



**New CBCS Scheme of Instruction &
Syllabi of
B.Sc.B.Ed.**

(Zoology, Botany & Chemistry)
(Effective from the academic session 2020- 2021)

Invertis Institute of Education

INVERTIS UNIVERSITY

Invertis Village, Bareilly-Lucknow NH-24,

Bareilly (U. P.) - 243123

India

The Process for Establishing the PEO's

The PEOs are established through the following process steps:

STEP 1: Vision and Mission of the Education Department are taken into consideration to interact with various stake holders, and establish the PEO's

STEP 2: The Head of the Department and other Senior Faculty prepares the draft version of PEOs and POs.

STEP 3: The draft version is discussed with stakeholders and their views are collected by the head of the department.

STEP 4: Head of the department reviews and analyzes the PEOs and POS and submits them to departmental committee.

STEP 5: The Departmental committee deliberates on the recommendations and freezes the PEOs and POs and submits them to the BOS for final approval.

The Program curriculum is designed by incorporating inputs from members of Board of Studies and Academic council and industry.

- ❖ Inputs are also obtained from alumni and other stakeholders.
- ❖ Therefore, PEOs are established, checked for consistency with the mission statement of the department.

PROGRAM OUTCOMES (POs): B.SC.B.Ed.

Program Outcomes (POs)		
PO1	Educational knowledge	Develop a conceptual understanding of the fundamental physical principles described above.
PO2	Problem analysis	Identify the relationship between the conceptual description of nature and its mathematical expression.
PO3	Interpersonal Skills	Examine the mathematical description of these principles that can be used to develop devices, structures, and technologies that are useful for mankind.
PO4	Critical thinking Skills	Use the mathematical description of these principles to develop problem solving skills that will benefit your future career.
PO5	Conduct investigations of problems	Students should be able to design, conduct, record, analyze, and explain the results of chemical experiments.
PO6	Use of Modern tools	Students should be able to use and/or identify methods by which to solve chemical problems.
PO7	Ethics	Develop understanding about teaching, pedagogy, school management and community involvement.
PO8	Individual and teamwork	Exhibit the leadership capacity and teamwork skills for decision making.
PO9	Communication skill	An ability to Demonstrate effective communication.
PO10	Subject specification	Make use of subject specific pedagogical knowledge and skills.
PO11	Holistic Development	Practice skills and approaches for enhancing understanding of subject matter knowledge to be taught in secondary schools.
PO12	Life-long learning	Build skills and abilities of communication, reflection, art, aesthetics, theatre, self expression and ICT.

CHOICE BASED CREDIT SYSTEM (CBCS)

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Therefore, it is necessary to introduce uniform grading system in the entire higher education in India. This will benefit the students to move across institutions within India to begin with and across countries. The uniform grading system will also enable potential employers in assessing the performance of the candidates. In order to bring uniformity in evaluation system and computation of the Cumulative Grade Point

Average (CGPA) based on student's performance in examinations, the UGC has formulated the guidelines to be followed.

Outline of Choice Based Credit System:

1. Core Course: A course, which should compulsorily be studied by a candidate as a core requirement is termed as a Core course.

2. Elective Course: Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

2.1 Discipline Specific Elective (DSE) Course: Elective courses may be offered by the main discipline/subject of study is referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).

2.2 Dissertation/Project: An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called dissertation/project.

2.3 Generic Elective (GE) Course: An elective course chosen generally from an unrelated discipline/subject, with an intention to seek exposure is called a Generic Elective. P.S.: A core course offered in a discipline/subject may be treated as an elective by other discipline/subject and vice versa and such electives may also be referred to as Generic Elective.

3. Ability Enhancement Courses (AEC)/Competency Improvement Courses/Skill Development Courses/Foundation Course: The Ability Enhancement (AE) Courses may be of two kinds: AE Compulsory Course (AECC) and AE Elective Course (AEEC). "AECC" courses are the courses based upon the content that leads to Knowledge enhancement. They ((i) Environmental Science, (ii) English/MIL Communication) are mandatory for all disciplines. AEEC courses are value-based and/or skill-based and are aimed at providing hands-on-training, competencies, skills, etc.

3.1 AE Compulsory Course (AECC): Environmental Science, English Communication/MIL Communication.

3.2 AE Elective Course (AEEC): These courses may be chosen from a pool of courses designed to provide value-based and/or skill-based instruction.

Project work/Dissertation is considered as a special course involving application of knowledge in solving / analyzing /exploring a real life situation / difficult problem. A Project/Dissertation work would be of 6 credits. A Project/Dissertation work may be given in lieu of a discipline specific elective paper.

Structure of B.Sc.B.Ed. (ZBC) CBCS

YEAR	SEMESTER	CORE COURSE	ABILITY ENHANCEMENT COMPULSORY COURSE (AECC)	ENHANCEMENT COURSE	SKILL ENHANCEMENT COURSE (SEC)	DISCIPLINE SPECIFIC ELECTIVES (DSE)	GENERIC ELECTIVE (GE)	
1	I	DSC 1A			SEC 1 (BED151)	DSE-1 EDUCATIONAL TECHNOLOGY		
		DSC 2A	AECC-1					
		DSC 3A						
		DSC 1A (P)						
		DSC 2A (P)						
	II	DSC 1B	AECC-2 EPC-I				DSE-2 ICT-I	GE-1 (SG/NSS/NCC)
		DSC 2B						
		DSC 3B						
		DSC 1B (P)						
		DSC 2B (P)						
2	III	DSC 2C			SEC-2 (BED351)	DSE-3 SOCIOLOGICAL ASPECT		
		DSC-3C						
		DSC-1C(P)						
		DSC-2C(P)						
		DSCE-3						
	IV	DSC-1D	AECC-3 EPC-II			SEC-3 (BED461)	DSE-4 CLASSROOM MANAGEMENT	
		DSC-2D						
		DSC-3D						
		DSC-1D(P)						
		DSC-2D(P)						
3	V	DSCE-4	AECC-4		SEC-4 (BED551)	DSE-5 ICT-II	GE-2 GEN. HINDI	
		DSC-1E						
		DSC-2E						
		DSC-3E						
		DSC-1E(P)						
	VI	DSC-2E(P)						
		DSCE-5						
		DSCE-6	AECC-5			SEC-5 (BED651)		GE-3 OPEN EDUCATIONAL RESOURCES
		DSC-1F						
		DSC-2F						
4	VII	DSC-3F						
		DSC-1F(P)						
		DSC-2F(P)						
		DSCE-7						
		DSCE-8						
	VIII	DSCE-9	AECC-6 (ENVIRONMENTAL.)			SEC-6 (BED771) SEC-7 BED861	DSE-6 BOD081/BOD082/BOD0 83	GE-4 EDUCATIONAL ENTREPRENEURS HIP
		DSCE-10						
		DSCE-11						
		DSCE-12						

Details of Course under B.Sc.B.Ed (ZBC)

Course	Theory+Practical	*Credits Theory+Tutorial
Core Course (28 Papers)	2X6=12	4x24=96
Core Course Practical / Tutorial* (12 Papers)		1X12=12
Discipline Specific Elective (06 Papers)		2X3=6 3X1=3 4X2=8
Generic Elective/Interdisciplinary (03 papers)		1X1=1 2X3=6
SKILL ENHANCEMENT COURSE (SEC) (06 papers)		1X2=2 2X4=8 12X1=12
Ability Enhancement Courses Ability Enhancement Compulsory Courses (4 Papers of 2 credit each) (2 Papers of 1 credit each) 1X2=2		2X4=8
TOTAL		176

I-SEMESTER										
S.N o.	Course code	Course Title	Category	L	T	P	CA	EE	TOTAL	CREDIT
1	BEB109	Zoology I	DSC-1A	3	1	0	30	70	100	4
2	BEB110	Botany I	DSC-2A	3	1	0	30	70	100	4
3	BEB106	Chemistry I	DSC-3A	3	1	0	30	70	100	4
4	BEB153	Life Science Lab – I	DSC-1A(P)	0	0	2	10	15	25	1
5	BEB151	Chemistry Lab – I	DSC 3A(P)	0	0	2	10	15	25	1
6	BED101	Childhood and Growing Up	DSCE-1	3	1	0	30	70	100	4
7	BED102	English language and communication	AECC-1	2	0	0	15	35	50	2
8	BED103	Educational Technology	DSE-1	2	1	0	15	35	50	2
9	BED151	Practicum I: Psychology practical	SEC-1	0	0	2	10	15	25	1
			Total	16	5	6	180	395	575	23
II-SEMESTER										
S.N O.	Course code	Course Title	Category	L	T	P	CA	EE	TOTAL	CREDIT
1	BEB209	Zoology II	DSC-1B	3	1	0	30	70	100	4
2	BEB210	Botany II	DSC-2B	3	1	0	30	70	100	4
3	BEB206	Chemistry II	DSC-3B	3	1	0	30	70	100	4
4	BEB253	Life Science Lab – II	DSC-1B(P)	0	0	2	10	15	25	1
5	BEB251	Chemistry Lab – II	DSC-3B(P)	0	0	2	10	15	25	1
6	BED201	Contemporary India And Education	DSCE-2	3	1	0	30	70	100	4
7	BED203	ICT in Education-I	DSE-2	2	1	0	15	35	50	2
8	BED261	EPC – I: Reading and Reflecting on Texts	AECC-2	2	1	0	15	35	50	2
9	BED251	SCOUT AND GUIDE CAMP/ NSS/NCC	GE-1	0	0	2	10	15	25	1
			Total	16	6	6	180	395	575	23

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III-SEMESTER										
S.N O.	Course code	Course Title	Category	L	T	P	CA	EE	TOTAL	CREDIT
1	BEB309	Zoology III	DSC-1C	3	1	0	30	70	100	4
2	BEB310	Botany III	DSC-2C	3	1	0	30	70	100	4
3	BEB306	Chemistry III	DSC-3C	3	1	0	30	70	100	4
4	BEB353	Life Science Lab – III	DSC-1C(P)	0	0	2	10	15	25	1
5	BEB351	Chemistry Lab – III	DSC-3C(P)	0	0	2	10	15	25	1
6	BED301	Development of Education System in India	DSCE-3	3	1	0	30	70	100	4
7	BED302	Sociological Aspect of Education	DSE-3	2	1	0	25	50	75	3
8	BED351	CULTURAL ACTIVITIES, SPORTS AND YOGA	SEC-2	0	0	2	10	15	25	1
			TOTAL	14	5	6	175	375	550	22
IV-SEMESTER										
S.NO.	Course code	Course Title	Category	L	T	P	CA	EE	TOTAL	CREDIT
1	BEB409	Zoology IV	DSC-1D	3	1	0	30	70	100	4
2	BEB410	Botany IV	DSC-2D	3	1	0	30	70	100	4
3	BEB406	Chemistry IV	DSC-3D	3	1	0	30	70	100	4
4	BEB453	Life Science Lab – IV	DSC-1D(P)	0	0	2	10	15	25	1
5	BEB451	Chemistry Lab-IV	DSC-3D(P)	0	0	2	10	15	25	1
6	BED401	Teaching, Learning and Assessment	DSCE-4	3	1	0	30	70	100	4
7	BED402	Classroom Management	DSE-4	3	1	0	30	70	100	4
8	BED461	EPC – II: Educational Excursion / Art and Craft Workshop	AECC-3	0	0	2	10	15	25	1
9	BED471	School Internship – I for School Observation (Two Week)	SEC-3	0	0	0	0	50	50	2
			Total	15	5	6	180	445	625	25

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V-SEMESTER										
S.N O.	Course code	Course Title	Category	L	T	P	CA	EE	TOTAL	CREDIT
1	BEB509	Zoology –V	DSC-1E	3	1	0	30	70	100	4
2	BEB510	Botany -V	DSC-1E	3	1	0	30	70	100	4
3	BEB506	Chemistry-V	DSC-2E	3	1	0	30	70	100	4
4	BEB553	Life science Lab V	DSC-1E(P)	0	0	2	10	15	25	1
5	BEB551	Chemistry Lab-V	DSC-2E(P)	0	0	2	10	15	25	1
6	BED503	Pedagogy of Physical Science	DSCE-5	2	0	0	15	35	50	2
7	BED505	Pedagogy of Biological Science	DSCE-6	2	0	0	15	35	50	2
8	BED506	ICT in Education-II	DSE-5	2	1	0	15	35	50	2
9	BED504	GENERAL HINDI	GE-2	2	0	0	15	35	50	2
10	BED551	Practicum IV : Micro Teaching, Preparation of Teaching Aid & Construction of Achievement/ Diagnostic Test	SEC-4	0	0	4	15	35	50	2
11	BED561	EPC-III Drama and Art in Education	AECC-4	0	0	2	10	15	25	1
			TOTAL	17	4	10	195	430	625	25
VI-SEMESTER										
S.N O.	Course code	Course Title	Category	L	T	P	CA	EE	TOTAL	CREDIT
1	BEB609	Zoology VI	DSC-1F	3	1	0	30	70	100	4
2	BEB610	Botany VI	DSC-1F	3	1	0	30	70	100	4
3	BEB606	Chemistry VI	DSC-2F	3	1	0	30	70	100	4
4	BEB653	Life Science Lab VI	DSC-1F(P)	0	0	2	10	15	25	1
5	BEB651	Chemistry lab VI	DSC-2F(P)	0	0	2	10	15	25	1
6	BED603	Pedagogy of Physical Science –II	DSCE-7	2	0	0	15	35	50	2
7	BED605	Pedagogy of biological Science-II	DSCE-8	2	0	0	15	35	50	2
8	BED606	Open Educational Resources	GE-3	2	0	0	15	35	50	2
9	BED671	School Internship – II for Practice Teaching (Two Week)	AECC-5	0	0	0	0	50	50	2
10	BED651	Practicum V : Workshop on Preparation for Teaching & Simulation Teaching	SEC-5	0	0	2	50	0	50	2
			TOTAL	17	3	4	205	395	600	24

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Semester VII

Sr. No.	CODE	Course Title	CATEGORY	L	T	P	CA	EE	TOTAL	CREDIT
1	BED771	SEC	SEC-6	0	0	0	50	250	300	12
TOTAL				0	0	0	50	250	300	12

Semester VIII

Sr. No.	CODE	Course Title	CATEGORY	L	T	P	CA	EE	TOTAL	CREDIT
1	BED801	Inclusive Education	DSCE-9	3	1	0	30	70	100	4
2	BEB803	Gender, School & Society	DSCE-10	2	0	0	15	35	50	2
3	BEB804	Educational Measurement & Evaluation	DSCE-11	3	1	0	30	70	100	4
4	BED805	Curriculum Development	DSCE-12	2	0	0	15	35	50	2
5	BOD081/BOD082 /BOD083	DSE-6	DSE-6	3	1	0	30	70	100	4
6	BED802	Environment Education	AECC-6	2	0	0	15	35	50	2
7	BED861	SEC-7	SEC-7	0	0	2	0	0	50	2
8	BED806	EDUCATIONAL ENTERPRENUERSHIP	GE-4	2	0	0	15	35	50	2
TOTAL				17	3	2	150	350	550	22

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Core Courses-1

S.NO.	THEORY	SUBJECT	PRACTICAL
1	Basics of inorganic Chemistry I	Life Science Lab – I	
2	Non-Chordate and Cell Biology	Chemistry Lab- I	
3	Diversity of Viruses, Bacteria, Algae, Lichens, & Fungi	Life Science Lab – II	
4	Basics of Organic Chemistry II	Chemistry Lab – II	
5	Evolution, Developmental Biology and Environmental II	Life Science Lab – III	
6	Diversity of Bryophytes, Pteridophytes, Gymnosperms & Angiosperms	Chemistry Lab – III	
7	Basics of Inorganic Chemistry III	Life Science Lab – IV	
8	Chordate and Comparative Anatomy & Histology	Inorganic Chemistry Lab – IV	
9	Physiology, Molecular Biology, Plant Biotechnology of Plants	Life Science Lab – V	
10	Basics of Organic Chemistry IV	Organic Chemistry Lab – V	
11	Biochemistry, Endocrinology and Animal Behaviour	Life Science Lab – VI	
12	Economic Botany and Plant Anatomy	Chemistry Lab – VI	
13	Basics of Physical Chemistry		
14	Economic Zoology, Microbiology and Immunology		
15	Cytogenetic, Plant Pathology		
16	Basics of Physical Chemistry I		
17	Physiology & Toxicology, Genetics and Biotechnology		
18	Plant Resource Utilization, Palynology and Biostatistics		

Core Courses-2

S.NO.	SUBJECT
1	Childhood and Development
2	Contemporary India And Education
3	Development of Education System in India
4	Teaching, Learning and Assessment
5	Pedagogy of Physical Science-I
6	Pedagogy of mathematical Science-I
7	Pedagogy of Physical Science-II
8	Pedagogy of mathematical Science-II
9	Inclusive Education
10	Educational measurement & Evaluation
11	Curriculum Development
12	Gender, School & Society

DISCIPLINE SPECIFIC ELECTIVES

S.NO.	SUBJECT
1	Educational Technology ICT in Education-I
2	Sociological aspects of Education Classroom Management
3	Special Education Guidance & Counselling
4	Value Education ICT in Education-II Assessment for Learning
5	Basic knowledge of computer : System & Generations Programmed Instruction
6	Language and communication Organizational Administration
7	Action research Gender School and society
8	Life skill education Childhood and growing up Early Childhood and education

Generic Electives (Any four)

S.NO.	SUBJECTS
1	SCOUT AND GUIDE/NSS/NCC GENERAL STUDIES OPEN EDUCATIONAL RESOURCES NATIONAL CONCERN AND EDUCATION Educational entrepreneurship VOCATIONAL EDUCATION
2	CONSTITUTION OF WORLD GEOGRAPHY OF WORLD LANGUAGE AND LINGUISTIC GENERAL HINDI TEXT AND PERFORMANCE GENDER AND HUMAN RIGHTS
3	CONTEMPORARY INDIA: WOMEN AND EMPOWERMENT ACADEMIC WRITING AND COMPOSITION COMPUTER LANGUAGE

ABILITY ENHANCEMENT COMPULSORY COURSE

S.NO.	SUBJECTS
1	English language and communication EPC – I : Reading & Reflecting on Texts
2	ENVIRONMENT EPC – II : Educational Excursion / Art & Craft workshop
3	School Internship (2 Week) EPC – III : Drama & Art in Education
4	English Language & Communication EPC - VI :Understanding The Self including Workshop on Self Development
5	Logical Reasoning EPC - V : Preparation & Presentation through ICT

SKILL ENHANCEMENT COURSE

S.NO.	SUBJECTS
1	Practicum I : Psychology Practical
3	Practicum III : Cultural Activities, Sports & Yoga
4	School Internship - I for School Observation (2 Week)
5	Practicum IV :Micro Teaching, Preparation of Teaching Aid & Construction of Achievement/ Diagnostic Test
6	Practicum V : Workshop on Preparation for Teaching & Simulation Teaching
7	School Internship (16 weeks including 2 week School and Community Awareness Program)

Ability Enhancement Elective Course (Any two)

S.NO.	SUBJECTS
1	English Language Teaching
2	Soft Skills
3	Translation Studies
4	Creative Writing
5	Technical Writing
6	Film Studies
7	Business Communication

Semester: I

Basics of Inorganic Chemistry I

Course Code: BEB106

Contact Hours: 60

Credit: 04 (L-3, T-1, P-0)

MM: 100

After going through the course the teacher trainee will be able to –

- Understand atomic structure and bonding models.
- Students can write electronic configuration of atoms and ions, understanding the meaning of ground versus excited state.
- They can now predict variation in atomic properties with position in the periodic table.

Course Outline:

Unit I: Atomic Structure

- Bohr's atomic model: Bohr's Theory as applied to hydrogen atom and its limitations
- de Broglie's concept of dual nature of matter: de Broglie's wave equation;
- confirmation of quantization of angular momentum (Bohr's theory) by de Broglie's concept
- **Pauli's exclusion Principle** Hund's rule of maximum multiplicity; Rule of stability of half – filled and completely filled orbitals, Aufbau's Principle. (n+1) rule
- Electronic configuration of elements up to Atomic No. 30

Unit II: Chemical Bonding-I

- Different types of Chemical Bonds; Ionic bond, Covalent bond, Co-ordinate bond, Failure of octet rule,
- Valence Bond Theory, σ and π bonds
- Dipole moment and its applications; Concept of resonance; Fajjan's Rules; Diagonal relationship; Hydrogen Bonding; Vander Waals forces. Bond length, Bond angle, bond energy and their applications; Bond order or bond multiplicity

Unit III: Chemical Bonding-II

- Salient features of Molecular Orbital Theory, Characteristics of π – molecular orbitals; Comparison of (i) bonding and antibonding molecular orbitals (ii) sigma and pi molecular orbitals; □Comparison between VBT and MOT.
- VSEPR Theory – assumptions and postulates of VSEPR Theory:
- shapes of molecules and ions; Hybridization: salient features and rules of hybridization; different types of hybridization.

Unit IV: Chemistry of s block elements

- Introduction and General Characteristics; Group IA: H, Li, Na, K, Rb, Cs, Fr (Alkali metals);
- Group IIA: Be, Mg, Ca, Sr, Ba, Ra (Alkaline earth metals); Comparison between alkaline earth metals and alkali metals;
- Magnesium acting as a bridge between groups IIA and IIB elements.

Unit V: Chemistry of p block elements

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

Suggested Reading:

- Advanced Inorganic Chemistry Vol. I & II by *Satya Prakash, G. D. Tuli, S. K. Basu & R. D. Madan S Chand & Sons*
- Selected Topics in Inorganic Chemistry by *Wahid U. Malik, G. D. Tuli, R. D. Madan, S. Chand.*

- Basic Inorganic Chemistry by *Cotton, Wilkinson & Gaus* John - Wiley.
- Advanced Inorganic Chemistry by *Cotton F. Albert* John - Wiley.
- Concise Inorganic Chemistry by J. D. Lee Blackwell.
- Inorganic Chemistry: Principles of Structure & Reactivity By *Huheey , E. A. Keiter , R. Keiter , O. K. Medhi* , Pearson Publications .
- Vogel, A.I. A text book of quantitative Inorganic Analysis, ELBS. 1978.

Zoology
Course Code: BEB 109

Credit: 04 (L-3, T-1, P-0)

Contact Hours: 60

MM: 100

Course Objectives:

1. To introduce variety of approaches to the study the diversity of non chordates and getting basic idea about the relationships among lower animals and to their environment.
2. To understand the major principles of evolutionary theory, and ranges from the origins of life, through the evolution of specific characters of simple animals.
3. To learn about the origins of advanced characters among non chordates.
4. To explore diversity of chordates ranging from protochordates to vertebrates.
5. To learn about the evolutionary significance of protochordates.
6. To explore basic characters of vertebrates and their adaptations to the different Environmental conditions.

Unit 1: Lower Non-chordates

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

Unit 2: Higher Non-chordates

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

Unit 3: Protochordates

- General features and Phylogeny of Hemichordata, Urochordata and Cephalochordata

Unit 4: Higher chordates or Vertebrates

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

Suggested readings

1. Miller & Harley: Zoology (6th ed. 2005, Brown)
2. Campbell & Reece: Biology (7th ed. 2005, Pearson)
3. Kotpal: Modern text book of Zoology: Invertebrates (11th ed. 2016 Rastogi)
4. Kotpal: Modern text book of Zoology: Vertebrates (4th ed. 2016 Rastogi)
5. Jordan & Verma: Invertebrate Zoology (Reprint 2014, S. Chand)
6. Jordan & Verma: Chordate Zoology (Reprint 2014, S. Chand)

Course Outcomes:

After completing the course, the students will be able to:

1. Define or describe all kinds of lower invertebrates such as protozoan, sponges and helminths and higher invertebrates like annelids, arthropods and marine animals.
2. Understand the significance of rich diversity of invertebrates along with different species and their relationship with different evolutionary characteristics.
3. Analyse the role of various kinds of chordates in development of economy, ecological stabilisation and scientific growth
4. Evaluate the comparative significance of taxonomic groups in ecosystem.
5. Create the basic knowledge of all kinds applications of chordates in daily life of human beings.

Course Code:

BOTANY 1

BEB 110: BIODIVERSITY (Microbes, ALGAE, FUNGI AND ARCHIGONIATE)

Course Code: BEB106

Credit: 04 (L-3, T-1, P-0)

Contact Hours: 60

MM: 100

Course Objectives:

1. To learn the general concept of organization in prokaryotic and eukaryotic cells.
2. To study in detail the classification, characters, reproduction and economic importance of algae, lichens and bryophyte
3. To learn the role of cryptogams in the environment.
4. To learn the basic information about the oldest known vascular plants on this planet.
5. To learn about the various types of life cycles, alternation of generation, conservative organs.
6. To learn a truly integrated view of Plant and environmental science which incorporates the molecular, cellular and ecological approaches to the subject?
7. To learn about the origins of cells and the evolution of lower organisms like viruses, fungi and bacteria and relationship with plant and animals.

Unit 1: MICROBES: Viruses – Discovery; General Structure- RNA virus (TMV) and DNA virus (Tphage); Replication-Lytic and Lysogenic Cycle; Economic Importance. b) Bacteria – Discovery; General Characteristics and Cell Structure; Reproduction Vegetative, Asexual and Genetic Recombination (Conjugation, Transformation and Transduction); Economic Importance.

Unit II: Algae: general characteristics, ecology and distribution; range of thallus organization and reproduction; classification of algae; morphology and life-cycles of the following: *Osillatoria, Chlamydomonas, Oedogoniurn, Volvox, Vaucheria, Chara, Odogonium, Ectocarpus, Sargassum, Polysiphonia*; economic importance.

Unit III: Fungi: general characteristics, ecology and distribution, range of thallus organization, cell wall composition, nutrition, reproduction and classification; life cycle of *Albugo, Aspergillus, Ustilago, Puccinia, Agaricus*; economic importance. **Lichens:** General account, reproduction and significance.

UNIT IV: Bryophytes: general characters, classification (up to family) reproduction and affinities. Comparative study of Gametophytic and sporophytic organization of: **Bryopsida:** *Sphagnum*; **Anthocerotopsida:** *Anthoceros*; **Hepaticopsida:** *Riccia, Marchantia*.

UNIT V: Pteridophytes: general characters, classification (up to family); heterospory and seed habit; stellar system and its evolution and affinities. Comparative study of morphology, anatomy, development, vegetative and reproductive systems of following: **Lycopsida-** *Lycopodium, Selaginella*; **Psilopsida-** *Rhynia*; **Filicopsida-** *Pteridium, Marsilea*.

UNIT VI: Gymnosperms: general characters, classification (up to family) reproduction and affinities. Comparative study of morphology, anatomy, development, vegetative and reproductive systems of following: *Cycas, Pinus* and *Ephedra*.

Suggested Reading:

1. An Introduction to Fungi: by Webster J (1985), Cambridge University Press, UK.
2. An Introduction to the Algae: by Morris I (1986), Cambridge University Press, UK.
3. An Introduction of Lichens: Bhatnagar, S. and Moitra, A. (1996), New Age International Limited, New Delhi.

4. Introduction of Algae Taxonomy, Oliver and Boyd. (2004), London. Gifford, E.M. and Foster, A.
5. Morphology and Evolution of Non-vascular Plants, (2011), W.H. Freeman & Company, New York.
6. Text Book of Algae (2003), A.K. Awasthi, II edition. Vikas Publishing House, New Delhi, India.
7. A text book of Botany Vol-I. S.K. Panday and P.S.Trivedi. Vikas Publishing House, New Delhi.
8. An Introduction to Pteridophytes. A. Rashid, II edition. Vikas Publishing House, New Delhi, India.

CO:By the end of this course, students will be able to:

- Define the differences between primitive and advanced cells
- Evaluate the trend of evolution from unicellular to multicellular organisms.
- Determine significance of thallus organization and alternation of generation among

Different groups studied.

- Determine the affinities among different groups studied.
- Exploit different studied groups for various environmental issues and assessments.
- Evaluate different studied groups for several bio- prospection studies.
- Describe the all introductory terms concerned with vascular cryptogams.
- Describe the various types of life cycles, alternation of generation, conservative organs, presence of vessels and tracheids.
- Create the comparative knowledge among different studied groups.

Chemistry lab - I

Course Code: BEB151

Contact Hours: 30

Course Outline

Credit: 01 (L-0, T-0, P-2)

MM: 50

LIST OF EXPERIMENTS

- (i) Estimation of carbonate and hydroxide present together in mixture.
- (ii) Estimation of carbonate and bicarbonate present together in a mixture.
- (iii) Estimation of Fe(II) and oxalic acid using standardized KMnO₄ solution.
- (iv) Estimation of Fe (II) with K₂Cr₂O₇ using potassium ferricyanide as external indicator.
- (v) Determination of boiling point of liquid compounds. (boiling point lower than and more than 100° C by distillation and capillary method)

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

Zoology Lab

BEB153

Credit: 1 (L-0, T-0, P-2)

Contact Hours: 30

MM: 50

Course Outline

1-Study of the following specimens:

Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physulia, Aurelia, Tubipora, Taenia solium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendru, Periplaneta, 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, Bulb, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders, Sorex, Bat, Funatnbulus, Loris

2. Study of transverse sections/chart of the following:

Sycon (as an example of Parazoa to show its structure, spicules and canal system), *Hydra* (as an example of diploblastic animal), *Fasciola* (as an example of triploblastic acoelomate animal), *Ascaris* (as an example of triploblastic pseudocoelomate animal), *Hirudinaria* (as an example of triploblastic schizocoelomate animal), Frog (as an example of triploblastic enterocoelomate animal) .

3. Key for Identification of scales of fishes; poisonous and non-poisonous snakes.

4. Temporary/Permanent mounting of given material

5. 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.

Botany Lab - I
BEB153

Credit: 1 (L-0, T-0, P-2)

Contact Hours: 30

MM: 50

Course Outline

Practicals:

1. Study of vegetative Structure: *Nostoc*, *Chlamydomonas* (electron micrographs), *Oedogonium*, *Vaucheria*, *Sargassum* and *Polysiphonia* through temporary preparations.
2. *Puccinia*: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; section/tease mounts of spores.
3. *Agaricus*: Specimens of button stage and full grown mushroom; Sectioning of gills of *Agaricus*.
4. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose)
5. *Marchantia*- morphology of thallus, w.m. rhizoids and scales, vs. thallus through gemma cup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore.
6. *Selaginella*- morphology, w.m. leaf with ligule, T.S. of stem; w.m. strobilus, w.m. microsporophyll and megasporophyll.
7. *Cycas*- T.S of coralloid root, T.S. of rachis vs. leaflet, *Pinus*- T.S. of needle and stem.

CO: By the end of this course, students will be able to:

- Learn about the small and large structures of the flora existing in different habitats of land.
- Understand the significance and method of developing a herbarium.
- Learnt about features of the flora responsible to adopt them in various kinds of habitats.
- Understand the distinguished anatomical features of algae, fungi, bryophytes, pteridophytes and gymnosperms.
- Understand the ecological significances of studied group of organisms.

Childhood and Growing Up

BED101

Credit: 04

(L-3, T-1, P-0)

Contact Hours: 60

MM: 100

After going through the course the teacher trainee will be able:

- To describe the growth and development of the learner
- To understand concept of cognition, cognitive processes, individual differences, adjustment and maladjustment.
- To Exemplify various defense mechanisms.
- To determine causes of maladjustment, different factors influencing child development and individual differences.
- To Find significance of various areas of individual differences among learners.
- To explain the theoretical approaches of human development and their application **Course Outline:**

Unit I: Understanding the Development of the Learner

- Concept and Principles of Growth and Development, Methods of studying development: Longitudinal, Cross-sectional, Cohort sequence,
- Developing Human- Stages (Prenatal development, Infancy, Childhood, Adolescence) □ Procedure of studying children- Observation, Interview and case study.
- Factors contributing to Growth and Development such as heredity, environment, nutrition,
- Concept of normal development, variations in development, role of education in human development,

Unit II: Understanding the Dimensions of individual development

- Dimensions of individual development: Physical and Motor development, Cognitive Development, Social development, Emotional development, Moral development, Language development; their interrelationships and processes of growth across various stages from infancy to adolescence.
- Meaning and concept of 'cognition' and its role in learning, Socio-cultural factors that influence cognition.
- Cognitive processes – sensation, perception, attention, memory, concept formation and problem solving in learning.
- Role of school, teachers and parents in physical and motor development, psycho social development, cognitive development, moral development and in handling adolescents.

Unit III: Theoretical Approaches to Development

- Cognitive & Social- cognitive theories (Piaget, Vygotsky, Bandura)
- Psychoanalytic Theory (Freud)
- Psycho social theory (Erikson),
- Moral development (Kohlberg)
- Development in Indian Context

Unit IV: Understanding Learner Diversity

- Individual Differences: Meaning, Concept and Causes.
- Areas of Learner differences with regards to: Learning Styles, Attitude, Aptitude, Personality (meaning, concept and types), Intelligence (meaning, concept and theories of intelligence - Spearman, Thurstone, Gardner, Concepts of IQ, EQ, SQ), Meta-cognition (meaning and process), Socio-Cultural contexts (multilingual and multicultural background) and Educational provisions.
- Viewing learner from different perspectives and organization of classroom activities accordingly- Learner as Imitator, Knower, Thinker, knowledge worker, Performer

Unit V: Understanding problems and facilitating development of the learner

- Concept and meaning of adjustment, characteristics of well-adjusted person, role of education in Adjustment
- Maladjustment: meaning and concept.
- Problems of adjustment in adolescents, role of school and teachers in helping the students facing problems of anxiety, withdrawal, aggression, delinquency, drug addition, failure and low achievement
□Adjustment Strategies or defense mechanisms. **Suggested Readings:**
- Agarwal, I.J.C (1994). Essentials of Educational Psychology. Vikas Publishing House, Pvt. Ltd., New Delhi.
- Bernard, H.W. (1972). Psychology of Learning and Teaching. Mc Grow Hill, New York.
- Chatterjee, S.K. (2000). Advanced Educational Psychology. Arunabhasen Books and ALLIED(P) Ltd.,
• Chauhan, S.S. (1996). Advanced Educational Psychology. Vikas Publishing House, New Delhi.
- DeCecco, J.P., & Crawford, W. (1977). Psychology of Learning and Instruction. Prentice Hall, New Delhi.
- Driscoll, P.M. (1994). Psychology of Learning for Instruction. Allyn & Becon, Boston.
- Freud, S (1935). A general Introduction to psychoanalysis. Live right, New York.
- Hurlick, E.B. (1992). Child Development. Mc Grow Hill, New York.
- Joyce, M., & Others (1992). Models of Teaching. Holt Rinehart and Winston, New York. Bruce R. Joyce (Author), Marsha Weil (Author), Emily Calhoun
- Lindgren, H.C. (1976) Educational Psychology in the Classroom. John Wiley, New York.
- Mangal, S.K. (1997). Advanced Educational Psychology. Prentice Hall of India Pvt., Ltd., New Delhi.
- Mildred, C.R.F. (1978). Infants, Children: Their Development and Learning. Grant Hill, New York. (Indian Reprint).
- Morgan, C.T. (1961). Introduction to Psychology. McGraw Hill, New York.
- Mussen, P.H., Conger, J.J., & Kagan, J. (1969). Child development and personality. Harper & Row, New York.
- Panda, K.C. (1997). Elements of Child Development. Kalyani Publishers, New Delhi.
- Sharma, P. (1995). Basics on Development and Growth of a Child. Reliance Publication, New Delhi.
- Slavin, E.R. (2003). Educational Psychology: Theory and Practice (7th ed.). Allyn& Becon, Boston.

Language and Communication – I
BED102

Credit: 02

(L-2, T-0, P-0)

Contact Hours: 30

MM: 50

After going through the course the teacher trainee will be able:

- To identify the basics of language learning and their importance.
- To explain the language as a tool of communication.
- To apply the oral and written communication skills in their daily life.
- To interpret the basics of functional grammar.
- To develop the writing skills by sentence formation, essay writing, paraphrasing and note making etc.
- To create the reading and writing skills by phonetics and comprehensive reading.

Course Outline:

Unit I: Language and Functional Grammar

- Concept, components, forms and Characteristics of language,
- Principles of Language, language as tool of communication
- Parts of speech, Tenses,
- Narration, Active - Passive voice,
- Subject verb agreement

Unit II: Reading and Speaking Skills

- Introduction to Phonetics,
- Reading Comprehension,
- Greetings, introducing oneself, making request,
- Expressing Gratitude, Complimenting and Congratulating.

Unit III: Writing Skills

- Sentence formation,
- Paragraph and Essay writing,
- Summarizing and paraphrasing
- Précis writing □ Note Making

Suggested Readings:

- Anderson, R.C. (1984). Role of Reader's Schema in Comprehension: Learning & Memory.
- Grellet, F. (1981). Developing Reading Skills: A Practical Guide to Reading & Comprehensive Exercise: Cambridge University Press.
- Kretchman, M.L. & Lowens, P. Dorinne, W. (1998). The Language & Business Communication: John Wiley & Sons, Limited.
- NCERT (2006). Position Paper: National Focus Groups on Teaching of Indian Language: (NCF-2005) New Delhi: NCERT.
- Raman, M. & Sharma, S. (2004). Technical Communication & Composition: The Oxford Press India.
- Sinha, S. (2000). Acquiring Literacy in School Seminar, P-38-42.
- Sinha, R. P. (2001). Current English Grammar & usage with Composition: Oxford University Press.
- Truk, C. (1985), Effective Speaking: Routledge, Cambridge University Press.
- Turley, R.M. (2015). *Writing Essays*: Routledge, II Revised Edition.

Educational Technology

Course Code: BED103

Credit: 02 (L-2, T-0, P-0)

Contact Hours: 30

MM: 50

After going through the course the teacher trainee will be able:

- To define the educational technology and its hardware and software approaches.
- To explain types of educational technology and its function.
- To use ICT in classroom.
- To compare Communication technology and information technology.
- To summarize the concept of computer and its types of generation.
- To describe the computer software and software system.

Course Outline

Unit I: Introduction to Educational Technology

- Educational technology-meaning, concept and types-hardware, software, systems approach,
- Need of Educational Technology in Teaching Learning Process
- Types of Educational technology -teaching technology, instructional technology and behavioural technology, information communication technology
- Scope and functions of Educational technology

Unit II: ICT in Education and its Psychological Bases

- Concept, meaning, nature, need, scope, advantages and limitations of ICT in education
- Possible Uses of Audio-Visual Media and Computers (Radio, Television, Computers)
- Approaches to integrating ICT in teaching and learning, Challenges in integrating ICT in school education, difference between Educational technology, Communication technology and information technology.
- 3A of ICT Application—Access, Availability, Affordability, Overview of WCAG (Web Content Access Guidelines)
- Dale's cone of experience, Multisensory instruction. Multisensory instructional approach and Constructivist approach.

Unit III: Introduction to Computer

- Introduction to Computer system, its characteristics, Types and Generations of computers,
- Basic components of a computer system - Control unit, ALU, Input /Output devices, Primary and Secondary memories.
- Introduction to Computer software, types of Software; System software, Application software, □System Software: Operating System, Assemblers, Compilers and Interpreter.
- Number System: Binary, Octal, Decimal, and Hexadecimal representation,

Suggested Readings:

- Computer Fundamentals, P.K. Sinha, BPB Publication, November, 2004.
- Computer Fundamental and Concepts, V. Raja Raman, PHI, 4th Edition, January 2010.
- Microsoft Office Reference Guide, Tom Bunzel, InformIT publication, 2007.

**Practicum -II (Psycholog
Practical)**

Course Code: BED151
Contact Hours: 60

Credit: 02 (L-0, T-0, P-4)
MM: 50

Course Outline:

It will have three components-

1. Conduction / administration of psychological assessment of **any four test or experiments related to following psychological traits**-
 - Achievement
 - Intelligence
 - Adjustment
 - Environment
 - Personality
 - Fatigue
 - Attitude
 - Aptitude
 - Creativity
 - Learning
 - Habits
 - Anxiety
 - Interest
 - Memory
 - Stress
2. Report writing for above activities.
3. Participation in Viva voce at the end of semester.

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

Semester: II

Basics of Organic Chemistry – I

BEB206

Credit: 04 (L-3, T-1, P-0)

Contact Hours: 60

MM: 100

After going through the course the teacher trainee will be able to –

- Understand the Structure and Bonding on organic molecules
- Classify the various types of intermediates involved in organic reactions
- Assign the configuration and conformation to various molecules
- Classify the various types of nucleophilic and electrophilic reactions involved
- Apply the concepts to understand various compounds used in everyday life **Course Outline:**

Unit I: Bonding and Mechanism of Organic reactions

- Hybridizations, Bond lengths and bond angles, bond energy; Localized and delocalized chemical bond, vander Waals interactions, resonance, hyperconjugation, aromaticity, inductive and other field effects, hydrogen bonding.
- Curved arrow notations, drawing electron movement with arrows, half-headed and double-headed arrow, homolytic and heterolytic bond breaking, Reactive intermediates- carbocations, carbanions, free radicals and carbenes. Electrophiles and Nucleophiles. Types of organic reactions.

Unit II: Stereochemistry

- Concept of isomerism, types of isomerism, optical isomerism, elements of symmetry, molecular chirality, optical activity, enantiomers, diastereomers, meso compounds and racemization.
- Relative and absolute configurations, sequence rules, D &L, R & S systems of nomenclature.
- Geometric isomerism- Nomenclature E and Z system.
- Conformation, conformational analysis of ethane, propane and n-butane.
- Conformations of cyclohexanes, axial and equatorial bonds,
- Newman projection and Saw horse formulae, Fischer and Flying wedge formulae

Unit III: Alkanes, Alkenes and Alkynes

- IUPAC nomenclature, sources, methods of preparation, physical properties,
- Chemical reactions of alkanes, alkenes and alkynes and their mechanism

Unit IV: Cycloalkanes, Cycloalkenes and Dienes

- Nomenclature, Methods of formation, conformation and chemical reactions of cycloalkanes, cycloalkenes and Dienes.
- Nomenclature and classification of dienes: isolated conjugated and cumulated dienes. Structure of allenes and butadiene, methods of formation, polymerization. Chemical reactions-1, 2 and 1, 4 additions, Diels-Alder reaction.

Unit V: Arenes and Aromaticity

- Nomenclature of benzene derivatives. Structure of benzene - molecular formula and Kekule structure. Stability and carbon-carbon bond lengths of benzene, resonance structure and MO picture. Concept of aromaticity, Huckel rule, aromatic ions.
- Mechanisms of SN1 & SN2 reaction, E1&E2 reaction (elementary treatment) of aliphatic hydrocarbon. Saytzeff & Hofmann elimination. Nucleophilic and electrophilic aromatic substitution. Energy profile diagrams. Activating and deactivating substituents. orientation and ortho/para ratio. Side chain reactions of benzene derivatives. Methods of formation and chemical reactions of alkylbenzenes

Suggested Reading:

- Organic Chemistry, **Morrison and Boyd**, Prentice Hall.
- Organic Chemistry, **L.G. Wade Jr.** Prentice Hall
- Fundamentals of Organic Chemistry **Solomons and Fryle**, John Wiley.

- Organic Chemistry, Vol. I, II and III **S.M. Mukherji, S.P. Singh and R.P. Kapoor**
- Organic Chemistry: **Morrison and Boyd**, Prentice Hall of India Pvt. Ltd. New Delhi
- Organic Chemistry, **Arun Bahl & B. S.Bahl**, S.Chand & Co. New Delhi □ Standard Methods of Chemical Analysis, W.W. Scott, The Technical Press.
- Experimental Organic Chemistry, Vol. I and II, P.R. Singh, D.S. Gupta and K.S. Bajpai, Tata McGraw Hill.
- Laboratory Manual in Organic Chemistry, R.K. Bansal, Wiley Eastern.

ZOOLOGY-II

BEB 209

Credit: 04 (L-3, T-1, P-0)

Contact Hours: 60

MM: 100

• **Course Objective**

- 1. To introduce the different anatomical feature of animals and its significance.
- 2. To learn the comparative account of anatomy of vertebrates.
- 3. To explore the evolutionary background of different physiological advancement in different animal groups.
- 4. To study the anatomical adaptations of animals in relation to their habit and habitat.
- 5. To learn the workability of major organs and organ systems of animals.
- 6. To study the basic principles and methodology of histology.

Unit 1 Anatomy of integumentary, digestive and respiratory system: Integument and its derivatives, endoskeleton - axial skeleton & appendicular skeleton Digestive system – Alimentary canal and associated glands, respiratory system – cutaneous respiration, Gills and lungs, Air sacs in birds.

Unit 2 Anatomy of circulatory, excretory and nervous system: Circulatory system – evolution of heart and aortic arches, portal systems, excretory system – kidney and its ducts, Nervous system – Comparative anatomy of Vertebrate brain, Structure of neuron, Sense organs – Comparative anatomy of ear and eye.

Unit-3 Basic processes of 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-4 Late embryonic development: Implantation of embryo in humans, Formation of human placenta and its functions, other types of placenta on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.

Unit-5 Applied developmental biology: Medical implications of developmental biology: Infertility – Diagnosing Infertility, IVF, Teratogenesis: teratogenic agents and effect of teratogens on embryonic development

Suggested readings

Comparative Anatomy

- 1) Carter, G.S. Structure and habit in vertebrate evolution – Sedgwick and Jackson, London.
 - 2) Kingsley, J.S. Outlines of Comparative Autonomy of Vertebrates
 - 3) Kent, C.G. Comparative anatomy of vertebrates
 - 4) Smith, H.S. Evolution of Chordata structure. Hold Rinchart and Winstoin Inc. New York.
 - 5) Walter, H.E. and Sayles, L.D. Biology of vertebrates, MacMillan & Co. New York.
 - 6) Outlines of comparative anatomy, Romer & Parsons, Central Book Depot, The Vertebrate Body (Saunders)
- Developmental Biology
- 1) Balinsky – Introduction to Embryology
 - 2) Gilbert- Embryology
 - 3) Jain – Embryology
 - 4) Tyagi, Agarwal- Embryology
 - 5) Mohan P Arora- Embryology
 - 6) Sastri, Singh, Tamar-Cell and Developmental biology.

Course Outcomes:

After completing the course, the students will be able to:

1. Describe basic anatomy of different groups of animals.
2. Identify specific characteristics of individual group of animals.
3. Determine physiological significance of various organs and organ systems in animals.
4. Understand the origin and advancement of anatomical features of animals
5. Discuss and compare the functioning of different organ system found in animals.
6. Apply histological principles and methodologies to analyze the internal structure of various organs of animals.

Course Code:

BOTANY 2:
BEB 210: (Taxonomy (Diversity of Angiosperms), Economic Botany and palynology)

Credit: 04 (L-3, T-1, P-0)

Contact Hours: 60
MM: 100

Course Objectives:

1. To learn the general principal of taxonomy.
2. To introduce the terms classification, nomenclature, herbarium and botanical gardens.
3. To learn different types of proposed classification and their merits and demerits
4. To study the taxonomy of common angiosperms.
5. To learn about meristematic tissues and cambium.
6. To study the mode of reproduction in flowering plants.
7. To learn the concept of origin of crops.
8. To learn the major food crops in India and their economic importance.
9. To learn the methods of cultivation of crops and their harvesting.
10. To study the economic uses of crops that produce food, fibers, timber and spices.
11. To learn about the medicinal plants in India.
12. To learn about energy plantation and bio-fuels.

UNIT I: Systematics: Evolutionary study of Classification of Angiosperms(Natural, Phylogenetic and Artificial), Bentham & Hooker, Engler&Prantl, Hutchinson, and Cronquist classification, Herbarium techniques and important Botanic Gardens.

UNIT II:Taxonomic study and economic importance of **Dicots:** Nymphaeaceae, Nelumbonaceae, Ranunculaceae, Malvaceae, Bombacaceae, Brassicaceae, Cucurbitaceae, Rosaceae, Leguminosaceae, Myrtaceae, Rutaceae, Apiaceae (Umbelliferaceae), Apocynaceae,

Solanaceae, Convolvulaceae, Cuscutaceae, Scrophulariaceae, Acanthaceae, Lamiaceae, Asteraceae, Rubiaceae, Euphorbiaceae, and Amaranthaceae.**Monocots:**Cyperaceae, Poaceae, Arecaceae. Liliaceae

UNIT III:**Morphology of vegetative and floral parts:** modifications – phyllodes, cladodes, and phylloclades; meristems-kinds, study of tissue system - epidermal, ground, and vascular (SAM) and (RAM); anatomy of roots, stems, and leaves; cambium - its function and anomalies in roots and stems.

UNIT IV: Vavilov'scentres of origin of crop plants, Origin, distribution, botanical description, brief idea of cultivation and economic uses of the following:

Food plants - cereals (rice, wheat and maize), pulses (gram and arhar), vegetables(potato, and onion), Botanical description, processing and uses of: Beverages-tea and coffee; Rubber- *Hevea*; Sugar; General account and sources of timber; energy plantations and biofuels.

UNIT V: Origin, distribution, botanical description, brief idea of cultivation and economic uses of the following: Fibers-cotton, jute and flax; Oils-groundnut, sunflower and coconut. Spices-coriander, fennel, ginger, turmeric, cloves. Medicinal plants-*Cinchona*, *Rauwolfia*, *Atropa*, *Opium*.**Palynology:** pollen structure, pollen morphology, pollen allergy, economic and taxonomic importance.

Suggested Reading:

1. Current concepts in Plant Taxonomy. Heywood, V.H. and Moore, D.M. (eds.) 1984. Academic Press, London.
 2. Principles of Angiosperms Taxonomy. New Age International Limited, New Delhi.
- Davis, P.H. and Heywood, V.H. 1963. , Oliver and Boyd. London.
- 3 Kocchar, S.L. 1998: Economic Botany in Tropics, 2nd edition, MacMillan India Ltd., New Delhi.
 - 4 Sambammurthy, A.V.S.S. And Subramanyam, N.S. 1989: A Textbook of Economic Botany, Wiley Eastern Ltd., New Delhi
 - 5 Sharma, O.P. 1996: Hills Economic Botany (Late Dr. A.F. Hill adapted by O.P. Sharma), Tata McGraw Hill Co. Ltd., New Delhi.
 - 6 Simpson, B.B. and Conner-Ogorzaly, M. 1986: Economic Botany- Plants in Our World, McGraw Hill, New York.

CO: By the end of this course, students will be able to:

- Discriminate the plant hierarchy in the surroundings.
- Evaluate the importance of taxonomy.
- Determine significance of nomenclature in plants.
- Identify flowering plants using floral formula and diagrams.
- Determine the anatomical structures, primary and secondary growth in angiosperms.
- Know the criteria of geological distribution.
- Determine the trend of migration of crops globally.
- Know different methodologies for crop cultivation.
- Know the types of major crops in India.
- Know the economic importance of plants.
- Know the various fibers and their exploitation.
- Know the major timber producing trees in India.
- Determine the significance of energy plantation.

Chemistry Lab II

Course Code: BEB251

Contact Hours: 30

Credit: 01 (L-0, T-0, P-2)

MM: 50

Course Outline:

1. Detection of extra elements (N , S and Halogens).
2. Detection of Phenol.
3. To separate given organic mixture for three components and identify each component.
4. Determination of melting point of Urea.
5. Detection of glucose.
6. Detection of Amide.

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

ZOOLOGY LAB

Course Code:

BEB253

Credit: 01 (L-0, T-0, P-2)

Contact Hours 30

MM: 50

Course Outline:

Ecological methods:

1. Use of pH meter for estimation of pH in water and soil samples
2. Study of micro organism of water and soil samples .
3. Determination of dissolved O₂, free CO₂ of water.
4. Zoo-plankton count by standard methods.
5. Report on Environmental audit Local Biodiversity Record (in group/individual of a particular area) – at least two records of faunal diversity along with ecological notes and photographic documentations in two seasons should be done. For example: butterfly community or bird community of a particular area.
6. Field work assessment Submission of field study report on any two of the following:
 - a. Ecosystem and its biodiversity assessment. (Any suitable ecosystem) (Various diversity indices with explanation must be presented).
 - b. Estuarine bheri/freshwater fish farm (species cultured/reared, whether exotic/ornamental fishes are cultured, viability of the farm, cost benefit accounts, impact on local people and prospect in the specific area)

Evolutionary Biology:

- 1: General discussion, distinguishing characters and classification of respective Phylum should be taken into consideration.
- 2: In Laboratory Note Book scheme of classification of all Phylum should be written before identification Key making with the specimens both from non-chordate (e.g., insects) and chordates (e.g., fishes) Identification with reasons of the following Museum specimens should be done.
- 3: Study of chick embryological slides in different phases of incubation.

Practical Work:

1. Specimens and slides of the Marsilea petiole, Marsilia Sporocarp, Seleaginella stem, Selaginella cone.
2. Specimens and slides of cycas leaflet, pinus needle, pinus stem and Ephedra stem.
3. To study the plant specimens of Pteridophytes (Lycopodium, Seleginella,.....).
4. Plants studied: Euphorbia hirta, Ocimum sanctum, Ageratum conyzoides, Thevetia peruviana, Calotropis procera, Ipomoea aquatic, Solanum nigram.
5. Embryology of the pollen grains.
6. T.S. of anther of angiospermic flowers

Botany Lab-II

Course Code: BEB253

Contact Hours 30

Credit: 01 (L-0, T-0, P-2)

MM: 50

1) Study of vegetative and floral characters of the following families (description, v.s. of flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):

- Ranunculaceae
- Brassicaceae
- Myrtaceae
- Apiaceae
- Asteraceae
- Solanaceae
- Rosaceae
- Euphorbiaceae
- Liliaceae
- Poaceae

2. Field visit and biodiversity assessment, preparation of report visit (local)
3. a) Timbers; b) Oil seeds; c) Sugars and starch; d) Fibres; e) Cereals; f) Legumes
4. Identification and description of the Cotton, Jute, Termeric, tea
5. Identification and description of the Clay and sandy soil
6. To calculate the economic yield of a crop
7. Herbarium preparation of wild plants

CO: By the end of this course, students will be able to:

- Recognize the group of plants in order to segregate them further for commercial or non-commercial purposes.
- Describe plant parts and their importance.
- Describe flowers and the concept of pollination.
- Identify and characterize plant group based on the availability of any part of plant.
- Understand the phylogeny of plants.
- Know herbarium preparation and its importance.

Contemporary India and Education

Course Code: BED201
P-0)

Credit: 4 (L-3, T-1,

Contact Hours: 60

MM: 100

After going through the course the teacher trainee

will be able - □To gain knowledge of philosophy and education.

- To describe the contribution of various school of philosophy and great educational thinkers to the field of education.
- To apply the different teaching methods and discipline in educational process.
- To analyze the contribution of philosophy to education.
- To evaluate the current issues of education system in present time. □To create awareness about contemporary educational practices.

Course Outline:

Unit I: Basic Concepts of Education:

- Education – Meaning, Aims, and scope
- Types (formal, in-formal and non-formal), Functions and Agencies of Education
□Meaning of Philosophy and its relationship with Education.
- Philosophical concepts of education – Metaphysics, Epistemology and Axiology.
- Constitutional concepts of education & their implications.

Unit II: Philosophical Bases of Education:

Aims, Teaching of methods, Discipline, and other salient features of

- Idealism
- Realism
- Naturalism
- Pragmatism

Unit III: Indian Educational Philosophies:

- Jainism and Buddhism
- Shankya
- Nyaya
- Vedant

Unit IV: Indian Educational Thinkers;

- Aurobindo,
- Gandhi,
- Vivekananda
- Tagore;

Unit V: Western Educational Thinkers;

- Rousseau,
- John Dewey,
- Montessori
- Froebel

Suggested Reading:

- Anand, C.L. et al (1983). The teacher and education in emerging Indian society, New Delhi: NCERT
- Bhatia, K.K. & Narang, C.L. (2003). Principles of Education (Methods and Techniques). Ludhiana: Tandon Publishers.
- Chaube and Chaube (1994) Foundations of Education, Vikas Publishing House Pvt. Ltd.
- Connor, D.J.O (1957). An Introduction to Philosophy of Education. London: Routledge.
- Dash B. N. (2004) Theories of Education & Education in the Emerging Indian Society, Dominant Publishers and Distributors, New Delhi
- Dewey J (1966) Democracy in Education, New York, Macmillan.
- Dewey J. (1952) Experience in Education Collier Macmillan.
- Gandhi M K (1956) Basic Education, Ahmedabad, Navajivan.
- Mani R S (1964) Educational Ideas and Ideals of Gandhi and Tagore, New Book Society New Delhi.
- Martin & Oliver, W.H. (1969). Realism in Education. New York: Harper Publishers.
- Mittal M. L. (2009) Education in the Emerging Indian Society, International Publishing House. □NCERT (1993). Teacher and Education in Emerging Indian Society, New Delhi □P.H. Phenix, (1964). Realms of Meaning. Mac Graw-Hill, New York.
- Pandey, R. (2014-15). Teacher in Emerging Indian Society, Alok Prakashan, Allahabad
- Pathak, P.D. & Tyagi, G.S.D. (1994). Principle of Education, Vinod Pustak Mandir, Agra □Saxena, N.R.S. (2010). Principles of education, Meerut: International Publishing House.
- Sharma, R.A. (2013). Philosophical and Sociological Foundation of Education, Lal Book Depot, Meerut
- Sharma, Ram Nath. (2000). Textbook of Educational Philosophy. New Delhi: Kanishka Publishers Distributors.
- Singh, R.P. (1993). Contemporary Indian Education Scene. Ambala Cantt: The Indian Publications.
- Singh, R.P. (1993). Indian Education – In depth Studies. New Delhi: Commonwealth Publishers.
- Taneja, V.R. (1973). Foundations of Education: Philosophical and Sociological. New Delhi: Sterling Publications.
- Walia J.S. (2001). Principles and Methods of Education. Jalandhar: Paul Publishers.
- Walia, J.S. (2004). Principles of Education. Jalandhar: Paul Publishers.

Language and Communication - II

**Course Code: BED202
P-0)**

Credit: 02 (L-2, T-0,

Contact Hours: 30

MM: 50

After going through the course the teacher trainee will be able: □To explain the various communication skills.

- To describes the role of communication in our life.
- To identify the various techniques/barriers of the communication.
- To define the vocabulary building and its significations.
- To apply the writing skills in daily life by formal and informal letters.
- To develop self development skills by social communication, interview and presentation skills.

Course Outline:

Unit I: Communication

- Introduction of Communication, Role and importance of Communication
- Process, Principles and Barriers of Communication, Feedback and its Importance,
- Flow of Communication- Downward, Upward & Lateral/Horizontal Communication,
- Types, Channel, Levels and models of communication

Unit II: Vocabulary Building

- Define Vocabulary Significance of Vocabulary
- One-word substitution, Synonyms and antonyms,
- homophones & homographs, idioms and Phrases,
- Vocabulary Drills
- Newspaper reading, making sentences by using words from Newspaper,

Unit III: Writing and Self-Development Skills

- Format of letters, Formal and informal Letters,
- Email writing etiquettes,
- Observation skills, Interview skills, Presentation skills.
- Social Communication skills, SWOT Analysis.

Suggested Reading:

- Bisen, V.& P. (2009). Business Communication:New Age InternationalPVt, LTd New Delhi.
- Kaul, A. (2002). Effective Business Communication: Prentice Hall of India (P) LTd, New Delhi.
- Krizan Buddy, A.C., Merrier, P. Logan J &William. (2008). Effective Business Communications: Engage Learning PVt, LTd.
- Lesiker, R. B.& Pettet, J.D. (1994). Business Communication: Theory and Application; Dame Pubns: Lucknow.
- Monippally, M. M. (1899). The Craft of Business Letter Writing: PVt, LTd New Delhi.

- Sharma, S. & Raman, M. (2004). Technical Communication: Published in India, oxford University Press.
- Thill, J.B. & Bobee, C. L. (1998). Excellence in Business Communication Skills: Prentice Hall of India PVT, LTD.
- Weygandth, J. J & Kinnel, P.D. (2011). Managerial Accounting: Tools of Business Decision Making Lucknow.

ICT in Education – I

Course Code: BED203
P-0)

Credit: 02 (L-2, T-0,

Contact Hours: 30

MM: 50

After going through the course the teacher trainee will be able:

- To describe use of media and computers in education.
 - To generalize computer, its various operating systems and applications in teaching learning process.
 - To construct and demonstrate activity by using MS – word, excel and power point and other applications.
 - To analyze importance of media and computers in education.
 - To appreciate the scope of ICT for improving the personal productivity and professional competencies
 - To plan to use various ICT applications for project based/problem based, constructivist learning environment
- Course Outline:**

Unit I: Using Media and Computers

- Media: Radio and Audio Media- Script Writing, Storytelling, Songs, etc., Television and Video in Education, Importance of Newspaper in Education
- Computer as a Learning Tool: Internet and Intranet, Effective Browsing of the Internet for Discerning and Selecting Relevant Information, Survey of Educational Sites and Downloading Relevant Material; Cross Collating Knowledge from Varied
- Introduction to operating systems, File and Folder Operations, virus and types of virus, Applications in windows- Paint, Notepad, Calculator, Adding or Removing New Programs using Control Panel,
- Computer-Aided Learning: Application of Multimedia in Teaching and Learning, Programmed Instruction; Computer-Assisted Instruction; Interactive Learning

Unit II: MS-Word

- Opening menus, toolbars, opening and closing documents, add header and footer, perform find replace operation,
- Preparing documents with insert pictures, Adding Tables, Align the text to left, right and justify and centre and underline the text,

- Prepare a job application letter enclosing your bio-data, Type the text, check spelling and grammar, bullets and, numbering list items.

Unit III: MS-Excel & Power Point

- Introduction, Starting MS-Excel, Basics of Spreadsheet,
- MS-Excel Screen and Its Components, Elementary Working with MS-Excel.
- Introduction, Starting MS-Power Point, Standard toolbar, formatting toolbar, and their use. Creating and opening a presentation. Use of slide sorter, adding header/footer.
- Use of animation features. Inserting pictures, resizing pictures. Inserting organization chart.

Suggested Reading:

- Kozma, R.B. (2003). Technology, Innovation, and Educational Change: A Global Perspective: A Report of the Second Information Technology in Education Study, Module 2. International Society for Technology in Education.
- Cabmbridge, D. (2010). E-Portfolios for Lifelong Learning and Assessment. John Wiley and Sons □Imison, T., Taylor, P.H. (2001). Managing ICT in the Secondary Schools. Heinemann: Oxford □Sinha, P.K. (2004). Computer Fundamentals, BPB Publication, New Delhi.
- Raman, V.R. (2010). Computer Fundamental and Concepts, PHI, Learning PVT Ltd. New Delhi.
- Gaskin,S., Ferrett, R.L., Vargas,A., McLellan, C. (2010). Go! With Microsoft Office, Pearson Education, New Delhi.
- Cox, J., Preppernau, J. (2007). Step by step Microsoft office 2007, Microsoft press,
- Abbot, C. (2001). ICT: Changing Education. Routledge Falmer. Florian, L., & Hegarty J. (2004). ICT and Special Educational Needs: A Tool for
- Sanders Donald, H. (1998). Computers Today. McGraw Hill Book Company: New Delhi
- Sarkar, S.K. &Gupta, A.K. (1998). Elements of Computer Science. S. Chand & Company: New Delhi
- Semenov, Alexy (2005). Information and Communication Technologies in Schools. A handbook for Teachers. UNESCO
- Mishra, S.(Ed.) (2009). STRIDE Hand Book 08: E-learning. IGNOU: New Delhi. Available at http://webserver.ignou.ac.in/institute/STRIDE_Hb8_webCD/STRIDE_Hb8_index.html

Practicum - II
(Scout Camp/ Community Awareness Camp)

Course Code: BED251
P-2)

Credit: 1 (L-0, T-0,

Hours: 30

MM: 50

After going through the course the teacher trainee will be able

- To understand the development of Bharat Scout and Guide Organization / Community Awareness Programs.
- To explain the role of Scout and Guide Camp/ Community Awareness Programs in teaching learning process
- To analyze the importance of various activities of Scout and Guide Camp / Community Awareness programs.
- To analyze the importance of Scout and Guide Camp / Community Awareness Programs in school education.
- To develop skills needed to become a successful Scout or Guide / Community Awareness volunteer.
- To organize various activities related to Scout and Guide Camp / Community Awareness Programs. **Course Outline:**

It will have three components-

1. Participation in all activities of Scout and Guide Camp / Community Awareness Programs.
2. Report writing for Scout and Guide Camp / Community Awareness Programs with your participation details.
3. Participation in Viva voce at the end of semester.

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