



Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS161	Title of the Course	Non Chordates-I “Protozoa to Helminthes”	L	T	P	C
Year	I	Semester	I	3	1	0	4
Pre-Requisite	10+2 with Biology	Co-requisite					
Course Objectives	This course is designed to enable the students to understand the general taxonomic rules on animal classification and the complex interactions among animals of different phyla. The students will acquire the knowledge about the distinguishing features of lower non chordates.						

Course Outcomes	
CO1	The students will learn about the diversity and classification of animals.
CO2	The students will learn about the characteristics of lower non-chordates. They will also learn about the structure, life-cycle and control of <i>Plasmodium</i> , <i>Monocystis</i> , <i>Fasciola hepatica</i> , <i>Taenia solium</i> , <i>Ascaris</i> and <i>Ancylostoma</i> .
CO3	The students will learn about the locomotion in Protozoa, Canal system in sponges, Organization of coelom and its types.
CO4	The expected outcome is to provide the students an in-depth understanding of colonial and social life in invertebrates.
CO5	The students will learn the physiological process of lower invertebrates and the relationship of the organ system

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	: Classification of protozoa	Outline of classification of animals (Chordates and non-chordates). Protozoa: General characters and classification up to classes; Locomotory Organelles and Locomotion in Protozoa; Plasmodium, Monocystis: - Structure, Life-cycle and Control.	8	CO1
2	: Classification of porifera	Porifera: General characters and classification up to classes; Sycon: - Morphology, Different types of cells, Canal System in Porifera.	8	CO2
3	Classification of cnidaria	Cnidaria: General characters and classification up to classes; Obelia: - Morphology of Obelia colony, Development Of Hydra, Polymorphism in Hydrozoa.	8	CO3
4	Classification of platyhelminthes	Platyhelminthes: General characters and classification up to classes; Fasciola hepatica, Taenia solium: - Structure, Life cycle, Pathogenicity & control measures.	8	CO4
5	Classification of nematehelminthes	Nematehelminthes: Ascaris and Ancylostoma: - Structure, Life cycle, Pathogenicity & control measures.	8	CO5

Reference Books:

1. Biodiversity and Quality of Life. Sengupta. Mc Millan India Pvt. Ltd.
2. Biology: P. H. Raven & G. B. Jhonson
3. Barnes, B.D. (1987). Invertebrate Zoology. 5th Edition, Saunders College Publishing.
4. Kotpal, R. L. (1988). Protozoa. Rastogi Publications
5. Marshall, A.J. and Williams, W.D. (1979). Text Book of Zoology Vol. I-Invertebrates, Macmillan.
6. Noble, E. R. and Noble, G. A. (1982). Parasitology-The Biology of Animal Parasites, Lea and Febiger, Philadelphia.
7. Ruppert, E.E. and Barnes, R.D. (1994). Invertebrate Zoology. 6th Edition, Saunders College Publishing.
8. Webb, J.E., Wallwork, J.A. and Elgood, J. H. (1981). Guide to Invertebrate Animals, English Language Book Society and Macmillan.

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1				3	1	3	3	3			
CO2	3	1				2	1	3	3	3			
CO3	3	1				1	1	2	3	3			
CO4	3	1				1	1	2	3	3			
CO5	3	1				1	1	3	3	3			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS203	Title of the Course	Cell biology and genetics	L	T	P	C
Year	I	Semester	I	3	1	0	4
Pre-Requisite	10+2 with Biology	Co-requisite					
Course Objectives	This course is designed to enable the students to understand the cell structure and its functions, signaltransduction and genetics.						

Course Outcomes	
CO1	Develop an understanding of the cell structure and their functions, cytoskeleton and prokaryotic and eukaryotic cells
CO2	Learn about Cell Division, Membrane transport, transduction, cell senescence and Programmed Cell Death.
CO3	Learn about Chromosomes, Chromosomal Variations, Chromosome mapping, structural and numerical aberrations
CO4	Learn about basic genetics, epistasis, Concepts of allosomes and autosomes, Linkage and Crossing Over.
CO5	Learn about mutations, human Genetics, DNA damage and repair.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Cell as a Basic unit of Living Systems	Discovery of cell, The Cell theory Ultrastructure of an eukaryotic cell – (both plant and animal cell). Structure and functions of cell organelles, Cytoskeletal structures (Microtubules, Microfilaments); cell motility.	8	CO1
2	Title of the unit: Cell Division	Cell cycle, mitosis and meiosis, Membrane transport: active and passive transport, introduction to signal transduction and its molecular mechanism, cell senescence, Programmed Cell Death.	8	CO2
3	Chromosomes: Structural Organization	Centromere, telomere, chromonema, euchromatin and heterochromatin, chemical composition and karyotype, nucleosomemodel, Special types of chromosomes: Salivary gland and Lampbrush chromosomes, Chromosomal Variations, Chromosome mapping, structural and numerical aberrations.	8	CO3
4	Mendelism	Mendel's laws of heredity, Test cross, Incomplete dominance and simple problems, Interaction of Genes: Supplementary factors, Comb pattern in fowls, Complementary genes: Flower color in sweet peas, Multiple factors: Skin color in human beings, Epistasis: Plumage colour in poultry, Multiple allelism: Blood groups in human beings, Concepts of allosomes and autosomes, XX-XY, XX-XO, ZW-ZZ, ZO-ZZ type, Linkage and Crossing Over, Mechanism and importance	8	CO4
5	Mutations	Spontaneous and induced mutations, Physical and chemical mutagens, Mutation at the molecular level, Mutations in plants, animals, and microbes for economic benefit of man. Human Genetics: Karyotype in man, inherited disorders: Allosomal (Klinefelter syndrome and Turner's syndrome), Autosomal (Down syndrome and Cri-Du- Chat syndrome). DNA Damage and Repair: Causes and Types of DNA damage, Major mechanisms of DNA repair: photoreactivation, nucleotide and base excision repairs, mismatch repair, SOS repair.	8	CO5

Reference Books:

1. Molecular Biology of cell – Bruce Alberts et al, Garland publications
2. Animal Cytology & Evolution – MJD, White Cambridge University Publications
3. Molecular Cell Biology – Daniel , Scientific American Books.
4. Cell Biology – Jack D. Burke, The William Twilkins Company.
5. Principles of Gene Manipulations – Old & Primrose, Black Well Scientific Publications.
6. Cell Biology & Molecular Biology – EDP Roberties & EMF Roberties, Sauder College.
7. Principles of Genetics – E.J. Gardener, M.J. Simmons and D.P. Snustad, John Wiley & Sons Publications

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1					2	2	2	1			
CO2	3	1					2	3	2	2			
CO3	3	1					2	3	2	3			
CO4	3	1					2	3	2	3			
CO5	3	1					2	3	2	3			

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS162	Title of the Course	Algae, Fungi, Bryophyta	L	T	P	C
Year	I	Semester	I	3	1	0	4
Pre-Requisite	10+2 with Biology	Co-requisite					
Course Objectives	This course is designed to enable the students to understand the general characteristics, habit, habitat, anatomy, morphology, thallus organization, reproduction, economic importance and Classification of algae, fungi, Lichens and Bryophytes.						

Course Outcomes	
CO1	Have basic knowledge of classification of algae, Economic importance and life Cycle
CO2	Learn about general features of fungi, Classification, thallus organization, cell wall composition, Reproduction and economic importance of fungi, life cycle
CO3	Have basic knowledge of Lichens
CO4	Identify General features of Bryophytes, Classification, Thallus organization, Reproduction and affinities of bryophytes, Economic importance of bryophytes with special reference to <i>Sphagnum</i>
CO5	Study Marchantiophyta – <i>Marchantia</i> ; Bryophyta - <i>Pogonatum</i> ; Anthocerotophyta – <i>Anthoceros</i> .

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Classification of algae	General features of algae, Classification, Range of thallus organization, Reproduction; Classification of algae, Economic importance and life Cycle with special reference to <i>Chlamydomonas</i> , <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Chara</i> and <i>Polysiphonia</i> .	8	CO1
2	Classification of fungi	General features of fungi, Classification, range of thallus organization, cell wall composition, Reproduction, economic importance of fungi, life cycle with special reference to <i>Rhizopus</i> (<i>Zygomycota</i>), <i>Alternaria</i> (<i>Ascomycota</i>), <i>Puccinia</i> , <i>Agaricus</i> (<i>Basidiomycota</i>)	8	CO2
3	Classification of lichens	Lichens: General account, classification, thallus organization, reproduction, physiology and role in environmental pollution; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance	8	CO3
4	Classification of Bryophytes	General features of Bryophytes, Classification, Thallus organization, Reproduction and affinities of bryophytes, Economic importance of bryophytes with special reference to <i>Sphagnum</i>	8	CO4
5	Classification of Marchantiophyta	General characters and life cycle with special reference to Marchantiophyta – <i>Marchantia</i> ; Bryophyta - <i>Pogonatum</i> ; Anthocerotophyta – <i>Anthoceros</i>	8	CO5

Reference Books:

1. Chapman V.J & Chapman D.J, The Algae, Macmillan India Ltd.
2. Fritsch F. B 1945, Structure and Reproduction of Algae Vol.I & II. Cambridge University Press.
3. Smith G.M 1955, Cryptogamic Botany Vol.I and II, McGraw Hill.
4. Vashishta B.R 1990, Botany for Degree Students, Vol 1,2 and 3. S.Chand & Co.
5. Singh V., Pandey P.C and Jain D.K 1998, A Text book of Botany for Undergraduate
6. Alexopoulos C.J & MIMS C.V 1988. Introductory Mycology, John Wiley & Sons.
7. Webster J 1970, Introduction to Fungi, Cambridge University Press.
8. Parihar N.S 1967, An Introduction to Embryophyta Vol I & II, General Book Depot.
9. Prempuri 1973, Bryophytes - A Broad perspective. Atmaram & Sons.

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1				2	1						
CO2	3	1				2	1						
CO3	3	1				2	1						
CO4	3	1				2	1						
CO5	3	1				2	1						

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21

Course Code	CH117	Title of the Course	General chemistry-I	L	T	P	C
Year	I	Semester	I	3	1	0	4
Pre-Requisite	10+2	Co-requisite					
Course Objectives	To learn about simple quantum mechanical treatments of atoms and molecules, atomic structures, periodic properties of elements, various electronic displacement effects in organic compounds, mechanisms of organic reactions. States of matters with an emphasis on the gaseous state.						

Course Outcomes

CO1	Explain the atomic structures based on quantum mechanics. Can write the electronic configuration of elements.
CO2	Justify the causes of periodicity and periodic properties of the different groups of elements.
CO3	Evaluate the state of hybridization, geometry of atoms, nucleophiles, electrophiles and various electron displacement effects
CO4	Investigate the mechanisms of organic reactions, design syntheses of organic molecules.
CO5	Explain various 'gas laws' governing the physical/chemical behaviour of gases.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Atomic Structure	Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, Schrodinger wave equation, significance of Ψ and Ψ^2 , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals. Aufbau and Pauli	8	CO1
2	Periodic Properties	Atomic and ionic radii, ionization energy, electron affinity and electronegativity definition, effective nuclear charge, methods of determination or evaluation, trends in periodic table and applications in predicting and explaining the chemical behavior.	8	CO2
3	Basic Concepts of Bonding in Organic Chemistry	Hybridisation, tetravalency of carbon, geometry of molecules; methane, ethane, ethylene, acetylene and benzene, Factors affecting covalent bond; Electron displacement effects, inductive, electromeric, resonance, hyperconjugation and steric effects.	8	CO3
4	Mechanism of Organic reactions	Homolytic and heterolytic bond breaking. Types of reagents-electrophiles and nucleophiles, Types of organic reactions. Energy considerations. Reactive intermediates-carbocations, carbanions, free radicals, carbenes, arynes and nitrenes (with examples). Assigning	8	CO4
5	Gaseous State	Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waals equation of state. Critical Phenomena: PV isotherms of real gases, continuity of states, the isotherms of van der Waals equation, relationship between critical constants and van der Waals constants, the law of corresponding states, reduced equation of state. Problems Molecular velocities: Root mean square, average and most	8	CO5

Reference Books:

1. New Concise Inorganic Chemistry by J.D. Lee Edition III Compton Printing Ltd London.
2. Principles of Inorganic Chemistry by HR Puri, R. Sharma & S.P. Jauhar, Vishal Publications Jalandhar.
3. Organic Chemistry, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International).
4. Modern Organic Chemistry, M. K. Jain and S.C. Sharma, Vishal Publications Jalandhar.
5. Physical Chemistry, P.W. Atkins, Oxford University Press.
6. Principles of Physical Chemistry, B.R. Puri & L.R. Sharma, Shoban Lal Nagin Chand & Co.

e-Learning Source:

1. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/104101090/lec1.pdf
2. https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/104106096/lec9.pdf
3. <https://ocw.mit.edu/high-school/chemistry/exam-prep/structure-of-matter/chemical-bonding/>
4. <https://www.youtube.com/watch?v=ZN06gfCAGWE> https://nptel.ac.in/content/syllabus_pdf/104105033.pdf

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1		2	1	1						
CO2	3	1	1		2	1	1						
CO3	3	1	2		2	1	1						
CO4	3	1	2		2	1	1						
CO5	3	1	2		2	1	1						

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21

Course Code	BS163	Title of the Course	Animal diversity Lab-1	L	T	P	C
Year	I	Semester	I	0	0	6	3
Pre-Requisite	10+2 with Biology	Co-requisite					
Course Objectives	The objective of this course is to have a firm foundation in the fundamentals of different animal phyla and to understand the importance of economic zoology.						

Course Outcomes

CO1	Understand how to prepare and study temporary and permanent slides
CO2	Describe different kinds of protozoans.
CO3	Understand and identify various animals from different phyla through specimens.
CO4	Learn to dissect Prawn and Pila.
CO5	Explain and differentiate between mouth parts of Anopheles and Culex.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Exp-01	Examination of pond water for different kinds of protozoans.	3	CO1-5
2	Exp-02	Permanent preparation of gemmule of Spongilla	3	CO1-5
3	Exp-03	Permanent preparation of parapodium of Neries	3	CO1-5
4	Exp-04	Permanent preparations of Septal nephridia of Pheretima	3	CO1-5
5	Exp-05	Permanent preparations of gill lamella of Pila	3	CO1-5
6	Exp-06	Dissections: Palaemon and Pila	3	CO1-5
7	Exp-07	Glycerine preparation of Proboscis of Musca	3	CO1-5
8	Exp-08	Mouth parts of male and female Anopheles and Culex	3	CO1-5
9	Exp-09	Study of the following specimens: Euplectella, Spongilla, Euspongia, Physalia, Euspongia, Corallium, Fungia, Madrepora, Metridium, Pennatula, Fungia, Neries, Heteroneries, Pheretima	3	CO1-5
10	Exp-10	Study of the following permanent slides: Different kinds of sponge spicules and sponging fibres of Euspongia, Amoeba, Euglena, Paramecium, Obelia, Aurelia, T.S. and L.S. of Sycon, Study of life history stages of Taenia, T.S. of Male and female Ascaris.	3	CO1-5

Reference Books:

1. Ruppert and Barnes, R.D. (2006). Invertebrate Zoology, VIII Edition. Holt Saunders International Edition.
2. Barnes, R.S.K., Calow, P., Olive, P.J.W., Golding, D.W. and Spicer, J.I. (2002). The Invertebrates: A New Synthesis, III Edition, Blackwell Science
3. Young, J. Z. (2004). The Life of Vertebrates. III Edition. Oxford university press. Pough H. Vertebrate life, VIII Edition, Pearson International.
4. Hall B.K. and Hallgrímsson B. (2008). Strickberger's Evolution. IV Edition. Jones and Bartlett Publishers Inc.

e-Learning Source:

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	1			1	3		2	3	3		
CO2	3	3	1			2	3	3	2	2	3		
CO3	3	3	1			2	3	3	2	1	3		
CO4	3	3	1			1	3	3	2	3	3		
CO5	3	3	1				3	3	2	1	3		

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	CH118	Title of the Course	Chemistry Practical-I	L	T	P	C
Year	I	Semester	I	0	0	6	3
Pre-Requisite	10+2 with Chemistry	Co-requisite					
Course Objectives	The purpose of the undergraduate chemistry Lab program at the Integral University is to provide the key knowledge base and laboratory resources to prepare students for careers as professionals in the field of chemistry, and various other industries..						

Course Outcomes	
CO1	Understand the basic analytical and technical skills and technical skills to work effectively in the various fields
CO2	Understand the basic titration methods and technical skills to work in the different fields of chemistry.
CO3	Able to detect presence of elements and functional group in organic compounds.
CO4	Remember to keep records of all performed experiments in the manner which is required in laboratory

10.Syllabus	
Exp-01	Preparation of standard solution related to normality & molarity.
Exp-02	Preparation of buffer solution, pH measurement.
Exp-03	Acid - base titration.
Exp-04	Oxidation-reduction (redox) titrations. a) To determine the strength of oxalic acid.
Exp-05	To determine the strength of potassium permanganate solution by using sodium thiosulphate solution.
Exp-06	To determine the strength of given copper sulphate solution by using sodium thiosulphate solution.
Exp-07	Complexometric titrations. a) To estimate the concentration of calcium ions with EDTA. b) To estimate the
Exp-08	Detection of element present in the given organic compounds.
Exp-09	Detection of functional group present in the given organic compounds. a) Carboxylic b) Phenolic c) Alcoholic
Exp-10	To determine the strength of ferrous ammonium sulphate (Mohr's salt) solution by using external indicator.

Reference Books:	
1.	Lee, J.D. Concise Inorganic Chemistry, Pearson Education.
2.	Huheey, J.E., Keiter, E.A., Keiter, R. L., Medhi, O.K. Inorganic Chemistry, Principles of Structure and Reactivity, Pearson Education 2006.
3.	Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford, 1970.
4.	Castellan, G. W. Physical Chemistry, Published by Narosa. Physical Chemistry, Puri Sharma & Pathania. Peter, A. & Paula, J. de. Physical Chemistry 9th Ed., Oxford University Press.

e-Learning Source:	
5.	https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/104101090/lec1.pdf
6.	https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/104106096/lec9.pdf https://ocw.mit.edu/high-school/chemistry/exam-prep/structure-of-matter/chemical-bonding/

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	1	1	2	1	3						
CO2	3	2	1	1	1	1	3						
CO3	3	1	1	1	1	1	2						
CO4	3	1	2	2	2	2	3						
CO5	2	2	2	2	2	2	3						

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS171	Title of the Course	Pteridophytes, gymnosperms, palaeobotany	L	T	P	C
Year	I	Semester	II	3	1	0	4
Pre-Requisite	10+2	Co-requisite					
Course Objectives	This paper deals to identify and classify the pteridophytes and gymnosperms. Understand the morphology, anatomy and life cycle of various genera of pteridophytes and gymnosperms along with their economic importance. Importance of studying this paper is highlighted reflecting on the elementary palaeobotany and geological time scale.						

Course Outcomes	
CO1	Understand the general features of pteridophytes, their classification, stellar organization and economic importance.
CO2	To understand the morphology, anatomy, development, vegetative and reproductive parts in various genera of pteridophytes.
CO3	The students will learn about the general characteristics of gymnosperms, classification, resemblances and differences of gymnosperms with pteridophytes and angiosperms. mapping, structural and numerical aberrations
CO4	To understand the morphology, anatomy, development, vegetative and reproductive parts in Coniferales.
CO5	Learn elementary palaeobotany including general account, types of fossils, methods of fossilization and geological time scale.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	General features of Pteridophytes	General features, Classification, Stellar organization; Homospory and Heterospory; Economic importance and life cycle of pteridophytes with special reference to <i>Pteris</i> .	8	CO1
2	Morphology, anatomy, development, vegetative & reproductive	Morphology, anatomy, development, vegetative and reproductive parts in Psilopsida - <i>Rhynia</i> ; Lycopsida - <i>Selaginella</i> ; Sphenopsida - <i>Equisetum</i> ; Filicopsida - <i>Adiantum, Marsilea</i> .	8	CO2
3	General characteristics of Gymnosperms	General characteristics of Gymnosperms, classification, resemblances and differences of Gymnosperms with Pteridophytes and Angiosperms. Economic importance and life Cycle with special reference to <i>Cycas</i> .	8	CO3
4	Morphology, anatomy, development, vegetative and reproductive parts in Coniferales – Pinus.	Morphology, anatomy, development, vegetative and reproductive parts in Coniferales – <i>Pinus</i> .	8	CO4
5	Elementary Palaeobotany	General account, types of fossils, methods of fossilization and geological time scale.	8	CO5

Reference Books:

1. Smith G.M 1955, Cryptogamic Botany Vol.I and II, McGraw Hill.
2. Vashishta B.R 1990, Botany for Degree Students, Vol 1,2 and 3. S.Chand & Co.
3. Singh V., Pandey P.C and Jain D.K 1998, A Text book of Botany for Undergraduate
4. Parihar N.S 1967, An Introduction to Embryophyta Vol I & II, General Book Depot.
5. Sporne K.R 1976, Morphology of Pteridophytes, B1 Publications.
6. Sharma O.P: Text book of Pteridophyta II edition:McMillan India Ltd.
7. Bhatnagar, S.P. and Moitra 1996. Gymnosperms. New Age International Limited, New Delhi.

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1				1	1						
CO2	3	1				1	1						
CO3	3	1				1	1						
CO4	3	1				1	1						
CO5	3	1				1	1						

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	CH119	Title of the Course	General chemistry-ii	L	T	P	C
Year	I	Semester	II	3	1	0	4
Pre-Requisite	10+2 with Chemistry	Co-requisite					
Course Objectives	The purpose of this course is to learn the structure and properties of ionic solids, shapes & geometries of molecules and their stereochemistry. Types and properties of colloids, first law of thermodynamics and related calculations.						

Course Outcomes	
CO1	Analyze the properties, structure of ionic solids by applying Born-Haber cycle, Fajan's rule etc.
CO2	Predict the geometry and shape of molecules by applying VB & VSEPR theories. Predict the properties of molecules by applying MO theory
CO3	Interpret the reactivity and stability of an organic molecule based on structure, including conformation and stereochemistry.
CO4	Able to prepare different types of colloids.
CO5	Understand the concepts of thermodynamics, different thermodynamic quantities such as heat and work and their measurements.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Ionic Solids	Ionic structures, radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and solubility of ionic solids, polarizing power and polarizability of ions, Fajan's rule. Metallic bond-free electron, valence bond and band theories.	8	CO1
2	Chemical Bonding	Covalent Bond; Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions. Valence shell electron pair repulsion (VSEPR) theory to NH ₃ , H ₃ O ⁺ , SF ₄ , ClF ₃ , ICl ₂ ⁻ and H ₂ O. MO theory, homonuclear and heteronuclear (CO and NO) diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.	8	CO2
3	Introduction to Stereochemistry of organic Compounds	Concept of isomerism. Optical isomers, enantiomers and diastereomers, chiral and achiral molecules with two stereogenic centres, absolute configuration, sequences rules, D & L and R & S systems of nomenclature. Geometrical isomerism - E & Z system of nomenclature, in alkenes oximes and cyclopropane derivative compounds.	8	CO3
4	Colloidal State	Definition of colloids, classification of colloids. Sols: properties -kinetic, optical and electrical; stability of colloids, protective colloids, Hardy-Schulze rule, gold number. Emulsions: types of emulsions, preparation. Gels: classification, preparation and properties	8	CO4
5	Thermodynamics	First law of thermodynamics: statement, definition of internal energy and enthalpy, Heat capacity. Heat capacities at constant volume and pressure and their relationship. Joule-Thomson coefficient and inversion temperature. Calculation of w, q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process. Problems.	8	CO5

Reference Books:
<ol style="list-style-type: none"> 1. New Concise Inorganic Chemistry by J.D. Lee Edition III Compton Printing Ltd London. 2. Principles of Inorganic Chemistry by HR Puri, R. Sharma & S.P. Jauhar, Vishal Publications Jalandhar. 3. Basic Inorganic Chemistry F.A. Cotton and G. Wilkinson III Edition. 4. Organic Chemistry, S.M. Mukherji, S.P. Singh and R.P. Kapoor, Wiley Eastern Ltd. (New Age International). 5. Modern Organic Chemistry, M. K. Jain and S.C. Sharma, Vishal Publications Jalandhar. 6. Physical Chemistry, P.W. Atkins, Oxford University Press.. K. Ghatak, "Physical Optics" (Tata McGraw Hill).

e-Learning Source:
<ol style="list-style-type: none"> 1. https://www.youtube.com/watch?v=O82d8aiIS5Y 2. https://ocw.mit.edu/high-school/chemistry/exam-prep/structure-of-matter/chemical-bonding/ 3. https://nptel.ac.in/courses/104103110/

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	2	1	1	2	2	3							
CO2	3	1	1	1	2	2	3							
CO3	3	2	1	1	1	1	3							
CO4	3	1	2	1	1	3	3							
CO5	3	2	2	1	2	2	3							

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS172	Title of the Course	Non chordates-ii "annelida to echinodermata	L	T	P	C
Year	I	Semester	II	3	1	0	4
Pre-Requisite	10+2 with Biology	Co-requisite					
Course Objectives	This course is designed to enable the students to understand the general taxonomic rules on animal classification and the complex interactions among animals of different phyla. The students will acquire the knowledge about the distinguishing features of higher non chordates.						

Course Outcomes	
CO1	The students will understand General characters and classification up to classes of annelida.
CO2	The students will understand General characters and classification up to classes of arthropoda.
CO3	The students will understand General characters and classification up to classes of mollusc.
CO4	The students will understand General characters and classification up to classes of echinodermata.
CO5	The students will understand the general characters of Protochordata, Urochordata and Cephalochordata.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Annelida	General characters and classification up to classes; Nereis and Hirudinaria: - Habits and Morphology; Metamerism in Annelida.	8	CO1
2	Arthropoda	General characters and classification up to classes; Palaemon:-Habits and Morphology, Apis:- Colony; Metamorphosis in Insects.	8	CO2
3	Mollusca	General characters and classification up to classes; Lamellidens and Pila:-Habits and Morphology, Torsion in Gastropods.	8	CO3
4	Echinodermata	General characters and classification up to classes; Pentaceros: - Habits and Morphology; Water-vascular system in Asteroidea.	8	CO4
5	Protochordates	General features of Protochordata; General Characters of Hemichordata and Affinities of Balanoglossus.	8	CO5

Reference Books:

- Biodiversity and Quality of Life. Sengupta. Mc Millan India Pvt. Ltd.
- Biology: P. H. Raven & G. B. Jhonson
- Barnes, B.D. (1987). Invertebrate Zoology. 5th Edition, Saunders College Publishing.
- Kotpal, R. L. (1988). Protozoa. Rastogi Publications
- Marshall, A.J. and Williams, W.D. (1979). Text Book of Zoology Vol. I-Invertebrates, Macmillan.
- Noble, E. R. and Noble, G. A. (1982). Parasitology-The Biology of Animal Parasites, Lea and Febiger, Philadelphia.
- Ruppert, E.E. and Barnes, R.D. (1994). Invertebrate Zoology. 6th Edition, Saunders College Publishing.
- Webb, J.E., Wallwork, J.A. and Elgood, J. H. (1981). Guide to Invertebrate Animals,
- English Language Book Society and Macmillan.

e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1				1	1	3	2				
CO2	3	1				1	1	3	2				
CO3	3	1				1	1	3	2	1			
CO4	3	1				1	1	3	2				
CO5	3	1				1	1	3	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS 233	Title of the Course	Animal physiology	L	T	P	C
Year	I	Semester	II	3	1	0	4
Pre-Requisite	10+2 with Biology	Co-requisite					
Course Objectives	The students will gain fundamental knowledge of animal physiology.						

Course Outcomes	
CO1	Understand the process of digestion and absorption.
CO2	Understand blood and cardiovascular system.
CO3	Students will gain knowledge of the muscle system, nervous system.
CO4	Students are taught the detailed concepts of respiration, excretion and osmoregulation.
CO5	Students gain fundamental knowledge of reproductive and endocrine systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Digestion and absorption	Role of salivary glands, liver, pancreas and intestinal glands. Digestion and absorption of carbohydrates, lipids and	8	CO1
2	Blood	Composition of blood, blood cells, plasma proteins and Rh factor; Blood coagulation – mechanism and regulation.	8	CO2
3	Respiration	Respiratory volumes, Haemoglobin and oxygen transport, carbon dioxide transport, Bohr’s effect and chloride shift. Excretion and osmoregulation: Structure of nephron, urine formation and its regulation; excretory product.	8	CO3
4	Muscle system	Muscles and Movement, Skeletal, cardiac and smooth muscle. Nervous system: central and peripheral nervous system, nerve impulse – its conduction and synaptic transmission, neurotransmitters.	8	CO4
5	Endocrine system	Endocrine glands and their functions; Nature of hormones; Regulation of hormone secretion; Mode of action of hormones. Reproductive system: testis, ovary, Spermatogenesis, Oogenesis, Totipotency.	8	CO5

Reference Books:
1. Textbook of Medical Physiology by Guyton. A.C., H. Sanders Philadelphia. 1988.
2. Physiological basis of Medical practice, West J.B., Best and Taylor.
3. Introduction to Physiology by Davidson H and Segal M.B. Academic Press.
4. Fox S I – Human Physiology, (McGraw Hill, 1998, ISBN: 0071157069)
5. Moffett D and Schauf C L – Human Physiology: Foundations & Frontiers, (Mosby, 1993, ISBN: 801669030)
6. Seeley R, Stephens T and Tate P – Anatomy & Physiology, (McGraw-Hill, 1999, ISBN: 0071169881)
7. Sherwood L – Human Physiology: From Cells to Systems, (Wadsworth Publishing, 2000, ISBN: 0534568262)
e-Learning Source:

Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1					2	2	3	1			
CO2	3	1					2	2	3	1			
CO3	3	1					2	2	3	1			
CO4	3	1					2	2	3	1			
CO5	3	1					2	2	3	1			

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	BS174	Title of the Course	Plant diversity lab-I	L	T	P	C
Year	1	Semester	II	0	0	6	3
Pre-Requisite	10+2	Co-requisite					
Course Objectives	This course is designed to enable the students to understand the general characteristics, habit, habitat, anatomy, morphology, thallus organization of algae, fungi, Lichens, Bryophytes, pteridophytes and gymnosperms. Students will also understand the types and Parts of inflorescence and flowers.						

Course Outcomes	
CO1	Identify and analyze dicot and monocot roots, stems and leaves.
CO2	Learn about general features of algae and fungi.
CO3	Identify and Learn basics of bryophytes, pteridophytes and gymnosperms.
CO4	Identify types of seed and fruit.
CO5	Study morphology of flower parts and inflorescence.

Unit	Title of the	Content of Unit	Contact Hrs.	Mapped CO
1	Exp-1	Transverse section of dicot and monocot roots	6	CO1
1	Exp-2	Transverse section of dicot and monocot stems	6	CO1
1	Exp-3	Transverse section of dicot and monocot leaves	6	CO1
2	Exp-4	Study of one example each of algae and fungi	6	CO2
3	Exp-5	Study of one example each of bryophyte, pteridophyte, gymnosperm	6	CO3
4/5	Exp-6	Morphology study of flower parts, inflorescence, seed, fruit types	6	CO4/CO5

Reference Books:
1. Bahadur, B., Rajam, M.V., Sahijram, L., Krishnamurthy, K.V. (Eds.). Plant Biology and Biotechnology. Volume I: Plant Diversity, Organization, Function and Improvement 2. James Bidlack, Shelley Jansky, Kingsley R Stern. Laboratory Manual for Stern's Introductory Plant Biology.

e-Learning Source:

PO- PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1				1	1						
CO2	3	1				2	1						
CO3	3	1				2	1						
CO4	3	1				1	1						
CO5	3	1				2	1						

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	Sign & Seal of HoD
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Integral University, Lucknow

Effective from Session: 2020-21

Course Code	CH120	Title of the Course	Chemistry Practical-II	L	T	P	C
Year	I	Semester	II	0	0	6	3
Pre-Requisite	10+2	Co-requisite					
Course Objectives	The purpose of the undergraduate chemistry Lab program at the Integral University is to provide the key knowledge base and laboratory resources to prepare students for careers as professionals in the field of chemistry, and various other industries.						

Course Outcomes

CO1	Remember to keep records of all performed experiments in the manner which is required in laboratory.
CO2	Able to Evaluate water quality parameters like chloride content and alkalinity.
CO3	Understand the basic titration methods and technical skills to work in the different fields of chemistry.
CO4	Know about the principles of qualitative and quantitative analysis of inorganic mixtures.
CO5	Analyze the importance of personal safety and care of equipment's and chemicals.

10. Syllabus

Exp-01	To determine the solubility of benzoic acid at different temperatures and to determine ΔH of the dissolution process.
Exp-02	To determine the enthalpy of solution of solid calcium chloride and calculate the lattice energy of calcium chloride from its enthalpy data using Born Haber Cycle.
Exp-03	To determine the heat of solution of KNO_3 by solubility method.
Exp-04	Estimation of hardness of water by EDTA.
Exp-05	Determination of R_f values and identification of organic compounds
Exp-06	Separation of green leaf pigments (spinach leaves may be used).
Exp-07	Preparation of separation of 2, 4-dinitrophenylhydrazones of acetone, 2-butanone, hexan-2, and 3-one using toluene and light petroleum (40:60).
Exp-08	Determination of R_f values and identification of organic compounds: Separation of a mixture of D, L – alanine, glycine, and L-Leucine using n-butanol: acetic acid: water (4:1:5), Spray reagent – ninhydrin.

Reference Books:

1. Advance Practical Chemistry: Jagdamba Singh, L.D.S Yadav, Jaya Singh, I.R. Siddiqui, Pragati Edition.
2. Practical Organic Chemistry, A.I. Vogel.
3. Practical Physical Chemistry: B. Viswanathan and P.S. Raghavan.
4. Experimental Inorganic Chemistry – W.G. Palmer.

e-Learning Source:

<https://www.fandm.edu/uploads/files/79645701812579729-genchem-reference-for-web.pdf>
<http://file.akfarmahadhika.ac.id/E-BOOK/12-1213-akfarmahad-16-1-vogelqu-d.pdf>
<https://faculty.psau.edu.sa/filedownload/doc-6-pdf-f06110ef2e1e1ae119cbacf71dd17732-original.pdf> <https://www.stem.org.uk/resources/collection/3959/practical-chemistry>

PO- PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2		3	1	2						
CO2	3	1	1		2		2						
CO3	3	1	2		1	1	2						
CO4	3	1	1		1	1	2						
CO5	2	1	1		2	1	2						

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator

Sign & Seal of HoD