of blood pressure of man.
- 10. Analysis of urine for urea, chloride, glucose and uric acid.
- 11. Estimation of haemoglobin content.

Text and reference books:

S.No	Title	Author	Publisher
1	Principles of Anatomy and	Tortora, G.J. and	John Wiley & Sons
	Physiology 8th edition	Derrickson, B.H.	
2	Vander's Human Physiology,11th	Widmaier, E.P., Raff,	McGraw Hill
	edition	H. and Strang, K.T.	
3	Textbook of Medical Physiology, 12 th	Guyton, A.C. and	Harcourt Asia Pvt.
	edition	Hall, J.E	Ltd/ W.B. Saunders
			Company
4	Biochemistry, 6 th edition	Berg, J. M.,	W.H
		Tymoczko, J. L. and	Freeman and Co.
	Kurs	Stryer, L	
5	Principles of Biochemistry, 6th	Nelson, D. L., Cox,	W.H. Freeman and
	edition	M. M. and Lehninger,	Co.
		A.L	



Course Code	BOT202
Course Title	Plant Physiology and Metabolism
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	10+2 Medical
Course Objective	To study underlying mechanism of basic plant metabolic and
(CO)	physiological processes.
	To study concepts behind working of plant body.

UNIT-I

Plant-water relations: Importance of water, physical properties of water, imbibitions, diffusion and osmosis, absorption, transport of water, water potential and its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.

Mineral nutrition: Essential elements, macro and micronutrients; Criteria of essentiality of elements; Role of essential elements; Transport of ions across cell membrane, active and passive transport, carriers, channels and pumps, Hydroponics.

UNIT-II

Translocation in phloem: Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading.

Photosynthesis: Photosynthetic Pigments (Chl a, b, xanthophylls, carotene); Photosystem I and II, reaction center, antenna molecules; z-scheme, photophosphorylation, Electron transport and mechanism of ATP synthesis; C3, C4 and CAM pathways of carbon fixation; Photorespiration.

UNIT-III

Carbohydrate metabolism: Carbohydrates- classification, occurrence, structure of mono, oligo and polysaccharides (starch, cellulose, pectin). Carbohydrate breakdown- Glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation, electron transport mechanism (chemi-osmotic theory), redox potential, Glyoxylate cycle, Oxidative Pentose Phosphate Pathway.

Nitrogen metabolism: Protein and amino acid structure features and functions. Biology of nitrogen fixation, importance of nitrate reductase and its regulation, ammonium assimilation, structure and function of lipids, fatty acid biosynthesis, β -oxidation, saturated and unsaturated fatty acids, storage and mobilization of fatty acids.

UNIT-IV

Enzymes: Structure and properties; Discovery and nomenclature, characteristics of enzymes, concept of holoenzyme, apoenzyme, coenzymes and cofactors regulation of enzyme activity. Mechanism of enzyme catalysis and enzyme inhibition.

Plant growth development: Definitions, phases of growth and development, kinetics of growth, seed dormancy, seed germination and factors of their regulation, plant movements,

physiology of flowering, florigen concept, biological clocks, physiology of senescence, fruit ripening, Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene.

Plant response to light and temperature: Photoperiodism (SDP, LDP, Day neutral plants); Phytochrome (discovery and structure), red and far red light responses on photomorphogenesis; Vernalization.

Text and reference books:

S. No.	Title	Author	Publisher
1	Plant Physiology	H N Srivastava	Pradeep Publishers
2	A Textbook of Plant	Dr S K Verma and Mohit	S. Chand Publishing
	Physiology, Biochemistry and	Verma	
	Biotechnology		
3	Fundamentals of Plant	V K Jain	S. Chand Publishing
	Physi <mark>ol</mark> ogy		
4	Plant Physiology	S N Pandey and B K Sinha	Vikas Publishing
			House
5	Biochemistry and Molecular	Bob B Buchanan, Wilhelm	Wiley International
	biology of Plan <mark>ts</mark>	Grissem and Russell L Jones	
6	Experiments in Plant	D Bajracharya	Narosa Publishing
	Physiology- A Laboratory		House
	Manual.		

Coordination chemistry, states of matter and chemical kinetics

Course Code	CHM 202
Course Title	Coordination chemistry, states of matter and chemical kinetics
Type of course	CORE
LTP	4:0:0
Credits	44LA DISTETAT ANDHAR (PUNIS)
Course prerequisite	BSc. 1st with chemistry as core subject
Course Objective	The aim of this course is to impart knowledge to the students about
	basic of transition elements, their bonding, states of matter and
	chemical kinetics.

Unit-I

Transition Elements (3d series):General group trends with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties, ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.Lanthanoids and actinoids: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only).

Coordination Chemistry: Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni and Cu (coordination numbers 4 and 6). Structural and stereoisomerism in complexes with coordination numbers 4 and 6.Drawbacks of VBT. IUPAC system of nomenclature.

Unit-II

Crystal Field Theory: Crystal field effect, octahedral symmetry. Crystal field stabilization energy (CFSE), Crystal field effects for weak and strong fields. Tetrahedral symmetry. Factors affecting the magnitude of D. Spectrochemical series. Comparison of CFSE for *Oh* and *Td* complexes, Tetragonal distortion of octahedral geometry. Jahn-Teller distortion, Square planar coordination.

Unit-III

Kinetic Theory of Gases: Postulates of Kinetic Theory of Gases and derivation of the kinetic gas equation. Deviation of real gases from ideal behaviour, compressibility factor, causes of deviation. van der Waals equation of state for real gases. Boyle temperature (derivation not required).

Maxwell Boltzmann distribution laws of molecular velocities and molecular energies (graphic representation – derivation not required) and their importance. Temperature dependence of these distributions. Most probable, average and root mean square velocities (no derivation). Collision cross section, collision number, collision frequency, collision diameter and mean free path of molecules. Viscosity of gases and effect of temperature and pressure on coefficient of viscosity (qualitative treatment only).

Liquids: Surface tension and its determination using stalagmometer. Viscosity of a liquid and determination of coefficient of viscosity using Ostwald viscometer. Effect of temperature on surface tension and coefficient of viscosity of a liquid (qualitative treatment only).

Solids: Forms of solids. Symmetry elements, unit cells, crystal systems, Bravais lattice types and identification of lattice planes. Laws of Crystallography - Law of constancy of interfacial angles, Law of rational indices. Miller indices. X–Ray diffraction by crystals, Bragg's law. Structures of NaCl, KCl and CsCl (qualitative treatment only). Defects in crystals.

Unit-IV

Chemical Kinetics: The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first and second order reactions (both for equal and unequal concentrations of reactants). Half–life of a reaction. General methods for determination of order of a reaction. Concept of activation energy and its calculation from Arrhenius equation. Theories of Reaction Rates: Collision theory and Activated Complex theory of bimolecular reactions. Comparison of the two theories (qualitative treatment only).

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Concise Inorganic Chemistry	1.D. Lee	ELBS
2	Inorganic Chemistry	A.G. Sharpe	ELBS
3	Introduction to Ligand Field	B.N. Figgis	Wiley Eastern.
4	Introduction to Liquid State	P.A. Eglestaff	Academic Press.

5	The Elements of Physical	P.w. Aikins	Oxford
	Chemistry		
6	Physical Chemistry, A Molecular	MacQuarrie and	University Science Books,
	Approach	Simon	
7	Principles of Inorganic Chemistry	Puri, Sharma and	Vishal publishers
		Kalia	

GENETICS AND EVOLUTIONARY BIOLOGY

Course Code	ZOO 202	
Course Title	Genetics and Evolutionary Biology	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	B.Sc Ist year	
Course Objective		
(CO)	and function, basis of genetics/inheritance and changes occurring in animal	
	species during various evolutionary eras.	

UNIT-I

Introduction to Genetics : Mendel's work on transmission of traits, Genetic Variation, Molecular basis of Genetic Information

Mendelian Genetics and its Extension: Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance

UNIT-II

Linkage, Crossing Over and Chromosomal Mapping:Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping

Mutations: Chromosomal Mutations: Deletion, Duplication, Inversion, Translocation, Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor Mutations.

Sex Determination: Chromosomal mechanisms, dosage compensation UNIT-III

History of Life : Major Events in History of Life

Introduction to Evolutionary Theories: Lamarckism, Darwinism, Neo-Darwinism

Direct Evidences of Evolution: Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse

Processes of Evolutionary Change:Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism);Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection

UNIT-IV

Species Concept: Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric)

Macro-evolution:Macro-evolutionary Principles (example: Darwin's Finches)

Extinction: Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution

Text and Reference Books:

S.No	Title	Author	Publisher
1	Principles of Genetics, 8th	Gardner, E.J., Simmons, M.J.,	Wiley India
	edition	Snustad, D.P.	lev.
2	Principles of Genetics, 5 th	Snustad, D.P., Simmons, M.J	John Wiley
	edition		and Sons Inc.
3	Concepts of Genetics, 10 th	Klug, W.S., Cummings, M.R.,	Benjamin Cummings
	edition	Spencer, C.A	
4	Geneti <mark>cs</mark> - A Molecular	Russell, P. J.	Be <mark>nj</mark> amin
	Approach, 3 rd edition		Cummings.
			7 1
5	Introduction to Genetic	Griffiths, A.J.F., Wessler, S.R.,	W. H. Freeman and
	Anal <mark>ys</mark> is, 9 th edi <mark>tion</mark>	Lewontin, R.C. and Carroll,	Co.
		S.B.	non-20
6	Evolution, 3 rd edition	Ridley, M.	Blackwell Publishing
7	Evol <mark>uti</mark> onary Bio <mark>logy</mark>	Douglas, J. Futuyma	Sinauer Associates.

PLANT PHYSIOLOGY AND METABOLISM PRACTICAL

Course Code	BOT204	
Course Title	Plant Physiology and Metabolism Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2 JULI JALANDHAN (-	
Course prerequisite	10+2 Medical	
Course Objective	To impart knowledge about plant functions through simple	
	physiological experiments	

LIST OF EXPERIMENTS

- 1. Determination of osmotic potential of plant cell sap by plasmolytic method.
- 2. To study the rate of transpiration from foliar surfaces.
- 3. Calculation of stomatal index and stomatal frequency of a mesophyte and a xerophyte.
- 4. Demonstration of Hill reaction.
- 5. Demonstrate the activity of catalase and study the effect of pH and enzyme concentration.

- 6. To study the effect of light intensity and bicarbonate concentration on O2 evolution in photosynthesis.
- 7. Comparison of the rate of respiration in any two parts of a plant.
- 8. To obtain the action spectrum of chlorophyll pigment.
- 9. Separation of amino acids by paper chromatography.

Demonstration experiments (any two)

- 1. Bolting.
- 2. Effect of auxins on rooting.
- 3. Suction due to transpiration.
- 4. R.Q.

Text and reference books:

S. No.	Title	Author	Publisher
1	Plant Physiology	H N Srivastava	Pradeep Publishers
2	A Textbook of Plant	Dr S K Verma and Mohit	S. Chand Publishing
	Physiology, Biochemistry and	Verma	1.1-
	Biotechnology		

COORDINATION CHEMISTRY, STATES OF MATTER AND CHEMICAL KINETICS PRACTICAL

Course Code	CHM 204
Course Title Coordination chemistry, states of matter and chemical kir	
Type of course	Practical
LTP	0:0:4
Credits 2	
Course prerequisite BSc. 1st with chemistry as core subject	
Course Objective	The aim of this course is to impart practical knowledge to the
	students about semi micro qualitative analysis and physical
	properties of solutions.

LIST OF EXPERIMENTS

Semi-micro qualitative analysis (using H₂S or other methods) of mixtures - not more than four ionic species (two anions and two cations, excluding insoluble salts) out of the following: Cations: NH4⁺, Pb²⁺, Bi³⁺, Cu²⁺, Cd²⁺, Fe³⁺, Al³⁺, Co²⁺, Ni²⁺, Mn²⁺, Zn²⁺, Ba²⁺,

 Sr^{2+} , Ca^{2+} , $K^+Anions: CO3^{2-}$, S^{2-} , SO^{2-} , $S2O3^{2-}$, $NO3^-$, $CH3COO^-$, Cl^- , Br^- , l^- , $NO3^-$, $SO4^{2-}$, $PO4^{3-}$, $BO3^{3-}$, $C2O4^{2-}$, $F^-(Spot\ tests\ should\ be\ carried\ out\ wherever\ feasible)$

- 1. Estimate the amount of nickel present in a given solution as bis(dimethylglyoximato) nickel(II) or aluminium as oximate in a given solution gravimetrically.
- 2. Estimation of (i) Mg²⁺ or (ii) Zn²⁺ by complexometric titrations using EDTA.
- 3. Estimation of total hardness of a given sample of water by complexometric titration.
 - (I) Surface tension measurement (use of organic solvents excluded).
 - a) Determination of the surface tension of a liquid or a dilute solution using a stalagmometer.
 - b) Study of the variation of surface tension of a detergent solution with concentration.
 - (II) Viscosity measurement (use of organic solvents excluded).
 - a) Determination of the relative and absolute viscosity of a liquid or dilute solution using an Ostwald's viscometer.
 - b) Study of the variation of viscosity of an aqueous solution with concentration of solute.
 - (III) Chemical Kinetics

Study the kinetics of the following reactions.

- 1. Initial rate method: Iodide-persulphate reaction
- 2. Integrated rate method:
 - a. Acid hydrolysis of methyl acetate with hydrochloric acid.
 - b. Saponification of ethyl acetate.
 - c. Compare the strengths of HCl and H₂SO₄ by studying kinetics of hydrolysis of methyl acetate

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Vogel's Qualitative Inorga	nic Svehla	Orient Longman
	Analysis		
2	Vogel's Textbook of Quantita	ive J. Basseff, R.C.	ELBS
	Inorganic Analysis (revised),	Dennery, G.H.	
		Jeffery and J.	
		Mendham	
3	Advanced Practical Phys	cal J.B. Yadav	KRISHNA Prakashan
	Chemistry		Media (P) Ltd,

GENETICS AND EVOLUTIONARY BIOLOGY PRACTICAL

Course Code	ZOO204	
Course Title	Genetics and Evolutionary Biology Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite 10+2 Medical		
Course Objective To impart knowledge about plant functions through simple		
	physiological experiments	

LIST OF EXPERIMENTS

- 1. Study of Mendelian Inheritance and gene interactions (Non Mendelian Inheritance) using suitable examples. Verify the results using Chi-square test.
- 2. Study of Linkage, recombination, gene mapping using the data.
- 3. Study of Human Karyotypes (normal and abnormal).
- 4. Study of fossil evidences from plaster cast models and pictures
- 5. Study of homology and analogy from suitable specimens/ pictures
- 6. Charts:
 - a) Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors
 - b) Darwin's Finches with diagrams/ cut outs of beaks of different species
- 7. Visit to Natural History Museum and submission of report

Text and Reference Books:

	1010 010 11010 20010			
S.No	Title	Author(s)	Publisher	
1	Principles of Genetics, 8th	Gardner, E.J., Simmons, M.J.,	Wiley India	
	edition	Snustad, D.P.		
2	Principles of Genetics, 5 th	Snustad, D.P., Simmons, M.J	John Wiley	
	edition		and Sons Inc.	

Skill Enhancement Courses (III - VI Semester)



Medicinal Botany

Course Code	BOT 205	
Course Title	Medicinal Botany	
Type of course	Skill Enhancement Courses	
LTP	0 0 4	
Credits	2	
Course prerequisite B.Sc Medical II year		
Course Objective	To understand medicinal plant with references to Botany.	

Unit 1: History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamahabhutas, saptadhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-e- tabiya, tumors treatments/ therapy, polyherbal formulations. (10 Lectures)

Unit 2: Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; In situ conservation: Biosphere reserves, sacred groves, National Parks; Ex situ conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding. (10 Lectures)

Unit 3: Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases. (10 Lectures)

Text and Reference Books

S.No	Title	Author(s)	Publisher
1	Medicinal Plants:	Trivedi P C,	Tata McGraw-Hill
	Ethnobotanical		Publishing Co. Ltd
	Approach, Agrobios,		
	India.	a Dir	
2	Medicinal Plant	Purohit and Vyas	Oxford University
	Cultivation: A Scientific	STONT MEAN.	Press, New York
	Approac <mark>h</mark> , 2nd edn.	ARRON .	10
	Agrobi <mark>os</mark> , India.	Spoon 1	
	12/1/10	100	

MEDICAL DIAGNOSTICS

Course Code	ZOO 205	
Course Title	Medical Diagnostics	
Type of course	Skill Enhancement Courses	
LTP	2 0 0	
Credits	2	
Course prerequisite	B.Sc Ist year	
Course Objective	To make students familiar with latest techniques available to diagnose	
	different diseases, their preventive measures and treatments.	

UNIT-I

Introduction to Medical Diagnostics and its Importance

UNIT-II

Diagnostics Methods Used for Analysis of Blood: Blood composition, Preparation of blood smear and Differential Leucocyte Count (D.L.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)

Diagnostic Methods Used for Urine Analysis: Urine Analysis: Physical characteristics; Abnormal constituents.

UNIT-III

Non-infectious Diseases: Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit

UNIT-IV

Infectious Diseases: Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis

Tumours: Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT Scan (using photographs).

Text and reference books:

S. No	Title	Author(s)	Publisher
1	Preventive and Social Medicine	Park K	B.B. Publishers
2	Textbook of Medical	Godkar P.B. and Godkar	Bhalani Publishing
	Laboratory Technology, II	D.P.	House
	Edition		
3	A Laboratory Manual for Rural	Cheesbrough M	
	Tropical Hospitals, A Basis for	55-20	
	Training Courses		15
4	Textbook of Medical	Guyton A.C. and Hall J.E	Saunders
	Physi <mark>ol</mark> ogy		
5	Pathologic Basis of Disease,	Robbins and Cortan	Saunders
	VIIIEdition		Andrew Market

BASIC ANALYTICAL CHEMISTRY

Course Code	CHM 209
Course Title	Basic analytical chemistry
Type of course	Skill Enhancement Cources
LTP	0:0:4
Credits	2
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core subject
Course Objective (CO)	The aim of this course is to impart
	practical knowledge to the students about
KHIALA DIC	analytical methods of chemical analysis.

UNIT I:

Introduction: Introduction to Analytical Chemistry and its interdisciplinary nature. Concept of sampling. Importance of accuracy, precision and sources of error in analytical measurements. Presentation of experimental data and results, from the point of view of significant figures. Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelating agents, use of indicators a. Determination of pH of soil samples. b. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration. Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. a. Determination of pH, acidity and alkalinity of a water sample. b. Determination of dissolved oxygen (DO) of a water sample.

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UNIT II:

Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration.

- a. Identification of adulterants in some common food items like coffee powder, asafoetida, chilli powder, turmeric powder, coriander powder and pulses, etc.
- b. Analysis of preservatives and colouring matter.

Chromatography: Definition, general introduction on principles of chromatography, paper chromatography, TLC etc.

- a. Paper chromatographic separation of mixture of metal ion (Fe³⁺ and Al³⁺)
- b. To compare paint samples by TLC method.

UNIT III:

Ion-exchange: Column, ion-exchange chromatography etc. Determination of ion exchange capacity of anion / cation exchange resin (using batch procedure if use of column is not feasible). Analysis of cosmetics: Major and minor constituents and their function

- a. Analysis of deodorants and antiperspirants, Al, Zn, boric acid, chloride, sulphate.
- b. Determination of constituents of talcum powder: Magnesium oxide, Calcium oxide, Zinc oxide and Calcium carbonate by complexometric titration.

Unit IV:

Suggested Applications (Any one):

- a. To study the use of phenolphthalein in trase cases.
- b. To analyze arson accelerants.
- c. To carry out analysis of gasoline.

Suggested Instrumental demonstrations:

- a. Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry.
- b. Spectrophotometric determination of Iron in Vitamin / Dietary Tablets.
- c. Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft drink

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Concise Inorganic Chemistry	1.D. Lee	ELBS
2	Inorganic Chemistry	A.G. Sharpe	ELBS
3	Vogel's Qualitative Inorganic	G Svehla	Prentice Hall
	Analysis (7 th Edition). ISBN-		
	13:978-0582218666,		
4	Vogel's Quantitative	J. Mendham, R.C.	Prentice Hall
	Chemical Analysis (6 th	Denney, J.D.	
	Edition), ISBN-13:978-	Barnes, M.J.K.	
	0582226289,	Thomas	
5	Instrumental Analysis	G.D. Christian	Allegn Becon, Latest edition
		and J.E.G. Reily	
6	Instrumental Methods of	G.W.Ewing,	McGraw Hill Pub, 1975.

Chemical Analysis	

FLORICULTURE

Course Code	BOT206	
Course Title	Floriculture	
Type of course	Theory	
LTP	2 0 0	
Credits	2 Care Minimum	
Course prerequisite	B.Sc IInd year	
Course Objective To provide knowledge about commercial aspect of floriculture in I		
(CO)	which may motivate students to take up it as professional occupation	

UNIT-I

Introduction: History of gardening; Importance and scope of floriculture and landscape gardening.

Nursery Management and Routine Garden Operations: Sexual and vegetative methods of propagation; Soil sterilization; Seed sowing; Pricking; Planting and transplanting; Shading; Stopping or pinching; Defoliation; Wintering; Mulching; Topiary; Role of plant growth regulators.

UNIT-II

Ornamental Plants: Flowering annuals; Herbaceous perennials; Divine vines; Shade and ornamental trees; Ornamental bulbous and foliage plants; Cacti and succulents; Palms and Cycads; Ferns and Selaginellas; Cultivation of plants in pots; Indoor gardening; Bonsai.

UNIT-III

Principles of Garden Designs: English, Italian, French, Persian, Mughal and Japanese gardens; Features of a garden (Garden wall, Fencing, Steps, Hedge, Edging, Lawn, Flower beds, Shrubbery, Borders, Water garden. Some Famous gardens of India.

Landscaping Places of Public Importance: Landscaping highways and Educational institutions.

UNIT-IV

Commercial Floriculture: Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life; Cultivation of Important cut flowers (Carnation, Aster, Chrysanthemum, Dahlia, Gerbera, Gladiolous, Marigold, Rose, Lilium, Orchids).

Diseases and Pests of Ornamental Plants.

Text and reference books:

S. No.	Title	Author	Publisher

1	Floriculture in India	Randhawa, G.S. and	Allied Publishers.
		Mukhopadhyay, A	

GREEN METHODS IN CHEMISTRY

Course Code	CHM 210
Course Title	GREEN METHOD IN CHEMISTRY
Type of course	SAC (THEORY)
LTP	4:0:0
Credits	4
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core
A D	subject
Course Objective (CO)	The aim of this course is to impart
	theoretical knowledge to the students
	Green chemistry and applications of green
	chemistry in organic synthesis.

UNIT – I

Introduction: Definitions of Green Chemistry. Brief introduction of twelve principles of Green Chemistry, with examples, special emphasis on atom economy, reducing toxicity, green solvents, Green Chemistry and catalysis and alternative sources of energy, Green energy and sustainability.

UNIT – II

The Real world Cases in Green Chemistry: Surfactants for carbon dioxide – Replacing smog producing and ozone depleting solvents with CO for precision cleaning and dry cleaning of garments.

Designing of environmentally safe marine antifoulant.

UNIT -III

Right fit pigment: Synthetic azo pigments to replace toxic organic and inorganic pigments. An efficient, green synthesis of a compostable and widely applicable plastic (poly lactic acid) made from corn.

UNIT - IV

Preparation and characterization of biodiesel from vegetable oil. Extraction of D-limonene from orange peel using liquid CO prepared from dry ice. Mechano- chemical solvent free synthesis of azomethine. Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II).

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Green Chemistry- Theory and Practical, 1998	Anastas, P.T. & Warner, J.K.	Oxford University Press

2	Introduction to Green Chemistry, 2001	Matlack, A.S.	Marcel Dekker
3	Real-World cases in Green Chemistry, 2000	Cann, M.C. & Connely, M.E.	American Chemical Society, Washington
4	Introduction to Green Chemistry, 2002	Ryan, M.A. & Tinnesand, M.	American Chemical Society, Washington

Ethnobotany

Course Code	BOT204	
Course Title	Ethnobotany	
Type of course	Theory	
LTP	0 0 4	
Credits	2	
Course prerequisite	10+2 Medical	
Course Objective	To impart knowledge about plant functions through simple	
1	physiological experiments	

Unit 1: Ethnobotany

Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Major and minor ethnic groups or Tribals of India, and their life styles. Plants used by the tribals: a) Food plants b) intoxicants and beverages c) Resins and oils and miscellaneous uses. (6 Lectures)

Unit 2: Methodology of Ethnobotanical studies

a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places. (6 Lectures)

Unit 3: Role of ethnobotany in modern Medicine

Medico-ethnobotanical sources in India; Significance of the following plants in ethno botanical practices (along with their habitat and morphology) a) Azadiractha indica b) Ocimum sanctum c) Vitex negundo. d) Gloriosa superba e) Tribulus terrestris f) Pongamia pinnata g) Cassia auriculata h) Indigofera tinctoria. Role of

ethnobotany in modern medicine with special example Rauvolfia sepentina, Trichopus zeylanicus, Artemisia, Withania. Role of ethnic groups in conservation of plant genetic resources. Endangered taxa and forest management (participatory forest management). (10 Lectures)

Unit 4: Ethnobotany and legal aspects

Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Biopiracy, Intellectual Property Rights and Traditional Knowledge. (8 Lectures)

Text Book for references:

- 1) S.K. Jain, Manual of Ethnobotany, Scientific Publishers, Jodhpur, 1995.
- 2) S.K. Jain (ed.) Glimpses of Indian. Ethnobotny, Oxford and I B H, New Delhi
- 3) Lone et al, Palaeoethnobotany
- 4) S.K. Jain (ed.) 1989. Methods and approaches in ethnobotany. Society of ethnobotanists,

Lucknow, India.

- 5) S.K. Jain, 1990. Contributions of Indian ethnobotny. Scientific publishers, Jodhpur.
- 6) Colton C.M. 1997. Ethnobotany Principles and applications. John Wiley and sons –

Chichester

7) Rama Ro, N and A.N. Henry (1996). The Ethnobotany of Eastern Ghats in Andhra 92

Pradesh, India. Botanical Survey of India. Howrah. 8) Rajiv K. Sinha – Ethnobotany The

Renaissance of Traditional Herbal Medicine – INA –SHREE Publishers, Jaipur 96 9)

Apiculture and Sericulture

Course code	ZOO315
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Course title	Apiculture and Sericulture
Type of course	Theory
LTP	2 0 0
Credits	2
Course objective	To impart basic knowledge about reaing of honey bess and silkworms for
	commercial production of honey and silk.

UNIT-I

Biology of Bees: Classification and Biology of Honey Bees; Social Organization of Bee Colony

Rearing of Bees and Bee Economy: Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth; Products of Apiculture Industry and its uses

UNIT-II

Introduction and Biology of Silkworm: Sericulture: Definition, history and present status Mulberry and non-mulberry Sericulture; Life cycle of *Bombyx mori*

UNIT-III

Rearing of Silkworms: Rearing house and rearing appliances; Disinfectants: Formalin, bleaching powder; Silkworm rearing technology: Early age and Late age rearing; Spinning, harvesting and storage of cocoons

UNIT-IV

Pests and Diseases of honey bees and silkworm: Bee Diseases and Enemies; Pests of silkworm: Uzi fly, dermestid beetles and vertebrates; Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial

Text and reference books:

S. no.	Title	Author	Publisher
1	Apiculture	P J Prost	Oxford and IBH, New
			Delhi
2	Apiculture	D S Bisht	ICAR Publication
3	Beekeeping in India	S Singh	ICAR Publication
4	Handbook of Practical Sericulture	S.R. Ullal and M.N.	CSB, Bangalore
	KHIATA	Narasimhanna	
5	Handbook of Silkworm Rearing	Agriculture and Technical	Fuzi Pub. Co. Ltd.,
		Manual-1	Tokyo, Japan

AQUATIC BIOLOGY

Course Code	ZOO317
Course Title	Aquatic Biology
Type of course	Theory
LTP	4 0 0
Credits	4

Course prerequisite	B.Sc Medical II year	
Course Objective	To provide the knowledge of different types of habitats in	
	ecosystem and their importance for the living being, so that we	
	can make our environment a pollution free.	

UNIT-I

Aquatic Biomes: Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

UNIT-II

Freshwater Biology: Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry,

Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide).

UNIT-III

Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous. Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes. Marine Biology: Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.

UNIT-IV

Management of Aquatic Resources: Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment; Water quality assessment- BOD and COD.

Text and Reference Books:

S. No	Title	Author(s)	Publisher
1	Bioresources Ecology 3rd Edition	Anathakrishnan	
2	Limnology, 2nd Edition	Goldman	
3	Fundamentals of Ecology, 5th Edition	Odum and Barrett	
4	Chemical and biological methods for water pollution studies	Trivedi and Goyal	

FUEL CHEMISTRY

Course Code	CHM 313
Course Title	FUEL CHEMISTRY
Type of course	SKILL ENHANCEMENT COURSE
LTP	2:0:0

Credits	2
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core subject
Course Objective (CO)	The aim of this course is to impart theoretical knowledge to the students in petroleum and fuel chemistry.

UNIT I:

Review of energy sources (renewable and non-renewable).

Classification of fuels and
their calorific value.

Coal: Uses of coal (fuel and nonfuel) in various industries, its composition, carbonization of coal. Coal gas, producer gas and water gas—composition and uses. Fractionation of coal tar, uses of coal tar bases chemicals, requisites of a good metallurgical coke, Coal gasification (Hydro gasification and Catalytic gasification), Coal liquefaction and Solvent Refining.

UNIT II:

Petroleum and Petrochemical Industry: Composition of crude petroleum, Refining and different types of petroleum products and their applications. Fractional Distillation (Principle and process), Cracking (Thermal and catalytic cracking)

UNIT III:

Reforming Petroleum and non-petroleum fuels (LPG, CNG, LNG, bio-gas, fuels derived from biomass), fuel from waste, synthetic fuels (gaseous and liquids), clean fuels. Petrochemicals: Vinyl acetate, Propylene oxide, Isoprene, Butadiene, Toluene and its derivatives Xylene.

UNIT IV:

Lubricants: Classification of lubricants, lubricating oils (conducting and nonconducting) Solid and semisolid lubricants, synthetic lubricants. Properties of lubricant (viscosity index, cloud point, pore point) and determination.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Principles of Instrumental	D. A. Skoog and	Saunder's College Publ.
	Methods of analysis	D.M.West	Latest edition.
2	Engineering Chemistry	Jain, P.C. & Jain, M.	Dhanpat Rai & Sons, Delhi
3	Instrumental methods of	B.K.sharma	Krishna prakashan media
	chemical analysis		LTD
4	Industrial Chemistry	Sharma, B.K. &	Goel Publishing House,
	12 0 DA	Gau <mark>r, H.</mark>	Meerut
5	Industrial Chemistry Vol-I,	Stocchi, E.	Elli <mark>s H</mark> orwood L <mark>td</mark> . UK
	1 00	Valor II	(19 <mark>90)</mark> .

MUSHROOM CULTURE TECHNOLOGY

Course Code	BOT310
Course Title	Mushroom Culture Technology
Type of course	Theory
LTP	2 0 0
Credits	2
Course prerequisite	B.Sc IInd year
Course Objective	To provide knowledge about commercial aspect of mushroom
[4:1	cultivation in India which may motivate students to take up it as
	professional occupation

UNIT-I

Introduction, history: Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - *Volvariella volvacea, Pleurotus citrinopileatus, Agaricus bisporus*.

UNIT-II

Cultivation Technology: Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.

UNIT-III

Storage and nutrition: Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.

UNIT-IV

Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.

Text and Reference Books:

S. No.	Title	Author	Publisher
1	Mushroom Cultivation	S C Tewari and Pankaj	Mittal Publications
	MIT - MIN AD	Kapoor	
2	Mushroom Production and	V N Pathak	Agrobios India
	Processing Technology		LTI
3	Mushroom Cultivation and	Suman and B C Sharma	Agrobios India
	Uses		-0.0-0
4	Food and Nutrition	M Swaminathan	Bangalore Printing and
	1 60		Publishing Co.

AOUARIUM FISH KEEPING

Course Code	Z 00314
Course Title	AQUARIUM FISH KEEPING
Type of course	Theory
LTP	2 0 0
Credits	2
Course prerequisite	B.Sc IInd year
Course Objective	To provide knowledge about commercial aspect of mushroom
	cultivation in India which may motivate students to take up it as
	professional occupation

Unit1: Introduction to Aquarium Fish Keeping

The potential scope of Aquarium Fish Industry as a Cottage Industry, Exotic and Endemic

species of Aquarium Fishes

Unit 2: Biology of Aquarium Fishes

Common characters and sexual dimorphism of Fresh water and Marine Aquariumfishes

such as Guppy, Molly, Sword tail, Gold fish, Angel fish, Blue morph, Anemone fish and

Butterfly fish

Unit 3: Food and feeding of Aquarium fishes

Use of live fish feed organisms. Preparation and composition of formulated fish feeds

Unit 4: Fish Transportation

Live fish transport - Fish handling, packing and forwarding techniques.

Unit 5: Maintenance of Aquarium

General Aquarium maintenance – budget for setting up an Aquarium Fish Farm as a

Cottage Industry

PHARMACEUTICAL CHEMISTRY

Course Code	CHM 318	
Course Title	PHARMACEUTICAL CHEMISTRY	
Type of course	SKILL ENHANCEMENT COURSE	
LTP	2:0:0	
Credits	2	
Course prerequisite	Bsc.	
Course Objective (CO)	The aim of this course is to impart theoretical knowledge to the students in Drugs & Pharmaceuticals	

UNIT I

Drugs & Pharmaceuticals: Drug discovery, design and development; Classification of drugs, Basic Retrosynthetic approach. Synthesis of the representative drugs of the following classes: analgesics agents, antipyretic agents, anti- inflammatory agents (Aspirin, paracetamol, lbuprofen);

UNIT-II

Antibiotics (Chloramphenicol); antibacterial and antifungal agents (Sulphonamides; Sulphanethoxazol, Sulphacetamide, Trimethoprim); antiviral agents (Acyclovir),

UNIT -III

Central Nervous System agents (Phenobarbital, Diazepam), Cardiovascular (Glyceryl trinitrate), antilaprosy (Dapsone), HIV-AIDS related drugs (AZT- Zidovudine).

UNIT -IV

Aerobic and anaerobic fermentation. Production of (i) Ethyl alcohol and citric acid, (ii) Antibiotics; Penicillin, Cephalosporin, Chloromycetin and Streptomycin, Production of Lysine, Glutamic acid, Vitamin B2, Vitamin B12 and Vitamin C.

Text and Reference Books

S. No	Name	Author(S)	P <mark>ubli</mark> sher
1	Introduction to Medicinal Chemistry	G.L. Patrick	Oxford University Press, UK.
2	Medicinal and Pharmaceutical Chemistry,	Hakishan, V.K. Kapoor	Vallabh Prakashan, Pitampura, New Delhi
3	Principles of Medicinal Chemistry	William O. Foye, Thomas L., Lemke, David A. William	B.I. Waverly Pvt. Ltd. New Delhi
4	Medicinal Chemistry-the role of organic chemistry in drug, 1993	C. R. Ganellin, and S. M. Roberts	Academic Press
5	Medicinal Chemistry- principles and practice,1994	F. D. King	Royal Society of Chemistry

LA, DISTT, IALANDHAR (PUN)

Discipline Elective Courses

(Semester-V)
(Any two of each subject in both semesters)

KHIALA, DISTT. JALANDHAR (PUNJAB)

CELL AND MOLECULAR BIOLOGY

Course Code	BOT301
Course Title	Cell and Molecular Biology
Type of course	Discipline Elective Courses (Theory)
LTP	4 0 0
Credits	4
Course prerequisite	B.Sc Medical II year
Course Objective	To impart knowledge about details of cell structure, cell
	organelles and their functions along with structural and functional
	details of genetic material

UNIT-I

Techniques in Biology: Principles of microscopy; Light Microscopy; Phase contrast microscopy; Fluorescence microscopy; Confocal microscopy; Sample Preparation for light microscopy; Electron microscopy (EM)- Scanning EM and Scanning Transmission EM (STEM); Sample Preparation for electron microscopy; X-ray diffraction analysis.

UNIT-II

Cell as a unit of Life: The Cell Theory; Prokaryotic and eukaryotic cells; Cell size and shape; Eukaryotic Cell components.

Cell Membrane and Cell Wall; The functions of membranes; Models of membrane structure; The fluidity of membranes; Membrane proteins and their functions; Carbohydrates in the membrane; Faces of the membranes; Selective permeability of the membranes; Cell wall. Cell Organelles: Mitochondria: Structure, marker enzymes, composition; Semiautonomous nature; Symbiont hypothesis; Proteins synthesized within mitochondria; mitochondrial DNA

UNIT-III

Cell Organelles: Chloroplast Structure, marker enzymes, composition; semiautonomous nature, chloroplast DNA. ER, Golgi body & Lysosomes: Structures and roles. Peroxisomes and Glyoxisomes: Structures, composition, functions in animals and plants and biogenesis.

Nucleus: Nuclear Envelope- structure of nuclear pore complex; chromatin; molecularorganization, DNA packaging in eukaryotes, euchromatin and heterochromatin, nucleolus and ribosome structure (brief).

UNIT-IV

Cell Cycle:Overview of Cell cycle, Mitosis and Meiosis; Molecular controls. Genetic material: DNA: Miescher to Watson and Crick- historic perspective, Griffith's and Avery's transformation experiments, Hershey-Chase bacteriophage experiment, DNA structure, types of DNA, types of genetic material.

DNA replication (Prokaryotes and eukaryotes): bidirectional replication, semi-conservative, semi discontinuous RNA priming, \acute{O} (theta) mode of replication, replication of linear, ds-DNA, replicating the 5 end of linear chromosome including replication enzymes.

Transcription (Prokaryotes and Eukaryotes)

Types of structures of RNA (mRNA, tRNA, rRNA), RNA polymerase- various types; Translation (Prokaryotes and eukaryotes), genetic code.

Regulation of gene expression: Prokaryotes (Lac operon and Tryptophan operon) and in Eukaryotes.

CELL AND MOLECULAR BIOLOGY PRACTICAL

Course Code	BOT303
Course Title Cell and Molecular Biology Practical	
Type of course	Discipline Elective Courses (Practical)
LTP	0 0 4
Credits	2
Course prerequisite	B.Sc Medical II year
Course Objective To impart practical knowledge about details of cell structure	
organelles and their functions along with structural and func	
	details of genetic material

LIST OF EXPERIMENTS

- 1. To study prokaryotic cells (bacteria), viruses, eukaryotic cells with the help of light and electron micrographs.
- 2. Study of the photomicrographs of cell organelles
- 3. To study the structure of plant cell through temporary mounts.
- 4. To study the structure of animal cells by temporary mounts-squamous epithelial cell and nerve cell
- 5. Preparation of temporary mounts of striated muscle fiber
- 6. To prepare temporary stained preparation of mitochondria from striated muscle cells /cheek epithelial cells using vital stain Janus green.
- 7. Study of mitosis and meiosis (temporary mounts and permanent slides).
- 8. Study the effect of temperature, organic solvent on semi permeable membrane.
- 9. Demonstration of dialysis of starch and simple sugar.
- 10. Study of plasmolysis and deplasmolysis on Rhoeo leaf.
- 11. Measure the cell size (either length or breadth/diameter) by micrometry.
- 12. Study the structure of nuclear pore complex by photograph (from Gerald Karp)
- 13. Study of special chromosomes (polytene & lampbrush) either by slides or photographs.
- 14. Study DNA packaging by micrographs.

Text and Reference Books:

S.No	Title	Author(s)	Publisher
1	Genetics- A Molecular	Russell, P. J.	Benjamin
	Approach, 3 rd edition		Cummings.
2	Introduction to Genetic Analysis, 9 th edition	Griffiths, A.J.F., Wessler, S.R., Lewontin, R.C. and Carroll, S.B.	W. H. Freeman and Co.
3	Evolution, 3 rd edition	Ridley, M.	Blackwell Publishing
4	Evolutionary Biology	Douglas, J. Futuyma	Sinauer Associates.

ANALYTICAL TECHNIQUES IN PLANT SCIENCES

Course Code	BOT305
Course Title	Analytical Techniques in Plant Sciences
Type of course	Discipline Elective Courses (Theory)
LTP	4 0 0
Credits	4
Course prerequisite	B.Sc Medical II year
Course Objective	To study various techniques used to study plant cell structure and
	functions

UNIT-I

Imaging and related techniques: Principles of microscopy; Light microscopy; Fluorescence microscopy: Confocal microscopy: Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.

UNIT-II

Cell fractionation: Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂, gradient, analytical centrifugation, ultracentrifugation, marker enzymes.

Radioisotopes: Use in biological research, auto-radiography, pulse chase experiment. **Spectrophotometry:** Principle and its application in biological research.

UNIT-III

Chromatography: Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ion-exchange chromatography; Molecular sieve chromatography; Affinity chromatography.

Characterization of proteins and nucleic acids: Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE **UNIT-IV**

Biostatistics: Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of

fit

ANALYTICAL TECHNIQUES IN PLANT SCIENCES PRACTICAL

Course Code	BOT307
Course Title	Analytical Techniques in Plant Sciences Practical

Type of course	Discipline Elective Courses (Practical)
LTP	0 0 4
Credits	2
Course prerequisite	B.Sc Medical II year
Course Objective	To demonstrate basic techniques used in cell biology

LIST OF EXPERIMENTS

- 1.Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.
- 2. Demonstration of ELISA.
- 3. To separate nitrogenous bases by paper chromatography.
- 4. To separate sugars by thin layer chromatography.
- 5. Isolation of chloroplasts by differential centrifugation.
- 6. To separate chloroplast pigments by column chromatography.
- 7. To estimate protein concentration through Lowry's methods.
- 8. To separate proteins using PAGE.
- 9. To separate DNA (marker) using AGE.
- 10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).
- 11. Preparation of permanent slides (double staining).

Text and Reference Books:

S.No	Title	Author(s)	P <mark>u</mark> blisher
1	An Introduction to Practical	Plummer, D.T.	Tata McGraw-Hill
	Biochemistry	000	Publishing Co. Ltd
2	Plant Microtechnique and	Ruzin, S.E.	Oxford University
	Microscopy		Press, New York
3	Short Protocols in Molecular	Ausubel, F., Brent, R.,	John Wiley & Sons
	Biology	Kingston, R. E.,	
		Moore, D.D.,	
	Comment of the last	Seidman, J.G., Smith	
4	Biostatistical Analysis.	Zar, J.H	Pearson Publication
	KHIATA	(01	INTAB)
	LA, DIST	T. IALANDHAR (PU	232

CELL BIOLOGY, BIOTECHNOLOGY AND REPRODUCTIVE BIOLOGY

Course Code	ZOO301	
Course Title	Cell Biology, Biotechnology and Reproductive Biology	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	B.Sc IInd year	
Course Objective	e 1. To enable the students to learn various aspects of cell biology and	
(CO)	techniques of biotechnology.	
	2. To aware the students about various reproductive processes and the	
	modern techniques to assist these processes.	

UNIT-I

Introduction to cell and molecular biology: Discovery of cell, basic properties, eukaryotic and prokaryotic cells, viruses. Structure and functions of Plasma membrane: Chemical composition of membrane, structure and function of membrane proteins, Fluid Mosaic Model, Membrane potential and nerve impulse

Interaction between cell and their environment: Interaction of cell with extracellular material, Tight Junctions, Gap Junctions and Plasmodesmata mediating intracellular communications, cell wall.

Membrane Trafficking: Endoplasmic Reticulum, Golgi complex, Types of vesicle transport and their functions, lysosomes.

Cytoskeleton and Cell motility: Study of cytoskeleton, microtubules, intermediate filaments, microfilaments.

UNIT-II

Biotechnology: Recombinant DNA technology and its applications, Cloning vectors: Plasmids, Cosmids, Phasmids, Lamda Bacteriophage, BAC, YAC, MAC and Expression vectors.

Restriction enzymes: Nomenclature, detailed study of Type II

Construction of genomic and cDNA libraries, Southern, Northern and Western Blotting, DNA sequencing (Sanger Method), Polymerase Chain Reaction.

UNIT-III

Reproductive Endocrinology: Gonadal hormones and mechanism of hormone action, steroids, glycoprotein hormones, and prostaglandins, regulation of gonadotrophin secretion in male and female; Reproductive System: Development and differentiation of gonads, genital ducts, external genitalia, mechanism of sex differentiation.

UNIT-IV

Reproductive Health: Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning

Text and reference books:

S.No	Title	Author	Publisher
1.	Cell and Molecular Biology	P.K. Gupta	Rastogi publications
2.	Knobil, E. et al. (eds).	The Physiology of	Raven Press Ltd
		Reproduction.	
3.	Animal Physiology	Mohan P. Arora	Himalyan Publishing,
			House
4.	G Karp, EDP & De Robertis	Cell and Molecular Biology	EMF, WB Saunders,
			Co Philadelphia, 8 th
			Edn 1995.
5.	Albert	Essential Cell Biology	, New York, 3 rd Edn,
		PRC	1997
	B	LDDS// WOOD	

CELL BIOLOGY, BIOTECHNOLOGY AND REPRODUCTIVE BIOLOGY PRACTICAL

Course Code	ZOO 303	
Course Tit <mark>le</mark>	Cell Biology, Biotechnology and Reproductive	
	Biology Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite	B.Sc IInd year	
Course Objective	To impart practical knowledge about basic animal cell structure	
	and cytological details of reproductive cells and organs	

List of experiments:

- 1. Study of cell cycle through model.
- 2. Cells present in human blood (WBC, RBC count and hemoglobin estimation)
- 3. Study the phenomenon of osmosis using blood.
- 4. Blood clotting and bleeding time
- 5. Erythrocyte sedimentation rate
- 6. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.

Text and reference books:

S.No	Title	Author	Publisher
1.	Cell and Molecular Biology	P.K. Gupta	Rastogi publications
2.	Knobil, E. et al. (eds).	The Physiology of	Raven Press Ltd
		Reproduction.	

APPLIED ZOOLOGY

Course Code	ZOO305
Course Title	Applied Zoology
Type of course	Theory
LTP	4 0 0
Credits	4
Course prerequisite	B.Sc Medical II year
Course Objective	To aware students about the various types of parasites and their
	relationship with their hosts. To find out some organisms which
	are fetal to animals and try for the control measures against them.

UNIT-I

Introduction to Host-parasite Relationship: Host, Definitive host, Intermediate host, Parasitism, Symbiosis, Commensalism, Reservoir, Zoonosis; Epidemiology of Diseases: Transmission, Prevention and control of diseases: Tuberculosis, Typhoid

UNIT-II

Rickettsiae and Spirochaetes: Brief account of Rickettsia prowazekii, Borrelia recurrentis and Treponema pallidum; Parasitic Protozoa: Life history and pathogenicity of Entamoeba histolytica, Plasmodium vivax and Trypanosoma gambiense

UNIT-III

Parasitic Helminthes: Life history and pathogenicity of Ancylostoma duodenale and Wuchereria bancrofti; Insects of Economic Importance: Biology, Control and damage caused by Helicoverpa armigera, Pyrilla perpusilla and Papilio demoleus, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum; Insects of Medical Importanc: Medical importance and control of Pediculus humanus corporis, Anopheles, Culex, Aedes, Xenopsylla cheopis UNIT-IV

Animal Husbandry: Preservation and artificial insemination in cattle; Induction of early puberty and synchronization of estrus in cattle; Poultry Farming: Principles of poultry breeding, Management of breeding stock and broilers, Processing and preservation of eggs

Fish Technology: Genetic improvements in aquaculture industry; Induced breeding and transportation of fish seed

Text and Reference Books:

S.No	Title	Author(s)	Publisher
1	Preventive and Social	Park, K.	B.B Publishers
	Medicine, 16 th Edition		
2	Medical Parasitology, 2 nd	Arora, D. R and	CBS Publications
	Edition	Arora, B	
3	Agricultural Pests of India	Atwal, A.S	Kalyani
	and South East Asia		Publishers
4	Agricultural Entomology	Dennis, H	Timber Press
5	Reproduction in Farm	Hafez, E. S. E	Lea & Fabiger Publisher
	Animals		

APPLIED ZOOLOGY PRACTICAL

Course Code	ZOO307
Course Title	Applied Zoology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	B.Sc Medical II year
Course Objective	To aware students about different techniques used in studying
	various types of causative agents of diseases. So that they can
	easily findout the symptoms of different diseases.

LIST OF EXPERIMENTS

- 1. Study of Plasmodium vivax, Entamoeba histolytica, Trypanosoma gambiense, Ancylostoma duodenale and Wuchereria bancrofti and their life stages through permanent slides/photomicrographs or specimens.
- 2. Study of arthropod vectors associated with human diseases: Pediculus, Culex, Anopheles, Aedes and Xenopsylla.
- 3. Study of insect damage to different plant parts/stored grains through damaged products/photographs.
- 4. Identifying feature and economic importance of Helicoverpa (Heliothis) armigera, Papilio demoleus, Pyrilla perpusilla, Callosobruchus chinensis, Sitophilus oryzae and Tribolium castaneum
- 5. Visit to poultry farm or animal breeding centre. Submission of visit report
- 6. Maintenance of freshwater aquarium

Text and Reference Books:

S.No	Title	Author(s)	Publisher
1	Medical Parasitology, 2 nd	Arora, D. R and	CBS Publications
	Edition	Arora, B	
2	Agricultural Entomology	Dennis, H	Timber Press

AQUATIC BIOLOGY

Course Code	ZOO309
Course Title	Aquatic Biology
Type of course	Theory
LTP	4 0 0

Credits	4
Course prerequisite	B.Sc Medical II year
Course Objective	To provide the knowledge of different types of habitats in
	ecosystem and their importance for the living being, so that we
	can make our environment a pollution free.

UNIT-I

Aquatic Biomes: Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.

UNIT-II

Freshwater Biology: Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry,

Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; dissolved gases (Oxygen, Carbon dioxide).

UNIT-III

Nutrient Cycles in Lakes-Nitrogen, Sulphur and Phosphorous. Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes. Marine Biology: Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.

UNIT-IV

Management of Aquatic Resources: Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment; Water quality assessment- BOD and COD.

Text and Reference Books:

S.	Title	Author(s)	Publisher
No			
1	Bioresources Ecology 3rd	Anathakrishnan	
	Edition		
2	Limnology, 2nd Edition	Goldman	
3	Fundamentals of Ecology, 5th	Odum and Barrett	
	Edition	I. JALANDHAR	
4	Chemical and biological	Trivedi and Goyal	
	methods for water pollution		
	studies		

AQUATIC BIOLOGY PRACTICAL

Course Code	ZOO311
Course Title	Aquatic Biology Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	B.Sc Medical II year

Course Objective	To give the training to the students regarding different techniques
	used in determination of various parameters of water and soil, so
	that we can check the their quality.

LIST OF EXPERIMENTS

- 1. Determine the area of a lake using graphimetric and gravimetric method.
- 2. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.
- 3. Determine the amount of Turbidity/transparency, Dissolved Oxygen, Free Carbon dioxide, Alkalinity (carbonates & bicarbonates) in water collected from a nearby lake/ water body.
- 4. Instruments used in limnology (Secchi disc, Van Dorn Bottle, Conductivity meter, Turbidity meter, PONAR grab sampler) and their significance.
- 5. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/ Fisheries Institutes.

Text and Reference Books:

S.	Title	Author(s)	Publisher
No			
1	Bioresources Ecology 3rd Edition	Anathakrishnan	
2	Limnology, 2nd Edition	Goldman	

ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Course Code	CHM 305
Course Title	ORGANOMETALLICS, BIOINORGANIC
Course Title	CHEMISTRY, POLYNUCLEAR
- 1	HYDROCARBONS AND UV, IR
	SPECTROSCOPY
Type of course	DISCIPLINE ELECTIVE(THEORY)
LTP	4:0:0
Credits	4
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as one core
	subject
Course Objective (CO)	The aim of this course is to impart theoretical
	knowledge to the students about
	organometallic chemistry and organic
	spectroscopy.

UNIT I

Chemistry of 3d metals: Oxidation states displayed by Cr, Fe, Co, Ni and Co. A study of the following compounds (including preparation and important properties); Peroxo compounds of Cr, $K_2Cr_2O_7$, $KMnO_4$, $[Fe(CN)_6]$, Sodium nitroprusside, $[Co(NH_3)_6]Cl_3$, $Na_3[Co(NO_2)_6]$.

UNIT-II

Organometallic Compounds Definition and Classification with appropriate examples based on nature of metal-carbon bond (ionic, s, p and multicentre bonds). Structures of methyl lithium, Zeiss salt and ferrocene. EAN rule as applied to carbonyls. Preparation, structure, bonding and properties of mononuclear and polynuclear carbonyls of 3d metals. p-acceptor behaviour of carbon monoxide. Synergic effects (VB approach)- (MO diagram of CO can be referred to for synergic effect to IR frequencies).

UNIT - II

Bio-Inorganic Chemistry: A brief introduction to bio-inorganic chemistry. Role of metal ions present in biological systems with special reference to Na +,K+,Mg2+ ions, Na/K pump; Role of Mg2+ions in energy production and chlorophyll. Role of Ca2+in blood clotting, stabilization of protein structures and structural role (bones). Polynuclear and heteronuclear aromatic compounds: Properties of the following compounds with reference to electrophilic and Nucleophilic substitution: Naphthalene, Anthracene, Furan, Pyrrole, Thiophene, and Pyridine.

Active methylene compounds: Preparation: Claisen ester condensation. Keto-enol tautomerism. Reactions: Synthetic uses of ethylacetoacetate (preparation of non-heteromolecules having

UNIT IV

Application of Spectroscopy to Simple Organic Molecules Application of visible, ultraviolet and Infrared spectroscopy in organic molecules. Electromagnetic radiations, electronic transitions, λ max& emax , chromophore, auxochrome, bathochromic and hypsochromic shifts. Application of electronic spectroscopy and Woodward rules for calculating 1 max of conjugated dienes and α,β — unsaturated compounds. Infrared radiation and types of molecular vibrations, functional group and fingerprint region. IR spectra of alkanes, alkenes and simple alcohols (inter and intramolecular hydrogen bonding), aldehydes, ketones, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1.	Concise Inorganic Chemistry	1.D. Lee	ELBS
2.	Inorganic Chemistry: Principles of Structure and Reactivity	James E. Huheey, Ellen Keiter & Richard Keiter	Pearson Publication.
3.	Bioinorganic Chemistry	Bertini, H. B. Grey, S. J. Lippard and J. S. Valentine	Viva Books Pvt. Ltd., New Delhi (1998
4.	Biological Inorganic Chemistry: An Introduction	Robert Crichton	.Elsevier Science (2008)

4	5. Biological Inorganic Chemistry: Structure and Reactivity	Harry B. Gray, Edward I. Stiefel et al.,	University Science Books.
(5. Inorganic Chemistry	G.L. Miessler & Donald A. Tarr	Pearson Publication.
7	7. Basic Inorganic Chemistry	F.A. Cotton & G. Wilkinson:	John Wiley & Sons
8	Shriver & Atkin's Inorganic Chemistry (5 th Edition),	P Atkins, T. Overton, J. Rourke, M. Weller, F. Armstrong, M. Hagerman	Oxford University Press,
Ģ	Organic Chemistry (Vol. I & II),	I.L. Finar	E.L.B.S.
1	O. Applications of Absorption Spectroscopy of Organic Compounds,	John R. Dyer:	Prentice Hall.
1	1. Spectroscopic Identification of Organic Compounds	R.M. Silverstein, G.C. Bassler & T.C. Morrill	John Wiley & Sons
1	2. Organic Chemistry,	R.T. Morrison & R.N. Boyd	Prentice Hall.
1	3. A Guide Book to Mechanism in Organic Chemistry	Peter Sykes:	Orient Longman.

ORGANOMETALLICS, BIOINORGANIC CHEMISTRY, POLYNUCLEAR HYDROCARBONS AND UV, IR SPECTROSCOPY

Course Code	CHM 307
Course Title	ORGANOMETALLICS, BIOINORGANIC CHEMISTRY,
	POLYNUCLEAR HYDROCARBONS AND UV, IR
	SPECTROSCOPY
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
LTP	0:0:4
Credits	2STT JALANDHAR (FUR
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as one core subject
Course Objective	The aim of this course is to impart practical knowledge to the students about organometallic chemistry and organic qualitative analysis.

^{1.} Separation of mixtures by chromatography: Measure the Rf value in each case. (Combination of two ions to be given)

ions to be given)
Paper chromatographic separation of Fe³⁺, A1³⁺ and Cr³⁺

Or

Paper chromatographic separation of Ni²⁺, Co²⁺, Mn²⁺ and Zn²⁺.

- 2. Preparation of any two of the following complexes and measurement of their conductivity:
- (i) tetraamminecarbonatocobalt (III) nitrate
- (ii) tetraamminecopper (II) sulphate
- (iii) potassium trioxala toferrate (III) trihydrate

Compare the conductance of the complexes with that of M/1000 solution of NaCl, MgCl₂ and LiCl₃ Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative.

Text and Reference Books

S. No	Name	Author(S)	Publi <mark>sh</mark> er
1	Vogel's Qualitative Inorganic Analysis (7th Edition).	A.I. Vogel, G Svehla	Prentice Hall
	Tillarysis († Edition).		
2		A.I. Vogel, J. Mendham,	Prentice Hall
	Analy <mark>si</mark> s (6 th Edition),	R.C. Denney, J.D. Barnes,	Married III
	1146 00	M.J.K. Thomas	1-0 0-0
3	Advanced Practical Inorganic Chemistry	Ayodha Singh	Campus Books 2002
4	Textbook of Practical Organic	Vogel, A.I., Tatchell, A.R.,	Prentice-Hall
4	Chemistry, 5th edition, 1996.	Furnis, B.S., Hannaford,	Fieldice-Hall
	Chemistry, 3th edition, 1990.	A.J. & Smith, P.W.G	
5	Practical Organic Chemistry	Mann, F.G. & Saunders,	Orient-Longman,
		B.C.	

INDUSTRIAL CHEMICAL AND ENVIRONMENT

Course Code	CHM 309
Course Title	INDUSTRIAL CHEMICAL AND
	ENVIRONMENT
Type of course	DISCIPLINE ELECTIVE(THEORY)
LTP	4:0:0
Credits	4
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core
	subject
Course Objective	The aim of this course is to impart
	theoretical knowledge to the students in
	Industrial processes and environmental
	chemistry.

UNIT I

Industrial Gases and Inorganic Chemicals Industrial Gases: Large scale production, uses, storage and hazards in handling of the following gases: oxygen, nitrogen, argon, neon, helium, hydrogen, acetylene, carbon monoxide, chlorine, fluorine, sulphur dioxide and phosgene.

Inorganic Chemicals: Manufacture, application, analysis and hazards in handling th efollowing chemicals: hydrochloric acid, nitric acid, sulphuric acid, caustic soda, common salt, borax, bleaching powder, sodium thiosulphate, hydrogen peroxide, potash alum, chrome alum, potassium dichromate and potassium permanganate.

UNIT II

Industrial Metallurgy Preparation of metals (ferrous and nonferrous) and ultrapure metals for semiconductor technology. Environment and its segments Ecosystems. Biogeochemical cycles of carbon, nitrogen and sulphur. Air Pollution: Major regions of atmosphere. Chemical and photochemical reactions in atmosphere. Air pollutants: types, sources, particle size and chemical nature; Photochemical smog: its constituents and photochemistry. Environmental effects of ozone, Major sources of air pollution. Pollution by SO₂, CO₂, CO, NOx, H₂S and other foul smelling gases. Methods of estimation of CO, NOx, SOx and control procedures. Effects of air pollution on living organisms and vegetation. Greenhouse effect and Global warming, Ozone depletion by oxides of nitrogen, chlorofluorocarbons and Halogens, removal of sulphur from coal. Control of particulates.

UNIT III

Water Pollution: Hydrological cycle, water resources, aquatic ecosystems, Sources and nature of water pollutants, Techniques for measuring water pollution, Impacts of water pollution on hydrological and ecosystems. Water purification methods. Effluent treatment plants (primary, secondary and tertiary treatment). Industrial effluents from the following industries and their treatment: electroplating, textile, tannery, dairy, petroleum and petrochemicals, agro, fertilizer, etc. Sludge disposal. Industrial waste management, incineration of waste. Water treatment and purification (reverse osmosis, electro dialysis, ion exchange). Water quality parameters for waste water, industrial water and domestic water.

UNIT IV

Energy & Environment: Sources of energy: Coal, petrol and natural gas. Nuclear Fusion / Fission, Solar energy, Hydrogen, geothermal, Tidal and Hydel, etc. Nuclear Pollution: Disposal of nuclear waste, nuclear disaster and its management.

BiocatalysisIntroduction to biocatalysis: Importance in "Green Chemistry" and Chemical Industry.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Standard methods for the	Andrew D. Eaton,	EPS group, INC Roman,
	examination of water and waste	Lenore, S. Clesceri	
	water- 19th Edn. 1995.	and A. E. Greenberg,	
2	Environmental Chemistry, , 2nd	A. K. DE	Wiley Eastern Ltd
	edition, 1990.		
3	Environmental Pollution	S. M. Khopkar,	Wiley Eastern Ltd.,
	Analysis, 1995		

4	Physical Electrochemistry-	Eliezer Gileadi,	Wiley-VCH 2011.
	Fundamentals, Techniques and		
	Applications		
5	Waste water treatment disposal and release-, INC second Edn., 1990.	Metcalf and eddy	Tata Mc Graw Hill
6	Environmental pollution control	C. S. Rao	Wiley Eastern
	and engineering, 1995.	C. S. Rao	Ltd.
7	Chemical and Biological methods	R. K. Trivedy,	Environmental
	for water pollution studies, 1986.	and P. K. Goel,	publications
8	Environmental Chemistry, 1994.	B. K. Sharma & H. Kaur	Goel publishing House,
9	Principles of Instrumental	D. A. Skoog and	Saunder's College Publ.
	Methods of analysis	D.M.West	Latest edition.

INDUSTRIAL CHEMICAL AND ENVIRONMENT PRACTICAL

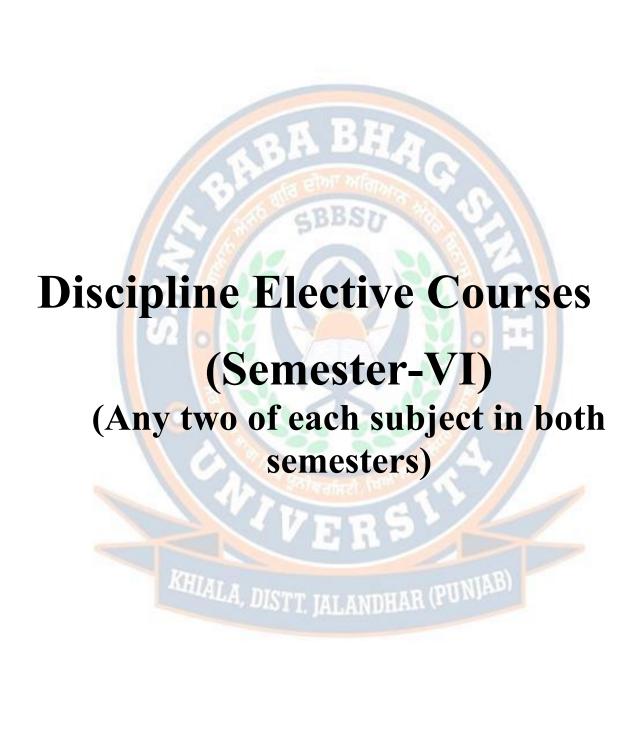
Course Code	CHM 311
Course Title	INDUSTRIAL CHEMICAL AND
	ENVIRONMENT
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
LTP	0:0:4
Credits	2
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as one
Kur	core subject
Course Objective	The aim of this course is to impart
AUL I. J.	practical knowledge to the students in
	Industrial processes and environmental
	chemistry.

- 1. Determination of dissolved oxygen in water.
- 2. Determination of Chemical Oxygen Demand (COD)
- 3. Determination of Biological Oxygen Demand (BOD)
- 4. Percentage of available chlorine in bleaching powder.
- 5. Measurement of chloride, sulphate and salinity of water samples by simple titration method (AgNO3 and potassium chromate).

- 6. Estimation of total alkalinity of water samples (CO3²⁻, HCO3⁻) using double titration method.
- 7. Measurement of dissolved CO₂.
- 8. Study of some of the common bio-indicators of pollution.
- 9. Estimation of SPM in air samples.
- 10. Preparation of borax/ boric acid.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Standard methods for the examination of water and waste water- 19th Edn. 1995.	Andrew D. Eaton, Lenore, S. Clesceri and A. E. Greenberg,	EPS group, INC Roman,
2	Environmental Pollution Analysis, 1995	S. M. Khopkar,	Wiley Eastern Ltd.,
3	Physical Electrochemistry- Fundamentals, Techniques and Applications	Eliezer Gileadi,	Wiley-VCH 2011.
4	Waste water treatment disposal and release-, INC second Edn., 1990.	Metcalf and eddy	Tata Mc Graw Hill
5	Environmental pollution control and engineering, 1995.	C. S. Rao	Wiley Eastern Ltd.
6	Chemical and Biological methods for water pollution studies, 1986.	R. K. Trivedy, and P. K. Goel,	Environmental publications
7	Principles of Instrumental Methods of analysis	D. A. Skoog and D.M.West	Saunder's College Publ. Latest edition.



GREEN CHEMISTRY

Course Code	CHM 310
Course Title	GREEN CHEMISTRY
Type of course	DISCIPLINE ELECTIVE(THEORY)
LTP	4:0:0
Credits	4
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core
FE ELV	subject
Course Objective (CO)	The aim of this course is to impart
50	theoretical knowledge to the students
	Green chemistry and applications of green
	chemistry in organic synthesis.

UNIT I

Introduction to Green Chemistry: What is Green Chemistry? Need for Green Chemistry. Goals of Green Chemistry. Limitations/ Obstacles in the pursuit of the goals of Green Chemistry. Principles of Green Chemistry and Designing a Chemical synthesis: Twelve principles of Green Chemistry with their explanations and examples and special emphasis on the following: Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum

Designing a Green Synthesis using these principles; Prevention of Waste/ byproducts; maximum incorporation of the materials used in the process into the final products, Atom Economy, calculation of atom economy of the rearrangement, addition, substitution and elimination reactions. Prevention/ minimization of hazardous/ toxic products reducing toxicity. risk = (function) hazard × exposure; waste or pollution prevention hierarchy.

UNIT II

Green solvents—supercritical fluids, water as a solvent for organic reactions, ionic liquids, fluorous biphasic solvent, PEG, solvent less processes, immobilized solvents and how to compare greenness of solvents. Energy requirements for reactions — alternative sources of energy: use of microwaves and ultrasonic energy.

Selection of starting materials; avoidance of unnecessary derivatization – careful use of blocking/protecting groups. Use of catalytic reagents (wherever possible) in preference to stoichiometric reagents; catalysis and green chemistry, comparison of heterogeneous and homogeneous catalysis, biocatalysis, asymmetric catalysis and photocatalysis.

Strengthening/ development of analytical techniques to prevent and minimize the generation of hazardous substances in chemical process

UNIT III

Examples of Green Synthesis/ Reactions and some real world cases

1. Green Synthesis of the following compounds: adipic acid, catechol, disodium iminodiacetate (alternative to Strecker synthesis)

- 2. Microwave assisted reactions in water: Hofmann Elimination, methyl benzoate to benzoic acid, oxidation of toluene and alcohols; microwave assisted reactions in organic solvents Diels-Alder reaction and Decarboxylation reaction
- 3. Ultrasound assisted reactions: Sono chemical Simmons-Smith Reaction (Ultrasonic alternative to Iodine)
- 4 Surfactants for carbon dioxide replacing smog producing and ozone depleting solvents with CO2 for precision cleaning and dry cleaning of garments.
- 5 Designing of Environmentally safe marine antifoulant.
- 6 Rightfit pigment: synthetic azopigments to replace toxic organic and inorganic pigments.

UNIT IV

Future Trends in Green Chemistry Oxidation reagents and catalysts; Biomimetic, multifunctional reagents; Combinatorial green chemistry; Proliferation of solvent less reactions; co crystal controlled solid state synthesis (C²S³); Green chemistry in sustainable development.

SBBSU

Text and Reference Books

S. No	Name	Author(S)	P <mark>ubli</mark> sher
1	Green Chemistry	V. K. Ahluwalia	New Age International
2	Green Chemistry- Theory and Practical, 1998	Anastas, P.T. & Warner, J.K.	Oxford University Press
3	Introduction to Green Chemistry,2001	Matlack, A.S.	Marcel Dekker
4	Real-World cases in Green Chemistry, 2000	Cann, M.C. & Connely, M.E.	American Chemical Washington Society,
5	Introduction to Green Chemistry,2002	Ryan, M.A. & Tinnesand, M.	American Chemical Society, Washington
6	Green Chemistry Experiments: A monograph	Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K.	I.K. International Publishing House Pvt Ltd. New Delhi
7	Green Chemistry: An introductory text	Lancaster, M.	RSC publishing, 2nd Edition.

GREEN CHEMISTRY PRACTICAL

Course Code	CHM 312
Course Title	GREEN CHEMISTRY
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
LTP	0:0:4
Credits	2
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core subject
Course Objective (CO)	The aim of this course is to impart practical knowledge to the students green methods of synthesis.
	methods of synthesis.

- 1. Safer starting materials: Preparation and characterization of nanoparticles of gold using tea leaves.
- 2. Using renewable resources: Preparation of biodiesel from vegetable/waste cooking oil.
- 3. Avoiding waste: Principle of atom economy. Use of molecular model kit to stimulate the reaction to investigate how the atom economy can illustrate Green Chemistry.

Preparation of propene by two methods can be studied

Triethylamine ion + OH⁻ → propene + trimethylpropene + water

 H_2SO_4/Δ

(II) 1-propanol → propene + water

Other types of reactions, like addition, elimination, substitution and rearrangement should also be studied for the calculation of atom economy.

- **4.** Use of enzymes as catalysts Benzoin condensation using Thiamine Hydrochloride as a catalyst instead of cyanide.
- 5. Alternative Green solvents Extraction of D-limonene from orange peel using liquid CO2 prepared form dry ice. Mechanochemical solvent free synthesis of azomethines.
- 6. Alternative sources of energy: Solvent free, microwave assisted one pot synthesis of phthalocyanine complex of copper (II). Photoreduction of benzophenone to benzopinacol in the presence of sunlight.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Green Chemistry	V. K. Ahluwalia	New Age International
2	Green Chemistry- Theory and	Anastas, P.T. &	Oxford
	Practical, 1998	Warner, J.K.	University Press

3	Introduction to Green Chemistry,2001	Matlack, A.S.	Marcel Dekker
4	Real-World cases in Green Chemistry, 2000	Cann, M.C. & Connely, M.E.	American Chemical Society, Washington
5	Introduction to Green Chemistry,2002	Ryan, M.A. & Tinnesand, M.	American Chemical Society, Washington
6	Green Chemistry Experiments: A monograph	Sharma, R.K.; Sidhwani, I.T. & Chaudhari, M.K.	I.K. International Publishing House Pvt Ltd. New Delhi
7	Green Chemistry: An introductory text	Lancaster, M.	RSC publishing, 2nd Edition.

ANALYTICAL METHOD IN CHEMISTRY

Course Code	CHM 314
Course Title	ANALYTICAL METHOD IN CHEMISTRY
Type of course	DISCIPLINE ELECTIVE(THEORY)
LTP	4:0:0
Credits	4
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core
	subject
Course Objective (CO)	The aim of this course is to impart
	theoretical knowledge to the students in
KHIRE	analytical methods in chemistry.
KHIALA, DISTT. JA	ANDHAR (PUNIS)
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UNIT I

Qualitative and quantitative aspects of analysis: Sampling, evaluation of analytical data, errors, accuracy and precision, methods of their expression, normal law of distribution if indeterminate errors, statistical test of data; F, Q and t test, rejection of data, and confidence intervals.

Optical methods of analysis: Origin of spectra, interaction of radiation with matter, fundamental laws of spectroscopy and selection rules, validity of Beer-Lambert's law. UV-Visible Spectrometry: Basic principles of instrumentation (choice of source, monochromator and detector) for single and double beam instrument; Basic principles of quantitative analysis: estimation of metal ions from aqueous solution, geometrical isomers, keto-enol tautomers.

Determination of composition of metal complexes using Job's method of continuous variation and mole ratio method.

UNIT II

Infrared Spectrometry: Basic principles of instrumentation (choice of source, NM monochromatic & detector) for single and double beam instrument; sampling techniques. Structural illustration through interpretation of data, Effect and importance of isotope substitution. Flame Atomic Absorption and Emission Spectrometry: Basic principles of instrumentation (choice of source, monochromatic, detector, choice of flame and Burner designs. Techniques of atomization and sample introduction; Method of background correction, sources of chemical interferences and their method of removal. Techniques for the quantitative estimation of trace level of metal ions from water samples.

UNIT III

Thermal methods of analysis: Theory of thermogravimetry (TG), basic principle of instrument Techniques for quantitative estimation of Ca and Mg from their mixture.

Electro-analytical methods: Classification of electro analytical methods, basic principle of pH metric, potentiometric and conduct metric titrations. Techniques used for the determination of equivalence points. Techniques used for the determination of pKa values.

UNIT IV

Separation techniques:Solvent extraction: Classification, principle and efficiency of the technique. Mechanism of extraction: extraction by solvation and chelation. Technique of extraction: batch, continuous and counter current extractions. Qualitative and quantitative aspects of solvent extraction: extraction of metal ions from aqueous solution, extraction of organic species from the aqueous and non-aqueous media.

Chromatography: Classification, principle and efficiency of the technique. Mechanism of separation: adsorption, partition & ion exchange. Development of chromatograms: frontal, elution and displacement methods. Qualitative and quantitative aspects of chromatographic methods of analysis: IC, GLC, GPC, TLC and HPLC. Role of computers in instrumental methods of analysis.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Electrochemical methods,	A.J. Bard, L.R.	Wiley, 1980.
	Fundamentals and Methods	Faulkner,	
2	Inorganic Chemistry	A.G. Sharpe	ELBS
3	Principles of Instrumental	D. A. Skoog and	Saunder's College Publ.
	Methods of analysis	D.M.West	Latest edition.

4	Vogel's Qualitative Inorganic	G Svehla	Prentice Hall
	Analysis (7 th Edition).		
5	Vogel's Quantitative Chemical	J. Mendham, R.C.	Prentice Hall
	Analysis (6 th Edition),	Denney, J.D.	
		Barnes, M.J.K.	
		Thomas	
6	Instrumental Analysis	G.D. Christian and	Allegn Becon, Latest edition
		J.E.G. Reily	
7	Instrumental Methods of Chemical	G.W.Ewing,	McGraw Hill Pub, 1975.
	Analysis	PRCI	11.5

ANALY<mark>TI</mark>CAL METHOD IN CHEMISTRY PRACTICAL

Course Code	CHM 316	
Course Title	ANALYTICAL METHOD IN CHEMISTRY	
Type of course	DISCIPLINE ELE <mark>CTI</mark> VE(PRA <mark>C</mark> TICAL)	
LTP	0:0:4	
Credits	2	
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core subject	
Course Objective (CO)	The aim of this course is to impart practical knowledge to the students about analytical methods of chemical analysis.	

I. Separation Techniques Chromatic

Chromatography:

- Separation of mixtures : Paper chromatographic separation of Fe^{3+} , Al^{3+} , and Cr^{3+} . (i)
- Separation and identification of the monosaccharides present in the given mixture (ii) (glucose & fructose) by paper chromatography. Reporting the Rf values.
- Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify (iii) them on the basis of their Rf values.
- Chromatographic separation of the active ingredients of plants, flowers and juices by (iv) TLC

II. Solvent Extractions:

- (i) To separate a mixture of Ni²⁺ & Fe²⁺ by complexation with DMG and extracting the Ni²⁺- DMG complex in chloroform, and determine its concentration by spectrophotometry.
- (ii) Determine the pH of the given aerated drinks fruit juices, shampoos and soaps.
- (iii)Determination of Na, Ca, Li in cola drinks and fruit juices using flame photometric techniques.

Analysis of soil:

- (i) Determination of pH of soil.
- (ii) Total soluble salt
 - (iii) Estimation of calcium, magnesium, phosphate, nitrate

Ion exchange:

- (i) Determination of exchange capacity of cation exchange resins and anion exchange resins.
- (ii) Separation of metal ions from their binary mixture.
- (iii) Separation of amino acids from organic acids by ion exchange chromatography.

BI Spectro-photometry

- (i) Determination of pKa values of indicator using spectrophotometry.
- (ii) Structural characterization of compounds by infrared spectroscopy.
- (iii) Determination of dissolved oxygen in water.
- (iv) Determination of chemical oxygen demand (COD).
- (v) Determination of Biological oxygen demand (BOD).

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Electrochemical methods,	A.J. Bard, L.R.	Wiley, 1980.
	Fundamentals and Methods	Faulkner,	
2	Inorganic Chemistry	A.G. Sharpe	ELBS
3	Principles of Instrumental	D. A. Skoog and	Saunder's College Publ.
	Methods of analysis	D.M.West	Latest edition.
4	Vogel's Qualitative Inorganic Analysis (7 th Edition).	G Svehla	Prentice Hall
5	Vogel's Quantitative Chemical Analysis (6 th Edition),	J. Mendham, R.C. Denney, J.D. Barnes, M.J.K. Thomas	Prentice Hall

6	Instrumental Analysis	G.D. Christian and	Allegn Becon, Latest
		J.E.G. Reily	edition
7	Instrumental Methods of Chemical	G.W.Ewing,	McGraw Hill Pub, 1975.
	Analysis		

CHEMISTRY OF MAIN GROUP ELEMENT, THEORIES OF ACIDS AND BASES

Course Code	CHM 306
Course Title	CHEMISTRY OF MAIN GROUP
	ELEMENT, THEORIES OF ACIDS AND
	BASES
Type of course	DISCIPLINE ELECTIVE(THEORY)
LTP	4:0:0
Credits	4
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core subject
Course Objective (CO)	The aim of this course is to impart
	theoretical knowledge to the students in
H 804	Main group elements.
	5 3 6 6
	30 000 113

UNIT I

Acids and Bases Brönsted–Lowry concept, conjugate acids and bases, relative strengths of acids and bases, effects of substituent and solvent, differentiating and levelling solvents. Lewis acid-base concept, classification of Lewis acids and bases, Lux-Flood concept and solvent system concept. Hard and soft acids and bases (HSAB concept), applications of HSAB process General Principles of Metallurgy: Chief modes of occurrence of metals based on standard electrode potentials, Ellingham diagrams for reduction of metal oxides using carbon and carbon monoxide as reducing agents. Hydrometallurgy with reference to cyanide process for gold and silver. Methods of purification of metals (Al, Pb, Ti, Fe, Cu, Ni, Zn, Au): electrolytic refining, zone refining, van Arkel-de Boer process, Parting Process, Mond's process and Kroll Process.

UNIT II

s- and p-Block Elements Periodicity in s- and p-block elements with respect to electronic configuration, atomic and ionic size, ionization enthalpy, electron gain enthalpy, electronegativity (Pauling scale). General characteristics of s-block metals like density, melting and boiling points, flame colour and reducing nature. Oxidation states of s- and p-block elements, inert-pair effect, diagonal relationships and anomalous behaviour of first member of each group. Allotropy in C, P and S. Complex forming tendency of s block elements and a preliminary idea of crown ethers and cryptates, structures of basic beryllium acetate, salicylaldehyde/acetylacetonato complexes of Group 1 metals. Solutions of alkali metals in liquid ammonia and

their properties. Common features, such as ease of formation, solubility and stability of oxides, peroxides, superoxides, sulphates and carbonates of *s*-block metals.

UNIT III

Structure, bonding and properties (acidic/ basic nature, oxidizing/ reducing nature and hydrolysis of the following compounds and their applications in industrial and environmental chemistry wherever applicable: Diborane and concept of multicentre bonding, hydrides of Groups 13 (EH3), 14, 15, 16 and 17.0xides

UNIT IV

Noble gases: Rationalization of inertness of noble gases, catharses, preparation and properties of XeF2, XeF4 and XeF6, bonding in these compounds using VBT and shapes of noble gas compounds using VSEPR Theory. Inorganic Polymers Types of inorganic polymers and comparison with organic polymers, structural features, classification and important applications of silicates. Synthesis, structural features and applications of silicones. Borazines and cyclophosphazenes – preparation, properties and reactions. Bonding in (NPCl₂)₃. of N and P, Ox acids of P, S and Cl. Halides and ox halides of P and S (PCl3, PCl5, SOCl2 and SO2Cl2). Interhalogen compounds. A brief idea of pseudo halides.

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Concise Inorganic Chemistry	1.D. Lee	ELBS
2	Inorganic Chemistry	A.G. Sharpe	ELBS
3	Inorganic Chemistry Principles	J.E. Huheey	Harper Inter science
	of Structure and Reactivity		
4	Principles of Inorganic	Puri, Sharma and	Vishal publishers
	Chemistry	Kalia	
	Day		777)
5	Synthesis and Technique in	G. S.Girlomi; R.J.	Latest edition, University
	Inorganic chemistry	Angleci	Science Books.
6	Physical Chemistry	R.A. Alberty	Wiley Eastern Ltd
7	Shriver & Atkin's Inorganic	P Atkins, T.	Oxford University Press,
	Chemistry (5 th Edition),	Overton, J. Rourke,	
		M. Weller, F.	
		Armstrong, M.	
		Hagerman	

CHEMISTRY OF MAIN GROUP ELEMENT, THEORIES OF ACIDS AND BASES PRACTICAL

Course Code	CHM 308
Course Title	CHEMISTRY OF MAIN GROUP ELEMENT,
	THEORIES OF ACIDS AND BASES
Type of course	DISCIPLINE ELECTIVE(PRACTICAL)
LTP	0:0:4
Credits	2
Course prerequisite	Bsc. Ist, IInd year with CHEMISTRY as core subject
Course Objective (CO)	The aim of this course is to impart practical knowledge to the students in qualitative and quantitative inorganic analysis

- 1. Iodometric estimation of potassium dichromate and copper sulphate
- 2. Iodimetric estimation of antimony in tartaremetic
- 3. Estimation of amount of available chlorine in bleaching powder and household bleaches
- 4. Estimation of iodine in iodized salts.
- 5. Iodimetric estimation of ascorbic acid in fruit juices.
- 6. Estimation of dissolved oxygen in water samples.
- 7. Gravimetric estimation of sulphate as barium sulphate.
- 8. Gravimetric estimation of aluminium as oximato complex
- 9. Preparation of the following :potash alum, chrome alum, tetraamminecopper(II) sulphate monohydrate, potassium trioxalatoferrate(III) (any two, including one double salt and one complex).

Text and Reference Books

S. No	Name	Author(S)	Publisher
1	Vogel's Qualitative Inorganic Analysis (7 th Edition). ISBN- 13:978-0582218666,	G Svehla	Prentice Hall
2	Vogel's Quantitative Chemical Analysis (6 th Edition), ISBN- 13:978-0582226289,	_	Prentice Hall
3	Advanced Practical Inorganic Chemistry	Ayodha Singh	Campus Books 2002

ECONOMIC BOTANY AND BIOTECHNOLOGY

Course Code	BOT302	
Course Title	Economic Botany and Biotechnology	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	B.Sc Medical II year	
Course Objective	To study economically important plants and recombinant DNA	
	techniques.	

UNIT-I

Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilov's work

Cereals: Wheat, Rice, Maize -Origin, morphology, uses

Legumes: General account with special reference to Gram, Pea, Soybean,

UNIT-I

Spices: General account with special reference to clove and black pepper (Botanical name, family, part used morphology and uses)

Beverages: Tea, Coffee (morphology, processing, uses)

UNIT-III

Oils and Fats: General description with special reference to groundnut

Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)

Plant tissue culture: Micropropagation; haploid production through androgenesis and gynogenesis; brief account of embryo & endosperm culture with their applications UNIT-IV

Recombinant DNA Techniques: Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase- PCR. Hybridoma and monoclonal antibodies, ELISA and Immunodetection. Molecular diagnosis of human disease, Human gene Therapy.

Text and reference books:

S. no.	Title	Author	Publisher
1	Economic Botany in the Tropics	Kochhar, S.L.	MacMillan Publishers
			India
2	Plant Tissue Culture: Theory and	Bhojwani, S.S. and	Elsevier Science
	Practice	Razdan, M.K	
3	Molecular Biotechnology-	Glick, B.R., Pasternak,	ASM Press
	Principles and Applications of	J.J.	
	recombinant DNA		

ECONOMIC BOTANY AND BIOTECHNOLOGY PRACTICAL

Course Code	BOT304
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Course Title	Economic Botany and Biotechnology Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite	B.Sc Medical II year	
Course Objective	To impart practical knowledge about economically important	
	plants and recombinant DNA techniques.	

LIST OF EXPERIMENTS

- 1. Study of economically important plants: Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests
- 2. Familiarization with basic equipments in tissue culture.
- 3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.
- 4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

Text and reference books:

S. no.	Tit le	Author	Publisher
1	Economic Botany in the Tropics	Kochhar, S.L.	MacMillan Publishers
		20101	India
2	Plant Tissue Culture: Theory and	Bhojwani, S.S. and	Elsevier Science
	Practice	Razdan, M.K	
3	Molecular Biotechnology-	Glick, B.R., Pasternak,	ASM Press
	Principles and Applications of	J.J.	
	recombinant DNA		

BIOINFORMATICS

Course Code	BOT306	
Course Title	Bioinformatics	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	B.Sc Medical II year	
Course Objective	To give knowledge about creation and usefulness of plant	
	databases and softwares related to it.	

UNIT-I

Introduction to Bioinformatics: Introduction, Branches of Bioinformatics, Aim, Scope and Research areas of Bioinformatics.

Databases in Bioinformatics: Introduction, Biological Databases, Classification format of Biological Databases, Biological Database Retrieval System.

UNIT-II

Biological Sequence Databases: National Center for Biotechnology Information (NCBI): Tools and Databases of NCBI, Database Retrieval Tool, Sequence Submission to NCBI, Basic local alignment search tool (BLAST), Nucleotide Database, Protein Database, Gene Expression Database.

EMBL Nucleotide Sequence Database (EMBL-Bank): Introduction, Sequence Retrieval, Sequence Submission to EMBL, Sequence analysis tools.

UNIT-III

DNA Data Bank of Japan (DDBJ): Introduction, Resources at DDBJ, Data Submission at DDBJ. Protein Information Resource (PIR): About PIR, Resources of PIR, Databases of PIR, Data Retrieval in PIR.

Swiss-Prot: Introduction and Salient Features Sequence Alignments: Introduction, Concept of Alignment, Multiple Sequence Alignment (MSA), MSA by CLUSTALW, Scoring Matrices, Percent Accepted Mutation (PAM), Blocks of Amino Acid Substitution Matrix (BLOSUM).

UNIT-IV

Molecular Phylogeny: Methods of Phylogeny, Software for Phylogenetic Analyses, Consistency of Molecular Phylogenetic Prediction.

Applications of Bioinformatics: Structural Bioinformatics in Drug Discovery, Quantitative structure-activity relationship (QSAR) techniques in Drug Design, Microbial genome applications, Crop improvement.

Text and reference books:

S. no.	Title	Author	Publisher
1	Bioinformatics: Principles and	Ghosh Z. and Bibekanand M	Oxford University Press
	Applications		
2	Bioinformatics and Functional Genomics	Pevsner J	Wiley-Blackwell
3	Discovering Genomics, Proteomics and	Campbell A. M., Heyer L. J	Benjamin Cummings
	Bioinformatics	Carpy (2.00)	

BIOINFORMATICS PRACTICAL

Course Code	BOT308	
Course Title	Bioinformatics Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite	B.Sc Medical II year	
Course Objective	To give practical knowledge about creation and usefulness of	
	plant databases and softwares related to it.	

LIST OF EXPERIMENTS

- 1. Nucleic acid and protein databases.
- 2. Sequence retrieval from databases.
- 3. Sequence alignment.
- 4. Sequence homology and Gene annotation.
- 5. Construction of phylogenetic tree.

Text and reference books:

S. no.	Title	Author	Publisher
1	Bioinformatics: Principles and	Ghosh Z. and	Oxford University
	Applications	Bibekanand M	Press
2	Bioinformatics and Functional	Pevsner J	Wiley-Blackwell
	Genomics		
3	Discovering Genomics,	Campbell A. M., Heyer	Benjamin Cummings
	Proteomics and	L. J	
	Bioinformatics		E.

IMMUNOLOGY

Course Code	Z OO302	
Course Title	Immunology	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	B.Sc Medical II year	
Course Objective	To make students aware about the immunological reaction taking	
	place in your body.	
	To aware students about statistical methods used in biology.	

UNIT I

Overview of the Immune System: Introduction to basic concepts in immunology, components of immune system, principles of innate and adaptive immune system, Cells and Organs of the Immune System Haematopoiesis, Cells of immune system and organs (primary and secondary lymphoid organs) of the immune system

UNIT-II

Antigens: Basic properties of antigens, B and T cell epitopes, haptens and adjuvants. Antibodies: Structure, classes and function of antibodies, monoclonal antibodies, antigen antibody interactions as tools for research and diagnosis

UNIT-III

Working of the immune system: Structure and functions of MHC, exogenous and endogenous pathways of antigen presentation and processing, basic properties and functions of cytokines, Classical pathway of Complement system.

UNIT-IV

Immune system in health and Vaccines: General introduction to vaccines, various types of vaccines, various types of hypersensitivities, Introduction to concepts of autoimmunity and immunodeficiency,

Text and Reference Books:

S.No	Title	Author	Publisher
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1.	Immunology, VI Edition	Kindt, T. J., Goldsby, R.A.,	W.H. Freeman and
		Osborne, B. A. and Kuby, J	Company
		(2006)	
2.	Immunology, VII Edition	David, M., Jonathan, B., David,	Mosby, Elsevier
		R. B. and Ivan R. (2006)	Publication
3.	Text book of	Dr. P. Madhavee Latha	S. Chand publications
	Immunology		
4.	Cellular and Mole <mark>cul</mark> ar	Abbas, K. Abul and Lechtman H.	Saunders Publication.
	Immunology. V Edition	Andrew (2003.)	
5.	Biostatistics	P. Ramakrishnan	Saras Publications
		"ES SIM MICHAEL	
	THE PROPERTY AND ADDRESS.	A Company of the Comp	

IMMUNOLOGY

Course Code	ZOO304	
Course Title	Immunology	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite	B.Sc Medical II year	
Course Objective	To study histology of immune system and physiology of	
	immunological reactions; graphical representation of data	

LIST OF EXPERIMENTS

- 1. Demonstration of lymphoid organs
- 2. Histological study of spleen, thymus and lymph nodes through slides/photographs
- 3. Preparation of stained blood film to study various types of blood cells.
- 4. ABO blood group determination.
- 5. Demonstration of Immunoelectrophoresis
- 6. Demonstration of ELISA
- 7. Chromatography (Paper and TLC).

Text and reference books:

	Text and receiving JA, DISTE TAX AND HAB (PUNIS)				
S. no.	Title	Author	Publisher		
1	Immunology	Kindt, T. J., Goldsby, R.A.,	W.H. Freeman and		
		Osborne, B. A. and Kuby, J	Company		
2	Immunology	David, M., Jonathan, B., David, R.	Elsevier Publication		
		B. and Ivan R			
3	Cellular and	Abbas, K. Abul and Lechtman H.	Saunders Publication		
	Molecular	Andrew			
	Immunology				

REPRODUCTIVE BIOLOGY

Course Code	ZOO306
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Course Title	Reproductive Biology	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite B.Sc Medical II year		
Course Objective To aware students about the organs of reproduction and the		
	hormonal secretions and the role played by each hormone for the	
	development of reproductive organs in humans.	

UNIT-I

Reproductive Endocrinology: Gonadal hormones and mechanism of hormone action, steroids, glycoprotein hormones, and prostaglandins, hypothalamo – hypophyseal – gonadal axis, regulation of gonadotrophin secretion in male and female; Reproductive System: Development and differentiation of gonads, genital ducts, external genitalia, mechanism of sex differentiation.

UNI-II

Functional anatomy of male reproduction

Outline and histological of male reproductive system in rat and human; Testis: Cellular functions, germ cell, system cell renewal; Spermatogenesis: kinetics and hormonal regulation; Androgen synthesis and metabolism; Epididymal function and sperm maturation; Accessory glands functions; Sperm transportation in male tract

UNIT-III

Functional anatomy of female reproduction: Outline and histological of female reproductive system in rat and human; Ovary: folliculogenesis, ovulation, corpus luteum formation and regression; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (rat and human) and their regulation, changes in the female tract; Ovum transport in the fallopian tubes; Sperm transport in the

female tract, fertilization; Hormonal control of implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its regulation

UNIT-IV

Reproductive Health Infertility in male and female: causes, diagnosis and management; Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization, ET, EFT, IUT, ZIFT, GIFT, ICSI, PROST; Modern contraceptive technologies; Demographic terminology used in family planning.

Text and reference books:

S. no.	Title	Author	Publisher
1	Reproduction in Mammals	Austin, C.R. and Short,	Cambridge University
		R.V	Press
2	Endocrinology	Degroot, L.J. and Jameson,	W.B. Saunders and
		J.L.	Company
3	The Physiology of	Knobil, E	Raven Press Ltd
	Reproduction		

REPRODUCTIVE BIOLOGY PRACTICAL

Course Code	ZOO308	
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Course Title	Reproductive Biology Practical	
Type of course	Practical	
LTP	0 0 4	
Credits	2	
Course prerequisite B.Sc Medical II year		
Course Objective To aware students about the different techniques used in stuvarious types of cells involved in formation of reproductive		
	organs.	

LIST OF EXPERIMENTS

- 1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.
- 2. Examination of vaginal smear rats from live animals.
- 3. Surgical techniques: principles of surgery in endocrinology. Ovarectomy, hysterectorny, castration and vasectomy in rats.
- 4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.
- 5. Human vaginal exfoliate cytology.
- 6. Sperm count and sperm motility in rat
- 7. Study of modern contraceptive devices

Text and reference books:

S. no.	Title	Author	Publisher
1	Reproduction in Mammals	Austin, C.R. and Short,	Cambridge University
		R.V	Press
2	Endocrinology	Degroot, L.J. and	W.B. Saunders and
		Jameson, J.L.	Company
3	The Physiology of Reproduction	Knobil, E	Raven Press Ltd

INSECT, VECTOR AND DISEASES

Course Code	ZOO310	
Course Title	Insect, Vector And Diseases	
Type of course	Theory	
LTP	4 0 0	
Credits	4	
Course prerequisite	B.Sc Medical II year	
Course Objective	To aware students about the role different insects in spreading the	
	various diseases so that they can aware a general human being to	
	take precautionary measure from insects	

UNIT-I

Introduction to Insects:General Features of Insects, Morphological features, Head – Eyes, Types of antennae, Mouth parts w.r.t. feeding habits

Concept of Vectors: Brief introduction of Carrier and Vectors (mechanical and biological vector),

Reservoirs, Host-vector relationship, Vectorial capacity, Adaptations as vectors, Host Specificity

Unit II

Insects as Vectors: Classification of insects up to orders, detailed features of orders with insects as vectors – Diptera, Siphonaptera, Siphonaptera, Hemiptera

Dipteran as Disease Vectors: Dipterans as important insect vectors – Mosquitoes, Sand fly, Houseflies; Study of mosquito-borne diseases – Malaria, Dengue, Chikungunya, Viral encephalitis, Filariasis; Control of mosquitoes Study of sand fly-borne diseases – Visceral Leishmaniasis, Cutaneous Leishmaniasis, Phlebotomus fever; Control of Sand fly Study of house fly as important mechanical vector, Myiasis, Control of house fly UNIT-III

Siphonaptera as Disease Vectors: Fleas as important insect vectors; Host-specificity, Study of Flea-borne diseases – Plague, Typhus fever; Control of fleas

Siphunculata as Disease Vectors: Human louse (Head, Body and Pubic louse) as important insect vectors; Study of louse-borne diseases –Typhus fever, Relapsing fever, Trench fever, Vagabond's disease, Phthiriasis; Control of human louse

UNIT-IV

Hempitera as Disease Vectors: Bugs as insect vectors; Blood-sucking bugs; Chagas disease, Bed bugs as mechanical vectors, Control and prevention measures.

Text and reference books:

S. no.	Tit <mark>le (</mark>	Author	P ublisher
1	A General Text Book of	Imms, A.D	Chapman & Hall
	Entomology	00 - 00 - 00	
2	The Insects: Structure and	Chapman, R.F	Camb <mark>rid</mark> ge
	Function		University Press
3	Entomology and Pest	Pedigo L.P	Prentice Hall Publication
	Management	MARINE MARINE	
4	Integrated Vector	Mathews, G.	Wiley-Blackwell
	Management		

INSECT VECTORS AND DISEASES PRACTICAL

Course Code	ZOO312
Course Title	Insect, Vector And Diseases Practical
Type of course	Practical
LTP	0 0 4
Credits	2
Course prerequisite	B.Sc Medical II year
Course Objective	To give hands on training to the students about the different types
	of insects and their body parts which are involved in spreading
	disease, so that they will remain away from them.

LIST OF EXPERIMENTS

- 1. Study of different kinds of mouth parts of insects
- 2. Study of following insect vectors through permanent slides/ photographs: *Aedes, Culex, Anopheles, Pediculus humanus capitis, Pediculus humanus*

corporis, Phithirus pubis, Xenopsylla cheopis, Cimex lectularius, Phlebotomus argentipes, Musca domestica, through permanent slides/photographs

3. Study of different diseases transmitted by above insect vectors

Submission of a project report on any one of the insect vectors and disease transmitted

Text and reference books:

S. no.	Title	Author	Publisher	
1	A General Text Book of	Imms, A.D	Chapman & Hall	
	Entomology			
2	The Insects: Structure and	Chapman, R.F	Cambridge	
	Function	- DRG-	University Press	
3	Entomology and Pest	Pedigo L.P	Prentice Hall Publication	
	Management			
4	Integrated Vector	Mathews, G.	Wiley-Blackwell	
	Management			

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Course Code	CHM326			
Course Title	Instrumental Methods Chemical of Analysis			
Type of course	Theory			
LTP	4 0 0			
Credits	4			
Course prerequisite	B.Sc Medical II year			
Course Objective	The aim of this course is to impart theoretical knowledge to the			
	students about various spectroscopic methods, chromatographic			
	methods for analysis.			

UNIT-I

Introduction to spectroscopic methods of analysis: Recap of the spectroscopic methods covered in detail in the core chemistry syllabus: Treatment of analytical data, including error analysis. Classification of analytical methods and the types of instrumental methods. Consideration of electromagnetic radiation.

Infrared spectroscopy: Interactions with molecules: absorption and scattering. Means of excitation (light sources), separation of spectrum (wavelength dispersion, time resolution), detection of the signal (heat, differential detection), interpretation of spectrum (qualitative, mixtures, resolution), advantages of Fourier Transform (FTIR). Samples and results expected. Applications: Issues of quality assurance and quality control, Special problems for portable instrumentation and rapid detection.

UNIT-II

UV-Visible/ Near IR — emission, absorption, fluorescence and photoaccoustic. Excitation sources (lasers, time resolution), wavelength dispersion (gratings, prisms, interference filters, laser, placement of sample relative to dispersion, resolution), Detection of signal (photocells, photomultipliers, diode arrays, sensitivity and S/N), Single and Double Beam instruments, Interpretation (quantification, mixtures, absorption vs. fluorescence and the use of time,

photoaccoustic, fluorescent tags).

UNIT-III

Separation techniques *Chromatography:* Gas chromatography, liquid chromatography, supercritical fluids, Importance of column technology (packing, capillaries), Separation based on increasing number of factors (volatility, solubility, interactions with stationary phase, size, electrical field), Detection: simple vs. specific (gas and liquid), Detection as a means of further analysis (use of tags and coupling to IR and MS), Electrophoresis (plates and capillary) and use with DNA analysis.

Immunoassays and DNA techniques

Mass spectroscopy: Making the gaseous molecule into an ion (electron impact, chemical ionization), Making liquids and solids into ions (electrospray, electrical discharge, laser desorption, fast atom bombardment), Separation of ions on basis of mass to charge ratio, Magnetic, Time of flight, Electric quadrupole. Resolution, time and multiple separations,

Detection and interpretation (how this is linked to excitation).

UNIT-IV

Elemental analysis: Mass spectrometry (electrical discharges).

Atomic spectroscopy: Atomic absorption, Atomic emission, and Atomic fluorescence. Excitation and getting sample into gas phase (flames, electrical discharges, plasmas), Wavelength separation and resolution (dependence on technique), Detection of radiation (simultaneous/scanning, signal noise), Interpretation (errors due to molecular and ionic species.

matrix effects, other interferences).

NMR spectroscopy: Principle, Instrumentation, Factors affecting chemical shift, Spincoupling, Applications.

Electroanalytical Methods: Potentiometry & Voltammetry

Radiochemical Methods

X-ray analysis and electron spectroscopy (surface analysis)

Text and reference books:

S. no.	Title	Author	Publisher
1	Principles of Instrumental	Skoog, D.A. Holler	Cengage
	Analysis	F.J. & Nieman, T.A	Learning India Ed
2	Instrumental Methods of Analysis,	Willard, H.H.,	Wadsworth Publishing
	7 th Ed	Merritt, L.L., Dean,	Company Ltd.
	TION IN	J. & Settoe, F.A	
3	Physical Chemistry	P.W. Atkins	
4	Fundamentals of Molecular	C.N. Banwell	
	Spectroscopy		
5	Infrared Spectral Interpretations: A	Brian Smith	
	Systematic Approach		

INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS PRACTICAL

Course Code	CHM328		
Course Title	Instrumental Methods of Chemical Analysis		
	Practical		
Type of course	Practical		

LTP	0 0 4			
Credits	2			
Course prerequisite	B.Sc Medical II year			
Course Objective	The aim of this course is to impart practical knowledge to the			
_	students about various spectroscopic methods, chromatographic			
	methods for analysis.			

LIST OF EXPERIMENTS

- 1. Safety Practices in the Chemistry Laboratory
- 2. Determination of the isoelectric pH of a protein.
- 3. Titration curve of an amino acid.
- 4. Determination of the void volume of a gel filtration column.
- 5. Determination of a Mixture of Cobalt and Nickel (UV/Vis spec.)
- 6. Study of Electronic Transitions in Organic Molecules (i.e., acetone in water)
- 7. IR Absorption Spectra (Study of Aldehydes and Ketones)
- 8. Determination of Calcium, Iron, and Copper in Food by Atomic Absorption
- 9. Quantitative Analysis of Mixtures by Gas Chromatography (i.e., chloroform and carbon tetrachloride)
- 10. Separation of Carbohydrates by HPLC
- 11. Determination of Caffeine in Beverages by HPLC
- 12. Potentiometric Titration of a Chloride-Iodide Mixture
- 13. Cyclic Voltammetry of the Ferrocyanide/Ferricyanide Couple
- 14. Nuclear Magnetic Resonance
- 15. Use of fluorescence to do "presumptive tests" to identify blood or other body fluids.
- 16. Use of "presumptive tests" for anthrax or cocaine
- 17. Collection, preservation, and control of blood evidence being used for DNA testing
- 18. Use of capillary electrophoresis with laser fluorescence detection for nuclear DNA (Y chromosome only or multiple chromosome)
- 19. Use of sequencing for the analysis of mitochondrial DNA
- 20. Laboratory analysis to confirm anthrax or cocaine
- 21. Detection in the field and confirmation in the laboratory of flammable accelerants or explosives
- 22. Detection of illegal drugs or steroids in athletes
 23. Detection of pollutants or illegal dumping
- 23. Detection of pollutants or illegal dumping
- 24. Fibre analysis

At least 10 experiments to be performed.

Text and reference books:

S. no.	Title	Author	Publisher	
1	Principles of Instrumental	Skoog, D.A. Holler	Cengage	
	Analysis	F.J. & Nieman, T.A	Learning India Ed	
2	Instrumental Methods of Analysis,	Willard, H.H.,	Wadsworth Publishing	
	7 th Ed	Merritt, L.L., Dean, J.	Company Ltd.	
		& Settoe, F.A		

3	Physical Chemistry		P.W. Atkins			
4	Electrochemical r	nethods,	A.J.	Bard,	L.R.	Wiley, 1980.
	Fundamentals and Methods		Faulkn	er,		

