

To,

The Principal Secretary to Governor  
Governor's Secretariat, Bihar, Patna

**Reference:** Letter No. BSU (UGC)- 02/2023 – 871 /(GS) 1 dated 09-06-2023

**Subject:** Preparation of Syllabus for 4 Year Undergraduate Courses in Universities of Bihar.

**Dear Sir,**

This is with reference to your letter no. BSU (UGC) 02/2023 – 871/ (GS) 1 dated 09-06-2023, we are, herewith submitting one set of prepared syllabus of Bachelor of Science, Zoology for 4 Year Undergraduate Courses in Universities of Bihar.

Following members were authorized by your esteemed office.

With regards,

**1. Prof. Ajit Kumar Sinha,**

Head, P.G. Department of Zoology, Veer Kunwar Singh University, Ara.

*Ajit Sinha*  
14.06.23

**2. Prof. Preety Sinha,**

Head, P.G. Department of Zoology, Patliputra University, Patna.

*Preety Sinha*  
14/6/23

**3. Dr. Rana Vikram Singh,**

Head, P.G. Department of Zoology, Jai Prakash University, Chapra.

*Rana Vikram Singh*  
14/06/2023

# Syllabus for 4 Year Undergraduate Courses in Universities of Bihar

## Bachelor of Science, Zoology

Prepared By :

**1. Prof. Ajit Kumar Sinha,**

Head, P.G. Department of Zoology, Veer Kunwar Singh University, Ara.

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**2. Prof. Preety Sinha,**

Head, P.G. Department of Zoology, Patliputra University, Patna.

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Head, P.G. Department of Zoology, Jai Prakash University, Chapra.

Dr. Vikram Singh  
14/06/2023

# Zoology

## (A) Major Core Courses

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	MJC-1 (T)	Diversity of Non-Chordates(T)	4	100
		MJC-1 (P)	Diversity of Non-Chordates(P)	2	100
2.	II	MJC-2 (T)	Diversity of Chordates (T)	4	100
		MJC-2 (P)	Diversity of Chordates (P)	2	100
3.	III	MJC-3 (T)	Comparative Anatomy(T)	3	100
		MJC-3 (P)	Comparative Anatomy(P)	2	100
		MJC-4 (T)	Physiology(T)	3	100
		MJC-4 (P)	Physiology(P)	1	100
4.	IV	MJC-5 (T)	Cell Biology (T)	3	100
		MJC-5 (P)	Cell Biology (P)	2	100
		MJC-6 (T)	Endocrinology (T)	3	100
		MJC-6 (P)	Endocrinology (P)	2	100
		MJC-7(T)	Ecology(T)	3	100
		MJC-7(P)	Ecology(P)	2	100
5	V	MJC-8 (T)	Biochemistry (T)	3	100
		MJC-8 (P)	Biochemistry (P)	2	100
		MJC-9 (T)	Genetics(T)	3	100
		MJC-9(P)	Genetics(P)	2	100
6	VI	MJC-10(T)	Developmental Biology(T)	3	100
		MJC-10(P)	Developmental Biology (P)	1	100
		MJC-11(T)	Evolution (T)	3	100
		MJC-11(P)	Evolution (P)	2	100
		MJC-12 (T)	Animal Behaviour(T)	3	100
		MJC-12(P)	Animal Behaviour(P)	2	100
7.	VII	MJC-13 (T)	Molecular Biology(T)	3	100
		MJC-13 (P)	Molecular Biology(P)	2	100
		MJC-14	Research Methodology	5	100
		MJC-15(T)	Immunology and microbiology (T)	4	100
		MJC-15(P)	Immunology and microbiology (P)	2	100
8.	VIII	MJC-16(T)	Instrumentation and Biometry	4	100

Sub Total = 80

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**(B) Minor Courses to be offered by the Department for students of other Departments of Science**

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	MIC-1 (T)	Diversity of Non-Chordates(T)	2	100
		MIC-1 (P)	Diversity of Non-Chordates(P)	1	100
2.	II	MIC-2 (T)	Diversity of Chordates (T)	2	100
		MIC-2 (P)	Diversity of Chordates (P)	1	100
3.	III	MIC-3(T)	Physiology(T)	2	100
		MIC-3(P)	Physiology(P)	1	100
4.	IV	MIC-4(T)	Ecology(T)	2	100
		MIC-4(P)	Ecology(P)	1	100
5.	V	MIC-5(T)	Cell Biology (T)	2	100
		MIC-5(P)	Cell Biology (P)	1	100
6.	V	MIC-6(T)	Genetics (T)	2	100
		MIC-6(P)	Genetics (P)	1	100
7.	VI	MIC-7(T)	Evolution (T)	2	100
		MIC-7(P)	Evolution (P)	1	100
8.	VI	MIC-8(T)	Developmental Biology(T)	2	100
		MIC-8(P)	Developmental Biology (P)	1	100
9.	VII	MIC-9(T)	Animal Behaviour(T)	3	100
		MIC-9(P)	Animal Behaviour(P)	1	100
10.	VIII	MIC-10(T)	Endocrinology (T)	3	100
		MIC-10(P)	Endocrinology (P)	1	100

Sub Total = 32

**(C) Multidisciplinary Courses to be offered**

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	MDC-1	To be selected from the basket	3	100
2.	II	MDC-2	To be selected from the basket	3	100
3.	III	MDC-3	To be selected from the basket	3	100

Sub Total = 09

**(D) Ability Enhancement Courses to be offered**

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	AEC-1	MIL	2	100
2.	II	AEC-2	Environmental Science	2	100
3.	III	AEC-3	Disaster Risk Management	2	100
4.	IV	AEC-4	NCC/NSS/NGOs/Social Service/ Scout and Guide/Sports	2	100

Sub Total = 08

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### (E) Skill Enhancement Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	SEC-1	To be selected from the basket	3	100
2.	II	SEC-2	To be selected from the basket	3	100
3.	III	SEC-3	To be selected from the basket	3	100

Sub Total = 09

### (F) Value Added Courses to be offered

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	I	VAC-1	To be selected from the basket	3	100
2.	II	VAC-2	To be selected from the basket	3	100

Sub Total = 06

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	v	INT-1	Summer Internship	4	100

Sl. No.	Sem	Type of Course	Name of Course	Credits	Marks
1.	VIII	RP-1	Research/Dissertation	12	100

Grand Total = 160 Credits

### (G) Basket for Multidisciplinary Courses (MDC)

To be decided by Respective Department

### (H) Basket for Skill Enhancement Courses (SEC)

See at the end of structure (this booklet)

### (I) Basket for Value Added Courses (VAC)

See at the end of structure (this booklet)

### Question Paper Pattern

The question paper pattern shall consist of three parts: -

**1. Part A - Compulsory-** Consisting of objective/Multiple choice type - each carrying two marks. 10x2= 20 marks

**Part-B -** Short answer type - Four questions are to be answered out of six questions. Each carrying five marks. 04x5 = 20 marks

**Part- C -** Long answer type questions. Three questions to be answered out of five Questions, each carrying ten marks. 03x10 = 30 marks

**2. Examinations shall not be held on OMR Sheets strictly.**

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## Syllabus for Four-Year B.Sc. in Zoology

### Programme Outcomes :

At the completion of the programme, students will attain:

**PO1. Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge of major concepts, theoretical principles and experimental findings in Zoology and its different subfields including biodiversity, physiology, biochemistry, ecology, evolutionary biology, cell biology, molecular biology, immunology and genetics etc. learning of the various techniques, instruments, computational software used for analysis of animal's forms and functions.

**PO2. Communication, thinking, reasoning and problem solving ability:** to convey the intricate zoological information effectively and efficiently, rationally analyze and solve the problems related to animal sciences, seeking solutions and logically solving them by experimentation and data processing.

**PO3. Leadership quality & Team spirit:** Ability to work effectively in a heterogeneous team and to recognise and mobilise relevant resources essential for a project, and manage the project in a responsible way by following ethical scientific conduct and bio-safety protocols.

**PO4. Digitally literate:** Capability of using computers for biological simulation, computation and appropriate software for biostatistics, and employing search tools to locate, retrieve, and evaluate zoology-related data.

**PO5. Environment and Sustainability:** Understand the environmental and sustainability issues, acquire self-paced and self-directed learning aimed at personal and social development.

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## Programme Specific Outcomes :

At the completion of the programme, students will attain the ability to:

**PSO1.** Students should be able to identify, classify and differentiate diverse chordates and non- chordates based on their morphological, anatomical and systemic organization.

**PSO2.** They will also be able to describe economic, ecological and medical significance of various animals in human life. This will create a curiosity and awareness among them to explore the animal diversity and explore related career options. The procedural knowledge about identifying and classifying animals will provide students professional advantages in teaching, research and taxonomist jobs in various government organizations.

**PSO3.** Acquired practical skills in molecular biology; biotechnology; microscopy; enzymology and analytical biochemistry and genetics will provide an extra edge to our students, who wish to undertake higher studies.

**PSO4.** In-depth knowledge and understanding about comparative anatomy and developmental biology of various biological systems; and learning about the organisation, functions, strength and weaknesses of various systems will let students critically analyse the way evolution has shaped these traits in the human body.

**PSO5.** Acquired skills in diagnostic testings, haematology, histopathology, staining procedures etc. used in clinical and research laboratories will provide students opportunity to work in diagnostic or research laboratory. Deep understanding of different physiological systems and methods available to measure vital physiological parameters and to comprehend the mechanism behind occurrence of different life threatening disease *via* laboratory examination, assessment of basic physiological functions by interpreting physiological charts will help to find their career options.

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## Semester -I

### Major Course 1 (MJC-1)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Non-Chordata	6	4	2

**Course outcomes:** After completion of the course, students should be able to:

- CO-1:** Learn about the importance of systematics, taxonomy, and structural organization of non-chordates.
- CO-2:** Understand & Appreciate the diversity of non-chordates living in varied habits and habitats.
- CO-3:** Understand evolutionary history and relationships of different non-chordates through functional and structural affinities.
- CO-4:** Critically analyse the organization, complexity and characteristic features of non chordates.
- CO-5:** Recognize the life functions and the ecological roles of the animals belonging to different phyla.
- CO-6:** Enhance collaborative learning and communication skills through practical sessions, teamwork, group discussions, assignments, and projects.

<b>MJC-1: Diversity of Non-Chordata (Theory: 4 credits) 40 hrs</b>		
Unit	Topics to be covered	No. of Lectures
1	1. Introduction to Non-chordates: General characteristics and classification (up to order) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nematelminths, Annelida, Arthropoda, Mollusca, Echinodermata.	8
2	2.1. Protozoa: Structure and Life cycle of Paramecium, Plasmodium, Entamoeba histolytica, Trypanosoma, L. donovani 2.2. Porifera: Spicules and Canal system in sponges; affinities of the Phylum	10
3	3.1. Cnidaria: Structure and Life Cycle: Obelia, Aurelia  3.2. Ctenophora: General organization of Hormiphora; affinities of the phylum.  3.3 Platyhelminthes and Nematelminths: Structure and Life cycle of <i>Fasciola hepatica</i> , <i>Taenia solium</i> , <i>Ascaris lumbricoides</i> .	10
4	4.1. Annelida: Earthworm, Leech: Structure, locomotion, alimentary canal Reproduction.  4.2. Arthropoda: Peripatus, Adaptive variations in insect mouth parts.  4.3. Mollusca: Structure and Life cycle: Unio, Pila. Torsion and Detorsion in Gastropoda  4.4. Echinodermata: Structure: Star fish; Larval forms in Echinoderms; Water Vascular System in Echinoderms	12
<b>TOTAL</b>		<b>40</b>

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**MJC-1: Diversity of Non-Chordata (Practical: 2 credits) 20 hrs**

**Practical:**

1. Study of whole mount of Euglena, Amoeba, Paramecium, Monocystis; Binary fission and Conjugation in Paramecium.
2. Study of Sycon; T.S. of Sycon, L.S. of Sycon; Gemmule, Hyalonema.
3. Permanent stained preparation of spicules of sponges.
4. Study of *Obelia*, *Aurelia*, *Metridium*, *Physalia*.
5. Specimen/slide of any one Ctenophore.
6. Study of adult *Fasciola hepatica*, *Taenia solium* and *Ascaris* (male & female).
7. Study of Aphrodite, Septal nephridia and Ovary of Earthworm; Jaws of leech; Trochophore larva.
8. Study of T.S. through pharynx, gizzard, and typhlosolar region of earthworm.
9. Study of Limulus, Scolopendra, Grasshopper, Phyllium, Praying mantis, & Palaemon, Sacculina, Cancer, Eupagurus, Apis, Musca. Salivary gland of Cockroach, Mouth parts of Mosquito.
10. Study of Chiton, Dentalium, Octopus, Glochidium larva.
11. Study of Asterias, Echinus, Antedon.

**Suggested 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. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson.
4. Verma P S, Jordan E L. (2009). *Invertebrate Zoology*. S. Chand publishers.
5. Brusca R C (2016). *Invertebrates*. Published by Sinauer Associates, an imprint of Oxford University Press.
6. S.S.Lal, *Practical Zoology Invertebrate*.

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**Semester -I**  
**Minor Course 1 (MIC-1)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Non-Chordata	3	2	1

**Course outcomes:** After completion of the course, students should be able to:

**CO-1:** Learn about the importance of systematics, taxonomy, and structural organization of non-chordates.

**CO-2:** Critically analyse the organization, complexity and characteristic features of non chordates.

**CO-3:** Recognize the life functions and the ecological roles of the animals belonging to different phyla.

<b>MIC-1: Diversity of Non-Chordata (Theory: 2credits) 20 hrs</b>		
Unit	Topics to be covered	No. of Lectures
1	I. Introduction to Non-chordates General characteristics and classification (up to order) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nematelminths, Annelida, Arthropoda, Mollusca, Echinodermata.	5
2	2. Structure and life history of:- (i) Protozoa - Paramecium (ii) Porifera - Sycon	4
3	3. Structure and life history of:- (iii) Cnidaria - Obelia (iv) Platyhelminthes - Fasciola (v) Aschelminthes - Ascaris	5
4	4. Study of coelomates:- (vi) Annelida - Pharetima (vii) Arthropoda - Palaemon (viii) Mollusca - Pila (ix) Echinodermata - Asteries (x) Hemichordata - Balanoglossus	6
<b>TOTAL</b>		<b>20</b>

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**MIC-1: Diversity of Non-Chordata (Practical) 10 hrs**

**(1 credit)**

**Practicals:**

1. Study of whole mount of *Euglena*, *Paramecium*, *Leishmania*
2. Study of Sycon, Spongilla, T.S. of Sycon, L.S. of Sycon.
3. Study of *Obelia*, *Aurelia*, *Gorgonia*
4. Study of adult *Fasciola hepatica*, *Taenia solium* and their life stages
5. Study of *Pheretima*, *Hirudinaria*
6. Study of T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
7. Study of *Limulus*, *Palaemon*, *Apis*.
8. Mouth parts of Mosquito and Cockroach.
9. Study of *Pila*, *Unio*.
10. Study of *Asterias*.

**Suggested 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. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. Verma P S, Jordan E L. (2009). *Invertebrate Zoology*. S. Chand publishers
5. Brusca R C (2016). *Invertebrates*. Published by Sinauer Associates, an imprint of Oxford University Press.
6. S.S.Lal, *Practical Zoology Invertebrate*.

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**Semester 1**  
**Multidisciplinary Course 1 (MDC-1)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Non-Chordata	3	2	1

**Course outcomes:** After completion of the course, students should be able to:

**CO-1:** Learn about the importance of systematics, taxonomy, and structural organization of non-chordates.

**CO-2:** Critically analyse the organization, complexity and characteristic features of non chordates.

**CO-3:** Recognize the life functions and the ecological roles of the animals belonging to different phyla.

<b>MDC-1: Diversity of Non-Chordata (Theory: 2credits) 20 hrs</b>		
Unit	Topics to be covered	No. of Lectures
1	1. Introduction to Non-chordates General characteristics and classification (up to order) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nematelminths, Annelida, Arthropoda, Mollusca, Echinodermata.	5
2	2 Structure and life history of:- (i) Protozoa - Paramecium (ii) Porifera - Sycon	4
3	3. Structure and life history of:- (iii) Cnidaria - Obelia (iv) Platyhelminthes - Fasciola (v) Aschelminthes - Ascaris	5
4	4. Study of coelomates: (vi) Annelida - Pharetima (vii) Arthropoda - Palaemon (viii) Mollusca - Pila (ix) Echinodermata - Asteries (x) Hemichordata - Balanoglossus	6
<b>TOTAL</b>		<b>20</b>

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**MJC-1: Diversity of Non-Chordata (Practical) 10 hrs**

**(1 credit)**

**Practicals :**

1. Study of whole mount of *Euglena*, *Paramecium*, *Leishmania*
2. Study of Sycon, Spongilla, T.S. of Sycon, L.S. of Sycon.
3. Study of *Obelia*, *Aurelia*, *Gorgonia*
4. Study of adult *Fasciola hepatica*, *Taenia solium* and their life stages
5. Study of *Pheretima*, *Hirudinaria*
6. Study of T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
7. Study of *Limulus*, *Palaemon*, *Apis*.
8. Mouth parts of Mosquito and Cockroach.
9. Study of *Pila*, *Unio*.
10. Study of *Asterias*.

**Suggested 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. Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
4. Verma P S, Jordan E L. (2009). *Invertebrate Zoology*. S. Chand publishers
5. Brusca R C (2016). *Invertebrates*. Published by Sinauer Associates, an imprint of Oxford University Press.
6. S.S.Lal, *Practical Zoology Invertebrate*.

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## Semester 2

### Major Course 2 (MJC-2)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Chordates	6	4	2

**Course Outcomes:** After completion of the course, the students will be able to:

**CO-1:** Understand different classes of chordates, level of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum.

**CO-2:** Study about diversity in animals making students understand about their distinguishing features.

**CO-3:** Appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata.

**CO-4:** Comprehend the circulatory, nervous and skeletal system of chordates.

**CO-5:** Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems.

<b>MJC-2: Diversity of Chordates (Theory: 4 credits)</b>		<b>40 hrs</b>
Unit	Topics to be covered	No. of Lectures
1	1. Introduction to Chordates General characteristics and classification (upto Order): Cephalochordata, Urochordata, Pisces, Amphibia, Reptilia, Aves, Mammals, Cyclostomata.	8
2	2. Origin and Evolution of Chordata. 3. Cephalochordata: Amphioxus. 4. Urochordata: Herdmania (including retrogressive metamorphosis). 5. Cyclostomata: Petromyzon.	10
3	6. Pisces: Migration, Osmoregulation, and accessory respiration. 7. Amphibia: Origin and Evolution; Parental care, Neoteny. 8. Reptilia: Poison and nonpoisonous snakes; Poison apparatus; biting and feeding mechanism in snakes.	12
4	9. Aves: Origin of birds; Flight adaptations; Migration in birds. 10. Mammals: Characters, distribution and affinities of Prototheria, Metatheria, Eutheria.	10
<b>TOTAL</b>		<b>40</b>

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**MJC-2: Diversity of Chordates (Practical: 2 credits)****20 hrs****Practical:**

1. Amphioxus: T.S through pharyngeal, intestinal, and caudal regions.
2. Herdmania: Whole mount, Spicules.
3. Cyclostomata: Petromyzon, Myxine.
4. Fish: Scoliodon, Torpedo, Chimaera, Labeo, Exocoetus, Echeneis, Hippocampus; Scales of fishes.
5. Amphibia: Ichthyophis, Bufo, Hyla, Alytes, Salamandra, Axolotle larva.
6. Reptilia: Chelone, Hemidactylus, Varanus, Vipera, Naja, Bungarus, Uromastix, Chamaeleon, Draco, Calotes, Heloderma; Key for Identification of poisonous and non-poisonous snakes.
7. Aves: Types of beaks and claws, Study of pecten from fowl head and brain of fowl.
8. Mammalia: *Sorex*, Bat (Insectivorous and Frugivorous), *Funambulus*, *Loris*, *Herpestes*, *Erinaceus*, *Macropus*, *Echidna*.

**Suggested Books:**

1. Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
2. Pough H. *Vertebrate life*, VIII Edition, Pearson International.
3. Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
4. Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
5. Classification from Young, J. Z. (2004) to be followed.
6. S.S.Lal, Practical Zoology Vertebrates.

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## Semester 2

### Minor Course 2 (MIC-2)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Chordates	3	2	1

**Course Outcomes:** After completion of the course, the students will be able to:

- CO-1:** To understand the General Characteristics and Classification of Hemichordata, Urochordata and Cephalochordata, the Larval forms of Protochordata and Retrogressive Metamorphosis in Urochordata
- CO-2:** To acquire knowledge about the General Characters and Classification of Agnatha, Pisces and Amphibia.
- CO-3:** To understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and Migration in Birds.

MIC-2: Diversity of Chordates (Theory: 2credits) 20 hrs		
Unit	Topics to be covered	No. of Lectures
1	1.General characteristics and classification (upto Order): Cephalochordata, Urochordata, Pisces, Amphibia, Reptilia, Aves, Mammals, Cyclostomata.	5
2	2.Cephalochordata: Amphioxus. 3. Urochordata: Herdmania (including retrogressive metamorphosis).	4
3	4.Pisces: Scoliodon. 5. Reptilia: Biting and feeding mechanism in snakes.	5
4	6.Aves: Flight adaptations, Elementary idea of migration. 7. Mammals: Characters, distribution and affinities of Prototheria & Metatheria.	6
<b>TOTAL</b>		<b>20</b>

*Asst. Prof.*  
14.06.23

*Ph.D.*  
14/6/23

*Dr. S. K. Singh*  
14/06/2023



**MIC-2: Diversity of Chordates (Practical) 10 hrs (1 credit)**

**Practical :**

1. Amphioxus: Section through pharyngeal, intestinal, and caudal regions.
2. Herdmania: Whole mount, Spicules
2. Cyclostomata: Petromyzon, Myxine
3. Fish: Scoliodon, Torpedo, Chimaera, Labeo, Exocoetus, Echeneis, Hippocampus; Scales of fishes
4. Amphibia: Ichthyophis, Bufo, Hyla, Alytes, Salamandra, Axolotle larva
5. Reptilia: Chelone, Hemidactylus, Varanus, Vipera, Naja, Bungarus, Uromastix, Chamaeleon, Draco, Calotes, Heloderma; Key for Identification of poisonous and non-poisonous snakes
6. Aves: Types of beaks and claws, Study of pecten from fowl head and brain of fowl.
7. Mammalia: *Sorex*, Bat (Insectivorous and Frugivorous), *Funambulus*, *Loris*, *Herpestes*, *Erinaceus*, *Macropus*, *Echidna*

**Suggested Books :**

1. Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
2. Pough H. *Vertebrate life*, VIII Edition, Pearson International.
3. Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
4. Hall B.K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
5. Classification from Young, J. Z. (2004) to be followed.
6. S.S.Lal, Practical Zoology Vertebrates

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**Semester 2**  
**Multidisciplinary Course 2 (MDC-2)**

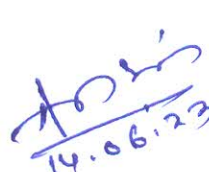
Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Chordates	3	2	1


**Course Outcomes:** After completion of the course, the students will be able to:

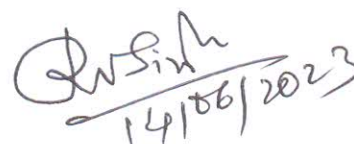
- CO-1:** To understand the General Characteristics and Classification of Hemichordata, Urochordata and Cephalochordata, the Larval forms of Protochordata and Retrogressive Metamorphosis in Urochordata
- CO-2:** To acquire knowledge about the General Characters and Classification of Agnatha, Pisces and Amphibia.
- CO-3:** To understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and Migration in Birds.

<b>MDC-2: Diversity of Chordates (Theory: 2credits) 20 hrs</b>		
Unit	Topics to be covered	No. of Lectures
1	1.General characteristics and classification (upto Order): Cephalochordata, Urochordata, Pisces, Amphibia, Reptilia, Aves, Mammals, Cyclostomata.	5
2	2.Cephalochordata: Amphioxus. 3. Urochordata: Herdmania (including retrogressive metamorphosis).	4
3	4.Pisces: Scoliodon. 5. Reptilia: Biting and feeding mechanism in snakes.	5
4	6.Aves: Flight adaptations, Elementary idea of migration. 7. Mammals: Characters, distribution and affinities of Prototheria & Metatheria.	6
<b>TOTAL</b>		<b>20</b>

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**MDC-2: Diversity of Chordates (Practical) 10 hrs (1 credit)**

**Practical**

1. Amphioxus: Section through pharyngeal, intestinal, and caudal regions.
2. Herdmania: Whole mount, Spicules
2. Cyclostomata: Petromyzon, Myxine
3. Fish: Scoliodon, Torpedo, Chimaera, Labeo, Exocoetus, Echeneis, Hippocampus; Scales of fishes
4. Amphibia: Ichthyophis, Bufo, Hyla, Alytes, Salamandra, Axolotle larva
5. Reptilia: Chelone, Hemidactylus, Varanus, Vipera, Naja, Bungarus, Uromastix, Chamaeleon, Draco, Calotes, Heloderma; Key for Identification of poisonous and non-poisonous snakes
6. Aves: Types of beaks and claws, Study of pecten from fowl head and brain of fowl.
7. Mammalia: *Sorex*, Bat (Insectivorous and Frugivorous), *Funambulus*, *Loris*, *Herpestes*, *Erinaceus*, *Macropus*, *Echidna*

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5. Classification from Young, J. Z. (2004) to be followed.
6. S.S.Lal, Practical Zoology Vertebrates.

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**Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System**

**Skill Enhancement Course (SEC)**

**Semester – I (SEC- 1)**

Science	Social Science/Arts	Commerce
<ul style="list-style-type: none"> <li>• Advance Spreadsheet Tools</li> <li>• Basic IT Tolls</li> <li>• Creative Writing</li> <li>• Communication in Everyday life</li> </ul>	<ul style="list-style-type: none"> <li>• Advance Spreadsheet Tools</li> <li>• Public Speaking in English Language &amp; Leadership</li> <li>• Creative Writing</li> <li>• Communication in Everyday life</li> </ul>	<ul style="list-style-type: none"> <li>• Advance Spreadsheet Tools</li> <li>• Digital Marketing</li> <li>• Creative Writing</li> <li>• Communication in Everyday life</li> </ul>

**Semester – II (SEC- 2)**

Science	Social Science/Arts	Commerce
<ul style="list-style-type: none"> <li>• Big Data Analysis</li> <li>• Beginners Course to Calligraphy</li> <li>• Introduction to Cloud Computing (AWS)</li> <li>• Personality Development &amp; Communication</li> </ul>	<ul style="list-style-type: none"> <li>• Big Data Analysis</li> <li>• Beginners Course to Calligraphy</li> <li>• Personality Development &amp; Communication</li> <li>• पटकथा लेखन</li> </ul>	<ul style="list-style-type: none"> <li>• Big Data Analysis</li> <li>• Beginners Course to Calligraphy</li> <li>• Business Communication</li> <li>• Personality Development &amp; Communication</li> </ul>

**Semester – III (SEC- 3)**

Science	Social Science/Arts	Commerce
<ul style="list-style-type: none"> <li>• Prospecting E-waste for sustainability</li> <li>• Visual Communication &amp; Photography</li> <li>• Graphic Design &amp; Animation</li> <li>• Statistical Software Package</li> <li>• Communication in Professional Life</li> </ul>	<ul style="list-style-type: none"> <li>• Personal Financial Planning</li> <li>• Visual Communication &amp; Photography</li> <li>• Statistical Software Package</li> <li>• Communication in Professional Life</li> <li>• रचानात्मक लेखन</li> <li>• रंगमंच</li> </ul>	<ul style="list-style-type: none"> <li>• Prospecting E-waste for sustainability</li> <li>• Sustainable Ecotourism &amp; Entrepreneurship</li> <li>• Visual Communication &amp; Photography</li> <li>• Statistical Software Package</li> <li>• Communication in Professional Life</li> </ul>

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**LIST OF SKILL ENHANCEMENT COURSES (SEC)**

SL. NO.	Course Title	LTP Distribution of the Course			Total Credits:	Total Marks = 100
		L	T	P		
1	Advance Spreadsheet Tools	1	0	3	3	End -Term Appraisal : 70 Marks Internal Assessment: 30 Marks
2	Basic IT Tolls	1	0	3	3	
3	Beginners Course to Calligraphy	1	0	3	3	
4	Big Data Analysis	1	0	3	3	
5	Business Communication	1	0	3	3	
6	Communication in Everyday life	1	0	3	3	
7	Communication in Professional Life	1	0	3	3	
8	Creative Writing	1	0	3	3	
9	Digital Marketing	1	0	3	3	
10	Graphic Design & Animation	1	0	3	3	
11	Introduction to Cloud Computing (AWS)	1	0	3	3	
12	Personal Financial Planning	1	0	3	3	
13	Personality Development & Communication	1	0	3	3	
14	Prospecting E-waste for sustainability	1	0	3	3	
15	Public Speaking in English Language & Leadership	1	0	3	3	
16	Statistical Software Package	1	0	3	3	
17	Sustainable Ecotourism & Entrepreneurship	1	0	3	3	
18	Visual Communication & Photography	1	0	3	3	
19	पटकथा लेखन	1	0	3	3	
20	रंगमंच	1	0	3	3	
21	रचानात्मक लेखन	1	0	3	3	

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## Skill Enhancement Course (SEC)

### • **Course Title - Advance Spreadsheet Tools**

#### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To enable the students to use Excel for advanced data analysis
- To equip the students to with automation skills on excel
- To enable the students to use excel for informed decision making.

#### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- By studying this course, students will be able to make meaningful representations of data in the form of charts and pivot tables.
- By studying this course, students will be able to draw analysis on data using spreadsheets and use interpretation to make decisions.
- By studying this course, students will be able to generate word documents with appropriate formatting, layout, proofing.
- By studying this course, students will be able to manage data for generating queries, forms and reports in a database.

### **SYLLABUS**

#### **Unit 1: Excel Advanced Techniques**

Templates, Efficiency, and Risk (Standard Deviation, Variance, and Coefficient of Variation), Data Validation; \*Functions and Power functions, Array Formulae (Frequency Distribution, mode.mult, mode.sngl), Tables, Advanced Range Names, What-if-analysis: Goal-seek, Data tables, and Scenario Manager; Data analysis ToolPak: Descriptive Statistics, Moving averages, Histogram, Covariance, correlation, and Regression analysis (only for projection); solver add in. Problem Solving using Solver (optimal product mix, workforce scheduling, transportation, capital budgeting, financial planning), Integrating excel with other tools: MS word, outlook, PowerPoint, Access, Power BI.

#### **Unit 2: Excel Interactivity and Automation**

Index and Match, Offset, Dynamic Charting, Database functions, Text functions, and Error functions: IfError, IsError, Aggregate, Circular Reference, Formula Auditing, Floating-Point Errors, Form Controls (Button, Combo, Check box, Spinner, List, Option), Visual Basic (only basic). Recording Macros, Absolute and relative macros, editing macros, Use of spinner buttons and command buttons; Sub Procedure, Function Procedure (creating New Functions); Working with Loops: Do\_while loop, For\_Next loop; Creating User Forms: Message Box, Input Box; If\_Then\_Else.

#### **Unit 3: Introduction to VBA**

Conditional Formatting, Charts that Inspire (Waterfall, Column, Line, Combo, Thermometer, Scatter, Histogram) Sheers, Sparklines, Graphics Tricks and Techniques, Worksheet Automation using Macros: Absolute and relative macros, editing macros, Creating new functions using macros, Use of spinner buttons and command buttons.



#### Unit 4: Data Analysis and Decision-Making

Working with External Data, Advanced Uses of PivotTables, PowerPivot, Reporting with PowerPivot, Power query, Dashboard, Creating a spreadsheet in the area of: Loan and Lease statement; Ratio Analysis; Payroll Accounting; Capital Budgeting (NPV & IRR), Portfolio Management, Breakeven analysis, and Sensitivity analysis; Operations Management: Constraint, Forecasting & Trend Analysis optimization, Assignment Problems; Depreciation Accounting (Single Method); Graphical representation of data; Frequency distribution and its statistical parameters; Correlation and Regression Analysis

#### Essential/recommended readings

- Excel 2016 Power Programming with VBA, Michael Alexander, Dick Kusleika, Wiley.
- Financial Analysis and Modelling Using Excel and VBA, Chandan Sengupta, Second Edition, Wiley Student Edition.
- MS Excel 2016, Data Analysis & Business Modelling, Wayne Winston, PHI.

#### Suggestive readings

- Microsoft Excel 2016 - Data Analysis and Business Modelling Paperback - 1 May
- 2017 Wayne L. Winston, Microsoft Press.
- Microsoft Excel Practical Formulae: From Basic Data Analysis to Advanced
- Formulae
- Manipulation Diane Griffiths.

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• **Course Title – Basic IT Tools**

**Learning Objectives**

The Learning Objectives of this course are as follows:

- To enable students develop IT skills that are a pre-requisite in today's work environment.
- To equip them with basic computing skills that will enhance their employability in general.
- To enable the student to analyse and present information in a meaningful manner.

**Learning outcomes**

The Learning Outcomes of this course are as follows:

- By studying this course, students will be able to use word-processor to generate documents with appropriate formatting, layout, review and referencing.
- By studying this course, students will be able to manage data in worksheets and workbooks and analyze it using spreadsheet functions and inbuilt formulas.
- By studying this course, students will be able to draw analysis on data using spreadsheets to make decisions.
- By studying this course, students will be able to make meaningful representations of data in the form of charts and pivot tables.
- By studying this course, students will be able to manage data in database tables and use the same for generating queries, forms and reports.

**SYLLABUS**

**Course Contents:**

**Unit 1: Introduction to Spreadsheets**

Spreadsheets: Concept of worksheets and workbooks, creating, opening, closing and saving workbooks, moving, copying, inserting, deleting and renaming worksheets, working with multiple worksheets and multiple workbooks, controlling worksheet views, naming cells using name box, name create and name define; Exchanging data using clipboard, object linking and embedding; Printing and Protecting worksheets: Adjusting margins, creating headers and footers, setting page breaks, changing orientation, creating portable documents and printing data and formulae; Implementing file level security and protecting data within the worksheet; Understanding absolute, relative and mixed referencing in formulas, referencing cells in other worksheets and workbooks, correcting common formula errors, working with inbuilt function categories like mathematical, statistical, text, lookup, information, logical, database, date and time and basic financial functions.

**Unit 2: Data Analysis in Spreadsheets**

Consolidating worksheets and workbooks using formulae and data consolidate command; Choosing a chart type, understanding data points and data series, editing and formatting chart elements, and creating sparkline graphics, Analysing data using pivot tables: Creating, formatting and modifying a pivot table, sorting, filtering and grouping items, creating calculated field and calculated item, creating pivot table charts, producing a report with pivot tables. Introduction to recording and execution of macros.





### Unit 3: Word Processing

Introduction: Creating and saving your document, displaying different views, working with styles and character formatting, working with paragraph formatting techniques using indents, tabs, alignment, spacing, bullets and numbering and creating borders; Page setup and sections: Setting page margins, orientation, headers and footers, end notes and foot notes, creating section breaks and page borders; Working with tables: Creating tables, modifying table layout and design, sorting, inserting graphics in a table, table math, converting text to table and vice versa; Create newspaper columns, indexes and table of contents, Spell check your document using inbuilt and custom dictionaries, checking grammar and style , using thesaurus and finding and replacing text; Create bookmarks, captions and cross referencing, adding hyperlinks, adding sources and compiling and bibliography; Mail merge: Creating and editing your main document and data source, sorting and filtering merged documents and using merge instructions like ask, fill-in and if-then-else; Linking and embedding to keep things together.

### Unit 4: Databases

Introduction to Database Development: Database Terminology, Objects, Creating Tables, working with fields, understanding Data types, Changing table design, Assigning Field Properties, Setting Primary Keys, using field validation and record validation rules, Indexing, working with multiple tables, Relationships & Integrity Rules, Join Properties, Record manipulation, Sorting & Filtering; Select data with queries: Creating Query by design & by wizard (Select, Make Table, Append, Delete, Cross Tab, Update, Parameterized Query, Find Duplicate and Find Unmatched), Creating multi table queries, creating & working with table joins. Using operators & expressions: Creating simple & advance criteria; Working with forms: Creating Basic forms, working with bound, unbound and calculated controls, understanding property sheet, Working with Data on Forms: Changing Layout, creating Sub Forms, creating list box, combo box and option groups; Working with Reports: Creating Basic Reports, Creating Header & Footer, Placing Controls on reports, sorting & grouping, Creating Sub reports.

### Essential/recommended readings

- Swinford, E., Dodge, M., Couch, A., Melton, B. A. (2013). Microsoft Office Professional 2013. United States: O'Reilly Media.
- Wang, W. (2018). Office 2019 For Dummies. United States: Wiley. Microsoft Lambert, J. (2019). Microsoft Word 2019 Step by Step. United States: Pearson Education.

### Suggestive readings

- Jelen, B. (2013). Excel 2013 Charts and Graphs. United Kingdom: Que.
- • Alexander, M., Jelen, B. (2013). Excel 2013 Pivot Table Data Crunching. United Kingdom: Pearson Education.
- • Alexander, M., Kusleika, R. (2018). Access 2019 Bible. United Kingdom: Wiley.

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• **Course Title – Beginners Course to Calligraphy**

**Learning Objectives**

The Learning Objectives of this course are as follows:

- To teach students the art of Calligraphy.
- To make students better at handwriting and embellish the scripts.
- To help the students communicate with creativity.

**Learning outcomes**

The Learning Outcomes of this course are as follows:

- Students will be skilled in calligraphy scripts.
- Learning flourishing will help to develop good writing.
- Practice sessions will further a project at the end of semester.
- Will induce skills to set up a business, too.

**SYLLABUS**

**Unit 1: Introduction to Calligraphy**

- Definition, History of calligraphy, Calligraphy at the Global level, Types of Calligraphy: Classical Calligraphy & Modern Calligraphy
- Practice Sessions: Introducing students to Calligraphy and its types through images, videos and animations.

**Unit 2: Introduction to the Writing tools**

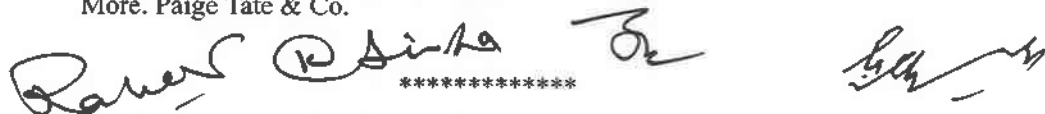
- Tool Kit, Different Types of Pens, Different Types of Nibs, Different Types of Brushes, Different Types of Inks
- Practice Sessions: Display of Writing items, Discussion on the usage of different types of pens, nibs and brushes through hands-on activities

**Unit 3: Foundation to Calligraphy**

- How to write letters?, Majuscules, Miniscules, Numbers, Learning Strokes, Sans Serif B-point, Celtic, Italian Script, Roman Script, Gothic Script
- Practice Sessions: Learning and practicing strokes- Upstroke, Downstroke, Overtum, Underturn, Compound curve, Oval, Ascending loop
- Hands-on activities and Assessment on Sans Serif B-point, Celtic, Italian Script, Roman Script, Gothic Script, Flourishing

**Essential/recommended readings**

- Suepsuan, P. A. (2021). Start Calligraphy The Right way to write: Learn Calligraphy The Complete Book - Modern Calligraphy Pen For Beginners, Learning Resources Step By Step Number Line, Mastering Modern Calligraphy. Independently published.
- C., & Co., T. P. (2020). Modern Calligraphy Set for Beginners: A Creative Craft Kit for Adults featuring Hand Lettering 101 Book, Brush Pens, Calligraphy Pens, and More. Paige Tate & Co.

The block contains several handwritten signatures in black ink. Below the signatures is a horizontal line of asterisks. The signatures appear to be 'Raver', 'P. A. Suepsuan', and another signature that is partially obscured. The asterisks are arranged in a slightly wavy line.

## • Course Title – Big Data Analytics

### Learning Objectives

The Learning Objectives of this course are as follows:

- To Understand the Big Data Platform and its Uses
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS.
- Provide hands on Hadoop Eco System
- To understand spark framework

### Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to identify Big Data and its Business Implications.
- After studying this course, students will be able to list the components of Hadoop and Hadoop Eco-System.
- After studying this course, students will be able to access and process data on distributed file system,
- After studying this course, students will be able to manage job execution in Hadoop environment.
- After studying this course, students will be able to develop Big Data Solutions using Hadoop Eco System.

### SYLLABUS

#### Unit 1: Fundamentals of Big Data Analysis

Data Storage and Analysis, Characteristics of Big Data, Big Data Analytics, Typical Analytical Architecture, Requirement for new analytical architecture, Challenges in Big Data Analytics - Need of big data frameworks

#### Unit 2: Hadoop Framework

Hadoop, Requirement of Hadoop Framework, Design principle of Hadoop -Comparison with other system, Hadoop Components - Hadoop 1 vs Hadoop 2, Hadoop Daemon's - HDFSCommands, Map Reduce Programming: I/O formats, Map side join, Reduce Side Join, Secondary sorting, Pipelining Map Reduce jobs

#### Unit 3: HDFS (Hadoop Distributed File System)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

#### Unit 4: Spark Framework and Data Analysis with Spark Shell

Introduction to GPU Computing, CUDA Programming Model, CUDA API, Simple Matrix, Multiplication in CUDA, CUDA Memory Model, Shared Memory Matrix Multiplication, Additional CUDA API Features. Writing Spark Application - Spark Programming in Scala, Python, R, Java - Application Execution.

### Practical Exercises

- Downloading and installing Hadoop.
- Understanding different Hadoop modes. Startup scripts, Configuration files.
- Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files.
- Run a basic word count Map reduce program to understand map reduce paradigm: To count words in a given file, to view the output file, and to calculate the execution time.
- Map Reduce Program to analyse time-temperature statistics and generate report with max/min temperature.
- Implement of Matrix Multiplication with Hadoop Map Reduce.
- Implementation of K-means clustering using Map Reduce.
- To study and implement basic functions and commands in R programming.
- To build Word cloud, a text mining method using R for easy to understand and visualization than a table data.
- To implement clustering program using R programming

### Essential/recommended readings

- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.
- Mike Frampton, "Mastering Apache Spark", Packt Publishing, 2015.
- Tom White, "Hadoop: The Definitive Guide", O'Reilly, 4th Edition, 2015.
- Nick Pentreath, Machine Learning with Spark, Packt Publishing, 2015.
- Mohammed Guller, Big Data Analytics with Spark, Apress, 2015.
- Donald Miner, Adam Shook, "Map Reduce Design Pattern", O'Reilly, 2012



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- **Course Title – Business Communication**

**Learning Objectives**

The Learning Objectives of this course are as follows:

- To train students to enhance written as well as oral communication in the corporate world.
- To help students in understanding the principles and techniques of business communication.
- To understand the use of electronic media for communication.

**Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to explain the need for communication in management.
- After studying this course, students will be able to appreciate the need of effective writing for communication.
- After studying this course, students will be able to demonstrate the skill of effective report writing and summarizing annual reports.
- After studying this course, students will be able to analyse business correspondence and e-correspondence.
- After studying this course, students will be able to appreciate oral presentations.

**SYLLABUS**

**Unit 1: Introduction to the essentials of Business Communication**

Meaning, process and functions. Need and importance. Medium: verbal & non-verbal communication. Channels: formal & informal. Levels of communication. Direction of communication: downward, upward, lateral, & diagonal. Effective communication: difficulties/barriers and solutions. Interactive and non-interactive techniques of communication. Listening as a tool of communication, Guidelines for effective listening.

**Unit 2: Effective Writing**

Guidelines for clear writing. References, bibliographical research tools. Citing methods, footnotes, discussion footnotes. Use of library and internet for collection, classification and interpretation of data and information.

**Unit 3: Report Writing**

Types of reports. Formal report: components and purpose. Organising information: outlining & numbering sections, section headings, sub-headings, & presentation. Writing reports on field work/visits to industries, business concerns. Summarising annual reports of companies: purpose, structure and principles. Drafting minutes.

**Unit 4: Business Correspondence and E-Correspondence**

Need and importance of business letters. Office memorandum, office circulars, notices and orders. Technology for communication. Effective IT communication tools. Electronic mail: advantages, safety and smartness in email. E-mail etiquettes.

**Unit 5: Spoken English and Oral Presentation**

Effective negotiation: elements, process and general guidelines. Telephonic conversation. Conducting & facing interviews. Conducting & participating in group decisions. Making presentations: content and organising. Features of a good presentation. Delivering a presentation.



**Practical Exercises:**

The learners are required to:

- learn how to summarise annual reports of companies.
- prepare presentations using power-point.
- participate in Group discussions and mock interviews.
- smartly draft business emails.

**Essential/recommended readings**

- C.B.Gupta (2019). Essentials of Business Communication, Sultan Chand & Sons.
- Kaul, A. Effective Business Communication, 2nd ed. PHI learning
- Lesikar, R.V. & Flatley, M.E. (2001). Basic Business Communication Skills for Empowering the Internet Generation, Tata McGraw Hill Publishing Company Ltd. New Delhi.
- Ludlow, R. & Panton, F.(1992). The Essence of Effective Communications, Prentice Hall of India Pvt. Ltd., New Delhi.
- Meyer C,Dev(2021). Communicating for Results,Oxford University Press
- Quintanilla, Kelly M, (2021), Business and Professional Communication, 4e, Sage Textbook
- R. C. Bhatia (2008), Business Communication, Ane Books Pvt Ltd, New Delhi.
- Raman and Singh(2012). Business Communication. Oxford University Press
- Scot, O., Contemporary Business Communication. Biztantra, New Delhi.

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• **Course Title – Communication in Everyday Life**

**Learning Objectives**

The Learning Objectives of this course are as follows:

- To lay down a basic foundation for basic communication that is a part of a student's everyday life.
- To inculcate the fundamentals of communication with the aim to enhance listening, speaking and writing skills.
- To hone practical skills that can be used in day-to-day affairs.

**Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to improve mediation skills.
- After studying this course, students will be able to building human relationships.
- After studying this course, students will be able to foster societal understanding & develop an independent perspective.
- After studying this course, students will be able to enhance social Communication skills of students.

**SYLLABUS**

**UNIT 1**

**Theory of Communication**

- Meaning, Features, Uses, Cycle, Feedback, Advantages
- Barriers
- 7 C's of Communication

**UNIT 2**

**Listening Skills**

- Netiquettes
- Audio-book Listening & Discussions
- Note-taking

**UNIT 3**

**Speaking Skills**

- Oral Presentation- Audio-Visual aids, Audience & Feedback, Delivery of Presentation, Handling Questions
- Group Discussion- Culture & History, Current Affairs, Society-related
- Public Speaking- Public Speech, Extempore
- Interview- Personal, Conversational, Public

**UNIT 4**

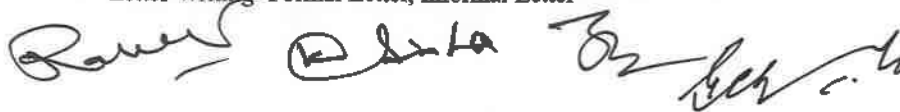
**Reading Skills**

- Close Reading
- Skimming
- Scanning

**UNIT 5**

**Writing Skills**

- Summarising
- Paraphrasing
- Note-making
- Essays- Expository Essay, Descriptive Essay, Narrative Essay
- Letter Writing- Formal Letter, Informal Letter



- Reports- Incidence, Newspaper, Organisational Report
- Analysis & Interpretation- Textual
- Intra & Inter-personal Skills - Monologue, Dialogue

### Suggested Readings

- Chaudhary, Shoma. "Understanding Interviews, Billy Elliot is my Story, Only LessHappy". Tehelka: The People's Paper, 18 February 2006.
- Kumar, Dinesh. "Understanding Values, Our Muddled Generation". The Hindu, 26March 2006.
- Learning to Write I, "Free Writing". In Fluency in English II, ed. Varma, Pramodini and Mukti Sanyal, pp. 1-5, Oxford, New Delhi, 2015.
- Learning to Write II, "Editing". In Fluency in English II, ed. Varma, Pramodini and Mukti Sanyal, pp. 25-27, Oxford, New Delhi, 2015.
- Learning to Write III, "What makes Good Writing Good". In Fluency in English II, ed. Varma, Pramodini and Mukti Sanyal, pp. 48-51, Oxford, New Delhi, 2015.

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## **Course Title – Communication in Professional Life**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To prepare the students for their upcoming professional fields.
- To inculcate the fundamentals of professional and business communication.
- To learn aspects of global communication.
- To enhance employability skills of the learners by enabling them to write effective resumes and face interviews with confidence

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to improve presentation skills to be learnt by effective use of verbal and non-verbal communication for the professional field.
- After studying this course, students will be able to acquire practical employability skills to be disseminated through focused sessions on practical employable knowledge.
- After studying this course, students will be able to enhance professional communication.
- After studying this course, students will be able to improve persuasion and negotiation skills which will be useful for the professional field.

### **UNIT 1**

- Theory of Business Communication
- Introduction
- What is Business Communication?
- Language of Business Communication
- Cultural Components - Cross-Cultural Communication, Cultural Shock, Stereotyping, Ethnocentrism
- Miscommunication & Effective Communication

### **UNIT 2**

#### **Listening Skills**

- Netiquettes
- Audio-book Listening & Discussions
- Note-taking

### **UNIT 3**

#### **Speaking Skills**

- Presentation Skills- Oral Presentation, Ppt. Preparation, Ppt. Presentation
- Group Discussion
- Talks- Domain-specific, Ted-Talks, Business Meets, Motivational Talks
- Telephonic Skills
- Persuasion Skills
- Meeting & Negotiation
- Interview- Promotion Interview, Job Interview, Business Interview
- Functions and activities of PR

*Ravi Ashish B. Ghosh*

#### UNIT 4

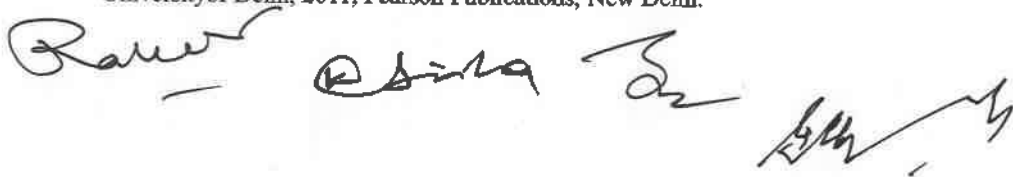
##### Writing Skills

- Summarising & Paraphrasing
- Job-Oriented Skills- CV, Resume & Bio- Data, Job Application Letter
- Documentation
- Advertisements & Invitation
- Letter Writing- Applications, Business Letters
- Report- Analytical Report, Project Report
- Digital Communication in Social Space- Social Media Posts (Twitter, Facebook), Blog Writing, Review Writing
- Advertisement/Invitation/Poster Designing- Canva/MS Word/Coral
- Memo, Office Order, Minutes
- Making Online Academic/Work Profile- LinkedIn

##### Suggested Readings

- Kaushik, J.C. and K.K. Sinha eds., English for Students of Commerce, Oxford University Press, New Delhi.
- Sethi, Anjana & Bhavana Adhikari, Business Communication, Tata McGraw Hill.
- Anjana Neira Dev, et.al, eds. Business English, Department of English,

University of Delhi, 2011, Pearson Publications, New Delhi.



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## **Course Title – Communication in Professional Life**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To build creative writing skills of students in the main inodes of creative writing vizpoetry, fiction (novel, short stories), non-fiction (life narratives, autobiographies andbiographies) and drama.
- To inculcate practical skills in students by mapping their creative talent which bebeneficial for employability too.
- To perform hands-on-activities to students to develop their creative skills throughpractical sessions.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to be sensitive to the texture ofliterary language.
- After studying this course, students will be able to develop craft in creative writing.
- After studying this course, students will be able to develop sense of expressingthemselves through poetry/short story/biography.
- After studying this course, students will be able to induce an understanding of therelationship between an individual and society.
- After studying this course, students will be able to get into different fields andpursue versatile career opportunities.
- After studying this course, students will be able to develop an understanding of theatre and performance through drama will also help them to develop observatoryand behavioural skills.
- After studying this course, students will be able to develop a critical thought processand a knack in putting it in words. Students may also utilise the learnings of proofreading and editing for their academic and professional growth.
- After studying this course, students will be able to go for publishing their own work.
- After studying this course, students will be able to write a book and submit.

## **SYLLABUS**

### **UNIT 1**

- Introduction to Creative Writing- Meaning, Importance
- Imagination & Writing- Peer-interaction, Activities on Imagination
- Tropes, Motifs and Figures- Learning tropes, motifs and figures through videos, Discussion on the findings
- Craft of Writing- Figure of Speech, Word Play, Character Creation
- Character Creation- Dialogue Enaction, Learning Characters through discussion on famous writings, Character Analysis, Writing activities on creating different types ofcharacters (gender/social background/ethnicity etc.)

### **UNIT 2**

- Close Reading
- Analysis and Interpretation- Reading different works in Literature, Discussionin small groups, Practice Writing Session
- Proofreading & Editing- Practice sessions on Proofreading & Editing of different types of writing



### UNIT 3

- Steps of Creative Writing- Pre-Writing, Writing, Post-Writing/Final Draft
- Types of Creative Writing- Poetry, Fiction, Non-Fiction (Life Narratives), Drama
- Creative Writing & Media- Film Review, Book Review, Other Writings in Media, Submission, Publication
- Learning to write Poetry- Reading & understanding Poetry; Practising tone, rhyme, metre, verses; Writing sessions
- Learning to write Fiction- Reading & understanding Fiction; Practicing different elements of fiction (Short story, Novella, Novel); Writing sessions
- Learning to write Non-Fiction- Reading & understanding Non-Fiction (Biographies & Autobiographies); Practicing different elements of non-fiction; Writing sessions
- Learning to write Drama- Reading & understanding Drama; Practicing different elements (plot, character, climax, verbal & non-verbal cues) of Drama; Writing sessions
- Submission & Publication (in Print & Digital) - Discussions over how & where to submit and publish (online/offline), Hands-on activities

#### Suggested Readings

- *Creative Writing: A Beginners' Manual* by AnjanaNeira Dev et al. for The Department of English, University of Delhi (New Delhi: Pearson, 2008).

Rahul D. S. & S. S.

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## **Course Title – Digital Marketing**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To acquaint the students with the knowledge of growing integration between the traditional and digital marketing concepts and practices in the digital era.
- To familiarize the students with the tools and techniques used by the digital marketers for driving the marketing decisions to attain marketing objectives.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the concept of digital marketing and its integration with traditional marketing.
- After studying this course, students will be able to understand customer value journey in digital context and behaviour of online consumers.
- After studying this course, students will be able to understand email, content and social media marketing and apply the learnings to create digital media campaigns.
- After studying this course, students will be able to examine various tactics for enhancing a website's position and ranking with search engines.
- After studying this course, students will be able to leverage the digital strategies to gain competitive advantage for business and career.

## **SYLLABUS**

### **Unit 1: Marketing in the Digital World**

Digital marketing: Concept, Features, Difference between traditional and digital marketing, Moving from traditional to digital Marketing; c

Digital Marketing Channels: Intent Based- SEO, Search Advertising; Brand Based- Display Advertising; Community Based-Social Media Marketing; Others- Affiliate, Email, Content, Mobile.

Customer Value Journey: 5As Framework; The Ozone 03 Concept Key; Traits of online consumer

### **Unit 2: Content and Email Marketing**

Content Marketing: Step-by-step Content Marketing Developing a content marketing strategy Email Marketing: Types of Emails in email marketing, Email Marketing best practices

### **Unit 3: Social Media Marketing and Display Marketing**

Social Media Marketing: Building Successful Social Media strategy; Social Media Marketing Channels; Facebook, LinkedIn, YouTube (Concepts and strategies)

Display Advertising: Working of Display Advertising; Benefits and challenges; Overview of Display ad Process.; Define- Customer, Publisher, Objectives; Format- Budget, Media, Ad Formats, Ad Copy.



#### Unit 4 Search Engine Marketing

Introduction of SEM: Working of Search Engine; SERP Positioning; online search behaviour, DMI's 5P Customer Search Insights Model.

Search Engine Optimization: Overview of SEO Process; Goal Setting-Types.

On-Page Optimization: Keyword Research, SEO Process -Site Structure, Content, Technical Mechanics, Headings, Image & Alt text, Social Sharing, Sitemaps, Technical Aspects- Compatibility, Structured Data Markup.

Off Page Optimisation: Link Formats, Link Building, Content Marketing, Social Sharing; Black and White Hat Techniques

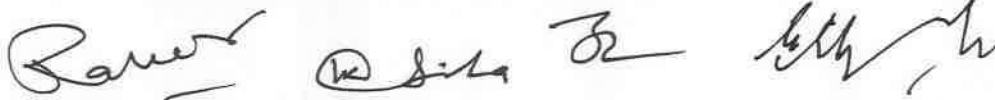
Search Advertising: Overview of PPC Process; Benefits of Paid Search; Basis of Ranking; Goal Setting-Objectives; Account Setting-Creation of Google Ads, Campaign architecture, Campaign setup, Targeting, Bid Strategy, Delivery, Ad Scheduling, Ad Rotation, Keyword Selection; Ad Copy composition, Ad Extension

#### Essential/recommended readings

- Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.
- Kartajaya, H., Kotler, P., & Setiawan, I. (2016). Marketing 4.0: moving from traditional to digital. John Wiley & Sons.
- Ryan, Damien: Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation. Kogan Page Limited.

#### Suggested Readings

- Moutusy Maity: Internet Marketing: A practical approach in the Indian Context
- Oxford Publishing
- Seema Gupta: Digital Marketing: Mcgraw Hill
- Ultimate guide to digital Marketing by Digital Marketer



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## **Course Title – Graphic Design and Animation**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To introduce the students to the skill of animation.
- To learn about the application of 2D and 3D animation.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the importance of animation and graphics design
- After studying this course, students will be able to learn graphics design in 2D and 3D animation.
- After studying this course, students will be able to learn the application of graphics design in 2D and 3D animation in advertising and other areas.

## **SYLLABUS**

### **Unit 1:2D Animation**

**Introduction to 2D Animation:** Introduction to 2D Animation, Drawing concept, Colour theory & basics, Incorporating sound into 2D animation

**Layout & Designing:** Basic of sketching, still life and assignment of basic drawing, Composition of basic elements, Work in different media, such as drawing, collage, and painting, Explore the relationship between elements and principal, Pixel and resolution: Vector and Bitmap Graphics. **Graphics and advertising (Practical)**

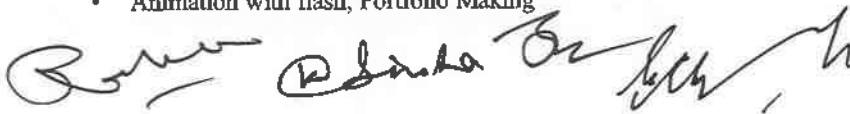
- Creating Digital Layout
- Professional image editing (PHOTOSHOP)
- Advertising and relevant case , Graphics and illustration (Corel Draw, Paint)
- Vector Composition , 2D animation (Macromedia Flash)

### **Broadcast Design (Practical)**

- Working with visual images
- Story Boarding
- Titles and Credit Making
- Stop motion animation

### **Production / Post-Production (Practical)**

- Paint & animate (scanning, tracing, ink & Paint)
- Understanding Background composition
- Basic Understanding of 2D animation and technique
- Animation with flash, Portfolio Making



## Unit 2: 3D Animation

**3D Modeling:** Introduction to 3D space in Blender, Introduction to Modeling Techniques, In-organic Modeling, Organic Modeling

**3D Shading:** Use of Materials & Shader, Shader and Texture Editing, Shading Organic Model, Shading In-Organic Models

### 3D Animation and Rigging (Practical)

- Introduction to 3D Animation
- Create, Edit and working with Animation Graph, Rigging using Blender
- Setting up controllers for joints
- Simple Skeleton structure with proper joint orientation

### 3D Lighting and Rendering (Practical)

- Understanding Lighting in Cycles
- Direct and Indirect Lighting
- Light Linking, Final Composition
- Creating composition and Light with the Shaded Models

### 3D Dynamics (Practical)

Introduction to Dynamics, Active and Passive Bodies  
Creating basic Simulation and collision using Rigid body  
Cloth Simulation, Simulation of Brick wall collision  
Introduction to Fluid Effects, Creating fluid simulation

### Project

#### (Digital Imaging)

- Design Print advertisement for Service
- Design Print advertisement for Product
- Design Print advertisement an Event
- Design Print advertisement on Social Awareness
- Design a collage with a social message

### 2D Animation

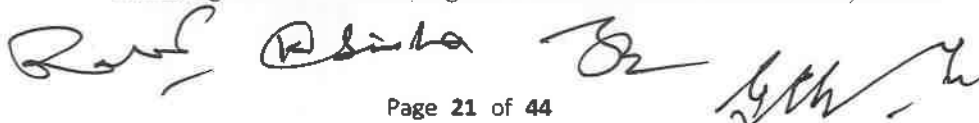
- Drawing fundamentals using lines
- Sketching of cartoon characters
- 2D Logo designing
- Storyboarding of a 30 seconds film
- Portfolio making of an organization

### 3D Animation

- Exploring the Interface of 3D application & Basic Modeling
- Create different types of Materials and create a Shading
- Create a simple walk cycle using the character rigs
- Create a composition and Light set up
- Create a Fluid simulation & rendering

### Suggested Readings:

- The Illusion of Life: Disney Animation, Ollie Johnston and Frank Thomas, Disney Editions.
- Blender Production Creating Short Animations from Start to Finish, Roland Hess, Routledge.
- Animating with Blender: Creating Short Animations from Start to Finish, Roland





Hess, Focal Press

- Simplified Drawing for Planning Animation, Wayne Gilbert, Anamie Entertainment Ltd.
- Getting Started in 3D with Maya, Adam Watkins, Routledge.
- Creating Characters with Personality: For Film, TV, Animation, Video Games, and Graphic Novels, Tom Bancroft, Watson-Guption
- Force: Dynamic Life Drawing for Animators, Mike Mattesi, Focal Press

**Note: Learners are advised to use the latest edition of readings.**

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## **Course Title – Introduction to Cloud Computing (AWS)**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To learn about cloud computing through Amazon Web Services (AWS) platform.
- To learn about AWS cloud concepts, services, security and architecture to build an application.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to Understanding cloud computing platform
- After studying this course, students will be able to differentiate between on-premises, hybrid-cloud, and all-in cloud
- After studying this course, students will be able to describe the basic global infrastructure of the AWS Cloud
- After studying this course, students will be able to understanding the core AWS services, including compute, network, databases, and storage.

### **SYLLABUS**

#### **Unit 1**

Introduction to cloud computing, Creating AWS account, AWS Management Console, AWS Documentation overview, Availability Zones, AWS Global Infrastructure.

#### **Unit 2**

Compute in the Cloud Amazon EC2, instance types.

#### **Unit 3**

Storage and Databases: - Amazon Simple Storage Service (Amazon S3), Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB.

#### **Project**

Create an AWS account and implement AWS cloud for deploying any application.

#### **Suggested Sources**

- Any free platform can be used, for example Amazon, Google, Azure etc.

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## **Course Title – Personal Financial Planning**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To familiarize students with different aspects of personal financial planning like savings, investment, taxation, insurance, and retirement planning
- To develop the necessary knowledge and skills for effective financial planning.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the meaning and appreciate the relevance of financial planning.
- After studying this course, students will be able to understand the concept of investment planning and its methods.
- After studying this course, students will be able to examine the scope and ways of personal tax planning.
- After studying this course, students will be able to analyse insurance planning and its relevance.
- After studying this course, students will be able to develop insight into retirement planning and its relevance.

### **SYLLABUS**

#### **Unit 1: Introduction to Financial Planning:**

Financial goals, steps in financial planning, budgeting incomes and payments, time value of money. Introduction to savings, benefits of savings, management of spending & financial discipline, Setting alerts and maintaining sufficient funds for fixed commitments.

#### **Unit 2: Investment Planning:**

Process and objectives of investment, concept and measurement of return & risk for various asset classes, measurement of portfolio risk and return, diversification & portfolio formation. Gold bond; Real estate; Investment in greenfield and brownfield Projects; Investment in fixed income instruments, financial derivatives & commodity market in India. Mutual fund schemes; International investment avenues. Currency derivatives and digital currency.

#### **Unit 3: Personal Tax Planning:**

Tax structure in India for personal taxation, Scope of personal tax planning, exemptions and deductions available to individuals under different heads of income and gross total income. Comparison of benefits - Special provision u/s 115 BAC vis-a-vis General provisions of the Income-tax Act, 1961, tax avoidance versus tax evasion.

#### **Unit 4: Insurance Planning:**

Need for insurance. Life insurance, health insurance, property insurance, credit life insurance and professional liability insurance.



**Unit 5: Retirement Benefits Planning:**

Retirement planning goals, process of retirement planning, Pension plans available in India, Reverse mortgage, Estate planning.

**Practical Exercises:**

The learners are required to:

- Perform electronic fund transfers through net banking and UPI.
- Identify certain recent Ponzi schemes in the market.
- Prepare tax planning for a hypothetical individual.

**Suggested Readings:**

- Halan, M. "Let's Talk Money: You've Worked Hard for It, Now Make It Work for You" Harper Collins Publishers, New York.
- Indian Institute of Banking & Finance. "Introduction to Financial Planning" Taxmann Publication, New Delhi.
- Keown A.J. "Personal Finance" Pearson, New York.
- Madura, J. "Personal Finance", Pearson
- Pandit, A. "The Only Financial Planning Book that You Will Ever Need" Network 18 Publications Ltd., Mumbai.
- Sinha, M. "Financial Planning: A Ready Reckoner" McGraw Hill Education, New York.
- Tripathi, V. "Fundamentals of Investment" Taxmann Publication, New Delhi.

**Note:** Learners are advised to use the latest edition of readings.

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## **Course Title – Personality Development and Communication**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To develop inter personal and effective communication skills.
- To develop problem solving skills and understand its influence on behaviour and attitudes of individuals.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand the importance of oral and written communication in day-to-day working of the organisation.
- After studying this course, students will be able to develop inter personal skills and problem-solving skills.
- After studying this course, students will be able to understand the role of body language in effective communication.

### **SYLLABUS**

#### **Unit 1**

Introduction, need for Communication, Process of Communication, Written and Verbal Communication, Visual communication, Signs, Signals and Symbols, Silence as a Mode of Communication, Inter-cultural, Intra-cultural, Cross-cultural and International communication, Communication through Questionnaires, Business Letter Writing, Electronic Communication.

#### **Unit 2**

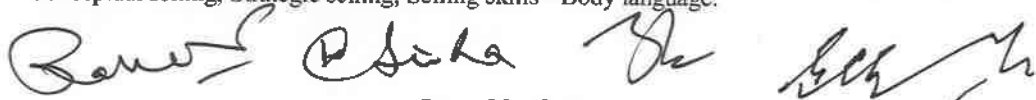
Business Cases and Presentations, Letters within the Organizations, Letters from Top Management, Circulars and Memos, Business Presentations to Customers and other stakeholders, presenting a Positive Image through Verbal and Non-verbal Cues, Preparing and Delivering the Presentations, Use of Audio-visual Aids, Report Writing.

#### **Unit 3**

Barriers to Communication, Improving Communication Skills, Preparation of Promotional Material, Non-verbal communication, Body language, Postures and gestures, Value of time, Organizational body language, Importance of Listening, Emotional Intelligence. Working individually and in a team, Leadership skills, Leadership Lessons, Team work and Team building, Feedback, Feed forward Interpersonal skills - Delegation, Humour, Trust, Expectations, Values, Status, Compatibility and their role in building team - work Conflict Management - Types of conflicts, how to cope with conflict.

#### **Unit 4**

Negotiation Skills, Types of Negotiation, Negotiation Strategies, Selling skills - Selling to customers, Selling to Superiors Selling to peer groups, team mates and subordinates, Conceptual selling, Strategic selling, Selling skills - Body language.



**Essential/recommended readings**

- Kushal Jin - Business Communication, VK India.
- Krishnamacharyulu, C. S. G, Ramakrishnan Lalitha - Personality Development, Interpersonal Skills and Career Management, Himalaya Publishing.
- Corvete Budjac - Conflict Management: A Practical Guide to Developing Negotiation Strategies, Pearson.

**Suggestive Readings**

- Mitra, B. K., Personality Development and Soft Skills, Oxford University Press.
- Kumar Sanjay and Pushplata, Communication Skills, Oxford University Press.
- Mandal S. K., Effective Communication and Public Speaking, Jaico Publishing.

Note: Latest edition of the readings may be used



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## Course Title – Prospecting E-waste for Sustainability

### Learning Objectives

The Learning Objectives of this course are as follows:

- To provide in-depth knowledge on the effective mechanisms to regulate the generation, collection, and storage of e-waste
- To gain insights into the internationally/nationally acceptable methods of transport, import, and export of e-waste within and between countries
- To develop a holistic view on recycling, treatment, and disposal of e-waste and related legislative rules.

### Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to holistically analyze the environmental impacts of e-waste
- After studying this course, students will be able to apply the skills and various concepts for sustainable management of e-waste
- After studying this course, students will be able to decipher the role of various national and international regulations for e-waste management
- After studying this course, students will be able to provide specific recommendations for improved methods for handling e-waste at different stages such as generation, collection, storage, transport, and recycling.

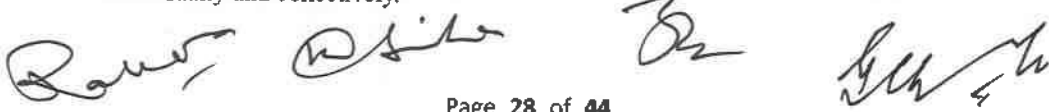
### SYLLABUS

#### Practical/Hands-on Exercises

- Identification of e-waste and its types
- Composition of e-waste and segregation- from the material provided
- Dismantling of e-waste and handling process
- Visit a nearby e-waste handling facility
- Environmental protection laws and producer's responsibility for e-waste management  
Build an understanding of how regulatory mechanisms can be utilized in the management of e-waste in educational institutions.
- Discussion on plausible ways and implementation of e-waste reduction at the source  
Evaluation of the status of e-waste handling at your institution. Suggest potential solutions as per the existing norms of E-Waste (Management) Rules, 2016 and beyond.
- Estimate how recycling of e-waste in metro cities will go in sync with the circular economy
- Develop an understanding and itinerary of the process for procuring e-waste import permissions.
- Inventory of the e-waste disposal mechanisms.
- Study the evolution of e-waste management rules and its implementation- Hazardous Waste Rules, 2008, E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016
- Study the international laws on e-waste management- the international legislations: The Basel Convention; The Bamako Convention; The Rotterdam Convention;
- Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union; Restrictions of Hazardous Substances (RoHS) Directive

#### Teaching and learning interface for practical skills:

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including (a) laboratory practicals; (b) field-work exercises; (c) customized exercises based on available data; (d) survey analyses; and (e) developing case studies; (f) demonstration and critical analyses; and (h) experiential learning individually and collectively.



Prospective sector(s):

- Ⓒ Electric and electronic industries,
- Ⓒ E-waste Recycling Unites,
- Ⓒ Private entrepreneurs,
  - Environmental consultancies,
- Ⓒ Pollution Boards, and
- Ⓒ Environmental NGOs

Suggested Readings:

- Hester, R.E. and Harrison, R.M., 2009. Electronic Waste Management: Design, Analysis and Application. Royal Society of Chemistry Publishing, Cambridge, UK.
- Fowler, B.A., 2017. Electronic Waste: Toxicology and Public Health Issues. Academic Press.
- Gaidajis, G., Angelakoglou, K. and Aktsoylou, D., 2010. E-waste: environmental problems and current management. Journal of Engineering Science and Technology Review, 3(1), pp. 193-199.
- Janyasuthiwong, S., 2020. Metal Removal and Recovery from Mining Wastewater and E-waste Leachate. CRC Press.

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## Course Title – Public Speaking in English Language and Leadership

### Learning Objectives

The Learning Objectives of this course are as follows:

- To impart leadership skills to students along with adequate communication skills to create strong leaders in the emerging social, political and corporate world.
- To create leaders with ethics and resilience in industry-based fields as well as social fields.
- To allow students to realise their leadership skills and nurture them through a hand-on practical approach which will be helpful in generating employable skills for them.

### Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to learn effective communication through Public Speaking will instill leadership development among students.
- After studying this course, students will be able to lead in different fields at the undergraduate level, be responsible citizens and employ leadership skills in their future endeavours, too.
- After studying this course, students will be able to strengthen their critical mindset, help them being assertive and put forward constructive viewpoints employing the skills learnt in the practice sessions.

## SYLLABUS

### UNIT 1

- Introduction to Effective Communication- Features, Advantages & Disadvantages
  - Importance of Listening
  - Oral communication- Meaning, Features & Importance
  - Reading Public Speech- Reading documented speeches delivered in the past; Understanding the art of word play, vocabulary and putting thoughts into words

### UNIT 2

- Public Speaking-
  - V What is Speech?, Overcoming Fear of Public Speaking, Language of Public Speech
  - V Drafting a Public Speech (Reading, research, writing, Fact check, Re-writing, Delivery)
  - Y' 3P's of Public Speaking (Preparation, Practice, Performance)
  - S Rhetoric Skills, Art of Informative & Persuasive speaking, Concluding Speech with Power
- Types of Public Speaking-
  - S Physical & Online
  - S Political, Organisational, Educational & Motivational
  - S Ted Talks, Public Speaking in Media
- Listening in groups and Discussion- Listening famous speeches (from history & everyday life); Analysis of its elements & classroom discussion
- Writing Public speech- Classroom Practice Sessions

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UNIT 3

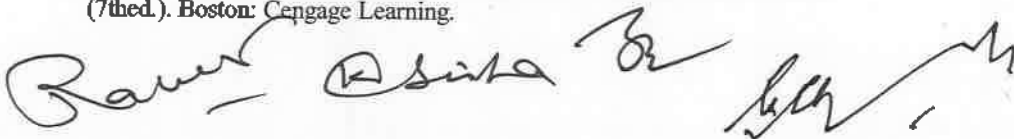
- Leadership Skills- (2 hrs.)
  - S Meaning, Features & Importance
  - S Historical Overview
  - S Leadership in Academic Life, Corporate Space, Public Life, Social Leadership and Political Leadership
- Leadership & Innovations- (2 hrs.)
  - S Audience analysis
  - S Audience Engagement & Leadership
  - S Influencing through Leadership
- Execution & Delivery of Public Speech- Learning rhetorics through speeches in the form of Audio/ Video; Learning Body Language & Paralanguage through ICT
- Developing leadership competence through Public Speaking- Intra-class Speech Competitions; Extempore; Group Discussion

UNIT 4

- Importance of Public Speaking in developing Leadership Skills
- Ethics in Public Speaking & Leadership
- Mock Parliament/MUNs
- Workshop

**Suggested Readings:**

- S Beebe, S. A., & Beebe, S. J. (2012). Public speaking: An audience-centred approach. (8th ed.). Boston: Pearson.
- S Cardon, P. (2014). Business communication: Developing leaders for a networked world. (international ed.). New York: McGraw-Hill.
- S Jaffe, C. I. (2013). Public speaking: Concepts & skills for a diverse society. (7th ed.). Boston: Cengage Learning.



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## Course Title – Statistical Software Package

### Learning Objectives

The Learning Objectives of this course are as follows:

- To familiarize students with data analysis using a statistical software package like SPSS or any other equivalent.
- To provide skills for research analysis and increase employability.
- To lay a foundation for advance data analysis work and higher education.

### Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to understand basic functions of statistical software package for managing variables and generate descriptive statistics to describe the data and analyze data through graphs and charts.
- After studying this course, students will be able to test differences in sample means.
- After studying this course, students will be able to identify relationships between variables and develop models for predicting dependent variables on the basis of independent variables.
- After studying this course, students will be able to understand data structures and identify clusters in data.
- After studying this course, students will be able to identify principal components that are relevant from a host of variables.

## SYLLABUS

### Unit 1: Getting started with the Software

Introduction: Data Entry, Storing and Retrieving Files, Generating New Variables; Managing Data - Listing cases, replacing missing values, computing new variables, recoding variables, selecting cases, sorting cases, merging files, Graphs - Creating and editing graphs and charts; Descriptive Statistics Procedures: Frequencies, Descriptive, Explore, Cross Tabulation.

### Unit 2: Hypothesis Testing for Means

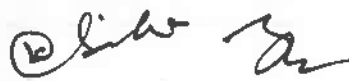
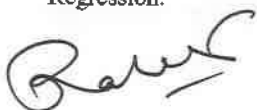
T-tests: One sample test, Independent samples and paired samples t-test; ANOVA - One-way analysis of variance with post hoc analysis, Two-way analysis of variance.

### Unit 3: Testing for Association between Variables

Chi-square Test of Independence; Bivariate Correlation Analysis: Simple Scatter Plot; Correlation Coefficient: Pearson, Spearman Rho and Kendall Tau Coefficient. Factor analysis.

### Unit 4: Regression Analysis

Linear Regression: Simple Linear Regression, Multiple regression analysis with matrix scatterplot. Multiple Regression: Standard (Enter) and Stepwise Method. Binary Logistic Regression.



**Essential/recommended readings**

- Performing Data Analysis using IBM SPSS, Lawrence S. Meyers, Glenn C. Gainst, J. Guarino, Wiley Publication
- SPSS for Windows Step by Step A Simple Guide and Reference, Darren George and Paul Malley
- SPSS in Simple Steps, Kiran Pandya, Smruti Bulsari, Sanjay Sinha, Dreamtech Press

**Suggestive Readings**

- Using SPSS in Research, Dr. Radha Mohan, Neelkamal.

*Radha Mohan* *Neelkamal*

*[Handwritten signature]*

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## Course Title – Sustainable Ecotourism and Entrepreneurship

### Learning Objectives

The Learning Objectives of this course are as follows:

- To train students in concepts and principles of sustainable ecotourism leading to a new generation of entrepreneurs
- To inculcate field-based practical skills in translating ecological systems into wealth generation while conserving natural resources
- To transform local biological wealth into a hub of global attraction and generate a scientific basis of Indian traditional knowledge

### Learning outcomes

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to develop next-generation ecological entrepreneurs
- After studying this course, students will be able to evolve eco-literate society by integrating market-based instruments with eco-cultural knowledge of traditional societies
- After studying this course, students will be able to practice ecological knowledge for wealth generation, environmental conservation, and popularization of Indian traditional knowledge

## SYLLABUS

### Practical/Hands-on Exercise

- Assess the current state of ecotourism in little-known/explored areas and examine ecotourism potential
- Field surveys to identify the existing locations having ecological, wildlife, scenic, and ethnic potential for ecotourism and analyze existing prevalent eco-practices having the potential to integrate with ecotourism programme
- Identify ten plant species having ecological, economic, and cultural significance as ecotourist attraction
- Develop stories on the selected wild habitats to attract ecotourists from within and outside the country
- Identify suitable track and prepare a checklist of birds and animals with their stories for a diverse group of ecotourists
- Examine the current state of natural resources and develop suitable messages and appropriate media for educating different target groups
- Survey and identify the target group for ecotourism based on their age, education, economic and other criteria and evaluate their psychological barriers to ecotourism
- Conduct inventory of facility and analyze a preliminary competitive advantage over ecological attractions in the nearby area
- Analyze tourist spending patterns and track preferences for ecotourism attractions in nearby areas and add value to ecological, wildlife, and cultural attractions
- Survey attitude and perception of residents regarding ecotourism plan and analyze costs and benefits of the sustainable ecotourism development programme using a demand-driven marketing approach
- Develop messages, stories, and pictures to attract tourists and promote ecotourism in the target area
- Analyze basic elements of ecotourism, the special needs of ecotourists, develop trips and travel packages offering an array of experiences and predict the market trends
- Develop ecotourist activities for individuals, families, and groups and craft social media campaigns for the proposed ecotourism business
- Develop a plan for strategic alliances and partnerships with other projects/groups/organizations for public-private partnership in the proposed ecotourism programme.

**Teaching and learning interface for practical skills:**

To impart training on technical and analytical skills related to the course objectives, a wide range of learning methods will be used, including

- (a) laboratory practical;
- (b) field-work exercises;
- (c) customized exercises based on available data;
- (d) survey analyses;
- (e) developing case studies;
- (f) demonstration and critical analyses;
- (h) experiential learning individually and collectively prospective sector(s):
  - Forest Departments
  - Tourism industry
  - World Bank
  - UNDP
  - WWF
  - Environmental NGOs

**Suggested Reading:**

- Ballantyne, R. and Packer, J., 2013. *International Handbook on Ecotourism*. Edward Elgar Publishing Limited, UK
- Blumstein, D.T., Geffroy, B., Sarnia, D.S. and Bessa, E., 2017. *Ecotourism's promise and*
- *Peril. A Biological Evaluation*. Springer Int. Publ. (Chapters 10-11)
- Fennell, D.A., 2014. *Ecotourism. An Introduction*. Routledge, London, UK.
- Fletcher, R., 2014. *Romancing the wild*. In *Romancing the Wild*. Duke University Press.
- Tanguay, G.A., and Rajaonson, J., (2015). *Evaluating Sustainable Tourism Using Indicators:*
- *Problems and Solutions*. In: Brophy, S.C., (Ed), *Ecotourism: Practices, Benefits and Environmental Impacts*. Nova Science Publishers, pp. 119 - 134.
- Wearing, S. and Schweinsberg, S., 2019. *Ecotourism: Transitioning to the 22nd century*. Routledge



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## **Course Title – Visual Communication and Photography**

### **Learning Objectives**

The Learning Objectives of this course are as follows:

- To synthesize a comprehensive view of principles involved in Visual Communication.
- To appreciate and express the cultural significance of photography as visual art and understand its evolution and purposes.
- To develop an awareness of compositional and organizational strategies for the effective deployment of formal elements of visual art.
- To read visual texts with a deep knowledge of visual history and theory.
- To create an ability of situating the content and form of the visual representation of thematic context.

### **Learning outcomes**

The Learning Outcomes of this course are as follows:

- After studying this course, students will be able to acquire knowledge of the cultural and historical importance of the visual medium.
- After studying this course, students will be able to explore the fundamentals and underlying theories of Visual Communication.
- After studying this course, students will be able to develop a thorough knowledge of concepts, and skills in creating photographs.
- After studying this course, students will be able to learn to identify and analyze semiotics in photographs.
- After studying this course, students will be able to develop a craftsmanship in creating aesthetically pleasing photographs.

### **SYLLABUS**

#### **Unit 1: Historical Background and Basics of Visual Communication**

Unit Description: The Unit I will give a brief history of the visual arts from the caveman to modern man. Skills of artistic schools of thought and Intertextuality in art in relation to culture.

Topics- Concept and History of Visual Communication, Human Eye and Visual Process, Visual culture and Information Education Communication, Theories of visual communication - Gestalt Theory of visual communication, Perceptual theory of Visual communication, Semiotics and cognitive approach in visuals

#### **Unit II: Theories of Visual Communication**

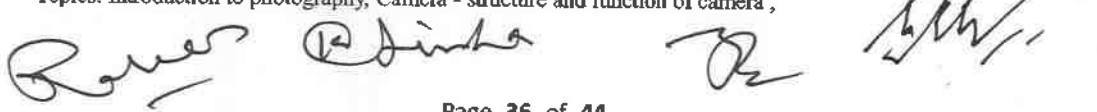
Unit Description: This unit will put emphasis on theories, semiotics and the study of signs. Through semiotic theories improve critical thinking skills, and learn to use semiotics to think logically and to analyze visual media in context of culture.

Topics: Fundamentals of Design: Definition. Approaches to Design, Centrality of Design, Elements of Design, Principles of Visual and other Sensory Perceptions. Colour psychology and theory (some aspects), Definition, Optical / Visual Illusions, etc., Various stages of design process, Learning skills to read signs and signifier in visuals for social messaging

#### **Unit III: Photography as Visual Communication**

Unit Description: This unit will provide skills to learn camera and lighting techniques.

Topics: Introduction to photography, Camera - structure and function of camera ,



Characteristics of light, Sources of Light-Nature, Artificial and Available, Lighting techniques-three-point lighting, Exposure - focusing, aperture, shutter speed, Depth of field.  
, Kinds of light indoor and outdoor - Electronic flash and artificial lights, Light meters

#### **Unit IV: Camera Compositions and Accessories**

Unit Description: This unit will provide skills about camera accessories and designing aesthetically rich compositions.

Topics: Camera lenses and accessories, Basic shots, angle, and view, Composition, Role of photographic image in visual communication, Basics of photojournalism, photo-features, photo - essays, writing captions, visual storytelling.

#### **Essential Readings**

- Barnes, Susan B. An Introduction to Visual Communication: From Cave Art to Second Life, Peter Lang Pub, 2011.
- Berger, Arthur Asa, Seeing is Believing: An Introduction to Visual Communication, McGraw-Hill Education, 2012.
- Lester, Paul Martin, Visual Communication: Images with Messages (6ed), Cengage Learning, 2013.
- Photography: A Critical Introduction - edited by Liz Wells London, Routledge, Oxon, 2015.
- Farrell, I. Complete Guide to Digital Photography, Quercus Publishing, UK, 2014.

#### **Suggested Readings**

- Mandav, Pradeep, Visual Media Communication, Authors Press, 2001.
- Williams, Rich, Visual Communication: Integrating Media, Art, and Science, Routledge, 2007

*Ramesh Pradeep* *R. Williams* *Rich Williams*

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## **Course Title - पटकथा लेखन**

### **Course Objective**

- पटकथा लेखन का परिचय कराना।
- विद्यार्थी की लेखन-क्षमता और भाषा-कौशल को बढ़ावा देना।
- विद्यार्थी की लेखन में रोजगार सम्बन्धी क्षेत्रों के लिए तैयार करना।

### **Course Learning Outcomes:**

- पटकथा लेखन तथा उसके तकनीकी शब्दों से विद्यार्थी अवगत हो सकेगा।
- पटकथा लेखन की जानकारी मिलने के उपरान्त विद्यार्थी के लिए रोजगार की संभावनाएँ बनेंगी।
- विद्यार्थी भाषायी सम्प्रेषण को समझते हुए लेखन से सम्बन्धित विभिन्न पक्षों से अवगत हो सकेगा।
- विद्यार्थी में अभिव्यक्ति कौशल का विकास हो सकेगा।

## **SYLLABUS**

### **यूनिट 1**

- पटकथा लेखन: परिचय
- पटकथा के तत्व
- पटकथा के प्रकार
- पटकथा की शब्दावली

### **यूनिट 2**

- पटकथा लेखन में शोध का महत्व
- चरित्र की निर्मिति और विकास
- एक दृश्य का लिखा जाना
- तीन अंक (थ्री एक्ट) और पाँच अंक (फाइव एक्ट) को समझना

*Ramendra Singh & Anurag*

### यूनिट 3

- वेबसीरीज के लिए पटकथा लेखन
- लघु फिल्म के लिए पटकथा लेखन
- वृत्तचित्र के लिए पटकथा लेखन
- विज्ञापन फिल्म के लिए पटकथा लेखन

### यूनिट 4

- पटकथा का पाठ और विश्लेषण
- किसी आईडिया को स्क्रीन प्ले के तौर पर विकसित करना

### सन्दर्भ पुस्तकें:

- पटकथा कैसे लिखें: राजेद्र पांडेय – वाणी प्रकाशन, दिल्ली, संस्करण 2015
- पटकथा लेखन : एक परिचय – मनोहर श्याम जोशी– राजकमल प्रकाशन, दिल्ली संस्करण 2000
- कथा–पटकथा : मन्नू भंडारी – वाणी प्रकाशन, दिल्ली , संस्करण 2014
- व्यावहारिक निर्देशिका: पटकथा लेखन: असगर वजाहत – राजकमल प्रकाशन, दिल्ली, संस्करण 2011
- आईडिया से परदे तक: रामकुमार सिंह–राजकमल प्रकाशन, दिल्ली, संस्करण 2021



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## **Course Title- रंगमंच**

### **Course Objective**

- हिन्दी रंगमंच का परिचय कराना।
- नाट्य-प्रस्तुति की प्रक्रिया की जानकारी देना।
- अभिनय के विभिन्न पक्षों से अवगत करना।
- रंगमंच के खेलों और गतिविधियों से अवगत कराना।

### **Course Learning Outcomes:**

- नाट्य-प्रस्तुति की प्रक्रिया से विद्यार्थी अवगत हो सकेगा।
- रंगमंच की जानकारी मिलने के उपरान्त इस क्षेत्र में विद्यार्थी के लिए रोजगार की संभावनाएँ बनेंगी।
- रंगमंचीय गतिविधियों से विद्यार्थी के व्यक्तित्व का विकास हो सकेगा।
- विद्यार्थी में अभिव्यक्ति कौशल का विकास हो सकेगा।

## **SYLLABUS**

### **यूनिट 1**

- भरत मुनि कृत नाट्यशास्त्र (संक्षिप्त परिचय)
- हिन्दी का पारंपरिक रंगमंच (संक्षिप्त परिचय)

### **यूनिट 2**

प्रस्तुति-प्रक्रिया: आलेख का चयन, अभिनेताओं का चयन, दृश्य-परिकल्पना (ध्वकन-संगीत-नृत्य-प्रकाश),

पूर्वाभ्यास



### यूनिट 3

अभिनय की तैयारी: वाचिक, आंगिक, आहार्य, सात्विक

### यूनिट 4

आशु अभिनय, थिएटर गेम्स, संवाद-वाचन, शारीरिक अभ्यास, सीन वर्क

### यूनिट 5

मंच प्रबंधन: सेट, रंग-सामग्री, प्रचार-प्रसार, ब्रोशर-निर्माण

### सन्दर्भ पुस्तकें:

- संक्षिप्त नाट्यशास्त्रम् – राधावल्लभ त्रिपाठी, वाणी प्रकाशन, दिल्ली, 2009
- रंग स्थापत्य: कुछ टिप्पणियाँ – एच0 वी0 शर्मा राष्ट्रीय नाट्य विद्यालय प्रकाशन, दिल्ली संस्करण 2004
- पारंपरिक भारतीय : रंगमंच अनंतधाराएँ – कपिला वात्स्यायन, अनुवाद-बदी उजम्मा, नेशनल बुक ट्रस्ट, दिल्ली, 1995
- हिंदी रंगमंच का लोकपक्ष, सं प्रो0 रमेश गौतम, स्वराज प्रकाशन, दिल्ली 2020
- मंच आलोकन – जी0 एन0 दासगुप्ता, अनुवाद – अजय मलकानी, नेशनल बुक ट्रस्ट, दिल्ली 2006
- रंगमंच के सिद्धांत –सं महेश आनंद, देवेन्द्र राज अंकुर, राजकमल प्रकाशन, दिल्ली 2008

Ramul R. Saha

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## Course Title- रचनात्मक लेखन

### Learning Objectives

- विद्यार्थियों के मौखिक और लिखित अभिव्यक्ति कौशल को विकसित करना।
- उनमें कल्पनाशीलता और रचनात्मकता का विकास करना।
- साहित्य की विविध विधाओं और उनकी रचनात्मक शैली का परिचय कराते हुए लेखन की ओर प्रेरित करना।
- प्रिंट एवं इलेक्ट्रॉनिक माध्यमों के लिए लेखन की प्रवृत्ति को विकसित करना।

### Learning outcomes

The Learning Outcomes of this course of this course are as follows:

इस पाठ्यक्रम के अध्ययन के पश्चात् विद्यार्थियों में :

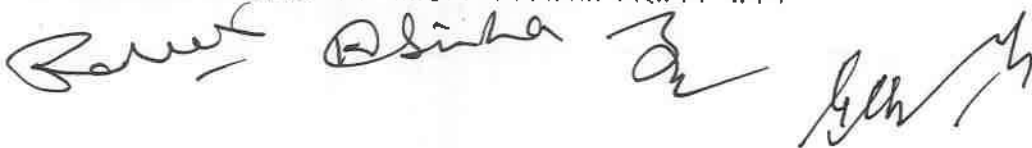
- मौखिक और लिखित अभिव्यक्ति कौशल को विकसित होने में मदद मिलगी।
- उसमें कल्पनाशीलता और रचनात्मकता का विकास हो सकेगा।
- साहित्य की विधि विधाओं और उनकी रचनात्मकता शैली का परिचय होगा जिससे वे स्वयं भी विधाओं में लेखन की अग्रसर हो सकेगे।
- प्रिंट एवं इलेक्ट्रॉनिक माध्यमों के लिए लेखन की ओर भी वे अग्रसर होंगे।

## SYLLABUS

### यूनिट 1

रचनात्मक लेखक: अवधारणा: स्वरूप आधार एवं विश्लेषण

- भाव एवं विचार की रचना में अभिव्यक्ति की प्रक्रिया
- अभिव्यक्ति के विविध क्षेत्र: साहित्य पत्रकारिता विज्ञापन भाषण



- लेखन के विविध रूप: मौखिक-लिखित गद्य-पद्य कथात्मक-कथेतर
- अर्थ निर्मित के आधार: शब्द और अर्थ की मीमांसा शब्द के पुराने-नए प्रयोग, शब्द की व्याकरणिक कोटि

## यूनिट 2

### भाषा भंगिमा और साहित्य लेखन

- भाषा भंगिमाएँ: औपचारिक-अनौपचारिक, मौखिक-लिखित, मानक भाषिक संदर्भ: क्षेत्रीय, वर्ग-सापेक्ष, समूह-सापेक्ष
- रचना-सौष्ठव: शब्दशक्ति, प्रतीक, बिम्ब, अलंकारवक्रता
- कविता: संवेदना भाषिक सौष्ठव, छंदबद्ध-छंदमुक्त, लय, गति, तुक
- कथा-साहित्य: वस्तु, पात्र, परिवेश, कथ्य और भाषा

## यूनिट 3

### विविध विधाओं एवं सूचना माध्यमों के लिए लेखन

- नाट्य-साहित्य: वस्तु, पात्र, परिवेश, कथ्य, रंगमंच और नाट्य-भाषा
- विविध गद्य विधाएँ: निबंध, संस्मरण, आत्मकथा, व्यंग्य, रिपोर्टाज, यात्रा-वृत्तांत
- प्रिंट माध्यम के लिए लेखन: फीचर, यात्रा-वृत्तांत, साक्षात्कार, विज्ञापन
- इलेक्ट्रॉनिक माध्यम के लिए लेखन: विज्ञापन, पटकथा, संवाद

### Practical Exercises if any:

नोट: उपर्युक्त का परिचय देते हुए इनका अभ्यास भी करवाया जाए।

*Ramesh* *Ramesh* *Ramesh*

### References and suggested readings

1. साहित्य चिंतन: रचनात्मक आयाम: रघुवंश
2. शैली: रामचंद्र मिश्र
3. रचनात्मक लेखक: सं० रमेश गौतम
4. कविता क्या है: विश्वनाथ प्रसाद तिवारी
5. कथा-पटकथा: मन्नू भंडारी
6. पटकथा लेखन: मनोहर श्याम जोशी
7. कला की जरूरत: अर्नेस्ट फिशर: अनुवादक: रमेश उपाध्याय
8. साहित्य का सौंदर्यशास्त्र: रवींद्रनाथ श्रीवास्तव
9. कविता: रचना-प्रक्रिया: कुमार विमल

Ramesh U. Singh

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3/1/20

**Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System**

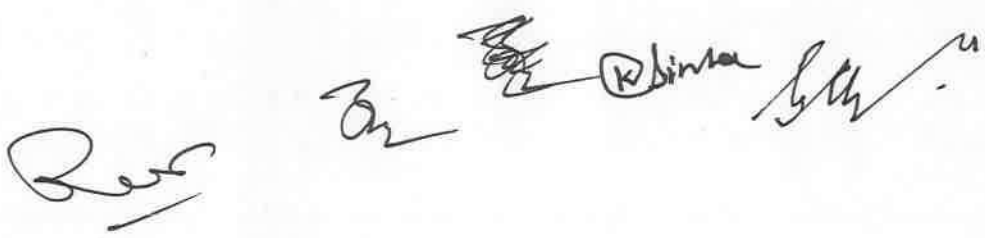
**Value Added Course (VAC)**

**Semester – I (VAC- 1)**

<b>Science</b>	<b>Social Science/Arts</b>	<b>Commerce</b>
<ul style="list-style-type: none"> <li>• Ayurveda &amp; Nutrition</li> <li>• Financial Literacy</li> <li>• Ethic &amp; Culture</li> <li>• Art of Being Happy</li> <li>• Swachh Bharat</li> <li>• Fit India</li> <li>• Panchakosha: Holistic Development of Personality</li> <li>• Culture &amp; Communication</li> </ul>	<ul style="list-style-type: none"> <li>• Gandhi &amp; Education</li> <li>• Sports for life</li> <li>• Ethic &amp; Culture</li> <li>• Art of Being Happy</li> <li>• Swachh Bharat</li> <li>• Fit India</li> <li>• Panchakosha: Holistic Development of Personality</li> <li>• भारतीय भक्ति परम्परा और मानव मूल्य</li> </ul>	<ul style="list-style-type: none"> <li>• Digital Empowerment</li> <li>• Sports for life</li> <li>• Ethic &amp; Culture</li> <li>• Art of Being Happy</li> <li>• Swachh Bharat</li> <li>• Fit India</li> <li>• Panchakosha: Holistic Development of Personality</li> <li>• Culture &amp; Communication</li> </ul>

**Semester – II (VAC- 2)**

<b>Science</b>	<b>Social Science/Arts</b>	<b>Commerce</b>
<ul style="list-style-type: none"> <li>• Vedic Mathematics</li> <li>• Emotional Intelligence</li> <li>• Yoga Philosophy &amp; Practice</li> <li>• Ethics &amp; Values in Ancient Indian Tradition</li> <li>• Constitutional Values &amp; Fundamental Duties</li> <li>• Social &amp; Emotional Learning</li> <li>• Ecology &amp; Literature</li> </ul>	<ul style="list-style-type: none"> <li>• Vedic Mathematics</li> <li>• Emotional Intelligence</li> <li>• Yoga Philosophy &amp; Practice</li> <li>• Ethics &amp; Values in Ancient Indian Tradition</li> <li>• Constitutional Values &amp; Fundamental Duties</li> <li>• Social &amp; Emotional Learning</li> <li>• सृजनात्मक लेखन के आयाम</li> </ul>	<ul style="list-style-type: none"> <li>• Vedic Mathematics</li> <li>• Emotional Intelligence</li> <li>• Yoga Philosophy &amp; Practice</li> <li>• Ethics &amp; Values in Ancient Indian Tradition</li> <li>• Constitutional Values &amp; Fundamental Duties</li> <li>• Social &amp; Emotional Learning</li> <li>• Ecology &amp; Literature</li> </ul>





**List of Value-Added Course (VAC)**

SL. No.	Course Title	LTP			Total Credits:	Total Marks = 100
		L	T	P		
1	Art of Being Happy	1	0	3	3	<b>End -Term Appraisal : 70 Marks</b>  <b>Internal Assessment: 30 Marks</b>
2	Ayurveda & Nutrition	1	0	3	3	
3	Constitutional Values & Fundamental Duties	1	0	3	3	
4	Culture & Communication	1	0	3	3	
5	Digital Empowerment	1	0	3	3	
6	Ecology & Literature	1	0	3	3	
7	Emotional Intelligence	1	0	3	3	
8	Ethics and Culture	1	0	3	3	
9	Ethics & Values in Ancient Indian Tradition	1	0	3	3	
10	Financial Literacy	1	0	3	3	
11	Fit India	1	0	3	3	
12	Gandhi & Education	1	0	3	3	
13	Panchakosha: Holistic Development of Personality	1	0	3	3	
14	Social & Emotional Learning	1	0	3	3	
15	Sports for life	1	0	3	3	
16	Swach Bharat	1	0	3	3	
17	Vedic Mathematics	1	0	3	3	
18	Yoga Philosophy & Practice	1	0	3	3	
19	भारतीय भक्ति परम्परा और मानव मूल्य	1	0	3	3	
20	सृजनात्मक लेखन के आयाम	1	0	3	3	

*Rest*

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**Value Added Courses (VAC)**

**Course Title – Arts of Being Happy**

**Course Objectives**

- To synthesize the insights developed by Human Development experts, Psychologists, Anthropologists on one hand, and the intellectual traditions of Vedantic Philosophy and Indology on the other towards the experience of happiness.
- To illustrate various factors that determine the subjective experience of happiness in a cross cultural context.

**Learning Outcomes**

- The students shall be able to evaluate the factors contributing to the phenomenon of happiness in the personal, familial and community life of an individual in different cultures in the Indian context.
- They will be able to develop healthy interpersonal relationships and wellbeing, cherishing the values of Indian culture and philosophy.
- They will be able to relate to the global phenomenon of sustainable development and become sensitive to the needs of the planet.
- They will be able to apply the experience of *Aananda* at a personal level.

**Syllabus of *The Art of Being Happy***

<b>Unit 1: Human Ecology and Happiness</b>
<ul style="list-style-type: none"><li>● Definitions/Factors of Happiness: Environmental and Social</li><li>● Physical, emotional and psychological well-being for happiness</li><li>● Physiological and hormonal basis of happiness</li><li>● Coping with Stress: A life saving skill</li></ul>
<b>Unit 2: Indological Theories of Happiness</b>
<ul style="list-style-type: none"><li>● <i>Punch Kosh</i> Theory &amp; Idea of Well Being</li><li>● Idea of Self and other</li><li>● Hierarchy and stages of happiness</li></ul> 13

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<b>Unit 3 : Happiness: Cross-cultural Contexts</b>
<ul style="list-style-type: none"> <li>● Culture and Happiness</li> <li>● Interpersonal Relationship: Comparative Perspective</li> <li>● Towards Self-Actualization</li> </ul>
<b>Unit 4: Local and Global Perspective of Happiness</b>
<ul style="list-style-type: none"> <li>● Measuring happiness: Key indicators</li> <li>● Happiness Index</li> <li>● India in Global Happiness Indices</li> </ul>

### Practical/ Practice Component

The course will be based on students' identification and operationalization of the concept of happiness and well-being. Students will explore the indicators and actualization of these concepts in everyday life.

- Community surveys on the facilities promoting positive mental health practices such as Yoga and Meditation Centres, Recreation clubs, and Parks for youth and senior citizens shall be carried out by the students.
- Extending help and social service by visiting old age homes/ hospitals/slum areas or any other disadvantaged groups.
- Students can undertake a field work / project independently or work as an Intern with NGOs working in the area of happiness and well-being.
- Critical appreciation of a documentary/ film based on Happiness and Well-being can be undertaken by the students.
- Workshops/ Sessions for the actualization of innate creative potential- ( Music, Drawing, Calligraphy, Dramatics)
- Hands-on Happiness: Gardening, Cleaning, Washing, Cooking, etc.
- If required, students can share their experiences in the form of a Project Report.
- Students may share their experiences in the form of Audio-video presentations of 15-20 minutes.
- Any other Practical/Practice as decided from time to time

### Essential Readings

- Hanumanthly, Vinayachandrea & Choudry, Anuradha. (2013). Understanding Happiness: A Vedantic Perspective. Psychological Studies. 59. 141-152. 10.1007/s12646-013-0230-x.
- Leontiev, Dmitry. (2012). Anthropology of Happiness: the state of Well-Being and the way of Joy, In Social Science, Vol 43 No 2 P93-104.
- Snyder .C.R. S.J. Lopez & J.T. Pedrotti. (2015). Positive Psychology (The Scientific and Practical Explorations of Human Strengths): Sage Publication. (Chapter 5: Subjective Well-being: The Science of Happiness and Life Satisfaction, Page 63 to 73)
- WorldDevelopmentIndicators2016. (2016).United States: World Bank Publications.
- Zelenski, John. (2019).

### Suggested Readings

- Baumgardner, S & Crothers, M. (2014). Positive Psychology. New Delhi: Pearson Education, India.
- Goleman, D. (2007). Social Intelligence: The new science of human relationships, RHUK
- Mathews, Gordon and Carolina Izquierdo. (eds). (2010). Pursuits of Happiness: Well being in Anthropological Perspective. Bergham Books
- Seligman, M. (2002). Authentic happiness: Using the new positive psychology to realize your potential for lasting fulfillment. New York: Free Press.
- Sri Aurobindo, The Synthesis of Yoga, Part Three: The Yoga of Divine Love, Chapter 7, The Ananda Brahman, pp. 569-570
- Positive Psychology: The Science of Well-Being, -Carleton University, Ottawa, Canada, Sage Publications Chapter 3: Happiness; page 77 to 110)

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## Course Title – Ayurveda and Nutrition

### COURSE OBJECTIVES:

- To introduce the basic principles of nutrition in Ayurveda
- To link the Ayurvedic nutrition with modern dietary practices for health
- To analyse basic tenets of traditional diets and health recipes
- To understand the contemporary food habits in everyday life

### LEARNING OUTCOMES:

- Awareness of traditional food cultures of India
- Evaluate changing food patterns and lifestyle over the years
- Understand Indian Knowledge Systems (IKS) and key Vedic principles with respect to Food and Nutrition
- Apply basic tenets of traditional diets for health and disease
- Prepare selected healthy recipes based on Ayurvedic principles

### Syllabus of *Ayurveda and Nutrition*

<b>Unit I: Introduction to Ayurvedic Nutrition</b>
<ul style="list-style-type: none"><li>● Ayurveda and Indian food cultures</li><li>● Nutrition and lifestyle transition over the years</li><li>● Regional Food Traditions of India</li></ul>
<b>Unit II: Basic principles of Food and Nutrition and Ayurveda</b>
<ul style="list-style-type: none"><li>● Understanding rich sources of nutrients</li><li>● Concept of <i>Doshas</i> &amp; assessment</li><li>● Ayurvedic Principles of food habits and factors determining quality of food (<i>Ahara vidhi visheshaayatana</i>)</li><li>● FSSAI regulations on Ayurvedic Aahar</li></ul>
<b>Unit III: Ayurvedic Diets</b>
<ul style="list-style-type: none"><li>● Principles of Diet: <i>Aharavidhi vidhan</i>, <i>Sattvic</i>, <i>Rajasi</i>, <i>Tamasic</i> foods</li><li>● Incompatible food (<i>Viruddha Ahara</i>), <i>Pathya</i>; <i>Apathya</i>; <i>Viprita Ahaar</i></li><li>● Lifestyle Management with <i>Dincharya</i> and <i>Ritucharya</i></li><li>● Application of Ayurvedic diets to stress linked food behaviour</li></ul>

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### Practical/ Practice Component

- Visit your local market and classify the available food items according to *Sattvic, Rajasi, Tamasic* foods
- Conduct a survey of 10-15 households in your locality:
  - To study food behaviour and analyse them in light of Ayurvedic dietary principles of *Sattvic, Rajasi, Tamasic*
  - To study the food consumption patterns and intake of incompatible food: *Viruddha Ahara, Pathya; Apathya; Viprita Ahaar*
  - To know about their adopted lifestyle *Dincharya* and *Ritucharya*

Students are required to visit available e-resources of University of Delhi, Ministry of

- Ayush with regard to Ayurveda and Nutrition.
- If required, students can share their experiences in the form of a Project Report.
- The students may share their experiences in the form of audio-visual presentations of 15-30 minutes.
- Any other Practical/ Practice as decided from time to time

### Essential Readings

- Rastogi S (2014) *Ayurvedic Science of Food and Nutrition*. ASIN: BOOHWMV094, Springer: ISBN-13: 978-1461496274
- Rastogi S (2010) Building bridges between Ayurveda and modern science. *Int J Ayurveda Res.* 1(1):41-46.
- FSSAI regulations on Ayurveda Aahar Regulations 2022. *Gazette of India CG-DL-E-07052022-235642*. New Delhi, Friday, May 6, 2022/ Vaisakha 6, 1944.
- Frawley D (2012) *Ayurvedic healing: A comprehensive guide*. Lotus Press, India.
- <https://iksindia.org/>: Indian Knowledge Systems

### Suggested Readings

- Charaka Samhita, Charaka (1998) In: Tripathi BN (ed) *Sutra Stahan Maharashtra Adhyay*. Chaukhamba Orientalia, Varanasi.
- Kapoor Kapil & Singh AK *Indian Knowledge Systems Volume- 1*. Indian Institute of Advanced Study Shimla. Published by DK Printworld (P) Ltd, N. Delhi. <https://www.lkouniv.ac.in>

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## Course Title – Constitutional Values And Fundamental Duties

### COURSE OBJECTIVES:

- Enrich students with knowledge and relevance of the Constitution.
- Develop awareness about Duties and Values.
- Inculcate a sense of Constitutionalism in thought and action.

### LEARNING OUTCOMES:

- Understand the Constitution and its relevance
- Appreciate the values and goals embedded in the Constitution.
- Recognise the importance of Fundamental Duties enshrined in the Constitution.
- Apply the spirit of fundamental values and duties in everyday national life.

### Syllabus of *Constitutional Values and Fundamental Duties*

<b>Unit I: The Constitution of India – an Introduction</b>
<ul style="list-style-type: none"><li>• Federal Republic, Rule of Law, Separation of Powers</li><li>• Sovereignty, Socialism, Democracy</li><li>• Secularism and <i>Sarva Dharma Sama Bhava</i></li></ul>
<b>Unit II: Constitutional Values</b>
<ul style="list-style-type: none"><li>• <b>Justice:</b> Social, Political, Economic</li><li>• <b>Liberty:</b> Thought, Expression, Belief, Faith, Worship</li><li>• <b>Equality :</b> Equality before law &amp; equal application of laws</li><li>• <b>Fraternity:</b> Dignity, Unity and Integrity</li></ul>
<b>Unit III: Fundamental Duties</b>
<ul style="list-style-type: none"><li>• Reflecting on the ancient Indian notions of righteousness and duty consciousness</li><li>• Fundamental Duties- Article 51A [(a) – (k)]</li><li>• Legal status of Fundamental Duties - Judicial approach</li></ul>

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### Practical/ Practice Component



- Reflections on some of the constitutional values/ fundamental duties and its contemporary relevance in day-to-day national life through group discussions and projects.
- Conduct workshops to spread awareness on the Fundamental Duties and Values.
- Students are required to conduct a survey (minimum 25 respondents) on assessing the awareness of the constitutional duties amongst the citizens.
- Students may share their experiences on Fundamental Duties and Values in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

### ESSENTIAL READINGS

- *Preamble to the Constitution of India, 1950.*
- *The Constitution of India, Articles - 14, 19, 21.*
- *The Constitution of India, Fundamental Duties [Ar. 51 A (a) – (k)].*

### SUGGESTED READINGS

- Durga Das Basu, *et al., Introduction to the Constitution of India* (LexisNexis, 26<sup>th</sup> edn, 2022).
- Leila Seth, *We, the Children of India: The Preamble to Our Constitution* (New Delhi, Puffin Books, Penguin Books India, 2010).
- Mahendra Pal Singh, V.N. Shukla's *Constitution of India*, (Eastern Book Company, Lucknow, 13<sup>th</sup> revised edn. 2017)
- B.R. Ambedkar Selected Speeches, (Prasar Bharati, New Delhi, 2019) available at: [https://prasarbharati.gov.in/whatsnew/whatsnew\\_653363.pdf](https://prasarbharati.gov.in/whatsnew/whatsnew_653363.pdf).

  
  
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**Course Title - CULTURE AND COMMUNICATION**

**Learning Objectives:**

- To focus on traditional values disseminated from Indian cultural heritage.
- To understand the interconnections between the legacy of our past and needs of our contemporary society.
- To learn to adapt, interact and celebrate our diversity and pluralistic culture.
- To develop communication skills in speaking, listening, reading and writing and apply them in our quotidian life as young citizens of contemporary India.
- To integrate ethical values and life skills.

**Course Outcomes:**

- Students will be able to appreciate the relevance of ancient Indian wisdom and core ethical values in our contemporary life.
- Students will be able to engage in a dialogue between the past and the present and inculcate the best principles towards a meaningful life.
- Students will be encouraged to involve themselves in team work and group activities to address challenges faced in metropolitan cities.
- Students will be able to develop communication skills, that is, analytical reading, empathetic listening, considerate speaking as well as informed writing.
- Extension activities will equip the students, drawn from diverse backgrounds, with life skills and confidence to integrate with a multicultural environment and work towards an inclusive community.
- Students will be encouraged to envisage and work towards an ethically robust society and thereby strengthen the nation.



**Unit I: Ethical Values from Indian Cultural Heritage**

- *Vasudhaiva Kutumbakam*
- United We Stand, Divided We Fall
- *Ek Bharat, Shresht Bharat*

**Unit II: Developing Life Skills**

- Empathy
- Adaptability
- Conserving our natural resources
- Sharing knowledge resources

**Unit III: Effective Communication in Everyday Life**

- empathetic listening
- considerate speaking
- analytical reading
- informed writing

**Practical/ Practice Component**

As hands-on experience is an essential component of the course, this section will focus on the practical aspects to correlate with the fundamental principles and learnings of the theory portion. Students will be encouraged to use the communication tools learnt through Unit 3 and corroborate the continuities of core principles studied in Unit 1 and 2.

- Students will be asked to conduct surveys/interviews in their neighbourhood or commuting routes to assess the nature and quality of negotiating our cultural diversity and pluralist traditions.
- Students would be assigned visits to old-age homes, hospitals, cancer wards, etc. to interact and write about their experiences with old people, caregivers, patients, nursing staff, helpers, etc.

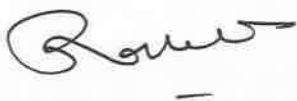

staff, helpers, etc.

- They will also be assigned visits to historically important places and monuments within the city and also converse with the tourists in order to trace a comprehensive view of the rich cultural history of India. They may create video documentaries, take and record tourists' interviews and/or write a journal entry of the visit using the communication skills learnt.

- Students shall make group presentations or individual reports on the activities undertaken. Discussions with classmates and the teacher shall be undertaken to evolve clarity of vision on the ethical values and effective communication skills learned through this course.

**ESSENTIAL READINGS:**

- Ramanujan, A.K. 'A Flowering Tree', *Cultural Diversity, Linguistic Plurality & Literary Traditions in India*. Department of English, OUP, 2015. pp 125-138
- Haksar, A. N. D. 'Chanakya Niti Shastra', *Chanakya Niti*. India, Penguin Random House India Private Limited, 2020.
- Dhanavel. S.P. *English and Soft Skills*. Orient Black Swan, 2010.
- Murthy, Sudha. 'The Nobel Prize', *Wise & Otherwise*. India, Penguin Random House India Private Limited, 2006.
- Murthy, Sudha. 'How to Beat the Boys', *Three Thousand Stitches: Ordinary People, Extraordinary Lives*. Penguin Books, 2017.
- Soyinka, Wole. 'Telephone Conversations', *The Individual and Society*, Department of English, Pearson Education, 2006. pp 122-23
- Bansode, Hira. 'Bosom Friend', *The Individual and Society*, Department of English, Pearson Education, 2006. pp 49-50

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## Course Title - Digital Empowerment

### **COURSE OBJECTIVES:**

- Understand the digital world and need for digital empowerment
- Create awareness about Digital India.
- Explore, communicate and collaborate in cyberspace.
- Building awareness on cybersafety and security.

### **LEARNING OUTCOMES:**

- Use ICT and digital services in daily life.
- Develop skills to communicate and collaborate in cyberspace using social platforms, teaching/learning tools.
- Understand the significance of security and privacy in the digital world.
- Evaluate ethical issues in the cyber world.

<b>Syllabus of Digital Empowerment</b>
<b>Unit I: Digital inclusion and Digital Empowerment</b>
<ul style="list-style-type: none"><li>• Needs and challenges</li><li>• Vision of Digital India: DigiLocker, E-Hospitals, e-Pathshala, BHIM, e-Kranti (Electronic Delivery of Services), e-Health Campaigns</li><li>• Public utility portals of Govt. of India such as RTI, Health, Finance, Income Tax filing, Education</li></ul>
<b>Unit II: Communication and Collaboration in the Cyberspace</b>
<b>Syllabus of Digital Empowerment</b>
<b>Unit I: Digital inclusion and Digital Empowerment</b>
<ul style="list-style-type: none"><li>• Needs and challenges</li><li>• Vision of Digital India: DigiLocker, E-Hospitals, e-Pathshala, BHIM, e-Kranti (Electronic Delivery of Services), e-Health Campaigns</li><li>• Public utility portals of Govt. of India such as RTI, Health, Finance, Income Tax filing, Education</li></ul>
<b>Unit II: Communication and Collaboration in the Cyberspace</b>

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<ul style="list-style-type: none"> <li>● Electronic Communication: electronic mail, blogs, social media</li> <li>● Collaborative Digital platforms</li> <li>● Tools/platforms for online learning</li> <li>● Collaboration using file sharing, messaging, video conferencing</li> </ul>
<b>Unit III: Towards Safe and Secure Cyberspace</b>
<ul style="list-style-type: none"> <li>● Online security and privacy</li> <li>● Threats in the digital world: Data breach and Cyber Attacks</li> <li>● Blockchain Technology</li> <li>● Security Initiatives by the Govt of India</li> </ul>
<b>Unit IV: Ethical Issues in Digital World</b>
<ul style="list-style-type: none"> <li>● Netiquettes</li> <li>● Ethics in digital communication</li> <li>● Ethics in Cyberspace</li> </ul>

#### **Practical/ Practice Component**

The course should be conducted in an interactive mode through demonstration, using appropriate tools.

- Conduct workshops on e-services initiated under Digital India.
- Spread digital literacy/awareness amongst the vulnerable groups and marginalised sections of the society like street vendors, domestic help, security guards, senior citizens.
- Students will take up team activities/ projects exploring digital services in the areas such as education, health, planning, farming, security, cyber security, financial inclusion, and justice, e-Kranti.
- Any other Practical/Practice as decided from time to time

#### **Essential Readings /Online Resources**

1. Rodney Jones and Christoph Hafner. "Understanding digital literacies: A practical Introduction". Routledge Books, 2nd edition, 2021.
2. <https://www.digitalindia.gov.in>
3. <https://www.digilocker.gov.in>
4. <https://www.cybercrime.gov.in>
5. <https://www.cybersafeindia.in>
6. <https://www.meity.gov.in/cyber-surakshit-bharat-programme>

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**Suggested Readings:**

1. David Sutton. "Cyber security: A practitioner's guide", BCS Learning & Development Limited, UK, 2017.
2. <https://www.mha.gov.in/document/downloads/cyber-safety-handbook>

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# Course Title – Emotional Intelligence

## **COURSE OBJECTIVES**

- Introduce the concept of emotional intelligence, its models and components.
- Understand the significance of emotional intelligence in self-growth and building effective relationships.
- Identify the measures of emotional intelligence.

## **LEARNING OUTCOMES**

- Self-Awareness, Self-Management, Social Awareness & Relationship Management.
- Discover personal competence and techniques of building emotional intelligence.
- Gain insights into establishing positive relationships.

## *Syllabus of Emotional Intelligence*

<b>Unit I: Fundamentals of Emotional Intelligence</b>
<ul style="list-style-type: none"><li>● Nature and Significance</li><li>● Models of emotional intelligence: Ability, Trait and Mixed</li><li>● Building blocks of emotional intelligence: self-awareness, self-management, social awareness, and relationship management</li></ul>
<b>Unit II: Personal Competence</b>
<ul style="list-style-type: none"><li>● Self Awareness: Observing and recognizing one's own feelings, Knowing one's strengths and areas of development.</li><li>● Self Management: Managing emotions, anxiety, fear, and anger.</li></ul>
<b>Unit III: Social Competence</b>
<ul style="list-style-type: none"><li>● Social Awareness: Others' Perspectives, Empathy and Compassion</li><li>● Relationship Management: Effective communication, Collaboration, Teamwork, and Conflict management</li></ul>
<b>Unit IV: Emotional Intelligence: Measurement and Development</b>
<ul style="list-style-type: none"><li>● Measures of emotional intelligence</li><li>● Strategies to develop and enhance emotional intelligence</li></ul>

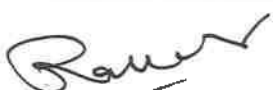
## **Practical/ Practice Component**

Students will practice self-management techniques to regulate emotions such as

- Mindfulness
- Conditioned relaxation response
- Boundary setting
- Any other

Students will practice various techniques of relationship management such as engaging with:

- Display of empathy
- Effective communication



- Teamwork
- Conflict resolution
- Any other
- If required, students can share their experiences in the form of a Project Report.

**Essential Readings**

- Any other Practical/Practice as decided from time to time
- Bar-On, R., & Parker, J.D.A.(Eds.) (2000). *The handbook of emotional intelligence*. San Francisco, California: Jossey Bros.
- Goleman, D. (2005). *Emotional Intelligence*. New York: Bantam Book.
- Sternberg, R. J. (Ed.). (2000). *Handbook of intelligence*. Cambridge University Press.

**Suggested Readings**

- HBR's 10 Must Reads on Emotional Intelligence (2015)
- HBR's 10 Must Reads on Managing Yourself (2011)
- Self Discipline : Life Management, Kindle Edition, Daniel Johnson.

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## Course Title - Ecology and Literature

### Course Objectives:

- To raise awareness among students towards the urgent predicament of Environmental and Ecological crisis and the need for reducing our carbon footprint upon fast depleting, ravaged ecological reserves.
- To develop a heightened ecological consciousness among students, leading to more responsible ecological behavior.
- To view environmental concerns as raised through plays, stories and poems.

### Learning Outcomes:

- The course will highlight the urgency of environmental crisis, making students conscious and aware of the role each one of us plays into environmental sensitivity and responsible ecological behavior.
- Students will be encouraged to respond to incidents of habitat destruction, deforestation, etc. and realize the need for our urgent intervention.

### Syllabus of Ecology and Literature

<b>Unit I: Negotiating environmental issues creatively</b> 1. William Wordsworth: 'In April beneath the scented thorn' 2. Rabindranath Tagore: 'The Waterfall' 3. Gieve Patel: 'On Killing a Tree'
<b>UNIT II. Ecocritical literary representations</b> 1. Mary Oliver: 'Sleeping in the Forest' 2. AK Ramanujan: 'A Flowering Tree' 3. Mamang Dai: 'Small Towns and the River'
<b>UNIT III: Empathetic exploration and imaginative re-enactments</b> 1. Amitav Ghosh's 'Part I: Stories' from <i>The Great Derangement: Climate Change and the Unthinkable</i> 2. Thangjam Bopishak: 'Volcano, You cannot erupt' from <i>Dancing Earth: An Anthology of Poetry from North-East India</i> 3. Thangjam Bopishak: 'Dali, Hussain, or Odour of Dream, Colour of Wind' from <i>Dancing Earth: An Anthology of Poetry from North-East India</i>

### Practical/ Practice Component

- Students would undertake field visits to a school or a slum in the neighborhood or the play area of residential complexes to share, narrate stories, poems and articulate the ideas

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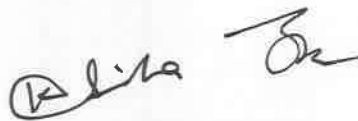
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engaged with in the classroom lectures.

- They shall apply imaginative and creative ways of presenting socially responsible ecological behavior through re-tellings of the texts they have studied in the class.
- Creative re-enactment of key ideas studied by students in the form of a play, to be done Individually and/or in a group to create awareness regarding environmental consciousness.
- They can also collectively organize a tree plantation drive in and around the college campus and adopt a sapling each in the college premises and in their neighborhood to take care of.
- Any other Practical/Practice as decided from time to time

**SUGGESTED READINGS:**

1. Akhter, Tawhida, and Ahmad Bhat, Tariq. Literature and Nature. United Kingdom, Cambridge Scholars Publishing, 2022.
2. Shiva, Vandana. 'Development, Ecology and Women', Staying Alive: Women Ecology and Development. India: Zed Books, 1988. pp 1-14
3. Carl, Safina. Prologue & Chapter 1, Beyond Words: What animals think and feel. Souvenir Press, 2015.
- . Garrard, Greg. *Ecocriticism*. United Kingdom: Taylor & Francis, 2011.
5. Wohlleben, Peter. *The Hidden Life of Trees: What They Feel, How They Communicate—Discoveries from a Secret World*. India: Penguin Books Limited, 2016.



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## Course Title - Ethics and Culture

### Course Objectives

- The course aims to help students explore ethical and cultural dimensions of their lives.
- The course provides a forum for students to pause, revisit their assumptions and beliefs, and become mindful of their thoughts, emotions and actions.
- It gives the students an opportunity to express themselves and inquire into their decision making processes. This will enable them to cultivate ethical values and participate in the creation of a society based on acceptance, compassion, and justice.

### Learning Outcomes

- Explore perspectives on ethics in thoughts, words and actions
- Evolve ethical decision making practises
- Understand the need for an ethical society and culture
- Introspect, become conscious of and assess one's stance in life
- Cultivate empathy, tolerance and compassion
- Apply the values learnt in the course to everyday life.

*Ramesh*      *Dr*      *John*      *John*

## Syllabus of *Ethics and Culture*

### Unit 1

<b>Unit I: Introduction   The Basis of Ethics</b>
<ul style="list-style-type: none"><li>● Getting to Know Each Other</li><li>● What to Expect from the Course?</li><li>● Recognition of Our Common Humanity</li><li>● Empathy, Compassion and Justice</li></ul>
<b>Unit II: The Role of Intelligence, Reason and Emotions</b>
<ul style="list-style-type: none"><li>● Discernment: What Is The Right Thing To Do?</li><li>● The Art of Conflict Resolution</li><li>● Destructive and Constructive Emotions</li><li>● The Need for Emotional Balance</li></ul>
<b>Unit III: Cultivating Inner Values   Ethics in the World of Work and Play</b>
<ul style="list-style-type: none"><li>● Training the Mind: Mindfulness and Kindness</li><li>● Meditation</li><li>● Discovering your Vocation and Interests</li><li>● Self-discipline, Integrity, Commitment, Creativity</li><li>● Work-Life Balance</li></ul>
<b>Unit IV: Striving for a Better World   Outreach Activities</b>
<ul style="list-style-type: none"><li>● Means and Ends</li><li>● Debate and Dialogue</li><li>● Culture as Shared Values</li><li>● Creating and Sustaining Ethical Cultures: The Role of Philosophy, Religion, Literature, Theatre, Cinema, Music, Media</li></ul>

### Practical/ Practice Component

#### Unit 1

1. The teacher may ask students to introduce themselves, sharing their regional and cultural roots. They may be asked to reflect on those aspects of their identities that reflect their cultural roots.
2. After a round of initial introduction, the teacher may ask students to list down a set of values that they think they have developed through their parents and grandparents. Are these values unique to their families, regional and/or ethnic backgrounds? Of these, which are the values they would like to sustain and which are the ones they would wish to modify?
3. The teacher may draw upon the values discussed by students in the previous lesson. Using these as the base, the teacher may ask students to think of ethical values that form the basis of their decisions.

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4. The teacher may ask students to think of people who they think have lived an 'ethical life'. These may be people who they know from their personal lives or people known for upholding ethical values in the face of adversity.
5. Students are encouraged to identify what are common human values necessary to realise shared common humanity—the feeling of interconnectedness/interdependence.
6. Class to be divided in small groups to discuss how each would make an effort to cultivate new morals/ethical values for betterment of their local environment.
7. Celebrating 'Sharing and Caring' based on regional diversity can be encouraged.
8. Engage students to do activities of 'being in the shoes of others' (peers, parents, siblings, house help/support or in any local community grappling with problems) to understand the problems empathetically.
9. The students can be asked to make bookmarks/cards to remind them about virtues pertaining to empathy versus sympathy, need versus greed, just versus unjust or compassion versus insensitivity.
10. Compassion is about cultivation of it as a daily value so students can in small groups undertake compassion based activities of looking after animals, birds, needy, elderly, differently abled, non-privileged etc. and share their thoughts in the class.

## Unit 2

1. Make the student think of a hard decision they have made. What made it hard? How did you make the decision? How do you assess it retrospectively?
2. Encourage students to think of judgements and decisions based on the dilemmas and challenges they faced? How do they go about making these decisions?
3. The teacher may introduce any well known story and ask the students to discuss the story from the point of view of the different characters.
4. Ask students how willing they are to deal with a conflict when it occurs. What strategies do they adopt to resolve the conflict?
5. The teacher may ask students to prepare posters with captions like "avoidance", "competition", "cooperation" and "adaptation" and then may ask students to identify with one of these styles which according to them best represents their style of dealing with conflict.
6. The students may be asked to discuss different such similar situations that they may have encountered and a discussion may be initiated on how they resolve those conflicts.
7. The students can be asked to write down certain destructive emotions that they are experiencing presently. How would they work to make them constructive? A classroom discussion could follow around this.
8. Ask the students to note down a list of constructive emotions experienced by them

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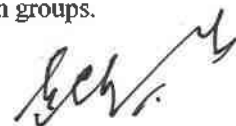
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recently. Were the constructive emotions less powerful as compared to the destructive ones experienced by them? Discussion in class can follow.

9. How do you (i) express, (ii) handle anger/ disgust/ distress/ fear ( any destructive emotion can be taken up). A healthy discussion in the class can take place around this.
10. Students may be asked to practice a simple breathing exercise. They can sit straight with eyes opened or closed in a comfortable position to just observe their breathing. They can repeat this exercise six to eight times and share (if they like) their experience of silence.
11. To identify your interests and develop a meaningful hobby.
12. Have an open conversation in the class about happiness.

### Unit 3

1. The students could observe various emotions that bottle-up in their minds and be asked to watch the flow of emotions non-judgmentally.
2. Students may be asked to recall their journey to the college that morning. Do they remember road signs, faces of people they crossed, the roads that they took, the people they interacted with, the sights and smells around them, or anything else?
3. Students could be asked to cultivate the habit of simple greeting as practice of gratitude and celebrate a day of joyful giving.
4. The students can close their eyes for 2-3 minutes and be asked to observe their thoughts, list them and categorise them into 'to be kept' or 'to let go'.
5. The teacher may ask students to close their eyes and imagine a situation in which they are truly happy. Students could wish for the well-being of two students in the same classroom in their meditative state.
6. Students could meditate on who has been their inspiration and the qualities of the person who has inspired them and then express gratitude to the person concerned.
7. The teacher may ask the students to think retrospectively about what they thought they would take up as a vocation when they were younger. How and why their choices were influenced and changed, if at all.
8. The teacher may ask the students to imagine and chart a journey and destination for themselves. They may also talk about the challenges they foresee.
9. The teacher may encourage the students to maintain a daily diary of their scheduling of time or a worklog and see how much time they effectively give to their work. The teacher may help the students identify the distractors and where one may be 'wasting' time and energy. The activity is designed to help students understand the value of effective time utilisation.
10. In this lesson, the teacher may ask the students to draw up a list of team ethics. They may build this based on their experiences of working with each other in groups.



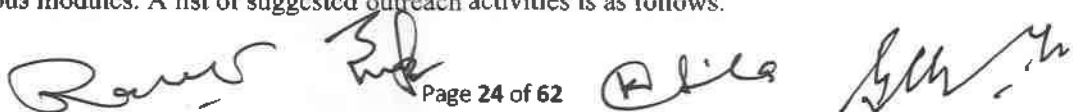
11. The teacher may ask the students to share an incident each where they felt pressurised/bored to complete some work. How did they deal with their stress and monotony of work?

#### Unit 4

1. Students will be asked to work in pairs and develop situations that pose ethical dilemmas and how to resolve them.
2. Students may be asked to look at a film or at an advertisement and discuss what they think about the question/s posed in them. The teacher may ask them if they can think of an alternative ethical approach to the problem posed.
3. Students will be asked to think of situations in which they lost their temper. Have they ever felt that in a fit of emotion they said something that they regretted later? If they had paused to listen and then respond, what would the other person have said? How would the outcome of the situation have been different?
4. A debate on any relevant topic may be conducted in the class. After the first round the students may be asked to adopt and argue their opponents point of view. At the end of this exercise the students can have an open discussion on which position finally appealed to them.
5. The teacher may give a short story to the students and ask them to change the ending. They may be asked to observe how characters and their views may have undergone change in the process.
6. There can be a discussion around a topic such as, the idea of corporal punishment, euthanasia etc. Students can be given a sheet of paper and can be asked to write for or against the theme. The idea is to enable them to understand that the positions they have taken vis-a-vis the theme are a result of different value orientations.
7. Popular foods from many parts of India can be discussed. Their origins can be traced to chart a kind of food history.
8. The teacher on the basis of discussions with students can draw from Philosophy, Religion, Literature, Theatre, Cinema, and Media to highlight that the choices people/characters make are grounded in their culture.
9. The students can discuss classical/folkdances that are performed in their respective groups. Details can be drawn based on the number of dancers, music (live or recorded) and costumes. The role of oral traditions and literature in indicating the importance of ethics in our everyday lives can be discussed.

#### **Suggested Activities for Outreach: Social/ Community Engagement and Service**

In the weeks that follow, students will be expected to engage in outreach activities that shall enable them to put into practice some of the ethical considerations deliberated upon and imbibed in the previous modules. A list of suggested outreach activities is as follows:



- Adopt a village with the aim of cultural and ethical learning
- Discussing health and hygiene issues in a community
- Tutoring students Gender sensitization
- Working on environmental issues
- Working with Child Care Centre such as Anganwadis and Balwadis
- Working with differently abled students
- Preserving cultural and heritage sites
- Spending time with senior citizen including a Senior Citizens Home
- Extending care to animals in animal welfare shelters
- Addressing issues relating to Reproductive Health
- Spreading awareness about adolescent health
- Addressing issues relating to mental health
- Health and nutrition awareness
- Swacchata Abhiyaan
- Sensitisation towards disease awareness
- Vriksharopan

If required, students can share their experiences in the form of a Project Report

Any other Practical/Practice as decided from time to time

**Suggested Readings:**

- Aristotle. *Nicomachean Ethics*. London: Penguin Classics, 2004
- Swami Vivekananda. *The Complete Works of Swami Vivekananda*. Advaita Ashrama, 2016.  
---[https://www.ramakrishnavivekananda.info/vivekananda/complete\\_works.html](https://www.ramakrishnavivekananda.info/vivekananda/complete_works.html)
- Panch Parmeshwar in English translation as The Holy Panchayat by Munshi Premchand
- The Silas Marner by George Eliot
- We are Seven by Wordsworth
- The Chimney Sweeper by William Blake

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## Coures Title - Ethics and Values in Ancient Indian Traditions

### COURSE OBJECTIVES:

- To understand the rich cultural traditions relating to discourses on life and its purpose, instilling of values relating to ethical and moral propriety.
- To make students more engaged with the past traditions of the country.
- To introduce students to early epics: Puranic, Buddhist and other traditions.

### LEARNING OUTCOMES:

- Students will develop an overview of indigenous philosophies.
- Understanding the richness of Indian heritage leading to greater sensitivity.
- Inspiration from history to deal with contemporary issues.
- Appreciate the traditions of diversity, discussions, debates and knowledge transmission.

### Syllabus of *Ethics and Values in Ancient Indian Traditions*

<b>Unit I The idea of India and Bharat</b>
<ol style="list-style-type: none"><li>1. 'Jambudvipa'; 'Aryavrata'; 'Bharat'; India</li><li>2. Early discourse on moral order- rta in Vedic traditions</li><li>3. Debates in the Upanishads and the Shramanic traditions</li></ol>
<b>Unit II State, Society and Dharma</b>
<ol style="list-style-type: none"><li>1. Kingship and Society: <i>Dharma, Neeti and Danda</i></li><li>2. <i>Rashtra</i>, Sanskar and making of socio-cultural milieu</li></ol>
<b>Unit III The 'Purpose of Life' in Texts</b>
<ol style="list-style-type: none"><li>1. 'Right Conduct': Buddhist, Jaina and Shramanic Traditions</li><li>2. <i>Puruṣārtha</i> Chatushtaya: <i>Dharma, Artha, Kāma and Mokṣa</i></li><li>3. Assimilation and Assertion: Ethical issues in Epics and Puranic traditions</li></ol>

### Practical/ Practice Component

- Discuss in your locality, in 10-15 households with regard to Ethics and Values in Indian traditions:
  - Vedic traditions
  - Puruṣārtha Chatushtaya
  - Buddhist, Jaina and Shramanic Traditions
  - Jambudvipa; Aryavrata; Bharat; India
- Students are required to explore e-resources available with University of Delhi and other academic institutions.

- Students are required to watch documentaries and films on the subject-related topics.
- If required, students can share their experiences in the form of a Project Report.
- Students may share their experiences in the form of audio-visual presentations of 15-30 minutes.
- Any other Practical/Practice as decided from time to time

#### Essential Readings

Buietenen, J.A.B. Van, *The Bhagwadgita in the Mahabharata: Text and Translation*. Chicago: Chicago University Press, 1981. Bhagwadgita by Geeta Press Gorakhpur.

Bhasham, A.L, *Wonder that was India: A Survey of the Culture of the Indian Subcontinent Before the Coming of the Muslims*. London, Sidgwick and Jackson, 1954

Dasgupta, S. N. *History of Indian Philosophy*. Cambridge University Press, 1923, Vol. I-II.

Hiltebeitel, Alf. *Rethinking the Mahabharata: A Reader's Guide to the Education of the Dharma King*. Chicago: Chicago University Press, 2001.

Kane, P.V. *History of Dharmashastra (Ancient and Medieval Religious and Civil Law)*, vol. II, parts 1-2; vol. III 3<sup>rd</sup> ed. Pune: Bhandarkar Oriental Research Institute, [1941, 1946].

Olivelle, Patric. *King, Governance, and Law in Ancient India: Kautilya's Arthashastra*. Oxford: Oxford University Press, 2013.

Sharma, Arvind. 'On Hindu, Hindustan, Hinduism and Hindutva'. *Numen*, 49(1), 2002, p. 1-36.

#### Suggested Readings

Olivelle, Patric. (text and trans.) *Manu's Code of Law: A Critical Edition and Translation of the Manava-Dharmashastra*. New Delhi: Oxford University Press, 2006.

Rocher, Ludo. 'The Concept of Boundaries in Classical India', in Peter Gaefkke and David A. Utz (eds.), *The Countries of South Asia: Boundries, Extensions, and Interrelations*

Philadelphia: University of Pennsylvania, Department of South Asia Regional Studies (Proceedings of The South Asia Seminar, III, 1982-1983), 1988, p. 3-10.

Sukthankar, V.S., S.K. Belvalkar, and P.L. Vaidya(ed.). *The Mahabharata*. Poona: Bhandarkar Oriental Research Institute, 1933-66.

Tripathi, Radhavallabh, ed. *India's Intellectual Traditions: A Revealed Through Sanskrit Sources*. New Delhi: Sahitya Akademi, 2016.

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## Course Title - Financial Literacy

### Course Objectives

- Familiarity with different aspects of financial literacy such as savings, investment, taxation, and insurance
- Understand the relevance and process of financial planning
- Promote financial well-being Learning Outcomes
- Develop proficiency for personal and family financial planning
- Apply the concept of investment planning
- Ability to analyse banking and insurance products
- Personal tax planning

Syllabus of <i>Financial Literacy</i>
<b>Unit I: Financial Planning and Financial products</b>
<ul style="list-style-type: none"><li>● Introduction to Saving</li><li>● Time value of money</li><li>● Management of spending and financial discipline</li></ul>
<b>Unit II: Banking and Digital Payment</b>
<ul style="list-style-type: none"><li>● Banking products and services</li><li>● Digitisation of financial transactions: Debit Cards (ATM Cards) and Credit Cards. Net banking and UPI, digital wallets</li><li>● Security and precautions against Ponzi schemes and online frauds</li></ul>
<b>Unit III: Investment Planning and Management</b>
<ul style="list-style-type: none"><li>● Investment opportunity and financial products</li><li>● Insurance Planning: Life and non-life including medical insurance schemes</li></ul>
<b>Unit IV: Personal Tax</b>
<ul style="list-style-type: none"><li>● Introduction to basic Tax Structure in India for personal taxation</li><li>● Aspects of Personal tax planning</li><li>● Exemptions and deductions for individuals</li><li>● e-filing</li></ul>

### Practical/ Practice Component

- Regular class activities to enhance students' understanding of topics and the application of concepts. The case study method may be followed as a teaching pedagogy.
- Numerical questions pertaining to each unit wherever applicable should be practiced.
- For the second unit, students may be assigned a project wherein they can log on to the website of various banks and conduct an in-depth analysis and comparison of various financial products offered.
- For Unit III, a Project related to building a dummy portfolio of stocks and tracking their returns may be given.

- An investment budget may be given to the students to select investment options that maximize the return and minimize the tax implications.
- For the last unit, students may also file a dummy IT return to get hands-on experience with e-filing.
- Students may conduct a financial literacy survey among at least 25 respondents to measure the level of financial literacy and share the findings in the awareness in the form of a report.
- Any other Practical/Practice as decided from time to time

### References

- *Introduction to Financial Planning (4th Edition 2017)* – Indian Institute of Banking & Finance.
- Sinha, Madhu. *Financial Planning: A Ready Reckoner July 2017*, McGraw Hill.

### Additional Resources

- Halan, Monika. *Lets Talk Money: You've Worked Hard for It, Now Make It Work for You* July 2018 Harper Business.
- Pandit, Amar *The Only Financial Planning Book that You Will Ever Need* , Network 18 Publications Ltd.



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## Course Title - Fit India

### Course Objectives:

- Encourage physical activity through engaging the students in sports and yoga.
- Understand the importance of a balanced diet .
- Build skills for self-discipline, self-confidence, cooperation and teamwork.
- Promote fitness as a joyful activity.

### Learning Outcomes:

- Adopting a healthy lifestyle.
- Knowledge of nutrition, diet and psycho-physiological aspects of fitness.
- Develop Self-esteem, Self-confidence, Self-discipline and team spirit as indicators of fitness.

### Syllabus of *Fit India*

#### Unit I: Participation in Physical Activity

- Fit India Protocol
- Physical Activity, Health and Fitness
- Indicators of Fitness

#### Practical/Practice

- Aerobic Work Out / Physical Activity (Walking)
- Yoga – Asanas (Lying, Sitting and Standing positions) and Pranayama
- Cardiovascular Testing by 12min/9 min Cooper Run/Walk test

#### Unit II: Health Related Fitness and their Components

- Muscular Strength and Endurance
- Body Composition and Flexibility

#### Practical/Practice

- Flexibility Training: Back Saver Sit and Reach test
- Muscular Strength Training: Curl Ups / Standing Broad Jump/ Vertical Jump/ Plyometric
- Endurance Training: 1 Mile RockPort Testor 12 /9 minute Cooper run/walk test.
- Ideal Body Weight, Body Mass Index (BMI), Waist:Hip Ratio, Waist:Height Ratio (Data of at least 10 persons to be collected)



### Unit III: Nutrition and Fitness

- Healthy Eating Plate
- Balanced Diet
- Caloric Content of Food

#### Practical/Practice

- Preparing Daily Diet and Calorie Chart
- Aerobic Work Out / Physical Activity (Walking)
- Assessment of Physical Activity with the Calorie intake.
- Asanas for :
  - digestive system
  - excretory system

### Unit IV: Psycho-physiological aspects of Fitness

- Sports Physiology and Psychology
- Depression, Anxiety and Stress Scale (DASS)
- Rosenberg Self Esteem Scale

#### Practical/Practice

- Skills learning and Participation in sports
- Group Games / Relays/ Minor Games
- Meditative Asanas and Pranayama
- Fitness component testing (as per Fit India Protocol and Norms) and Analysis of Results
- Data of at least 10 persons to be collected on DASS and self-esteem scale

**Note:** Concepts are to be taken up during the practical/practice hours.

#### Essential Readings:

- Fit India Website: <https://fitindia.gov.in>
- Wener W.K. Hoeger, Sharon
- A. Hoeger - Fitness and Wellness-Cengage Learning (2014).

#### SUGGESTED READINGS:

- Charles R. Corbin, Gregory J. Welk, William R. Corbin, Karan A. Wells - Concepts of Fitness And Wellness\_ A Comprehensive Lifestyle Approach-McGraw-Hill (2015)
- W.Larry Kenney, Jack H. Wilmore, Devid L.Costil(2015). Physiology of Sports and Exercise, Second Edition. USA. Human Kinetics.
- Websites of International Sports Federations
- Website of Ministry of Youth Affairs and Sports



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## Course Title - GANDHI AND EDUCATION

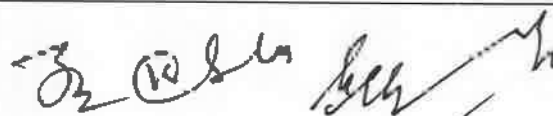
### Course Objectives

1. Seek inspiration from Gandhi's thoughts on education.
2. Analyse Gandhian education philosophy for moral and character development.
3. Understand Gandhi's Idea on Self-reliant education (Swavalambi Shiksha)
4. Relate Gandhi's educational thoughts to NEP 2020

### Learning Outcomes

1. Value Gandhian perspective on education
2. Appreciate the significance of education in Indian languages
3. Evaluate the application of Gandhian thoughts in NEP 2020
4. Realise the principles of NEP 2020 in vocational and skill oriented education.

Unit I: Gandhi's Philosophy and education
<ul style="list-style-type: none"><li>● Gandhi's Philosophy on education</li><li>● Education for character building and moral development</li><li>● Education relating to health, hygiene, heritage, and handicraft</li></ul>
Unit II: Gandhi's Experiment in Education
<ul style="list-style-type: none"><li>● Gandhi's educational ideas on use of Indian Language as a medium of Instruction, TextBook and Teacher.</li><li>● Gandhi's educational thought on Elementary and Adult Education.</li><li>● Gandhi's vision on Higher Education</li></ul>
Unit III: Gandhi's Educational Thought on Skill and Vocational Education
<ul style="list-style-type: none"><li>● Rural development through Skill and Local Need Based education</li><li>● Skill education in NEP 2020 and Gandhi</li><li>● Gandhi's Idea on Self-reliance (Swavalambi Shiksha) and its reflection in contemporary educational policy.</li></ul>



### Practical/ Practice Component

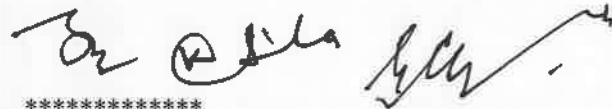
- Regular visits to Gandhi Museum and library to gain insight on Gandhi
- Excursion to Gandhi Ashrams located in different places like Sewagram, Wardha, Sabarmati, Ahmedabad etc.
- Workshops/projects in collaboration with Gandhi Bhawan, Gandhi Smriti and Darshan, Gandhi Peace Center. Ashrams based on innovation in village & cottage industry, Khadi, handicrafts, organic farming etc.
- Adoption of one place for Swachhta Mission or Skill Education
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

### ESSENTIAL READINGS

- महात्मा गांधी. (2014). बन्नि यादी शिक्षा. वाराणसी : सर्वसेवा संघ प्रकाशन.
- गांधी, मो. क. (2010). मेरे सपनों का भारत. अहमदाबाद : नवजीवन प्रकाशन मंदिर. नवजीवन प्रकाशन मंदिर. (1960). शरीर-श्रम. अहमदाबाद: मो. क. गांधी. pp- 196-231
- प्रभ, ुआर. के. व राव, य. ुआर. (1994). महात्मा गांधी के विचार. इंडिया: नेशनल बकू ट्रस्ट.
- Anand T. Hingorani, ed.] Gandhi, M.K. Our Language Problem (Bombay:
- Bharatiya Vidya Bhavan, ), pp. 53-55
- TOWARDS NEW EDUCATION written by M. K. Gandhi Edited by Bharatan Kumarappa

### SUGGESTED READINGS:

- गांधी. मो.क. (2012). स य के योग अथवा आ मकथा ( वेद , काशीनाथ.अनवु ादक) अहमदाबाद: नवजीवन काशन मं दर
- गांधी. मो.क. (2012). ह्दं वराज (नणावती. अमतलाल् ठाकोरदास. अनवु ादक). अहमदाबाद: नवजीवन काशन मं दर
- Coomaraswamy, Anand K. (1910). Art and Swadeshi . Munshi Ram Manoharalal. Delhi



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## **Course Title - Panchakosha: Holistic Development of Personality**

### **Course Objectives**

- To introduce Five *Koshas* – five levels of mind-body complex – *Annamaya*, *Pranayama*, *Manomaya*, *Vigyanamaya* and *Anandamaya Kosha*; for a holistic development of personality.
- To generate awareness about physical and mental wellbeing through the Indian concept of *Panchkosha*.
- To develop a positive attitude towards self, family and society amongst students.
- To guide students build personalities based on the understanding of *Panchkosha*.

### **Learning Outcomes**

- Enhanced physical and mental health.
- Coping with peer pressures and stress.
- Improved concentration leading to better overall performance.
- Manage life situations through a balanced and mature approach.

### **Syllabus of Panchkosha: Holistic Development of Personality**

Unit I: Elements of Personality
<ul style="list-style-type: none"><li>● <i>PanchaKosha</i>: Introduction</li><li>● Five aspects of Human Personality: <i>Annamaya Kosha</i> (Physical body), <i>Pranamaya Kosha</i> (Vital life force energy), <i>Manomaya Kosha</i> (Psychological wellness), <i>Vijnanamaya Kosha</i> (Intellect), <i>Anandamaya Kosha</i> (Happiness and Blissfulness)</li><li>● Health: Mental and Physical</li></ul>
Unit II: <i>Annamaya Kosha</i> and <i>Pranamaya Kosha</i>
<ul style="list-style-type: none"><li>● Human Body and <i>Pancha Karmendriyas</i></li><li>● <i>Annamaya Kosha</i>: Balanced diet and exercise for healthy body</li><li>● <i>Pranamaya Kosha</i>: Development of life force, <i>Pranayam</i></li><li>● <i>Charucharya</i>: Social Etiquettes</li></ul>
Unit III: <i>Manomaya Kosha</i> and <i>Vijnanamaya Kosha</i>
<ul style="list-style-type: none"><li>● <i>Antahkarana</i> and its functions</li><li>● <i>Pancha Gyanendriyas</i></li><li>● <i>Manomaya Kosha</i> : Controlling the <i>Mana</i> (mind)</li><li>● <i>Vijnanamaya Kosha</i>: Ability of discretion and decision making</li></ul>
Unit IV. <i>Anandamaya Kosha</i> and Beyond
<ul style="list-style-type: none"><li>● <i>Anandamaya Kosha</i>: Experience of happiness and bliss</li><li>● Self-realisation, Nature of Consciousness: <i>Sat-Chit-Ananda</i></li></ul>

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### Practical/ Practice Component

- Recitation of select verses from *Taitiriyopansid*
- *Asana*
- *Pranayama*
- Meditation
- Visit to a Yog shivir or meditation centres
- Students are required to watch documentaries and films on the subject-related topics.
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

### Essential Readings

- पंचकोश विवेक, स्वामी परमहंस योगानन्द, <https://ndl.iitkgp.ac.in/पर उपलब्ध>
- विवेक चडामू णि, आदि शंकराचार्यद्वारा लिखित, अरविन्द आनंद द्वारा अनदि त, चौखम्भा प्रकाशन, वाराणसी, 2015
- Vivek Chudamani, Adi Shankaracharya, Swami Turiyananda (Sanskrit and English), Sri Ramakrishna Math, Mylapore, 2019
- सभी के लिए योग, बी.के.एस. आयंगर, प्रभात प्रकाशन, 2018
- Yoga The Path to Holistic Health: The Definitive Step-by-step Guide, B.K.S. Iyengar, Dorling Kingsley, London, 2021
- The Sacred Science of Yoga & The Five Koshas, Christopher Sartain, CreateSpace Independent Pub, 2015 Suggested Readings
- PanchaKosha: The five sheaths of the human being, Swami Nishchalanand, Kindle edition.
- Upanisadvakya Mahakosa. (An Upanishadic Concordance, taken from 239 Upanishads, G. S. Sadihale (Compiled by). Chowkhamba Vidyabhawan, Varanasi, 2014
- The Pentagon of Creation: As Expounded in the Upanishads, Ajai Kumar Chhawchharia, CreateSpace Independent Pub, 2015

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## **Course Title - Social and Emotional Learning**

### **Course Objectives**

- This course aims to develop social and emotional awareness in students and initiate them towards better personal and social well-being.
- To create an awareness towards self, others, the environment and their harmonious coexistence.

### **Learning Outcomes**

- Students will be able to become aware of oneself and the society.
- Make informed lifestyle choices and extend the self in the joy of giving.
- Develop empathy, compassion, connect with nature and evolve emotionally to create a more harmonious society.
- Cultivate sensitivity towards discriminatory practices and explore possible solutions.

<b>Syllabus of <i>Social and Emotional Learning</i></b>
<b>Unit I: Introduction   Self-Awareness and Happiness</b>
<ul style="list-style-type: none"><li>● Getting to Know Each Other</li><li>● What to Expect from this Course?</li><li>● Getting to Know Oneself</li><li>● What Makes One Happy/ Unhappy? Outer vs Inner Sources of Happiness, Joy of Giving</li></ul>
<b>Unit II: Social Relationships   Mindfulness</b>
<ul style="list-style-type: none"><li>● Sharing vs Power: Peers, Family and Society</li><li>● Going Beyond Power Relationships Through Open Conversation</li><li>● The Value of Silence and Reflection</li><li>● Practice of Mindfulness</li></ul>
<b>Unit III: Identity, Self-Image, Status, Self-Worth   Digital Identity</b>
<ul style="list-style-type: none"><li>● Identity Construction and Expression: Individual and Collective</li><li>● Accepting and Valuing Oneself</li><li>● Understanding the Gendered World</li><li>● Identifying and transcending stereotypes</li><li>● Identity Formation and Validation in the Digital World</li><li>● Discrimination and its Forms</li></ul>

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#### Unit IV : Lifestyle Choices | Stress and Its Management

- What Choices Does One Get To Make?
- Is Choice influenced? Relationships, Career Choices
- Career Pressures, Examinations
- Dealing with Disappointment, Coping Skills, Health and Fitness
- Connect With Nature: Sensitivity Towards Other Sentient Beings

#### Practical/ Practice Component Unit 1

##### Getting to Know Each Other

In this lecture, the teacher will facilitate social engagement and personal reflection through a round of introductions. This also provides an opportunity for the teacher and students to recognise the deeper meanings that lie underneath routine exercises of introduction. For example, the adjectives that people use to describe themselves are indicative of the image that they wish others to hold of them. But do they hold the same image about themselves?

Teachers may begin the class by introducing themselves. Any introductory exercise that serves as an ice breaker and creates the classroom space as one of vibrant and open discussions, may be used. Teachers should try and ensure participation of all students in this exercise.

##### Activities

###### 1. Who is in your circle?

Students may be asked to draw three concentric circles on their notebooks. The central circle is for the topic, the second for 'Love', and third for 'Like'. The space outside the circles is for 'Don't like'. The class decides on one topic, such as food, movies, web series, books, music, interests, etc. Each topic is taken up in turn and students are asked to write what they love, like, and don't like in the circles and share it with others. The exercise helps students to identify with their peers in commonalities and differences. The teacher may use prompts such as 'Why do you like this show?', 'Why do you dislike this food?' etc.

###### 2. I am...

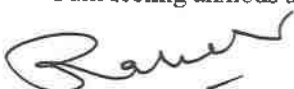
Students are asked to complete the sentences. The teacher may take turns and ask random students to answer it or the teacher may write these on the board and ask every student to write the answer in their notebooks. Some suggested prompt sentences are:

I am excited about.....

I wish I could.....

I am wondering.....

I am feeling anxious about....



Students can choose to share some of the answers with the class. The purpose of the exercise is to bring most students to speak in class and share their honest feelings and thoughts.

### 3. Introduce Yourself... Know Yourself

In this exercise, the teacher asks all students to take turns to introduce themselves. It is likely that most students will talk about their names, previous qualifications and hobbies. At the end of the introductions, the teacher can identify commonalities such as previous courses undertaken, regional identities, age, or similar common factors. The teacher may then use the following prompts to facilitate discussion:

Do these define you? Are you something more?

Would you like to change any of these qualifiers?

Is there something about you that you would like to share with us? Do you ever wonder about your identity/ identities?

### What to Expect from this Course?

In this class, the focus is on understanding the relevance of the course and providing a course overview. Students will be able to explore the various dimensions of their lives and develop insights about themselves and their relationships. By discussing the outline of the course and the suggested activities, the teacher shall bring to the fore the exploratory journey that the students will embark upon. The students' questions relating to the course contents will also be addressed in this lecture.

### Activities

In this class, the teacher may undertake an overview of the course, discussing each week's themes briefly. The nature of assignments and evaluation can also be detailed out. The teacher may hold a discussion with students on the following:

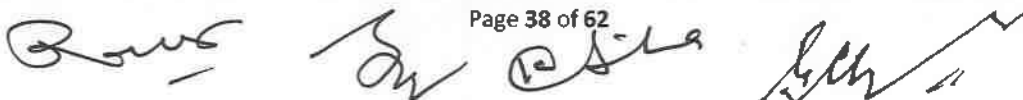
1. Why is social and emotional learning important?
2. What can the teacher do to make the classroom a more welcoming and open space for you?
3. What would be some of the activities that you would like to undertake during the course? Such as watching movies, reading books, maintaining a reflective journal, engagement in the field, mindfulness exercises, etc.

### Self Awareness and Happiness

The aim of this module is to help students develop awareness about themselves – who they are, what their strengths and limitations are, and how they can develop themselves. This will help them to learn interlinkages and distinctions between thoughts, emotions and behaviours. This module will make them aware of the differences between happiness and pleasure and help them ponder on sources of happiness.

### Self Awareness

Self-awareness is the experience and understanding of one's own personality – how an individual understands his own feelings, motives, desires, and behaviour, and the triggers for the same. Hence, self-awareness can be considered to be vital for personal development.



Students would thereby become more grounded and confident. This lesson will focus on the student's intrapersonal and interpersonal awareness through discussions and activities.

#### Activities

1. Students are asked to make a timeline of important events in their life and how each one affected them at that time. Do they see it differently today?
2. SWOT Analysis can be done by each student – Strengths, Weaknesses, Opportunities and Threats.
3. How do they envision their ideal person – What does your ideal person look like? What characteristics do they possess? Identify the gap. How do they plan to fill/reduce the gap?

#### Happiness

The term 'happiness' includes pleasant and positive emotions which can range from deep satisfaction and contentment to pleasure and excitement. The focus of this session would be to discuss techniques to develop the long-lasting feelings of contentment rather than momentary and short-lived emotions of excitement and pleasure. This will encourage and foster feelings of wellbeing and life satisfaction. The teacher will use activities in order to inculcate the ways of developing and sustaining happiness.

#### Activities

Writing a gratitude Journal – include in it what you are grateful for.

Mindfulness exercises and developing a mindful way of doing things.

“As one door closes, another door opens”. A discussion based on the three opportunities that they think they lost and consider what it was they gained in the process.

#### Unit 2

##### Social Relationships

In this module, students will be asked to turn their gaze towards the society in which they are located and where they form social relations. They will be asked to introspect and understand the ways in which they connect with their immediate and extended social surroundings. In this context, peers and family exercise a significant influence on the identities of adolescents and young adults. The students will be asked to assess the nature of their relationship with friends and family and explore these negotiations in the context of sharing versus power. The teacher will help students broaden their understanding by extending the discussion to include other social relationships, beyond peers and family. They will be encouraged to think about how they are influenced and how they in turn influence the people around them. The class shall explore the importance of open conversation as a means to resolve conflicts and contradictions.

##### Sharing vs Power: Peers

Identity formation and development is significantly dependent on the peer group with which the individual interacts. During this class, the students may pose the following question to themselves and to each other- What is the nature of the relationships that they share with their peers? Adolescents and young adults like to conform to peer expectations. Students may

explore whether relationships between peers are equal. What forces mediate these relationships? By posing examples from real life, the teacher will encourage the students to closely examine their relationships with their friends and family.

#### **Activities**

Ask the students to describe their close friends with fictitious names. They should then be asked why they are close to them and what is the one quality about their friends that they appreciate.

Divide students into groups of 5 each. This can vary depending on the class size. Each group can discuss how they were influenced by their friends in decision making processes.

The class/ group can share a story from their life about how they made a decision based on peer pressure. They should also share the result. Were they happy or unhappy about it? The findings can be discussed in the class.

#### **Sharing vs Power: Family**

The family is often considered to be a given and stable construct in which one is born or placed. As the relationships of adolescents with people outside the home grow, their interactions with their families evolve and take on a new and sometimes difficult character. Discussions and activities in the class should help the students objectively analyse their family space and the way in which they negotiate with it at different points of time. Through examples from day to day life, the teacher will help the students understand such spaces and the role they play.

#### **Activities**

Describe the ideal family. The students can think about the nature of the ideal created by them. What is the role played by siblings in your personal development?

Role play can be used to perform the different roles in a family so as to understand the different points of view within it.

#### **Sharing vs Power: Society**

The individuals generally extend the nature of their relationships with the family to the larger social world. In their pursuit to seek autonomy and independence, they may form new kinds of relationships in the larger social context. These relationships may be characterised by imbalances in power. This lecture will try to help the students strike a balance between self and society and stress the role of dialogue, sharing and cooperation.

#### **Activities**

The teacher can ask the students to describe any one constructive social role performed by them. (Any way in which they helped people around them). They can draw, speak, share a photograph or write a creative piece about it.

In the years to come what kind of role do you see yourself performing in society?

Share any one story about a person that has really influenced you? It can be about a public figure or anyone around you.

#### **Going Beyond Power Through Open Conversation**

In the previous lectures, the discussion has been around family, peer groups and society. In this session, the focus will be on the ways to build a more egalitarian society—one that is more collaborative, inclusive and takes into account different points of view. Open Conversation is suggested as a way by which acceptance, active listening and empathy can be

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encouraged.

### **Activities**

The students can be asked to present a brief performance showing the way in which open conversation can help in conflict resolution.

Movies in line with classroom discussions held in the past few weeks can be shown to the students. Movie screening should be followed by a discussion.

A short story, poem or a play can be used to build on classroom discussions.

### **Mindfulness**

This module focuses on the significance of silence, introspection and non-judgmental awareness of the present moment. These mental practices are for understanding and building humane connection with self and others. The students are sometimes unable to spare time for their inner growth. Mindfulness practices aim at self-awareness and self-acceptance for overall well being. Valuing and practicing silence helps in the process of deeper reflection and builds inner strength to face conflicts with calmness. It hones the ability to develop mental equanimity and equipoise.

### **The Value of Silence and Reflection**

The students will learn to understand the value of silence in the noise around. The practice of silence helps in self-reflection and connecting the inner and outer worlds. It enables one to experience joy, contentment and peace. Silence is a way of understanding how to enjoy one's own company and not to confuse being alone with loneliness. The students will appreciate that silence and solitude are positive and constructive.

### **Activities**

The students can be asked to maintain silence and watch the flow of thoughts and emotions. In the process of silence the students can identify what gives them happiness and what they can do to create happiness for others.

The students can visit natural spaces to understand how silence runs in the sounds of nature which can help them realise peace.

### **Practice of Mindfulness**

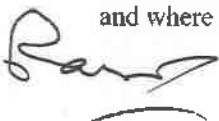
Through this lesson, the students will understand the significance of mindfulness as a daily practice for understanding that happiness depends on the self-training of mind. The joy of living in the moment with full awareness and steadiness of mind are important for accepting and cherishing all experiences positively and non-judgmentally.

### **Suggested Activities**

Mindful walk/trek in the garden/forest/mountains or at a monument. Mindful eating while enjoying all elements of tastes in different types of food can also be done.

The students can be engaged in groups for non-judgmental listening

The class can be divided to discuss what activities of the day they engage with full awareness and where the moments go unnoticed





## **Identity, Self-image, Status, Self-worth**

The module is designed to help the learners revisit the constructs of identity, self and personhood. It builds on questions such as 'who am I', 'how do others and I see myself', 'does status and self-image affect my sense of self-worth'. Specifically, it deals with how one's identity takes shape and thereon begins to be an integral part of oneself. It encourages the students to think about what factors influence their self-worth, such as achievements and accumulations, wealth, career or popularity. The students learn to accept and appreciate self and others.

### **Identity Construction and Expression: Individual and Collective**

This lesson is aimed to help the learners deconstruct their sense of identity and rechart the signifiers/ markers and processes which have played a pivotal role in constructing their sense of identity and self. It unfolds processes of socialisation within family, school, community and society at large have played a role in making students who they are. How do these processes shape our notions of self-concept, self-evaluation, and self-esteem? The students will be able to become aware of their individual and collective sense of identity and self.

#### **Activities**

The teacher may ask the students to imagine one's identity in different contexts that are significant for identity construction. For instance, what does identity of being someone's 'child' entail; likewise what kind of an identity does one expect of oneself as a sibling, student and as a friend.

The teacher may ask the students to read from biographies/autobiographies of people from other cultures and discuss excerpts from the books. The teacher may elaborate the qualities of these people.

The teacher may organise a field visit with the students to different places. Ask the students to survey people from those locales about their experiences.

### **Accepting and Valuing Oneself**

This lesson builds on the previous lesson by unpacking how concerns revolving around self-image and status may affect one's sense of self. It aims to make one aware why a challenge to one's identity may lead to discomfort and conflict. Students will be encouraged to accept their physical appearance and identity and to value self-worth. This lesson invites them to undertake an inward journey.

#### **Activities**

The teacher may ask students to respond to different characters in a movie where challenges to their identity lead to different kinds of responses.

What will change after 10 years in terms of your identity and what according to you will not change?

The teacher may ask the students to identify an 'open space' and 'sit alone' and write a reflective essay on the theme, 'remember what makes you, you'.

### **Gender Roles**



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The objective of this module is to enable the students to differentiate between biological and psychological context of gender in order to understand how their gendered identities are socially constructed. Gender refers to the characteristics of men and women and includes norms, behaviour and roles associated with being man or woman, girl or boy. Further, this will enable the students to become aware that their destiny need not be determined by biology.

### **Understanding a Gendered World**

The objective of this lecture is to enable the students to understand that gender roles are taught by the process of socialization, beginning with the family. Everyday things that we do like eating, speaking, walking, our gestures and even the professions that we think we choose are all often influenced by societal norms.

#### **Activities**

The teacher may ask the students to list things associated under the heading; men and women. Once listed, the headings can be interchanged and a discussion may follow.

Ask students to bring an artefact from home, it can be a childhood picture. On the basis of the picture students can share childhood experiences. Through the narrative of their oral history students can share experiences of how they acquired gender.

### **Identifying and Transcending Stereotypes**

In the previous lecture, students have been made aware that gender stereotypes are socially constructed, that the ways in which we interact with others and with ourselves are shaped by gender. The objective of this lecture is to explain the importance of thinking beyond the stereotypes and to reinforce that biological differences between genders should not lead to social discrimination.

#### **Activities**

Movie viewing: Students and teachers can choose any movie for discussion.

Quiz cards: On the cards the following can be written and the student can be asked to identify which is socially constructed and which refers to biology.

Men are Breadwinners, Women are homemakers.

Males have XY chromosomes, Females have XX chromosomes.

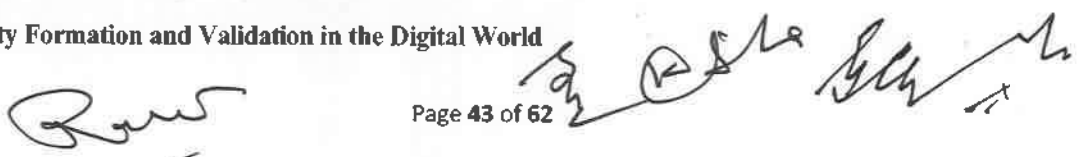
Women give birth to babies, men don't.

Boys don't cry

### **Digital Identity**

It may be constricting to identify exclusively with ideas like region, ethnicity, language, gender, nationality. For, in this increasingly interconnected world, students find themselves at the intersection of many ideas - evolving and fixed, dominant and marginalised. This rainbow of ideas provides an opportunity to appreciate the diversity in the constitution of an individual's identity. But what happens when one is given a chance to construct a digital identity for oneself? Digital platforms and social networking sites arguably provide an individual the choice to portray oneself the way one likes. Do we choose to present our authentic selves or do we prefer to present highly curated versions of ourselves? Do social media posts reflect self-respect and self-love?

### **Identity Formation and Validation in the Digital World**



Through this session, students are expected to realise the ways in which they construct themselves digitally and how that construction is a manifestation of conformity, resistance and/or subversion, of the dominant ideologies. Students should be encouraged to reflect on what exactly they are seeking from engaging with social media. They need to think how the joy of sharing ideas may be different from the egoic need for compulsive validation.

#### Activities

Think of the digital filters that you use before sharing your photographs with others. Why do you think you need to do that?

We often feel happy about being validated in the form of 'likes' and positive comments on our social media posts. However, do you feel sad when that does not happen? What could be the possible reason for your mind to have this line of thought?

#### Digital Identities: Impact on the Self

The students will carry forward the learnings from the previous session and continue their inquiry in the realm of motivations for curating a digital self and its relation to self-esteem. They would be encouraged to engage in a non-judgemental conversation which would motivate them to inquire whether their digital activities are a result of anxiety which may be emanating from their self-image.

#### Activities

Do you think the use of digital filters is disrespectful to your self? Is not using them a source of anxiety for you? Can this have anything to do with your self-esteem?

Think of situations that make you feel sad on social media. Note them down. Do you think not exposing yourself to such a situation is a solution or do you think you also need to locate the issue within yourself?

Try spending a day without doing any activity on social media like posting anything or surfing other people's accounts for their activities. At the end of the day observe how you feel.

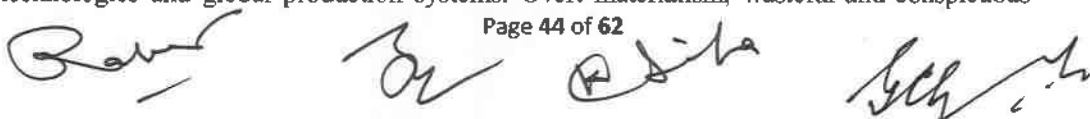
#### Unit IV

#### Lifestyle Choices

How we choose to live and behave influences our social and emotional wellbeing. In this module we analyse our lifestyle choices relating to material and cultural consumption, relationships and career. Students will be encouraged to inquire whether our everyday choices are based on a culture of passive consumption and conformism. We will seek to explore possibilities of alternative forms of living premised on ethical consumption, altruism, simple and sustainable living.

#### What Choices Does One Get to Make?

In this session, the attempt will be to explore the extent to which consumerism impacts our lifestyle choices and the repercussions of these on our natural and social environment. Today we live in an era of mass consumption and consumer culture fostered by advanced technologies and global production systems. Overt materialism, wasteful and conspicuous



consumption unmindful of the larger implications are key aspects of this phenomenon. In this lecture, we explore our lifestyle choices such as our physical image, attire, dietary choices, desire for dream homes and destination weddings. This would be the starting point for a re-imagination of a world based upon choices that would lead to simple and sustainable living.

### **Suggested Activities**

Students may be asked to work through their consumption history right from their childhood. A discussion may then be initiated by asking the students to reflect on their consumption choices and their motives behind the same.

The teacher may identify a few products like tea, coffee, coca-cola, jeans etc and ask the students to trace product histories and geographies.

The students may be asked to discuss a strong desire to possess an object and then deconstruct that desire. Discussion may emphasise upon why they wanted it?

### **Is Choice Influenced? Relationships, Career Choices**

In this lecture, we examine the extent to which lifestyle choices, regarding relationships and career, get influenced and by what factors. Do we really have a choice as regards the career that we intend to pursue? Often factors like family, gender, the need for security and stability influence our choices. Recognizing and mapping the space of freedom and unfreedom with respect to our choices is a necessary life skill that would enable a more self-aware and harmonious living.

### **Activities**

Reflect on an instance where you may have inflicted pain on someone and also think of a moment when you felt someone was insensitive in their conduct of a relationship.

The teacher may divide the class into small groups and hold a discussion on what constitutes a successful career.

Reflect on the various career options available in your society and discuss what you would prefer to pursue and why?

### **Discrimination**

The module is designed to help the learners understand the origin and nature of discrimination and the effects thereof. Discrimination can be on various grounds such as ethnicity, religion, caste, race, gender, disability, or place of birth. One's discriminatory actions can lead to social fragmentation. The module encourages the learners to introspect their actions and seeks to celebrate diversity.

### **Why and How? Forms of Discrimination**

The objective of this lesson is to make learners aware of different forms of discrimination. On the one hand, an individual can be a victim of discrimination, and on the other, the same person

may harbour prejudice or discriminate against others. It is pertinent to understand our own biases and introspect our actions.

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### Activities

The teacher can ask students to count their friends who belong to different backgrounds. They can reflect on what they have learned by interacting with these friends.

Ask students to learn about their neighbourhood and document what groups live there, what has been the nature of their relationships.

An exercise on privilege using nothing but wadded up papers and a trash can. Students Learn A Powerful Lesson About Privilege. <https://youtu.be/2KImvmuxzYE>

### Stress and Its Management

This module is designed to give students an opportunity to articulate the pressures and challenges that one experiences in life. It gives students a chance to spell out how pressure to perform well can become a source of stress. The module is aimed to equip the learners with ways of dealing with disappointments with regard to the choice of career path and with performance related stress. It brings to fore skills of coping with stress and disappointments. It also highlights the role of physical well-being in keeping oneself mentally healthy.

### Career Pressures, Examinations

This lesson is designed to help students have a relook at the challenges and pressures they have recently faced or are facing on account of career choices and examinations. It gives them a space to articulate what they might have faced while making these choices. This lesson also gives them an opportunity to highlight the uncertainties and challenges they foresee in their future lives.

### Activities

The teacher may ask the students to organise themselves in groups of 4-6. Each of the groups have to do a role-play around the themes on career pressures.

Show images of different people and ask the students to quickly jot down impressions. The collective answers serve as a springboard for discussions. Students may learn about their own

biases through this activity.

The teacher may ask the students to identify movies where struggles related to career and performance pressure stand out.

The teacher may ask the students to share their experiences about the following:

- First few months into an academic programmes
- 2 months before examinations
- On the day of examination
- 15 days after examinations get over

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## Dealing with Disappointments, Coping Skills, Health and Fitness

This session aims to equip the learners with coping skills to manage stress and deal with disappointments. Furthermore, it makes them aware of the importance of health and fitness for maintaining mental health.

### Activities

The teacher can ask the students to write how they come to know they are stressed and what they do when they are stressed? The teacher may engage them in a discussion on coping skills and channelize students' energies into positive ways of resolutions of conflict and stress.

The teacher may ask the students to discuss the lives of high achievers and low achievers and how performance pressures drive their lives. Can they draw similarities and differences in the sources of stresses and how they deal with these stresses?

Ask each of the students to share their daily regime to keep themselves physically fit. The students may also share how each one mentally 'feels/experiences' when one is engaged in physical exercises.

### Connect with Nature

This module is designed to strengthen bonds with nature while understanding its intrinsic value as opposed to its instrumental value. Issues of global warming and environmental degradation are the consequences of a disconnect between humans and nature. The aim is to cultivate environmental awareness through virtues of altruistic responsibility, empathy, cohesiveness, and mutual sustainability between nature, flora-fauna, animals and humans. The students may be engaged in activities to build bridges between the inner environment (one's self) and external environment (nature). In this way, they can celebrate oneness with nature and perceive nature not as a means but an end in itself.

### Sensitivity Towards Other Sentient Beings

The students, in this session, would participate in group based environmental activities as a way of building social responsibility towards all sentient beings. Any action against even a part of nature impacts the whole. Thus, it is the responsibility of all, to create a safe environment for all sentient beings to live in harmony.

### Activities

Students can be encouraged for Nature walks, nature drives, treks and hikes, nature photography, adopting natural spaces in local areas, plantation drives, visiting biodiversity parks, adopting spaces for greening etc.

Visits to animal shelters can be organised to sensitize the students.

Films can be screened on environmental sustainability, environmental consciousness etc

- Any other Practical/Practice as decided from time to time



### Suggested Readings

- Black, Donna Lord (2022). Essentials of Social and Emotional Learning (SEL). NJ : Wiley.
- Goleman, Daniel (2005). Emotional Intelligence. USA: Bantam.
- Swami Vivekanand. (2016). The complete works of Swami Vivekanand. Advaita Ashrama. (<https://www.ramakrishnavivekanand.info/vivekanand/complete-works.html>)



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## Course Title - Sports for Life

### Course Objectives

- To imbibe the significance of sports to promote health, fitness and wellness in life.
- To understand the values of teamwork, tolerance, goal-setting and decision making.
- To learn the strategies and tactical moves while playing a sport.
- To understand the importance of physical activity in reference to 3S: strength, speed and suppleness.

### Learning Outcomes

- Acquire values of cooperation, team spirit, determination, and endurance.
- Acquire good health and psychological well-being through sports participation.
- Apply the decision making-ability and goal-setting skills acquired through sports participation in everyday life.
- Acquire skills for engaging in moderate or vigorous physical activity and sports participation.
- Reduce exposure to screen time on electronic gadgets and channelising energy through sports participation.

### Syllabus of *Sports for Life*

#### Unit I: Rules and Techniques

##### *Concept*

- Rules of the Sport
- Techniques / skills in the sport/ Aerobic Skills

##### *Practical*

- Marking of the court / field
- Outdoor Adventure Activity
- Skills learning in sports
- Group Games / Relays
- Participation in Intramural competitions

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<p><b>Unit II: Components of Fitness</b></p> <p><i>Concepts</i></p> <ul style="list-style-type: none"> <li>● Meaning and Development of Strength, Speed, Endurance, Flexibility and Coordinative Abilities.</li> </ul> <p><i>Practical</i></p> <ul style="list-style-type: none"> <li>● Skills learning and Participation in sports</li> <li>● Group Games / Relays / Minor games</li> <li>● Participation in Intramural competitions</li> </ul>
<p><b>Unit III: Benefits of sports and physical activity</b></p> <p><i>Concepts</i></p> <ul style="list-style-type: none"> <li>● Effect of exercise on the body</li> <li>● Organizing of a sports competition</li> <li>● Balanced Diet</li> </ul> <p><i>Practical</i></p> <ul style="list-style-type: none"> <li>● Skills learning and participation in sports</li> <li>● Group Games, / Relays /Step Aerobics</li> <li>● Participation in Intramural competitions</li> </ul>
<p><b>Unit IV: Sports in Contemporary Times</b></p> <p><i>Concepts</i></p> <ul style="list-style-type: none"> <li>● Honours and Awards associated with sports and sportspersons</li> </ul> <p><i>Practical</i></p> <ul style="list-style-type: none"> <li>● Skills learning and Participation in sports</li> <li>● Participation in Intramural competitions</li> </ul>

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### Note

- The concepts are to be dealt with during the practical/practice classes.
- The list of suggestive sports: Aerobics and Physical Activity, Athletics, Archery, Badminton, Basketball, Boxing, Chess, Carrom, Cricket, Football, Handball, Hockey, Kabaddi, Kho-Kho, Swimming, Shooting, Squash, Table-Tennis, Tennis, Taekwando, Volleyball, Wushu, Wrestling etc.

### **Suggested Readings**

- James R Morrow Jr., Dale P. Mood, James G. Disch, Minsoo Kang - Measurement and Evaluation in Human Performance-Human Kinetics Publishers (2015)
- W.Larry Kenney, Jack H. Wilmore, Devid L.Costil.(2015). Physiology of Sports and Exercise, Second Edition. USA.Human Kinetics.
- Wener W.K. Hoeger, Sharon A. Hoeger - Fitness and Wellness-Cengage Learning (2014).
- Kansal DK (2012).A practical approach to Measurement Evaluation in Physical Education &Sports selection. Sports & Spiritual Science Publications, New Delhi.
- Websites of International Sports Federations, Ministry of Youth Affairs and Sports Govt. Of India.



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## **Course Title - Swachh Bharat**

### **COURSE OBJECTIVES:**

- To understand the developmental challenges with reference to sanitation infrastructure and practices.
- To build values of cleanliness, hygiene and waste management in diverse socio-economic contexts.
- To understand planning of social policy and programmes.
- To use waste management techniques at community level.
- To instill a sense of service towards society and the Nation. **LEARNING OUTCOMES:**
- Understanding the significance of the Swachh Bharat Abhiyan.
- Ability to analyse and predict the sanitation challenges of India
- Determine the link between sanitation and development.
- Contribute to the Swachh Bharat Abhiyan through real time projects/fieldwork

### **Syllabus of Swachh Bharat**

<b>Unit I: Introduction to Swachh Bharat Abhiyan</b>
<ul style="list-style-type: none"><li>● Gandhian philosophy of Cleanliness</li><li>● Swachh Bharat Abhiyan (SBA)</li><li>● Hygiene, Sanitation &amp; Sustainable Waste Management</li><li>● Agencies and nodal Ministries for SBA</li><li>● Different phases of the SBA and its evaluation</li><li>● Citizens' Responsibilities: Role of <i>Swacchagrahi</i></li></ul>
<b>Unit II: Swachh Bharat: Rural and Urban Facets</b>
<ul style="list-style-type: none"><li>● Indicators for Swachh Bharat</li><li>● Rural<ul style="list-style-type: none"><li>❖ Sanitation coverage across households (2014 vs. 2022)</li><li>❖ Open Defecation Free (ODF) Villages: Parameters</li><li>❖ ODF plus model: Key indicators</li></ul></li><li>● Urban<ul style="list-style-type: none"><li>❖ Sustainable sanitation</li><li>❖ Waste/water and solid waste management</li><li>❖ Garbage Free Cities</li></ul></li></ul>
<b>Unit III: Prospects and Challenges</b>
<ul style="list-style-type: none"><li>● Attitudes and Perceptions</li><li>● Operational and Financial issues</li><li>● Monitoring &amp; Supervision</li><li>● Community Mobilization</li></ul>



## Practical/ Practice Component

### Suggested Activities: List of activities to be undertaken:

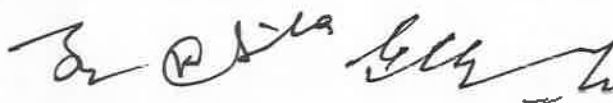
- Identify plastic and e-waste in and around the institution and suggest innovative technologies to minimize wastage.
- Identify events/fests that generate maximum waste and ways to minimize it.
- Visit canteen/shops and track the lifecycle of wet/dry waste in and around the institution and document the findings in the form of a Project Report.
- Conduct interviews of stakeholders to understand the level of awareness.
- Conduct a Clean Audit of the Institution and identify areas for action.
- Conduct cleanliness drives.
- Organise Swachhata Pakhwada meetings, rallies, and mobilization camps within the identified communities.
- Students may participate in the Swachh Bharat Internship programme.
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

### Essential Readings

- "Swachh Bharat Mission - Gramin, Department of Drinking Water and Sanitation, Ministry of Jal Shakti"
- India 2021, Ministry of Information & Broadcasting
- <http://swachhbharatmission.gov.in/SBMCMS/swachhta-pakhwada.htm>
- <https://swachhbharatmission.gov.in/SBMCMS/about-us.htm>
- [https://www.communityledtotalsanitation.org/sites/communityledtotalsanitation.org/files/ODF\\_verification\\_checklist.pdf](https://www.communityledtotalsanitation.org/sites/communityledtotalsanitation.org/files/ODF_verification_checklist.pdf)
- <https://sbm.gov.in/phase2dashboard/PhaseII/NationDashboard.aspx>
- <https://www.niti.gov.in/sites/default/files/2019-08/Report%20of%20Sub-Group%20of%20Chief%20Ministers%20on%20Swachh%20Bharat%20Anhiyaan.pdf>

### Suggested Readings

- <https://swachhbharatmission.gov.in/SBMCMS/writereaddata/Portal/Images/pdf/brochure/Greywatermanagement.pdf>
- [https://swachhbharatmission.gov.in/SBMCMS/writereaddata/Portal/Images/pdf/brochure/PWMB5\\_28th\\_June.pdf](https://swachhbharatmission.gov.in/SBMCMS/writereaddata/Portal/Images/pdf/brochure/PWMB5_28th_June.pdf)
- GoI (2020). Swachh Bharat Mission (Grameen) Phase 2: Operational guidelines. Department of Drinking Water and Sanitation, Ministry of Jalshakti.
- MoHUA (2017). Guidelines for Swachh Bharat Mission - Urban (PDF). Ministry of Housing and Urban Affairs, Government of India.



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## Course Title - Vedic Mathematics

### Course Objectives:

- Foster love for maths and remove its fear through Vedic Mathematics
- Enhance computation skills in students through Vedic Mathematics
- Develop logical and analytical thinking
- Promote joyful learning of mathematics
- Discuss the rich heritage of mathematical temper of Ancient India

### Learning Outcomes:

- Overcome the fear of maths
- Improved critical thinking
- Familiarity with the mathematical underpinnings and techniques
- Ability to do basic maths faster and with ease.
- Appreciate the Mathematical advancements of Ancient India.

### Syllabus of Vedic Mathematics

<b>Unit I: Vedic Maths- High Speed Addition and Subtraction</b>
<ul style="list-style-type: none"><li>• Vedic Maths: History of Vedic Maths and its Features</li><li>• Vedic Maths formulae: <i>Sutras</i> and <i>Upsutras</i></li><li>• Addition in Vedic Maths: Without carrying, Dot Method</li><li>• Subtraction in Vedic Maths: <i>Nikhilam Navatashcaramam Dashatah</i> (All from 9 last from 10)</li><li>• Fraction –Addition and Subtraction</li></ul>
<b>Unit II: Vedic Math - Miracle Multiplication and Excellent Division</b>
<ul style="list-style-type: none"><li>• Multiplication in Vedic Maths: Base Method (any two numbers upto three digits)</li><li>• Multiplication by <i>Urdhva Tiryak Sutra</i></li><li>• Miracle multiplication: Any three-digit number by series of 1's and 9's</li><li>• Division by <i>Urdhva Tiryak Sutra</i> (Vinculum method)</li></ul>
<b>Unit III: Vedic Maths-Lightening Squares and Rapid Cubes</b>
<ul style="list-style-type: none"><li>• Squares of any two-digit numbers: Base method</li><li>• Square of numbers ending in 5: <i>Ekadhikena Purvena Sutra</i></li><li>• Easy square roots: <i>Dwandwa Yoga</i> (duplex) <i>Sutra</i></li><li>• Square root of 2: <i>Baudhayana Shulbasutra</i></li><li>• Cubing: <i>Yavadunam Sutra</i></li></ul>
<b>Unit IV: Vedic Maths-Enlighten Algebra and Geometry</b>

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- Factoring Quadratic equation: *Anurupyena, Adyamadyenantyamantya Sutra*
- Concept of *Baudhayana* (Pythagoras) Theorem
- Circling a square: *Baudhayana Shulbasutra*
- Concept of pi: *Baudhayana Shulbasutra*
- Concept angle ( $\theta$ )  $0^\circ, 30^\circ, 45^\circ, 60^\circ$  and  $90^\circ$ : *Baudhayana number*

**Note:** Some of the theoretical concepts would be dealt with during practice hours.

### Practical/ Practice Component

he students are expected to demonstrate the application of Vedic Maths: *Sutra and Upsutra*

- Conduct workshops under the supervision of the course teacher to spread awareness on the utility of Vedic Mathematics.
- Students are required to visit nearby retail shops/local vendors to purchase stationery/vegetables/bread and butter and use tricks of Vedic maths of addition and subtraction to calculate the amount to pay and receive the difference.
- Students may share their experience with the class teacher in the form of audio-video presentations of 15 minutes.
- If required, students can share their experiences in the form of a Project Report.
- Any other Practical/Practice as decided from time to time

### Essential Readings

- The Essential of Vedic Mathematics, Rajesh Kumar Thakur, *Rupa Publications*, New Delhi 2019.
- Vedic Mathematics Made Easy, Dahaval Bathia, *Jaico Publishing*, New Delhi 2011
- Vedic Mathematics: Sixteen Simple Mathematical formulae from the Vedas, Jagadguru Swami Sri Bharati Krishna Trithaji, *Motilal Banarasidas*, New Delhi 2015.
- Learn Vedic Speed Mathematics Systematically, Chaitnaya A. Patil 2018.

### Suggested Readings

- A Modern Introduction to Ancient Indian Mathematics, T S Bhanumurthy, Wiley Eastern Limited, New Delhi
- Enjoy Vedic Mathematics, S M Chauthaiwale, R Kollaru, The Art of Living, Bangalore
- Magical World of Mathematics, VG Unkalkar, Vandana publishers, Bangalore





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## Course Title - Yoga: Philosophy and Practice

### Course Objectives

- To learn the fundamentals of Yoga for harmonising the body, mind and emotions.
- To demonstrate the value and the practice of holistic living.
- To value the heritage of Yoga for self and society.

### Learning Outcomes

- Understanding ways to harmonise the body and mind through Yoga.
- Disciplining the mind through practicing Yoga.
- Understanding of consciousness through practical training.

### Syllabus of Yoga: *Philosophy and Practice*

<b>Unit I: Yoga: <i>Asana, Prāṇāyāma and Dhyana</i></b>
<ul style="list-style-type: none"><li>• History of Yoga</li><li>• Significance of Asana</li><li>• Effect of Prāṇayama</li><li>• Importance of <i>Dhyana</i></li></ul>
<b>Unit II: Patanjali's <i>Yogasūtra</i> and <i>Chakra</i></b>
<ul style="list-style-type: none"><li>• Patanjali's <i>Yogasūtra</i>: a summary</li><li>• First sutra</li><li>• Second sutra</li><li>• <i>Chakras</i> (psychic centres)</li></ul>
<b>Unit III: Understanding <i>Asana</i> and <i>Pranayama</i></b>
<ul style="list-style-type: none"><li>• Asana: the basics</li><li>• <i>Surya Namaskara</i></li><li>• <i>Nadishodhana Prāṇayama</i></li></ul>

### Practical/ Practice Component

- Surya Namaskar
- Selected Asana
- *Prāṇayama*
- Relaxation exercises for the eyes (7 steps) neck (4 steps)
- Concentration on *Bhṛumadhya*

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- Project Work (effect of everyday concentration on breath for 15 minutes: reflections to be compiled in the form of a Project report.
- Any other Practical/Practice as decided from time to time

### Essential Readings

- Āsanās, Prāṇāyāma and Mudra Bandh , Swami Satyananda Saraswati, Yoga Publications Trust, Munger, Bihar, India, 2004.
- Patanjali Yogasutras, Commentary by Swami Vivekanand, Rajyoga

### Suggested Readings

- Patanjali Yog Pradeep- Swami Omanand Saraswati, Gita Press, Gorakhpur, 2013.
- Science of Pranayama-Swami Sivananda, Edition by David De Angellis, 2019, All Rights Reserved.
- Udayveer Shastri Granthavali, 4, Patanjali- Yoga Darshanam, Udayavir Shastri, Govindram Hasanand, Delhi 6.

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Swami Satyananda Saraswati

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## Course Title - भारतीय भक्ति परंपरा और मानव मूल्य

### COURSE OBJECTIVES

- भारतीय भक्ति की महान परंपरा, प्राचीनता और इसके अखिल भारतीय स्वरूप से छात्रों का परिचय कराना
- भारतीय भक्ति परंपरा के माध्यम से छात्रों में मानव मूल्यों और गुणों को जगाकर उनका चारित्रिक विकास करना और एक अच्छे मनुष्य का निर्माण करना ।
- छात्रों को भारतीय नैतिक, सांस्कृतिक और सामाजिक मूल्यों के प्रति जागरूक करना ।
- भारतीय भक्ति परंपरा के माध्यम से राष्ट्रीयता और अखिल भारतीयता की भावना जागृत करना।

### LEARNING OUTCOMES

- भारतीय भक्ति परंपरा के माध्यम से छात्रों में मानव मूल्यों और गुणों को विकास होगा और वे एक अच्छे और चरित्रवान मनुष्य बन सकेंगे।
- भारतीय भक्ति परंपरा के सांस्कृतिक और सामाजिक पक्षों की जानकारी हो सकेगी।
- भक्ति की प्राचीनता और अखिल भारतीय स्वरूप की जानकारी से राष्ट्रीयता और अखिल भारतीयता की भावना जागृत और मजबूत होगी।
- प्रमुख भक्त कवियों का परिचय और उनके विचारों की जानकारी हो सकेगी।

Unit I: भारतीय भक्ति परंपरा

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भक्ति: अर्थ और अवधारणा भक्ति के विभिन्न संप्रदाय और सिद्धांत भारत की सांस्कृतिक एकता और भक्ति भक्ति का अखिल भारतीय स्वरूप
Unit II: भारत के कुछ प्रमुख भक्त और उनके विचार
संत तिरुवल्लवर , आण्डाल, अक्कमहादेवी, ललयद , मीराबाई, तलसीदास , कबीरदास, रैदास, गुरु नानक, सरदास , जायसी, तकाराम , नामदेव, नरसिंह मेहता, वेमना, कंचन , नम्बियार, चैतन्य महाप्रभ, चंडीदास, सारला दास, शंकरदेव
Unit III: मानव मूल्य और भक्त
मानव मूल्य का अर्थ चयनित भक्त कवियों की जीवन मूल्यपरक कविताएँ

### Practical/ Practice Component

- पाठ्यक्रम में उल्लिखित कवियों में से किसी एक कवि की रचनाओं में विभिन्न मानव मूल्यों के आधार पर प्रोजेक्ट
- वर्तमान समय में भक्ति की प्रासंगिकता को समझना; सर्वे और साक्षात्कार पद्धति के आधार पर.
- जीवन में मानव मूल्यों के प्रतिपालन पर सर्वे और साक्षात्कार के आधार पर एक रिपोर्ट बनाना.
- उल्लिखित कवियों में से किसी एक कवि से संबंधित किसी मठ, आश्रम या मंदिर आदि, अथवा कोई फिल्म/ डॉक्यूमेंट्री के आधार पर रिपोर्ट बनाना.
- आवश्यक हो, तो छात्र प्रोजेक्ट रिपोर्ट के रूप में अपने अनभव साझा कर सकें
- Any other Practical/Practice as decided from time to time

### Essential Readings

- 'भक्ति का उद्भव और विकास तथा वैष्णव भक्ति के विविध रूप', भारतीय साहित्य का समेकित इतिहास, संपादक- डॉ नगेंद्र, हिंदी माध्यम कार्यान्वयन निदेशालय, दिल्ली विश्वविद्यालय, दिल्ली, पृष्ठ संख्या 215-250
- कुछ प्रमुख कवियों के चयनित पद
- 'भक्ति आंदोलन और भक्ति काव्य', शिव कुमार मिश्र, अभिव्यक्ति प्रकाशन, इलाहाबाद, 1994
- 'मानव मूल्य और साहित्य', डॉ धर्मवीर भारती, भारतीय ज्ञानपीठ, नई दिल्ली, 1999 Suggested Readings:
- 'भक्ति के आयाम', डॉ. पी. जयरामन, वाणी प्रकाशन, नई दिल्ली
- 'हिंदी साहित्य का इतिहास', आचार्य रामचंद्र शुक्ल, लोक भारती प्रकाशन, इलाहाबाद

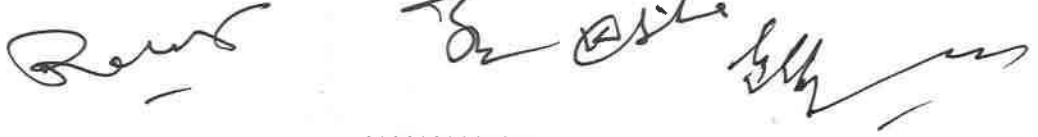
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● 'मध्यकालीन हिंदी काव्य का स्त्री पक्ष', डॉ. पनमू कुमारी, अनामिका पब्लिशर्स एंड डिस्ट्रीब्यूटर्स, नई दिल्ली

● 'मध्यकालीन हिंदी भक्ति काव्य: पनु मूलमूयांकन के आयाम', डॉ. पनमू कुमारी, अनामिका पब्लिशर्स एंड डिस्ट्रीब्यूटर्स, नई दिल्ली



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## Course Title - सृजनात्मक लेखन के आयाम

### पाठ्यक्रम का उद्देश्य (Course Objectives):

1. सृजनात्मक और भाषायी कौशल का संक्षिप्त परिचय कराना
2. विचारों का प्रभावी प्रस्तुति करण करना
3. सृजनात्मक चिंतन और लेखन क्षमता को विकसित करना
4. मीडिया लेखन की समझ विकसित करना पाठ्यक्रम अध्ययन के परिणाम

### (Learning Outcomes):

1. सृजनात्मक चिंतन और लेखन क्षमता का विकास हो सके गा
2. लेखन और मौखिक अभिव्यक्ति की प्रभावी क्षमता विकसित हो सके गी
3. मीडिया लेखन की समझ विकसित होगी
4. विद्यार्थी में अपने परिवेश, समाज तथा राष्ट्र के प्रति संवेदनशीलता का विकास होगा

### Syllabus: सृजनात्मक लेखन के आयाम

इकाई - 1 (Unit I): सृजनात्मक लेखन <ul style="list-style-type: none"><li>● सृजनात्मक लेखन: अर्थ, स्वरूप और बोध</li><li>● सृजनात्मक लेखन और परिवेश</li><li>● सृजनात्मक लेखन और व्यक्तित्व निर्माण</li></ul>
इकाई - 2 (Unit II): सृजनात्मक लेखन : भाषिक संदर्भ <ul style="list-style-type: none"><li>● भाव और विचार का भाषा में रूपान्तरण</li><li>● साहित्यिक भाषा की विभिन्न छवियाँ</li><li>● प्रिंट तथा इलेक्ट्रॉनिक माध्यमों की भाषा का अंतर</li></ul>
इकाई 3 (Unit III): सृजनात्मक लेखन - विविध आयाम

*Ram*

*Dr. ...*

*Dr. ...*

*Dr. ...*

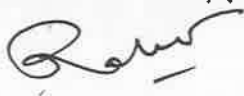
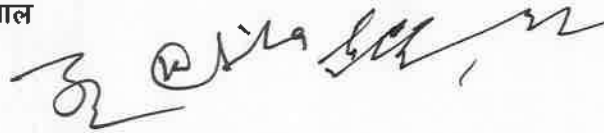
- कविता, गीत, लघु कथा
- हास्य - व्यंग्य लेखन,
- पल्लवन, संक्षेपण, अनूच्छेद

#### Practical/ Practice Component

- कक्षा में प्रत्येक विद्यार्थी द्वारा 'मेरी पहली रचना' शीर्षक से किसी भी विधा में लेखन
- किसी भी साहित्यिक रचना का भाषा की दृष्टि से विश्लेषण
- इकाई- 3 में उल्लिखित विधाओं में विद्यार्थियों द्वारा लेखन एवं सामूहिक चर्चा
- प्रत्येक इकाई से संबन्धित परियोजना कार्य: ० समसामयिक विषयों पर किसी भी विधा में लेखन - बदलते जीवन मूल्य, महामारी, राष्ट्र निर्माण में छात्र की भूमिका, युवाओं के कर्तव्य, पर्यावरण संरक्षण, लोकतन्त्र में मीडिया की भूमिका, ऑनलाइन शॉपिंग अथवा अन्य समसामयिक विषय ० किसी उत्सव, मेला, प्रदर्शनी, संग्रहालय और किसी दर्शनीय स्थल का भ्रमण तथा उस पर परियोजना कार्य
- प्रिंट माध्यम के खेल, राजनीति, आर्थिक और फिल्म जगत आदि से जुड़ी सामुदायिक भाषा की दृष्टि से विवेचन
- इलेक्ट्रॉनिक माध्यम के समाचार, धारावाहिक, विज्ञापन आदि का भाषा की दृष्टि से विवेचन
- आवश्यक हो, तो छात्र प्रोजेक्ट रिपोर्ट के रूप में अपने अनभव साझा करें
- Any other Practical/Practice as decided from time to time अनिवार्य पाठ

#### (ESSENTIAL READINGS)

- लेखन एक प्रयास, हरीश चन्द्र काण्डपाल

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**Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System**

**Ability Enhancement Courses (AEC)**

**Semester – I (AEC- 1)**

<b>Science</b>	<b>Social Science/Arts</b>	<b>Commerce</b>
• MIL	• MIL	• MIL

**Semester – II (AEC- 2)**

<b>Science</b>	<b>Social</b>	<b>Commerce</b>
• Environmental Science	• Environmental Science	• Environmental Science

**Semester – III (AEC- 3)**

<b>Science</b>	<b>Social</b>	<b>Commerce</b>
• Course on Disaster Risk Management	• Course on Disaster Risk Management	• Course on Disaster Risk Management

**Semester – IV (AEC- 4)**

<b>Science</b>	<b>Social Science/Arts</b>	<b>Commerce</b>
• Course on NCC/NSS/NGO's/Social Service/Scout & Guide/Sports	• Course on NCC/NSS/NGO's/Social Service/Scout & Guide/Sports	• Course on NCC/NSS/NGO's/ Social Service/Scout & Guide/Sports

**List of Ability Enhancement Course (AEC)**

SL. NO.	Course Title	LTP Distribution of the Course			Total Credits:	Total Marks = 100
		L	T	P		
1	MIL (Semester – I)	2	1	0	2	End -Term Appraisal : 70 Marks
2	Environmental Science (Semester – II)	2	1	0	2	
3	Course on Disaster Risk Management (Semester – III)	2	1	0	2	
4	Course on NCC/NSS/NGO's/Social Service/Scout & Guide/Sports (Semester – IV)	2	1	0	2	Internal Assessment: 30 Marks



## Proposed Course Structure for 4 Year Undergraduate Programme under CBCS System

### Ability Enhancement Course (AEC)

#### Semester – I (AEC- 1)

Science	Social Science/Arts	Commerce
• MIL	• MIL	• MIL

#### ENGLISH COMMUNICATION

##### Course Learning Objectives:

The purpose of this course is to introduce students to the theory, fundamentals and tools of communication and to develop in them vital communication skills which should be integral to personal, social and professional interactions. The present course hopes to address some of the aspects of effective communication skills through an interactive mode of teaching-learning process. The various dimensions of communication skills that will be focused in the course include language of communication, speaking skills such as personal communication, social interactions and communication in professional situations such as interviews, group discussions and office environments, important reading skills as well as writing skills such as report writing, note taking etc.

##### Syllabus:

##### 1. Introduction:

- Theory of Communication
- Types and modes of Communication
- Effective Communication/ Mis- Communication
- Barriers and Strategies

##### 2. Language of Communication:

- Verbal and Non-verbal (Spoken and Written)
- Personal, Social and Business
- Intra-personal, Inter-personal and Group communication

##### 3. Speaking Skills

- Dialogue
- Group Discussion
- Interview
- Public Speech
- Role Play/Extempore Presentations



#### 4. Reading and Understanding

- Close Reading
  - Comprehension, Analysis and Interpretation
  - Summary Paraphrasing Translation (from Indian language to English and vice-versa)
- Literary/Knowledge Texts

#### 5. Writing Skills

- Making notes
- Documenting
- Report Writing
- Writing Letters - job applications, CV and Resume
- Academic Writing
- Writing a Proposal

#### Readings:

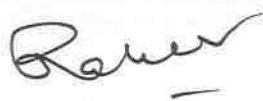
1. Fluency in English - Part II, Oxford University Press, 2006.
2. Business English, Pearson, 2008.
3. Language, Literature and Creativity, Orient Blackswan, 2013.
4. 4. Language through Literature (forthcoming) ed. Dr. Gauri Mishra, Dr Ranjana Kaul, Dr Brati Biswas

#### REMEDIAL ENGLISH

#### Learning Objectives:

English language skills – reading, writing, speaking and listening – are fundamental in constructing knowledge in all academic disciplines, succeeding in the world of work, and making sense of everyday life. The standards and benchmarks enlisted in this syllabus can help students adapt to the continually changing world of communication and develop a global outlook.

Through this course the students will be able to acquire the following set of literacy standards/ skills and implement them as working strategies: 1. Will engage in and gain basic proficiency in reading and comprehension 2. Will speak to a) inform b) describe c) explain d) persuade. The style and vocabulary will be at the beginners' level. 3. Make use of the grammar, syntax and tone of speech at the preliminary level. 4. Will read a variety of materials to facilitate comprehension. 5. Will understand the elements of grammar and its functions in a text. 6. Employ reading strategies such as scanning, selecting and summarising at the preliminary level. 7. Learn types of sentences – statement, question, exclamation, affirmative and negative. 8. Will gain and demonstrate basic competence in speaking, reading and writing.





Syllabus:

READING

1. Simple comprehension texts of description, narration, information, explanation and persuasion based on higher order thinking skills.
2. Contextualised grammar focus.
3. Vocabulary – basic synonyms and antonyms.

GRAMMAR

1. Parts of speech
2. Transformation of parts of speech
3. Nouns – gender and number; Countable and uncountable nouns
4. Verbs and tenses
5. Use of auxiliaries
6. Agreement of verb with subject
7. Use of articles
8. Use of adjectives and adverbs
9. Use of selected prepositions
10. Affirmative, negative and interrogative sentences
11. Question tags
12. Phrasal verbs
13. Direct and indirect narration

ENGLISH: ACADEMIC WRITING

Learning Objectives:

The syllabus aims to develop a critical and informed response to a range of texts/extracts, the skills of summarization and condensation, the skills of comprehension, the skills of analysis, synthesis and evaluation of content, correct usage and application of vocabulary.

Syllabus:

1. Features of Argumentative/Persuasive Writing

Reading and General Understanding

Writing practice: identifying arguments, counterarguments, non-arguments refuting arguments, style of persuasion, organizing an argumentative essay

Grammar Focus: Use of conjunctions as connectors, conditionals, noun clauses

2. Features of Comparison and Contrast Essay

Reading and General Understanding

Writing Practice: developing a comparison-contrast structure

Grammar Focus: Clauses for comparison, contrast, concession, transitions

3. Features of Literary Analysis

Reading and General Understanding



Writing Practice: plot devices, themes, symbols, figures of speech, tone, mood, style, organizing discourse structure

Grammar Focus: Conditional Sentences

4. Planning an Academic Essay

Writing Practice: discourse structure, essay-outline, paragraph-sequence, using citation.

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*Tom*

*John*

## Semester – II (AEC- 2)

Science	Social Science/Arts	Commerce
• Environmental Science	• Environmental Science	• Environmental Science

### Unit 1: Introduction to environmental studies

- Multidisciplinary nature of environmental studies
- Scope and importance; Concept of sustainability and sustainable development.

### Unit 2: Ecosystems

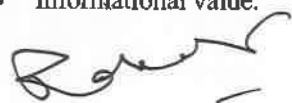
- What is an ecosystem?
- Structure and function of ecosystem;
- Energy flow in an ecosystem: food chains, food webs and ecological succession.
- Case studies of the following ecosystems:
  - a) Forest ecosystem
  - b) Grassland ecosystem
  - c) Desert ecosystem
  - d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

### Unit 3: Natural Resources: Renewable and Non – renewable Resources

- Land resources and land-use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over – exploitation of surface and ground water, floods, droughts, conflicts
- Over water (international & inter-state), Dams – benefits and problems.
- Food resources: World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, waterlogging, salinity.
- Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies

### Unit 4: Biodiversity and Conservation

- Levels of biological diversity: genetic, species and ecosystem diversity; Bio-geographic zones of India; Biodiversity patterns and global biodiversity hotspots.
- India as a mega-biodiversity nation; Endangered and endemic species of India, threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions.
- Conservation of biodiversity: In – situ and Ex – situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.



#### Unit 5: Environmental Pollution

- Environmental pollution: types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies

#### Unit 6: Environmental Policies & Practices

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).
- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

#### Unit 7: Human Communities and the Environment

- Human population growth: Impacts on environment, human health and welfare.
  - Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Water conservation, rain water harvesting, watershed management.
- Wasteland reclamation.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.

#### 1. Visit to local polluted site (any one)

- a) Urban: Identify the major sources of air pollution in a city or town of North Bengal region.
- b) Rural: Analyse the major sources of organic pollution in villages and adjoining agricultural fields.
- c) Industry: Prepare a list of the large and medium industries in and around your college area and the probable pollutants they may produce.

#### 2. Study of flora and fauna (any one)

- a) Prepare a list of the economic plants available in the college block.
- b) List the birds sighted and found nesting at the college campus and its surroundings with the season of their occurrence.
- c) Record insects associated with any common crop/grassland/tree of the college area with an idea of their habitat.

#### 3. Visit to local area to document environmental assets (any one):



- a) Trip to any riverine system of Terai or the dooars: comment on the direction, volume and quality of water, flowing as observed.
- b) Record the nature of vegetation/forest type/land use pattern at the site of visit.
- c) Analyse the cause of deforestation and landslide on hill slope, if sighted.

4. Study of ecosystems. (any one)

- a) Pond: water parameters – turbidity, pH, producers (phyto and zooplanktons) and related consumers (fishes and birds).
  - b) Grassland on hill slope: producers (plants), insects, consumers (birds, mammals, reptiles etc.)
  - c) Forest: practical concept of forest type, stories, dominant trees and sub – dominant vegetation, observed and reported major herbivores and carnivores in a forest ecosystem.
5. Submission of a field work (covering the above practical works undertaken)

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**Semester – III (AEC- 3)**

<b>Science</b>	<b>Social Science/Arts</b>	<b>Commerce</b>
• Course on Disaster Risk Management	• Course on Disaster Risk Management	• Course on Disaster Risk Management

**Learning Objectives:**

The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

**Introduction on Disaster Different Types of Disaster :**

**A) Natural Disaster:** such as Flood, Cyclone, Earthquakes, Landslides etc.

**B) Man-made Disaster:** such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea, Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc. Causes, effects and practical examples for all disasters.

**Risk and Vulnerability Analysis :**

1. Risk : Its concept and analysis
2. Risk Reduction
3. Vulnerability : Its concept and analysis
4. Strategic Development for Vulnerability Reduction

**Disaster Preparedness and Response Preparedness:**

1. Disaster Preparedness: Concept and Nature
2. Disaster Preparedness Plan
3. Prediction, Early Warnings and Safety Measures of Disaster.
4. Role of Information, Education, Communication, and Training,
5. Role of Government, International and NGO Bodies.
6. Role of IT in Disaster Preparedness
7. Role of Engineers on Disaster Management.

**Response**

1. Disaster Response: Introduction
2. Disaster Response Plan
3. Communication, Participation, and Activation of Emergency Preparedness Plan

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4. Search, Rescue, Evacuation and Logistic Management
5. Role of Government, International and NGO Bodies
6. Psychological Response and Management (Trauma, Stress, Rumor and Panic)
7. Relief and Recovery
8. Medical Health Response to Different Disasters
10. Role of Educational Institute.

Rehabilitation, Reconstruction and Recovery

1. Reconstruction and Rehabilitation as a Means of Development.
2. Damage Assessment
3. Post Disaster effects and Remedial Measures.
4. Creation of Long-term Job Opportunities and Livelihood Options,
5. Disaster Resistant House Construction
6. Sanitation and Hygiene
7. Education and Awareness,
8. Dealing with Victims' Psychology,
9. Long-term Counter Disaster Planning

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*Rover*

*Dr. Simha Singh*

*Sheela*

4. Search, Rescue, Evacuation and Logistic Management
5. Role of Government, International and NGO Bodies
6. Psychological Response and Management (Trauma, Stress, Rumor and Panic)
7. Relief and Recovery
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**Semester – IV (AEC- 4)**

<b>Science</b>	<b>Social Science/Arts</b>	<b>Commerce</b>
• Course on NCC	• Course on NCC	• Course on NCC

**Learning Objectives:**

The course aims to :

- (a) Provide knowledge about the history of NCC, its organization, and incentives of NCC for their career prospects.
- (b) Inculcate spirit of duty and conduct in NCC cadets.
- (c) Provide understanding about different NCC camps and their conducts.
- (d) Provide understanding about the concept of national integration and its importance.
- (e) Provide understanding about the concept of self-awareness and emotional intelligence.
- (f) Provide understanding about the concept of critical & creative thinking.
- (g) Provide understanding about the process of decision making & problem solving.
- (h) Provide understanding about the concept of team and its functioning.
- (i) Provide understanding about the concept and importance of Social service.

**Learning Outcomes:**

After completing this course, the cadets will be able to: -

- (a) Understand the basic concept of NCC.
- (b) Respect the diversity of different Indian culture.
- (c) Practice togetherness, teamwork and empathy in all walks of their life.
- (d) Do their own self-analysis and will work out to overcome their weakness for better performance in all aspects of life.
- (e) Critically think and analyse.

**Medium of Instruction:** Hindi and English

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## Syllabus of NCC-I

<b>Unit I: NCC General 4 Lectures</b>
<i>Subtopics:</i> <ul style="list-style-type: none"><li>● Aims, Objectives and Organization of NCC</li><li>● Incentives for NCC Cadets</li><li>● Duties of NCC Cadets</li><li>● NCC Camps: Types and Conduct</li></ul>
<b>Unit II: National Integration</b>
<i>Subtopics:</i> <ul style="list-style-type: none"><li>● National Integration: Importance and Necessity</li><li>● Factors affecting National Integration</li><li>● Unity in Diversity</li><li>● Threats to National Security</li></ul>
<b>Unit III: Personality Development</b>
<i>Subtopics:</i> <ul style="list-style-type: none"><li>● Factors</li><li>● Self-Awareness</li><li>● Empathy</li><li>● Critical and Creative Thinking</li><li>● Decision Making and Problem Solving</li></ul>
<b>Unit IV: Social Service and Community Development</b>
<i>Subtopics:</i> <ul style="list-style-type: none"><li>● Basics of Social Service</li><li>● Rural Development Programmes</li><li>● NGO's</li><li>● Contribution of Youth</li></ul>

### Practical/Practice Component

- Drill
- Field Craft & Battle Craft
- Map Reading
- Weapon Training
- Social Service & Community Development
- Any other Practical/Practice as decided from time to time

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*Dr*

*P. Srinivas*

*Y. S. Srinivas*

**Suggested Readings:**

- DGNCC Cadet's Hand Book - Common Subjects -All Wings (in English)
- DGNCC Cadet's Hand Book - Common Subjects -All Wings ( in Hindi)
- DGNCC Cadet's Hand Book – Specialised Subjects –Army, Navy and Air Wing

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**Syllabus for four year Undergraduate Course  
In Universities of Bihar**

**Bachelor of Science  
Zoology**



**Submitted by  
Subject Expert Committee**

21.09.2023

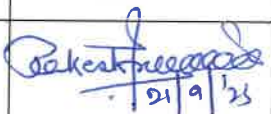
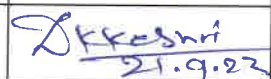
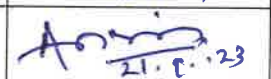
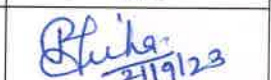
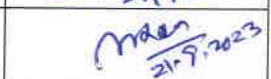


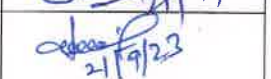
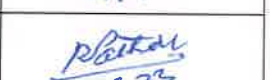
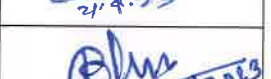

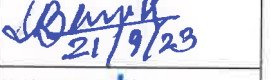

To,  
The Principal Secretary to Governor  
Raj Bhawan, Patna.

**Subject: Submission of Uniform Syllabus for 4 year Undergraduate Courses of Bachelor of Science under CBCS in the Subject- Zoology.**

Sir,

With reference to letter No. BSU (UGC) -02/2023-1457/GS (I) dated 14.09.2023, a meeting of the panel of experts in Zoology was held on 20-09-2023 & 21-09-2023 to finalize the syllabus of Zoology. We are submitting the syllabus of the same.

Your Sincerely,

Sl. No.	Name and Designation	Signature
1	Prof. (Dr) Rakesh Prasad (Retd.) Department of Zoology, Jai Prakash university, Chapra.	 21/9/23
2	Prof. (Dr) Dilip Kumar Keshri Department of Zoology, Magadh University, Bodhgaya	 21.9.23
3	Prof. (Dr) Ajit Kumar Sinha Department of Zoology, Veer Kunwar Singh University, Ara	 21.9.23
4	Prof. (Dr) Preety Sinha Department of Zoology, Patliputra University, Patna	 21/9/23
5	Prof. (Dr) Parimal Kumar Khan Department of Zoology, Patna University, Patna.	 21.9.2023
6	Prof. (Dr) Narendra Srivastava Department of Zoology, B N Mandal University, Madhepura	 21/9/23
7	Prof. (Dr) Rana Vikram Singh Department of Zoology, Jai Prakash university, Chapra	 21/9/23
8	Dr. Gyanendra Bahadur Chand Department of Zoology, Patna University, Patna	 21/9/23
9	Sri Ravindra Nath Pathak Department of Zoology, D A V College, J P university, Chapra.	 21.9.23
10	Dr. Dhiraj Kumar Department of Zoology, R S College, BRA Bihar University, Muzaffarpur	 21/09/2023
11	Dr. Shushovan Banik Department of Zoology, L N M U, Darbhanga	 21/9/23
12	Dr. Mayank Madhukar Department of Zoology, R D & D J College, Munger University, Munger	 21.09.23
13	Dr. Sujata Kumari Department of Zoology, M M College, Patna University, Patna.	 21/9/23

**Syllabus for 4 Year Undergraduate Course in Universities of Bihar.  
Bachelor of Science, Zoology.**

**Programme Outcomes:** At the completion of the programme, students will attain:

- PO1. Disciplinary knowledge:** Acquire comprehensive knowledge of major concepts, theoretical principles and experimental findings in Zoology, and some of the applied areas of study such as wildlife conservation and management; environmental science; various techniques, instruments, used for analysis of animal forms and functions.
- PO2. Effective communication and Critical thinking:** Convey the intricate zoological information effectively and efficiently, analyze and solve the problems related to animal sciences without reckoning on assumptions and guesses.
- PO3. Research & Leadership quality:** Recognize and mobilize relevant resources essential for a research project, and manage the project in a responsible way by following ethical scientific conduct and bio-safety protocols.
- PO4. Digitally literate and Ethical awareness:** Use computers for computation and data analysis with appropriate software for biostatistics, and employ search tools to locate and retrieve relevant information, recognize and avoid unethical behaviour such as fabrication, or misrepresentation of data or commit plagiarism.
- PO5. Environment and Sustainability:** Understand the environmental and sustainability issues, acquire self-paced and self-directed learning aimed at personal and social development.

**Programme Specific Outcomes:** At the completion of the programme, students will attain:

- PSO1.** Students should be able to identify, classify and differentiate diverse chordates and non chordates based on their morphological, anatomical and systemic organization.
- PSO2.** They will also be able to describe economic, ecological and medical significance of various animals in human life. This will create a curiosity and awareness among them to explore the animal diversity and explore related career options. The procedural knowledge about identifying and classifying animals will provide students professional advantages in teaching, research and taxonomist jobs in various government organizations.
- PSO3.** Acquired practical skills in molecular biology; biotechnology; microscopy; enzymology and analytical biochemistry and genetics will provide an extra edge to our students, who wish to undertake higher studies.
- PSO4.** In-depth knowledge and understanding about comparative anatomy and developmental biology of various biological systems; and learning about the organisation, functions, strength

and weaknesses of various systems will let students critically analyse the way evolution has shaped these traits in the human body.

**PSO5.** Acquired skills in diagnostic testings, haematology, histopathology, staining procedures etc. used in clinical and research laboratories will provide students opportunity to work in diagnostic or research laboratory. Deep understanding of different physiological systems and methods available to measure vital physiological parameters and to comprehend the mechanism behind occurrence of different lifethreatening disease *via* laboratory examination, assessment of basic physiological functions by interpreting physiological charts will help to find their career options.

### (A) Major Core Courses

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	I	MJC-1 (T)	Diversity of Non-Chordates (T)	4	100
		MJC-1 (P)	Diversity of Non-Chordates (P)	2	100
2.	II	MJC-2 (T)	Diversity of Chordates (T)	4	100
		MJC-2 (P)	Diversity of Chordates (P)	2	100
3.	III	MJC-3 (T)	Comparative Anatomy (T)	3	100
		MJC-3 (P)	Comparative Anatomy (P)	2	100
		MJC-4 (T)	Physiology (T)	3	100
		MJC-4 (P)	Physiology (P)	1	100
4.	IV	MJC-5 (T)	Cell Biology (T)	3	100
		MJC-5 (P)	Cell Biology (P)	2	100
		MJC-6 (T)	Endocrinology (T)	3	100
		MJC-6 (P)	Endocrinology (P)	2	100
		MJC-7 (T)	Ecology (T)	3	100
		MJC-7 (P)	Ecology (P)	2	100
5.	V	MJC-8 (T)	Biochemistry (T)	3	100
		MJC-8 (P)	Biochemistry (P)	2	100
		MJC-9 (T)	Genetics (T)	3	100
		MJC-9 (P)	Genetics (P)	2	100
6.	VI	MJC-10 (T)	Developmental Biology (T)	3	100
		MJC-10 (P)	Developmental Biology (P)	1	100
		MJC-11 (T)	Evolution (T)	3	100
		MJC-11 (P)	Evolution (P)	2	100
		MJC-12 (T)	Animal Behaviour (T)	3	100
		MJC-12 (P)	Animal Behaviour (P)	2	100

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7.	VII	MJC-13 (T)	Molecular Biology (T)	3	100
		MJC-13 (P)	Molecular Biology (P)	2	100
		MJC-14	Research Methodology	5	100
		MJC-15 (T)	Immunology and Microbiology (T)	4	100
		MJC-15 (P)	Immunology and Microbiology (P)	2	100
8.	VIII	MJC-16 (T)	Instrumentation and Biometry	4	100

Sub Total = 80

**(B) Minor Courses to be offered by the Department for students of other Departments of Science**

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	I	MIC-1 (T)	Diversity of Non-Chordates(T)	2	100
		MIC-1 (P)	Diversity of Non-Chordates(P)	1	100
2.	II	MIC-2 (T)	Diversity of Chordates (T)	2	100
		MIC-2 (P)	Diversity of Chordates (P)	1	100
3.	III	MIC-3(T)	Physiology(T)	2	100
		MIC-3(P)	Physiology(P)	1	100
4.	IV	MIC-4(T)	Ecology(T)	2	100
		MIC 4(P)	Ecology(P)	1	100
5.	V	MIC-5(T)	Cell Biology (T)	2	100
		MIC-5(P)	Cell Biology (P)	1	100
6.	V	MIC-6(T)	Genetics (T)	2	100
		MIC-6(P)	Genetics (P)	1	100
7.	VI	MIC-7(T)	Evolution (T)	2	100
		MIC-7(P)	Evolution (P)	1	100
8.	VI	MIC-8(T)	Developmental Biology(T)	2	100
		MIC-8(P)	Developmental Biology (P)	1	100

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9.	VII	MIC-9(T)	Animal Behaviour(T)	3	100
		MIC-9(P)	Animal Behaviour(P)	1	100
10.	VIII	MIC-10(T)	Endocrinology (T)	3	100
		MIC-10(P)	Endocrinology (P)	1	100

**Sub Total = 32**

**(C) Multidisciplinary Courses to be offered**

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	I	MDC-1	To be selected from the basket	3	100
2.	II	MDC-2	To be selected from the basket	3	100
3.	III	MDC-3	To be selected from the basket	3	100

**Sub Total = 09**

**(D) Ability Enhancement Courses to be offered**

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	I	AEC-1	MIL	2	100
2.	II	AEC-2	Environmental Science	2	100
3.	III	AEC-3	Disaster Risk Management	2	100
4.	IV	AEC-4	NCC/NSS/NGOs/Social Service/ Scout and Guide/Sports	2	100

**Sub Total = 08**

**(E) Skill Enhancement Courses to be offered**

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	I	SEC-1	To be selected from the basket	3	100
2.	II	SEC-2	To be selected from the basket	3	100
3.	III	SEC-3	To be selected from the basket	3	100

**Sub Total = 09**

**(F) Value Added Courses to be offered**

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	I	VAC-1	To be selected from the basket	3	100
2.	II	VAC-2	To be selected from the basket	3	100

**Sub Total = 06**

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	V	INT-1	Summer Internship	4	100

Sl. No.	Semester	Type of Course	Name of Course	Credits	Marks
1.	VIII	RP-1	Research/Dissertation	12	100

**Grand Total Credits = 160**

**(G) Basket for Multidisciplinary Courses (MDC)**  
To be decided by Respective Department

**(H) Basket for Skill Enhancement Courses (SEC)**  
See at the end of structure (this booklet)

**(I) Basket for Value Added Courses (VAC)**  
See at the end of structure (this booklet)

### Question Paper Pattern

The question paper shall consist of three parts: -

**Part A -Compulsory-** Consisting of ten objective/Multiple choice type - each carrying two marks. 10x2= 20 marks

**Part B -Short answers type -** Four questions are to be answered out of six questions - each carrying five marks. 04x5 = 20 marks

**Part C- Long answers type questions. Three questions to be answered out of five questions - each carrying ten marks. 03x10 = 30 marks**

**Examinations shall not be held on OMR Sheets strictly.**

**Syllabus for Four-Year B.Sc. Course in Zoology**

**Semester -I**

**Major Course 1 (MJC-1)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Non-Chordates	6	4	2

**Course outcomes:** After completion of the course, students should be able to:

- CO-1:** Learn about the importance of systematics, taxonomy, and structural organization of non-chordates.
- CO-2:** Understand & appreciate the diversity of non-chordates living in varied habits and habitats.
- CO-3:** Understand evolutionary history and relationships of different non-chordates through functional and structural affinities.
- CO-4:** Critically analyze the organization, complexity and characteristic features of non-chordates.
- CO-5:** Recognize the life functions and the ecological roles of the animals belonging to different phyla.

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**CO-6:** Enhance collaborative learning and communication skills through practical sessions, team-work, group discussions, assignments and projects.

<b>MJC-1: Diversity of Non-Chordates (Theory: 4 Credits) 40hrs</b>		
<b>Unit</b>	<b>Topics to be covered</b>	<b>No. of Lectures</b>
1	1. Introduction to Non-chordates: General characteristics and classification (up to order) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematelminthes, Annelida, Arthropoda, Mollusca and Echinodermata.	8
2	2.1. Protozoa: Structure and Life cycle of <i>Paramecium</i> , <i>Plasmodium</i> and <i>Leshmania donovani</i> . 2.2. Porifera: Spicules and Canal system in sponges; affinities of the Phylum.	10
3	3.1. Cnidaria: Structure and Life Cycle: <i>Obelia</i> and <i>Aurelia</i> . 3.2. Ctenophora: General organization of Hormiphora; affinities of the phylum. 3.3 Platyhelminthes and Nematelminthes: Structure and Life cycle of <i>Fasciola hepatica</i> , <i>Taenia solium</i> and <i>Ascaris lumbricoides</i> .	10
4	4.1. Annelida: Earthworm and Leech: Structure, locomotion, alimentary canal and reproduction. 4.2. Arthropoda: <i>Palaemon</i> and <i>Peripatus</i> , Adaptive variations in insect mouth parts. 4.3. Mollusca: Structure and Life cycle: <i>Unio</i> , <i>Pila</i> . Torsion and Detorsion in Gastropoda. 4.4. Echinodermata: Structure: Star fish; Larval forms in Echinoderms; Water Vascular System in Echinoderms.	12
<b>TOTAL</b>		<b>40</b>

<b>MJC-1: Diversity of Non-Chordates (Practical: 2 Credits) 20 hrs</b>		
<b>End Semester Examination</b>		
<b>Time – 3 hours</b>	<b>Full Marks-70</b>	
Permanent slides	15	
Museum specimen	15	
Larval forms	10	
Comments on display charts provided Practical record/Chart/Model	10	
Viva-voce	10	
<b>Sl. No.</b>	<b>Name of Practicals/Experiments</b>	

Pragati  
Anam  
Shreya  
Prachi  
Anam  
Dhruv  
Rishik  
Rishik  
Sujatha

1	Study of whole mount of <i>Euglena</i> , <i>Amoeba</i> , <i>Paramecium</i> , <i>Monocystis</i> ; Binary fission and Conjugation in <i>Paramecium</i> .
2	Study of <i>Sycon</i> ; T.S. of <i>Sycon</i> , L.S. of <i>Sycon</i> ; Gemmule, Hyalonema.
3	Permanent stained preparation of spicules of sponges
4	Study of <i>Obelia</i> , <i>Aurelia</i> , <i>Metridium</i> , <i>Physalia</i> .
5	Specimen/slide of any one Ctenophore.
6	Study of adult <i>Fasciola hepatica</i> , <i>Taenia solium</i> and <i>Ascaris</i> (male & female).
7	Study of Aphrodite, Septal nephridia and Ovary of Earthworm; Jaws of leech; Trochophore larva.
8	Study of T.S. through pharynx, gizzard, and typhlosolar region of earthworm.
9	Study of <i>Limulus</i> , <i>Scolopendra</i> , Grasshopper, <i>Phyllium</i> , Praying mantis, Palaemon, Sacculina, Cancer, <i>Eupagurus</i> , <i>Apis</i> , <i>Musca</i> . Salivary gland of Cockroach, Mouth parts of Mosquito.
10	Study of <i>Chiton</i> , <i>Dentalium</i> , Octopus, Glochidim larva.
11	Study of <i>Asterias</i> , <i>Echinus</i> , <i>Antedon</i> .
	Practical Records/Charts/Models.
	Viva-voce.

### Suggested Books:

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- 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.
- Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson.
- Verma P S, Jordan E L. (2009). *Invertebrate Zoology*. S. Chand publishers.
- Brusca R C (2016). *Invertebrates*. Published by Sinauer Associates, an imprint of Oxford University Press.
- S. S. Lal, *Practical Zoology Invertebrate*.

Semester -I

Minor Course 1 (MIC-1)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Non-Chordates	3	2	1

**Course outcomes:** After completion of the course, students should be able to:

**CO-1:** Learn about the importance of systematics, taxonomy, and structural organization of non-chordates.

**CO-2:** Critically analyse the organization, complexity and characteristic features of non-chordates.

**CO-3:** Recognize the life functions and the ecological roles of the animals belonging to different phyla.

MIC-1: Diversity of Non-Chordates (Theory: 2 Credits) 20 hrs		
Unit	Topics to be covered	No. of Lectures
1	I. Introduction to Non-chordates General characteristics and classification (up to order) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematelminths, Annelida, Arthropoda, Mollusca, Echinodermata.	5
2	2. Structure and life history of:- Protozoa - <i>Paramecium</i> Porifera - <i>Sycon</i>	4
3	3. Structure and life history of:- Cnidaria - <i>Obelia</i> Platyhelminthes - <i>Fasciola</i> Aschelminthes - <i>Ascaris</i>	5
4	4. Study of coelomates:- Annelida - <i>Pheretima</i> Arthropoda - <i>Palaemon</i> Mollusca - <i>Pila</i> Echinodermata - <i>Asteries</i> Hemichordata - <i>Balanoglossus</i>	6
	<b>TOTAL</b>	<b>20</b>

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MIC-1: Diversity of Non-Chordates (Practical: 1 Credit) 10 hrs	
End Semester Examination	
Time – 3 hours	Full Marks-70
Permanent slides	15
Museum specimen	15
Larval forms	10
Comments on display charts provided	10
Practical record/Chart/Model	10
Viva-voce	10
Sl. No.	Name of Practicals/Experiments
1	Study of whole mount of <i>Euglena</i> , <i>Paramecium</i> , <i>Leshmania</i>
2	Study of <i>Sycon</i> , <i>Spongilla</i> , T.S. of <i>Sycon</i> , L.S. of <i>Sycon</i> .
3	Study of <i>Obelia</i> , <i>Aurelia</i> , <i>Gorgonia</i>
4	Study of adult <i>Fasciola hepatica</i> , <i>Taenia solium</i> and their life stages
5	Study of <i>Pheretima</i> , <i>Hirudinaria</i>
6	Study of T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
7	Study of <i>Limulus</i> , <i>Palaemon</i> , <i>Apis</i> .
8	Mouth parts of Mosquito and Cockroach.
9	Study of <i>Pila</i> , <i>Unio</i> .
10	Study of <i>Asterias</i> .

**Suggested Books :**

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- 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
- Barrington, E.J.W. (1979). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
- Verma P S, Jordan E L. (2009). *Invertebrate Zoology*. S. Chand publishers
- Brusca R C (2016). *Invertebrates*. Published by Sinauer Associates, an imprint of Oxford University Press.
- S. S. Lal, *Practical Zoology, Invertebrate*.

Semester -I

Multidisciplinary Course 1 (MDC-1)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Non-Chordates	3	2	1

**Course outcomes:** After completion of the course, students should be able to:

**CO-1:** Learn about the importance of systematics, taxonomy, and structural organization of non-chordates.

**CO-2:** Critically analyse the organization, complexity and characteristic features of non chordates.

**CO-3:** Recognize the life functions and the ecological roles of the animals belonging to different phyla.

MDC-1: Diversity of Non-Chordata (Theory: 2credits)20 hrs		
Unit	Topics to be covered	No. of Lectures
1	I. Introduction to Non-chordates General characteristics and classification (up to order) of the following Phyla: Protozoa, Porifera, Cnidaria, Ctenophora, Platyhelminthes and Nematelminths, Annelida, Arthropoda, Mollusca, Echinodermata.	5
2	2 Structure and life history of:- Protozoa - <i>Paramecium</i> Porifera - <i>Sycon</i>	4
3	3. Structure and life history of:- Cnidaria - <i>Obelia</i> Platyhelminthes - <i>Fasciola</i> Aschelminthes - <i>Ascaris</i>	5
4	4. Study of coelomates: Annelida - <i>Pheretima</i> Arthropoda - <i>Palaemon</i> Mollusca - <i>Pila</i> Echinodermata - <i>Asteries</i> Hemichordata - <i>Balanoglossus</i>	6
	<b>TOTAL</b>	<b>20</b>



MDC-1: Diversity of Non-Chordates (Practical: 1 Credit) 10 hrs	
End Semester Examination	
Time – 3 hours	Full Marks-70
Permanent slides	15
Museum specimen	15
Larval forms	10
Comments on display charts provided	10
Practical record/Chart/Model	10
Viva-voce	10
Sl. No.	Name of Practicals/Experiments
1	Study of whole mount of <i>Euglena</i> , <i>Paramecium</i> , <i>Leshmania</i>
2	Study of <i>Sycon</i> , <i>Spongilla</i> , T.S. of <i>Sycon</i> , L.S. of <i>Sycon</i> .
3	Study of <i>Obelia</i> , <i>Aurelia</i> , <i>Gorgonia</i>
4	Study of adult <i>Fasciola hepatica</i> , <i>Taenia solium</i> and their life stages
5	Study of <i>Pheretima</i> , <i>Hirudinaria</i>
6	Study of T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm.
7	Study of <i>Limulus</i> , <i>Palaemon</i> , <i>Apis</i> .
8	Mouth parts of Mosquito and Cockroach.
9	Study of <i>Pila</i> , <i>Unio</i> .
10	Study of <i>Asterias</i> .

#### Suggested Books:

- Ruppert and Barnes, R.D. (2006). *Invertebrate Zoology*, VIII Edition. Holt Saunders International Edition.
- 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
- Baillington, E.J.W. (1919). *Invertebrate Structure and Functions*. II Edition, E.L.B.S. and Nelson
- Verma P. S, Jordan E. L. (2009). *Invertebrate Zoology*. S. Chand publishers
- Brusca R C (2016). *Invertebrates*. Published by Sinauer Associates, an imprint of Oxford University Press.
- S. S. Lal, *Practical Zoology, Invertebrate*.

#### Semester II

#### Major Course 2 (MJC-2)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Chordates	6	4	2

**Course Outcomes:** After completion of the course, the students will be able to:

**CO-1:** Understand different classes of chordates, level of organization and evolutionary relationship between different subphyla and classes, within and outside the phylum.

**CO-2:** Study about diversity in animals making students understand about their distinguishing features.

**CO-3:** Appreciate similarities and differences in life functions among various groups of animals in Phylum Chordata.

**CO-4:** Comprehend the circulatory, nervous and skeletal system of chordates.

**CO-5:** Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems.

MJC-2: Diversity of Chordates (Theory: 4 Credits) 40 hrs		
Unit	Topics to be covered	No. of Lectures
1	1.1 Introduction to Chordates: 1.2 General characteristics and classification (upto Order): Cephalochordata, Urochordata, Cyclostomata, Pisces, Amphibia, Reptilia, Aves and Mammalia.	8
2	2.1 Origin and Evolution of Chordata. 2.2 Cephalochordata: <i>Amphioxus</i> . 2.3 Urochordata: <i>Herdmania</i> (including retrogressive metamorphosis). 2.4 Cyclostomata: <i>Petromyzon</i> .	10
3	3.1 Pisces: Migration, Osmoregulation, and Accessory respiration. 3.2 Amphibia: Origin and Evolution; Parental care and Neoteny. 3.3 Reptilia: Poison and Non-poisonous snakes; Poison apparatus; biting and feeding mechanism in snakes.	12
4	4.1 Aves: Origin of birds, Flight adaptations and Migration in birds. 4.2 Mammalia: Characters, distribution and affinities of Prototheria Metatheria and Eutheria.	10
<b>TOTAL</b>		<b>40</b>

MJC-2: Diversity of Chordates (Practical: 2 Credits) 20 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Permanent slides	15	
Museum specimen	15	
Larval forms	10	

Comments on display charts provided	10
Practical record/Chart/Model	10
Viva-voce	10
<b>Sl. No.</b>	<b>Name of Practicals/Experiments</b>
1	Amphioxus: T.S through pharyngeal, intestinal, and caudal regions.
2	Herdmania: Whole mount, Spicules.
3	Cyclostomata: Petromyzon, Myxine
4	Fish: Scoliodon, Torpedo, Chimaera, Labeo, Exocoetus, Echeneis, Hippocampus; Scales of fishes.
5	Amphibia: Ichthyophis, Bufo, Hyla, Alytes, Salamandra, Axolotle larva.
6	Reptilia: Chelone, Hemidactylus, Varanus, Vipera, Naja, Bungarus, Uromastix, Chamaeleon, Draco, Calotes, Heloderma; Key for Identification of poisonous and non-poisonous snakes.
7	Aves: Types of beaks and claws, Study of pecten from fowl head and brain of fowl.
8	Mammalia: <i>Sorex</i> , Bat (Insectivorous and Frugivorous), <i>Funambulus</i> , <i>Loris</i> , <i>Herpestes</i> , <i>Erinaceus</i> , <i>Macropus</i> , <i>Echidna</i> .

### Suggested Books:

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
- Hall B. K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Classification from Young, J. Z. (2004) to be followed.
- S. S. Lal, *Practical Zoology Vertebrates*.

### Semester II Minor Course 2 (MIC-2)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Chordates	3	2	1

**Course Outcomes:** After completion of the course, the students will be able to:

**CO-1:** To understand the General Characteristics and Classification of Hemichordata, Urochordata and Cephalochordata, the Larval forms of Protochordata and Retrogressive Metamorphosis in Urochordata

**CO-2:** To acquire knowledge about the General Characters and Classification of Agnatha, Pisces and Amphibia.

**CO-3:** To understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and Migration in Birds.

MIC-2: Diversity of Chordates (Theory: 2credits)20 hrs		
Unit	Topics to be covered	No. of Lectures
1	General characteristics and classification (upto Order): Cephalochordata, Urochordata, Cyclostomata, Pisces, Amphibia, Reptilia, Aves and Mammals.	5
2	Cephalochordata: <i>Amphioxus</i> . Urochordata: <i>Herdmania</i> (including retrogressive metamorphosis).	4
3	Pisces: <i>Scoliodon</i> . Reptilia: Biting and feeding mechanism in snakes.	5
4	Aves: Flight adaptations, Elementary idea of migration. Mammals: Characters, distribution and affinities of Prototheria and Metatheria.	6
<b>TOTAL</b>		<b>20</b>

MIC-2: Diversity of Chordates (Practical: 1 Credits) 10 hrs		
End Semester Examination		
Time – 3 hours	Full Marks-70	
Permanent slides	15	
Museum specimen	15	
Larval forms	10	
Comments on display charts provided Practical record/Chart/Model	10	
Viva-voce	10	
Sl. No.	Name of Practicals/Experiments	
1	Amphioxus: Section through pharyngeal, intestinal, and caudal regions.	
2	Herdmania: Whole mount, Spicules.	
3	Cyclostomata: <i>Petromyzon</i> , <i>Myxine</i>	
4	Fish: <i>Scoliodon</i> , <i>Torpedo</i> , <i>Chimaera</i> , <i>Labeo</i> , <i>Exocoetus</i> , <i>Echeneis</i> , <i>Hippocampus</i> ; Scales of fishes.	
5	Amphibia: <i>Ichthyophis</i> , <i>Bufo</i> , <i>Hyla</i> , <i>Alytes</i> , <i>Salamandra</i> , Axolotle larva.	
6	Reptilia: <i>Chelone</i> , <i>Hemidactylus</i> , <i>Varanus</i> , <i>Vipera</i> , <i>Naja</i> , <i>Bungarus</i> , <i>Uromastix</i> , <i>Chamaeleon</i> , <i>Draco</i> , <i>Calotes</i> , <i>Heloderma</i> ; Key for Identification of poisonous and non-poisonous snakes.	

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7	Aves: Types of beaks and claws, Study of pecten from fowl head and brain of fowl.
8	Mammalia: <i>Sorex</i> , Bat (Insectivorous and Frugivorous), <i>Funambulus</i> , <i>Loris</i> , <i>Herpestes</i> , <i>Erinaceous</i> , <i>Macropus</i> , <i>Echidna</i> .

**Suggested Books:**

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
- Hall B. K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Classification from Young, J. Z. (2004) to be followed.
- S. S. Lal, *Practical Zoology Vertebrates*.

**Semester II**

**Multidisciplinary Course 2 (MDC-2)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Diversity of Chordates	3	2	1

**Course Outcomes:** After completion of the course, the students will be able to:

- CO-1:** To understand the General Characteristics and Classification of Hemichordata, Urochordata and Cephalochordata, the Larval forms of Protochordata and Retrogressive Metamorphosis in Urochordata
- CO-2:** To acquire knowledge about the General Characters and Classification of Agnatha, Pisces and Amphibia.
- CO-3:** To understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and Migration in Birds.

MDC-2: Diversity of Chordates (Theory: 2 Credits) 20 hrs		
Unit	Topics to be covered	No. of Lectures

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1	General characteristics and classification (upto Order): Cephalochordata, Urochordata, Cyclostomata , Pisces, Amphibia, Reptilia, Aves and Mammals.	5
2	Cephalochordata: <i>Amphioxus</i> . Urochordata: <i>Herdmania</i> (including retrogressive metamorphosis).	4
3	Pisces: <i>Scoliodon</i> .  Reptilia: Biting and feeding mechanism in snakes.	5
4	Aves: Flight adaptations, Elementary idea of migration. Mammals: Characters, distribution and affinities of Prototheria & Metatheria.	6
	<b>TOTAL</b>	<b>20</b>

<b>MDC-2: Diversity of Chordates (Practical: 1 Credits) 10 hrs</b>	
<b>End Semester Examination</b>	
<b>Time – 3 hours</b>	<b>Full Marks-70</b>
Permanent slides	15
Museum specimen	15
Larval forms	10
Comments on display charts provided Practical record/Chart/Model	10
Viva-voce	10
Sl. No.	Name of Practicals/Experiments
1	Amphioxus: Section through pharyngeal, intestinal, and caudal regions.
2	Herdmania: Whole mount, Spicules.
3	Cyclostomata: <i>Petromyzon</i> , <i>Myxine</i>
4	Fish: <i>Scoliodon</i> , <i>Torpedo</i> , <i>Chimaera</i> , <i>Labeo</i> , <i>Exocoetus</i> , <i>Echeneis</i> , <i>Hippocampus</i> ; Scales of fishes.
5	Amphibia: <i>Ichthyophis</i> , <i>Bufo</i> , <i>Hyla</i> , <i>Alytes</i> , <i>Salamandra</i> , Axolotle larva.
6	Reptilia: <i>Chelone</i> , <i>Hemidactylus</i> , <i>Varanus</i> , <i>Vipera</i> , <i>Naja</i> , <i>Bungarus</i> , <i>Uromastix</i> , <i>Chamaeleon</i> , <i>Draco</i> , <i>Calotes</i> , <i>Heloderma</i> ; Key for Identification of poisonous and non-poisonous snakes.
7	Aves: Types of beaks and claws, Study of pecten from fowl head and brain of fowl.
8	Mammalia: <i>Sorex</i> , Bat (Insectivorous and Frugivorous), <i>Funambulus</i> , <i>Loris</i> , <i>Herpestes</i> , <i>Erinaceous</i> , <i>Macropus</i> , <i>Echidna</i> .

Suggested Books:

*Handwritten signatures and scribbles:* Mayank, Ashish, Sanku, etc.

- Young, J. Z. (2004). *The Life of Vertebrates*. III Edition. Oxford university press.
- Pough H. *Vertebrate life*, VIII Edition, Pearson International.
- Darlington P.J. *The Geographical Distribution of Animals*, R.E. Krieger Pub Co.
- Hall B. K. and Hallgrimsson B. (2008). *Strickberger's Evolution*. IV Edition. Jones and Bartlett Publishers Inc.
- Classification from Young, J. Z. (2004) to be followed.
- S. S. Lal, Practical Zoology Vertebrates.

### Semester III

#### Major Course 3 (MJC-3)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Comparative Anatomy	5	3	2

**Course Outcomes:** Upon completion of the course, students should be able to:

- CO-1: Explain comparative account of the different vertebrate systems
- CO-2: Understand the pattern of vertebrate evolution, organization and functions of various systems.
- CO-3: Learn the comparative account of integument, skeletal components, their functions and modifications in different vertebrates.
- CO-4: Understand the evolution of heart, modification in aortic arches, structure of respiratory organs used in aquatic, terrestrial and aerial vertebrates; and digestive system and its anatomical specializations with respect to different diets and feeding habits.
- CO-5: Learn the evolution of brain, sense organs and excretory organs to a complex, highly evolved form in mammals;
- CO-6: Learn to analyze and critically evaluate the structure and functions of vertebrate systems, which helps them to discern the developmental, functional and evolutionary history of vertebrate species.

MJC-3: Comparative Anatomy of Vertebrates (Theory: 3 credits) 30 hrs		
Unit	Topics to be covered	No. of lectures

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1	1. Integumentary System: Structure and derivatives of integument, functions of skin.	4
2	2. Skeletal System: Basic plan of axial and appendicular skeleton.	4
3	3. Digestive System: Alimentary canal and associated glands.	4
4	4. Respiratory System: Respiratory organs and accessory respiratory organs.	5
5	5. Circulatory System: 5.1 General plan of circulation. 5.2 Evolution of heart and aortic arches.	4
6	6. Urinogenital System: Evolution of kidney and urinogenital ducts.	4
7	7. Nervous System: Comparative account of Central nervous system and Peripheral nervous system.	5
	<b>Total</b>	<b>30</b>

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MJC-3: Comparative Anatomy (Practical: 2 Credits) 20 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Study of placoid, cycloid and ctenoid scales of fish through permanent slides.	15
2	Study of afferent and efferent branchial vessels of Scoliodon through videos/models.	15
3	Study of digestive tract of frog/ rat through videos/models.	10
4	Disarticulated skeleton of Frog, Varanus, Fowl and Rabbit (Skull, Limb bones, Vertebral Column, Sternum, Girdles, Ribs)	10
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

**Suggested Books:**

- Kardong, K.V. (2005). Vertebrate's Comparative Anatomy, Function and Evolution. IV Edition. McGraw-Hill Higher Education.
- Kent, G.C. and Carr R.K. (2000). Comparative Anatomy of the Vertebrates. IX Edition. The McGraw-Hill Companies.
- Kotpal, R. L. (2010). Modern text book of zoology: vertebrates. Rastogi Publications.

**Online Tools and Web Resources:**

- SWAYAM (Structure of heart), Link <https://www.swayamprabha.gov.in/index.php/program/archive/9>.
- COURSERA (PALEONTOLOGY: Early vertebrate evolution, Link – <https://www.coursera.org/learn/early-vertebrate-evolution>).

### Major Course 4 (MJC-4)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physiology	4	3	1

**Course Outcomes:** Upon completion of the course, students will be able to:

- CO-1: Know the principles of normal biological function in human body.
- CO-2: Outline basic human physiology and correlate with histological structures.
- CO-3: Comprehend and analyse problem-based questions on physiological aspects.
- CO-4: Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and use of feedback loops to control the same.
- CO-5: Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.

MJC-4: Physiology (Theory: 3 Credits) 30 hrs		
Unit	Topics to be covered	No. of lectures
1	1. Digestive System: 1.1 Digestion, Absorption and Assimilation of Carbohydrates, Protein and Lipid. 1.2 Digestive glands.	5
2	2. Neuromuscular Physiology: 2.1 Structure of neuron, Propagation of nerve impulse. 2.2 Structure of skeletal muscle, Mechanism of muscle contraction 2.3 Neuromuscular junction.	5
3	3. Respiratory Physiology: 3.1 Ventilation and Internal Respiration. 3.2 Respiratory pigments. 3.3 Transport of gases in blood.	4
4	4. Cardiovascular System: 4.1 Components of blood and their function, blood coagulation. 4.2 Coronary circulation and heart beat. 4.3 Cardiac cycle and ECG. 4.4 Nervous and chemical regulation of heart rate.	8

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*Dr. D. K. Srinivas*  
*Dr. Anis*  
*Dr. Ok*  
*Dr. H. K.*  
*Dr. P. S.*  
*Dr. R. S.*  
*Dr. S. S.*  
*Dr. T. S.*  
*Dr. U. S.*  
*Dr. V. S.*  
*Dr. W. S.*  
*Dr. X. S.*  
*Dr. Y. S.*  
*Dr. Z. S.*

5	5. Renal and Reproductive Physiology: 5.1 Structure of nephron and renal blood supply. 5.2 Mechanism of urine formation and its regulation. 5.3 Acid- Base balance. 5.4 Spermatogenesis and oogenesis. 5.5 Menstrual cycle.	8
<b>Total</b>		<b>30</b>

<b>MJC-4: Physiology (Practical: 1 Credit) 10hrs</b>		
<b>End Semester Examination</b>		
<b>Time – 3 hours</b>		<b>Full Marks-</b>
<b>70</b>		
Sl. No.	Name of Practicals/Experiments	Marks
1	Enumeration of red blood cells and white blood cells using haemocytometer,	10
2	Determination of erythrocyte sedimentation rate.	10
3	Estimation of haemoglobin.	10
4	Examination of histological sections of mammalian oesophagus, stomach, duodenum, ileum, rectum, trachea, lung, Testis and Ovary.	20
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

**Suggested Books:**

- Tortora, G.J.& Grabowski, S (2006) Principles of Anatomy & Physiology, XI edition. John Wiley & Sons
- Vander A, Sherman J, and Luciano D (2014). Vander's Human Physiology: The mechanism of Body Function. XIII Edition, Mc Graw Hills.
- Guyton, A.C & Hall, J.E. (2006). Textbook of Medical Physiology, XI Edition. Hecourt Asia PTE Ltd/W.B. Saunders Company

**Online Tools and Web Resources:**

- e portals like SWAYAM
- <http://nsdl.niscair.res.in>

**Semester III**  
**Minor Course 3 (MIC-3)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physiology	3	2	1

**Course Outcomes:**

Upon completion of the course, students will be able to:

- Know the principles of normal biological function in human body.
- Outline basic human physiology and correlate with histological structures.
- Comprehend and analyse problem-based questions on physiological aspects.
- Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and use of feedback loops to control the same.
- Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.

MIC-3: Physiology (Theory: 2 credits) 20 hrs		
Unit	Topics to be covered	No. of lectures
1	1.1. Structure and function of digestive system, 1.2. Digestion and absorption of food.	3
2	2.1. Structure of neuron and propagation of nerve impulse. 2.2. Structure of skeletal muscle and mechanism of muscle contraction.	4
3	3.1. Structure of respiratory organs, pulmonary ventilation, 3.2. Transport of gases in blood.	4
4	4.1. Structure of excretory organs. 4.2. Mechanism of urine formation.	2
5	5.1. Structure and functions of heart. 5.2. Cardiac cycle.	2
6	6.1. Structure and functions of endocrine glands. 6.2. Spermatogenesis and oogenesis.	5
<b>Total</b>		20

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MIC-3: Physiology (Practical: 1 Credit)		10 hrs
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Enumeration of red blood cells and white blood cells using haemocytometer,	10
2	Determination of erythrocyte sedimentation rate.	10
3	Estimation of haemoglobin.	10
4	Examination of histological sections of mammalian oesophagus, stomach, duodenum, ileum, rectum, trachea, lung, Testis and Ovary.	20
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

**Suggested Books:**

- Tortora, G.J.& Grabowski, S (2006) Principles of Anatomy & Physiology, XI edition. John Wiley & Sons
- Vander A, Sherman J, and Luciano D (2014). Vander's Human Physiology: The mechanism of Body Function. XIII Edition, Mc Graw Hills.
- Guyton, A.C & Hall, J.E. (2006). Textbook of Medical Physiology, XI Edition. Hercourt Asia PTE Ltd/W.B. Saunders Company

**Online Tools and Web Resources:**

- e portals like SWAYAM  
<http://nsdl.niscair.res.in>

**Multidisciplinary Course 3 (MDC-3)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Physiology	3	2	1

**Course Outcomes:**

Upon completion of the course, students will be able to:

- Know the principles of normal biological function in human body.
- Outline basic human physiology and correlate with histological structures.
- Comprehend and analyse problem-based questions on physiological aspects.

- Recognize and explain how all physiological systems work in unison to maintain homeostasis in the body; and use of feedback loops to control the same.
- Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.

MDC-3: Physiology (Theory: 2 credits) 20 hrs		
Unit	Topics to be covered	No. of lectures
1	1.1. Structure and function of digestive system, 1.2. Digestion and absorption of food.	3
2	2.1. Structure of neuron and propagation of nerve impulse. 2.2. Structure of skeletal muscle and mechanism of muscle contraction.	4
3	3.1. Structure of respiratory organs, pulmonary ventilation. 3.2. Transport of gases in blood.	4
4	4.1. Structure of excretory organs. 4.2. Mechanism of urine formation.	2
5	5.1. Structure and function of heart. 5.2. Cardiac cycle.	2
6	6.1. Structure and function of endocrine glands. 6.2. Spermatogenesis and oogenesis.	5
<b>Total</b>		20

MDC-3: Physiology (Practical: 1 Credit)		10 hrs
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Sl. No.	Name of Practicals/Experiments	Marks
1	Enumeration of red blood cells and white blood cells using haemocytometer,	10
2	Determination of erythrocyte sedimentation rate.	10
3	Estimation of haemoglobin.	10
4	Examination of histological sections of mammalian oesophagus, stomach, duodenum, ileum, rectum, trachea, lung, Testis and Ovary.	20
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

**Suggested Books:**

- Tortora, G.J. & Grabowski, S (2006) Principles of Anatomy & Physiology, XI edition.

John Wiley & Sons

- Vander A, Sherman J, and Luciano D (2014). Vander's Human Physiology: The mechanism of Body Function. XIII Edition, Mc Graw Hills.
- Guyton, A.C & Hall, J.E. (2006). Textbook of Medical Physiology, XI Edition. Hercourt Asia PTE Ltd/W.B. Saunders Company

**Online Tools and Web Resources:**

- e portals like SWAYAM  
<http://nsdl.niscair.res.in>

**Semester IV  
Major Course 5 (MJC-5)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Cell Biology	5	3	2

**Course Outcome:** Upon completion of the course, students should to be able to:

- CO-1:** Understand fundamental principles of cell biology.
- CO-2:** Explain structure and functions of cell organelles involved in diverse cellular processes.
- CO-3:** Appreciate how cells grow, divide, survive, die and regulate these important processes.
- CO-4:** Comprehend the process of cell signaling and its role in cellular functions.
- CO-5:** Have an insight of how defects in functioning of cell organelles and regulation of cellular processes can develop into diseases.
- CO-6:** Learn the advances made in the field of cell biology and their applications.

MJC-5: Cell Biology (Theory: 3 Credits) 30 hrs		
Unit	Topics to be covered	No. of lectures
1	1. Overview of Virus, Prokaryotic and Eukaryotic cells.	2
2	2. Plasma Membrane: 2.1 Various models of plasma membrane. 2.2 Transport across membranes (passive and active transport).	6
3	3. Cytoplasmic organelles: 3.1 Endoplasmic Reticulum – Structure, Signal hypothesis. 3.2 Golgi apparatus – Structure, Protein sorting. 3.3 Lysosomes and Peroxisomes. 3.4 Mitochondria – Structure, Respiratory chain and oxidative phosphorylation.	10

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4	4. Nucleus: 4.1 Structure of Nucleus. 4.2 Euchromatin and Heterochromatin.	6
5	5. Cell Division: 5.1 Cell cycle and Molecular basis of its regulation. 5.2 Mitosis and Meiosis.	6
	<b>Total</b>	<b>30</b>

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MJC-5: Cell Biology (Practical: 2 Credits) 20hrs		
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Sl. No.	Name of Practicals/Experiments	Marks
1	Vital staining of mitochondria in buccal epithelium	10
2	Preparation of temporary stained squash of onion root tip to study various stages of mitosis.	15
3	Study of various stages of meiosis through permanent slides.	10
4	Preparation of temporary stained mount to show the presence of Barr body in human female blood cells/ cheek cells. or Preparation of polytene chromosome from salivary gland of Chironomus larva.	15
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

#### Suggested Books:

- Cooper, G.M., Hausman, R.E. (2009) The Cell: A Molecular Approach. V Edition, ASM Press and Sinauer Associates.
- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments, VI Edition, John Wiley & Sons Inc.
- Powar, C. B. (1991) Cell Biology, Himalaya Publishing House

#### Online Tools and Web Resources:

- <https://swayam.gov.in/course/150-cell-biology>
- <https://swayam.gov.in/courses/5173-biochemistry-and-cell-biology>
- <https://www.jove.com/science-education-library/9/cell-biology>
- <https://www.khanacademy.org/science/biology>

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**Major Course 6 (MJC-6)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Endocrinology	5	3	2

**Course Outcome:** After completion of the course the students will be able to:

**CO-1:** Understand endocrine system and the basic properties of hormones.

**CO-2:** Appreciate the importance of endocrine system and the crucial role it plays along with the nervous system in maintenance of homeostasis.

**CO-3:** Gain insight into the molecular mechanism of hormone action and its regulation.

**CO-4:** Know the regulation of physiological process by the endocrine system and its implication in diseases.

**CO-5:** Gain knowledge about the prevalent endocrine disorders and critically analyze their own and their family's health issues.

MJC-6: Endocrinology (Theory: 3 Credits) 30 hrs		
Unit	Topics to be covered	No. of lectures
1	1. Introduction to Endocrinology: 1.1 Overview of the endocrine system. 1.2 Classification of hormones and their synthesis.	6
2	2. Hypothalamo-hypophysial system: 2.1 Structure of hypothalamus and its role in neuroendocrine regulation. 2.2 Structure of pituitary gland, its hormones and function. 2.3 Hormonal dysfunction associated with pituitary gland.	10
3.	3. Peripheral Endocrine Glands: 3.1 Functional histology, hormones and function of Thyroid, Parathyroid, Adrenal, Islets of Langerhans and Gonads. 3.2 Disorders related to hypersecretion and hyposecretion of hormones.	8
4.	4. Molecular Endocrinology: 4.1 Hormone receptors. 4.2 Mechanism of hormone action (Steroid and Non-steroid). 4.3 Regulation of hormone action.	6
<b>Total</b>		<b>30</b>

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MJC-6: Endocrinology (Practical: 2 Credits) 20 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of practicals/experiments	Marks
1	Display of gonads, thyroid, adrenal, pancreas in mammal through videos/models	15
2	Study of the permanent slides of Pituitary, Adrenal, Ovary, Testes, Islets of Langerhan's, Thymus, Thyroid and Parathyroid, Study of the permanent slide of vaginal smears	4x5=20
3	Estimation of plasma level of any hormone using ELISA Or Chromatographic separation of steroid hormones using paper chromatography.	15
4	Practical Records/Charts/Models	10
5	Viva- voce.	10

**Suggested Books:**

- J. Larry Jameson Leslie De Groot (2010). Endocrinology. VI Edition.
- David O. Norris. Vertebrate Endocrinology. V Edition, Elsevier Academic press.
- Franklin F. Bolander. Molecular Endocrinology. III Edition, Academic Press, USA.

**Online Tools and Web Resources:**

- <https://www.endocrine.org/topics>

**Major Course 7 (MJC- 7)**

**Course Outcome:** Upon completion of the course, students should be able to:

**CO-1:** Demonstrate an understanding of key concepts in ecology with emphasis on historical perspective, role of physical factors and concept of limiting factors.

Course Title	Credit	Credit Distribution	
		Theory	Practical
Ecology	5	3	2

**CO-2:** Comprehend the population characteristics, dynamics, growth models and interactions.

**CO-3:** Understand the community characteristics, ecosystem development and climax theories.

**CO-4:** Know about the types of ecosystems, food chains, food webs, energy models and ecological efficiencies.

**CO-5:** Apply the basic principles of ecology in wildlife conservation and management.

**CO-6:** Inculcate scientific quantitative skills, evaluate experimental design, read graphs, and analyse and use information available in scientific literature.

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MJC-7: Ecology (Theory: 3 Credits) 30 hrs		
Unit	Topics to be covered	No. of lectures
1	1. Components of Ecology: 1.1 Biotic factors. 1.2 Abiotic factors. 1.3 Laws of limiting factors.	2
2	2. Ecosystem: 2.1 Definition, structure, and function of different types of ecosystems including wetland ecosystem. 2.2 Food chain and Food web. 2.3 Energy flow through the ecosystem, Ecological pyramids and Ecological efficiencies. 2.4 Biogeochemical cycles.	10
3	3. Population ecology: 3.1 Study of population attributes (Natality, Mortality, Density). 3.2 Life tables; Exponential and logistic growth, equation and patterns, r and k strategies. 3.3 Population interactions; Lotka-Volterra model.	6
4	4. Community Ecology: 4.1 Community characteristics: species richness, dominance, diversity, abundance, Ecotone and Edge effect. 4.2 Ecological succession with examples and types.	4
5	5. Applied Ecology: 5.1 Biodiversity - Importance and threats. 5.2 Wildlife conservation and management; National Parks, Bioreserves and Sanctuaries. 5.3 Pollution and its hazards.	8
<b>Total</b>		<b>30</b>

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MJC-7: Ecology (Practical: 2 Credits)		20 hrs
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Analysis of Soil/Pond Biota Or Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided.	10
2	Determination of dissolved oxygen and pH measurements of different water samples.	15
3	Determination of population density in a natural/ hypothetical community by quadrat method.	15
4	Report on a visit to National Park/Biodiversity Park/ Wild life sanctuary/Zoo.	10
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

**Suggested Books:**

- Odum, E.P. (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Smith, R. L. (2000). Ecology and field biology. Harper and Row published

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**Semester IV**  
**Minor Course 4 (MIC-4)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Ecology	3	2	1

**Course Outcome:** Upon completion of the course, students should be able to:

- Demonstrate an understanding of key concepts in ecology with emphasis on historical perspective, role of physical factors and concept of limiting factors.
- Comprehend the population characteristics, dynamics, growth models and interactions.
- Understand the community characteristics, ecosystem development and climax theories.
- Know about the types of ecosystems, food chains, food webs, energy models, and ecological efficiencies.
- Apply the basic principles of ecology in wildlife conservation and management.
- Inculcate scientific quantitative skills, evaluate experimental design, read graphs, and analyse and use information available in scientific literature.

<b>MIC-4: Ecology (Theory: 2 Credits)      20 hrs</b>		
Unit	Topics to be covered	No. of lectures
1	Introduction to Ecology, Scope of ecology, Laws of limiting factors.	2
2	Population dynamics, Demographic indices, Population interactions.	4
3	Community: Biodiversity and study of diversity index.	2
4	Ecosystem: Types of ecosystems, Detailed study of Aquatic ecosystem, Food chain, Food web, Ecological pyramids and Biogeochemical cycle.	7
5	Applied Ecology: Wildlife conservation; Importance, threats and management, Protected areas; National Parks, Bioreserves and Sanctuaries.	5
	<b>Total</b>	<b>20</b>

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MIC- 4: Ecology (Practical: 1 Credit)		10hrs
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Sl. No.	Name of Practicals/Experiments	Marks
1	Analysis of Pond Biota	10
2	Determination of dissolved oxygen of different water samples.	15
3	Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided.	15
4	Determination of population density in a natural/ hypothetical community by quadrat method.	10
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

#### Suggested Books:

- Odum, E.P. (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
- Smith, R. L. (2000). Ecology and field biology. Harper and Row publisher
- Colinvaux, P.A. (1993). Ecology. John Willey & Sons, Inc
- Krebs, C. J. (2001). Ecology. Benjamin Cummings.

#### Semester V Major Course 8 (MJC-8)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Biochemistry	5	3	2

**Course Outcome:** After the completion of the course, the student will be able:

- CO1- To understand the structure, classification and importance of Carbohydrates and Proteins.
- CO2- To understand the structure and significance of physiologically important Lipids.
- CO3- To understand the basic structure and types of DNA and RNA, Base pairing, denaturation and renaturation of DNA.
- CO4- To understand the types of Enzymes, Mechanism of Enzyme Action and Enzyme Kinetics.

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MJC-8: Biochemistry (Theory: 3 credits) 30 hrs		
Unit	Topics to be covered	No. of Lectures
1	1. Elementary idea of biomolecule: 1.1 Structure and classification of Carbohydrates, Lipid and Protein. 1.2 Structure, classification and physiological importance of Amino Acids. 1.3 Structure, classification and physiological importance of Vitamins.	10
2	2. Enzymes: 2.1 Nomenclature and classification, Isozymes. 2.2 Kinetics of enzyme-substrate reactions. 2.3 Regulation of enzyme action.	6
3	3. Carbohydrate Metabolism: 3.1 Glycolysis and Citric acid cycle. 3.2 Pentose Phosphate Pathway, Gluconeogenesis, Glycogenolysis and Glycogenesis.	8
4	4. Lipid and Protein Metabolism: 4.1 Beta oxidation and omega-oxidation of fatty acids, Ketogenesis. 4.2 Transamination, Deamination, Urea cycle.	6
<b>TOTAL</b>		<b>30</b>

MJC 8 : Biochemistry (Practical: 2 credits) 20 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Sl. No.	Name of Practicals/Experiments	Marks
1	Qualitative tests of carbohydrates, proteins and lipids.	20
2	Paper chromatography of amino acids.	15
3	Demonstration of impact of pH, temperature and inhibitors on the action of salivary amylase.	15
4	Practical Records/Charts/Models.	10
5	Viva- voce.	10

**Suggested Books:**

- Cox, M.M and Nelson, D.L. (2008). *Lehninger's Principles of Biochemistry*, V Edition, W.H. Freeman and Co., New York.



- Berg, J.M., Tymoczko, J.L. and Stryer, L. (2007). *Biochemistry*, VI Edition, W.H. Freeman and Co., New York.
- Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). *Harper's Illustrated Biochemistry*, XXVIII Edition, International Edition, The McGraw- Hill Companies Inc.\
- Hames, B.D. and Hooper, N.M. (2000). *Instant Notes in Biochemistry*, II Edition, BIOS Scientific Publishers Ltd., U.K.

### Major Course 9 (MJC-9)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Genetics	5	3	2

**Course Outcome:** After the completion of the course, the student will be able:

CO 1- To explain and discuss the genetic variation through linkage and crossing over.

CO 2- To describe sex-linked, sex limited and sex influenced inheritance.

CO 3- To understand the Concept behind genetic disorder, gene mutations and molecular basis of mutations and to explain the criteria for extra-chromosomal inheritance.

CO 4- To describe the molecular mechanisms of recombination in bacteria and to explain and distinguish the concept of transposable genetic elements in prokaryotes and eukaryotes. To Solve genetic based problems.

### MJC-9 Genetics (Theory: 3 credits) 30 hours

Unit	Topics to be covered	No. of Lectures
1	1. Mendelian Genetics and Linkage: 1.1 Principles of inheritance, Incomplete dominance and co-dominance, Multiple alleles, Lethal alleles, Epistasis and Pleiotropy. 1.2 Linkage and crossing over; its cytological basis and molecular mechanisms, Recombination frequency, Interference and coincidence.	8
2	2. Mutations: 2.1 Gene mutation - Chemical and Physical mutagenesis. 2.2 Chromosomal aberrations – Structural and Numerical. 2.3 Detection of mutations in <i>Drosophila</i> - CLB method and attached X method.	8
3	3. Sex Determination: 3.1 Chromosomal mechanisms of sex determination. 3.2 Genetic and molecular basis of sex determination in <i>Drosophila</i> . 3.2 Sex-linked inheritance, sex-influenced and sex-limited characters.	6
4	4. Extra-chromosomal Inheritance and Quantitative Genetics:	8

4.1 Criteria for extra-chromosomal inheritance. 4.2 Antibiotic resistance in <i>Chlamydomonas</i> , Kappa particles in <i>Paramoecium</i> and Maternal effects (Shell spiralling in <i>snail</i> ). 4.3 Polygenic inheritance.	
<b>TOTAL</b>	<b>30</b>

<b>MJC-9 : Genetics (Practical: 2 credits) 20 hrs</b>		
<b>End Semester Examination</b>		
<b>Time – 3 hours</b>		<b>Full Marks- 70</b>
<b>Sl. No.</b>	<b>Name of Practicals/Experiments</b>	<b>Marks</b>
1	Identification of various mutants of <i>Drosophila</i> in the given photograph/ specimen. Practical Records / charts / models. Viva-voce.	15
2	Calculate allelic/ genotypic frequencies using Hardy-Weinberg's Principle.	20
3	Solving problem based on Mendelian laws and Linkage map from <i>Drosophila</i> crosses.	15
4	Practical Records/Charts/Models.	10
5	Viva- voce.	10

**Suggested Books:**

- Gardner, E.J., Simmons, M.J., Snustad, D.P. (2008). *Principles of Genetics*. VIII Edition. Wiley India
- Snustad, D.P., Simmons, M.J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc
- Klug, W.S., Cummings, M.R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings
- Russell, P. J. (2009). *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings
- Fletcher H. and Hickey I. (2015). *Genetics*. IV Edition. GS, Taylor and Francis Group, New York and London.

**Semester V**  
**Minor Course 5 (MIC-5)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Cell Biology	3	2	1

MIC-5: Cell Biology (Theory: 2 Credits) 20 hrs		
Unit	Topics to be covered	No. of lectures
1	Overview of Prokaryotic and Eukaryotic cells	2
2	Plasma Membrane: Fluid Mosaic Model, Active and passive transport.	3
3	Endomembrane System: Structure and Functions of Endoplasmic Reticulum, Golgi apparatus, Lysosomes and Peroxisomes.	4
4	Mitochondria: Structure, Respiratory chain and ATP production.	4
5	Nucleus: Structure of Nucleus and organization of Chromatin.	3
6	Cell cycle: Mitosis, Meiosis and their regulation in brief.	4
	<b>Total</b>	<b>20</b>

MIC-5: Cell Biology (Practical:1 Credit) 10 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Vital staining of mitochondria in buccal epithelium	15
2	Study of various stages of mitosis through permanent slides. (any two)	5x2=10
3	Study of various stages of meiosis through permanent slides (any two)	5x2=10
4	Preparation of temporary stained mount to show the presence of Barr body in human cheek cells.	15
5	Practical Records/Charts/Models.	10
6	Viva- voce.	10

**Suggested Books:**

- Cooper, G.M., Hausman, R.E. (2009) The Cell: A Molecular Approach. V Edition, ASM Press and Sinauer Associates.
- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments, VI Edition, John Wiley & Sons Inc.
- Powar, C. B. (1991) Cell Biology, Himalaya Publishing House.
- Alberts et al: Molecular Biology of the Cell (2008, Garland)

### Minor Course 6 (MIC-6)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Genetics	3	2	1

**Course Outcome:**

- To understand variation, linkage and crossing over.
- To understand sex linked inheritance.
- To understand genetic disorders and mutations.
- To understand extra chromosomal inheritance.

MIC - 6 Genetics (Theory: 2 credits) 20 hours		
Unit	Topics to be covered	No. of Lectures
1	1.1 Principles of Genetic inheritance, Incomplete dominance and co-dominance. 1.2 Concept of Linkage and crossing over.	5
2	2.1 Gene mutation - Chemical and Physical mutagenesis. 2.2 Chromosomal aberrations – Structural and Numerical.	4
3	3.1 Chromosomal mechanisms of sex determination. 3.2 Sex-linked inheritance, sex-influenced and sex-limited characters.	6
4	4.1. Extra-chromosomal Inheritance. 4.2 Kappa particles in <i>Paramecium</i> and Maternal effects (Shell spiralling in <i>snail</i> ).	5
<b>TOTAL</b>		<b>20</b>

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MIC-06 : Genetics (Practical: 1 Credit) 10 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Preparation of Polytene chromosomes from Chironomous/Drosophila.	20
2	Identification of various mutants of Drosophila in the given photograph.	15
3	Study of pedigree analysis of human inherited traits.	15
4	Practical Records/Charts/Models.	10
5	Viva- voce.	10

**Suggested Books:**

- Gardner, E. J., Simmons, M. J., Snustad, D. P. (2008). *Principles of Genetics*. VIII Edition. Wiley, India
- Snustad, D. P., Simmons, M. J. (2009). *Principles of Genetics*. V Edition. John Wiley and Sons Inc
- Klug, W. S., Cummings, M. R., Spencer, C.A. (2012). *Concepts of Genetics*. X Edition. Benjamin Cummings
- Russell, P. J. (2009). *Genetics- A Molecular Approach*. III Edition. Benjamin Cummings
- Fletcher H. and Hickey I. (2015). *Genetics*. IV Edition. G S, Taylor and Francis Group, New York and London.

**Semester VI  
Major Course 10 (MJC-10)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Developmental Biology	4	3	1

**Course Outcome:** After the completion of the course, the student will be able:

CO 1- To describe the mechanism of gametogenesis, fertilization and blocks to polyspermy.

CO 2- To explain early embryonic development in frog and chick.

CO 3- To understand the concepts of late embryonic development in model organisms.

CO4 - To describe post embryonic development such as metamorphosis and regeneration with suitable examples and apply important experiments and project work.

MJC-10: Developmental Biology (Theory: 3 credits) 30 hours		
Unit	Topics to be covered	No. of Lectures
1	1. Introduction: 1.1 Principles and Basic concepts of development biology - Phases of development, Cell-Cell interaction, Differentiation and growth 1.2 Gametogenesis: Spermatogenesis and Oogenesis.	10

	1.3 Mechanism of fertilization, Types of eggs and cleavage, Blastulation, Fate maps (including Techniques).	
2	2. Early and Late Embryonic Development: 2.1 Early development of frog and chick up to gastrulation. 2.2 Late Embryonic Development: Fate of Germ Layers, Extra-embryonic membranes in birds, Placentation.	8
3	3. Post Embryonic Development: 3.1 Metamorphosis: Changes, hormonal regulations in amphibians. 3.2 Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each).	6
4	4. Implications of Developmental Biology: 4.1 Teratogenesis: Teratogenic agents and their effects on embryonic development. 4.2 In vitro fertilization, Stem cell, Amniocentesis. 4.3 Basic concept of Aging and senescence.	6
	<b>TOTAL</b>	<b>30</b>

<b>MJC-10: Developmental Biology (Practical: 1 Credit) 10 hrs</b>		
<b>End Semester Examination</b>		
<b>Time – 3 hours</b>		<b>Full Marks-70</b>
Sl. No.	Name of Practicals/Experiments	Marks
1	Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula, neurula, tail-bud stage, tadpole (external and internal gill stages).	2x5=10
2	Study of whole mounts of developmental stages of chick through permanent slides (Different hours of incubation).	5x3=15
3	Study of the developmental stages and life cycle of Drosophila from stock culture.	15
4	Study of different sections of placenta (Photomicrograph/ slides).	10
5	Practical Records/Charts/Models.	10
6	Viva-voce.	10

**Suggested Books:**

- Gilbert, S. F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA
- Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press
- Carlson, R. F. Patten's Foundations of Embryology
- Kalthoff (2008). Analysis of Biological Development, II Edition, McGraw-Hill Publishers
- Lewis Wolpert (2002). Principles of Development. II Edition, Oxford University Press

**Major Course 11 (MJC-11)**

Course Title	Credit	Credit Distribution
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		<b>Theory</b>	<b>Practical</b>
<b>Evolution</b>	<b>5</b>	<b>3</b>	<b>2</b>

**Course Outcome:** After the completion of the course, the student will be able:

- CO 1-** To understand the basis of origin of life such as: chemogeny, RNA world, biogeny and evolution of eukaryotes.
- CO 2-** To obtain the various evolutionary concepts and heritable variation and to understand concept of species, isolating mechanisms, modes of speciation and adaptive radiation.
- CO 3-** To explain and different types of fossils, geological time scale, climatic conditions, hominid characteristics, primate phylogeny and evolution of horse and man.
- CO 4-** To understand Hardy-Weinberg principle of genetic equilibrium and its destabilizing forces such as Natural selection, Mutation, Migration and genetic drift.

<b>MJC-11: Evolution (Theory: 3 credits) 30 hours</b>		
<b>Unit</b>	<b>Topics to be covered</b>	<b>No. of hours</b>
1	1. Origin of Life: 1.1 Chemogeny and RNA World. 1.2 Evolution of Eukaryotes.	6
2	2. Evolutionary concepts: 2.1 Lamarckism, Darwinism and Neo-Darwinism. 2.2 Types and causes of Variation and their role in evolution.	8
3	3. Evidences of Evolution: 3.1 Evidences of Organic Evolution. 3.2 Types of fossils and geological time scale. 3.2 Evolution of horse and man. 3.3 Human migration-Theories, Mitochondrial DNA and Y-chromosome studies.	8
4	4. Population Genetics: 4.1 Hardy-weinberg Law, gene pool and allele frequency. 4.2 Natural selection (concept of fitness, types of selection, kin selection). 4.3 Genetic Drift (mechanism, founder's effect, bottleneck phenomenon).	8
<b>TOTAL</b>		<b>30</b>

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MJC-11: Evolutionary Biology (Practical: 2 Credits) 20 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Study of types of fossils, Archaeopteryx.	15
2	Vestigial, Analogous and Homologous organs using suitable specimens or Sampling for discrete characteristics (dominant vs recessive) for discontinuous variations e.g. hitch-hiker's thumb, tongue rolling and ear lobe.	15
3	Calculation of genotypic, phenotypic and allelic frequencies from the data provided.	20
4	Practical records/ charts/ models	10
5	Viva- voce.	10

#### Suggested Books:

- Ridley, M. (2004). Evolution III Edition Blackwell publishing
- Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers.
- Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
- Snustad. S Principles of Genetics.
- Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell
- Savage, Evolution

#### Major Course 12 (MJC-12)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Animal Behaviour	5	3	2

**Course Outcomes-** After the completion of the course, the student will be able:

- CO 1-** To understand various pattern of animal behaviours such as stereotyped, instinct, learnt, associative behaviour along with operant conditioning and habituation imprinting and to explain the concept of social and sexual behaviour.
- CO 2-** To provide the concept of biological rhythm, photoperiod and regulation of seasonal reproduction of vertebrates and role of melatonin.
- CO 3-** To understand the relevance of biological clock in terms of chronopharmacology, chronomedicine and chronotherapy.
- CO 4-** To develop the skill in this course by performing practical works such as studying nest and nesting habitat of birds and social insects and other significant experiments.



MJC-12: Animal Behaviour (Theory: 3 credits)		30 hours
Unit	Topics to be covered	No. of Lectures
1	1. Introduction to Animal Behaviour: 1.1 Definition of behaviour. 1.2 Brief profile of modern ethologists (Karl von Frisch, Ivan Pavlov, Konrad Lorenz, Niko Tinbergen). 1.3 Proximate and ultimate causes of behaviour.	6
2	2. Patterns of behaviour and its Control: 2.1 Stereotyped Behaviour; Orientation and Reflex. 2.2 Innate and Learned behaviours.	8
3	3. Biological Rhythm: 3.1 Biological clocks in animals, Adaptive significance of biological clocks 3.2 Types of biological rhythms- Tidal, Lunar, Circadian and Circannual 3.3 Role of melatonin	8
4	4. Social and Sexual Behaviour: 4.1 Social behaviour of insects (Honey bee), Foraging and dances in honey bee. 4.2 Parental care in fishes and amphibians.	8
<b>TOTAL</b>		<b>30</b>

MJC-12: Animal Behaviour (Practical: 2 Credits) 20 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Sl. No.	Name of Practicals/Experiments	Marks
1	Study of the pattern of Behaviour (any one of the followings) a) Photo Tactile Response in Earthworms or <i>Paramecium</i> . b) Geotactic Response of Earthworm or Pest.	15
2	Comment upon the given specimen with response to parental care – Ichthyophis, Alytes and Hippocampus etc.	15
3	Submit and write-up on any one of the given topic: a) Courtship in Peacock /Pigeons b) Maternal Behavior in Rats /Cats c) Study of nests and nesting behavior of the birds and social insects d) Study of honey bee hive	20
4	Practical records/ charts/ models	10
5	Viva- voce.	10

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Pankaj  
Shikha  
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Ravi  
Sipal  
Banik



- Ridley, M. (2004). Evolution III Edition Blackwell publishing
- Hall, B.K. and Hallgrimson, B (2008). Evolution IV Edition. Jones and Barlett Publishers.
- Douglas, J. Futuyma (1997). Evolutionary Biology. Sinauer Associates.
- Pevsner, J (2009). Bioinformatics and Functional Genomics. II Edition Wiley-Blackwell

### Minor Course 08 (MIC-08)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Developmental Biology	3	2	1

**Course Outcome:** After the completion of the course, the student will be able:

CO 1- To describe the mechanism of gametogenesis, fertilization.

CO 2- To explain early embryonic development in frog and chick.

CO 3- To understand the concepts of late embryonic development in model organisms.

CO4 - To describe post embryonic development such as metamorphosis and regeneration with suitable examples and apply important experiments and project work.

MIC-08 : Developmental Biology (Theory: 2 credits) 20 hours		
Unit	Topics to be covered	No. of Lectures
1	Introduction: 1. Basic concepts of reproduction and development.	4
2	Early and Late Embryonic Development: 2.1 Gametogenesis - Spermatogenesis, Oogenesis. 2.2 Types of eggs, Patterns of cleavage and Blastulation. 2.3 Early development of frog up to gastrulation, 2.4 Extra-embryonic membranes in birds.	6
3	Post Embryonic Development: 3.1 Metamorphosis: Changes, hormonal regulations in amphibians; 3.3 Ageing: Concepts and Theories	5
4	Implications of Developmental Biology: 4.1 Teratogenesis: Teratogenic agents and their effects on embryonic development. 4.2 In vitro fertilization.	5
<b>TOTAL</b>		<b>20</b>

MIC-08: Developmental Biology (Practical: 1 Credit) 10 hrs		
End Semester Examination		
Time – 3 hours		Full Marks-
70		
Sl. No.	Name of Practicals/Experiments	Marks
1	Study of whole mounts and sections of developmental stages of frog through permanent slides: Cleavage stages, blastula, gastrula.	20
2	Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak 18, 24, 36, 48, 72, and 96 hours of incubation.	20
3	Study of different sections of placenta (Photomicrograph/ slides)	10
4	Practical/Project report on chick embryo development.	10
5	Viva- voce.	10

#### Suggested Books:

- Gilbert, S. F. (2010). Developmental Biology, IX Edition, Sinauer Associates, Inc., Publishers, Sunderland, Massachusetts, USA
- Balinsky B. I. and Fabian B. C. (1981). An Introduction to Embryology, V Edition, International Thompson Computer Press.
- Carlson, R. F. Patten's Foundations of Embryology.
- Kalthoff (2008). Analysis of Biological Development, II Edition, McGraw Hill Publishers.
- Lewis Wolpert (2002). Principles of Development. II Edition, Oxford University Press.

#### Semester VII Major Course 13 (MJC-13)

Course Title	Credit	Credit Distribution	
		Theory	Practical
Molecular Biology	5	3	2

**Course Outcome:** After the completion of the course, the student will be able:

CO 1- To understand Central dogma of molecular biology. Explain and distinguish mechanism of replication, transcription and translation in prokaryotes and eukaryotes.

CO 2- To understand and explain the post transcriptional modifications in eukaryotes.

CO 3- To explain and differentiate the mechanism of gene expression and regulation in prokaryotes and eukaryotes

CO 4- To describe the concept of regulatory RNAs, Ribo-switches and RNA interference and to enhance skill in molecular biology through relevant experiments.

MJC-13: Molecular Biology (Theory: 3 credits) 30 hours		
Unit	Topics to be covered	No. of Lectures
1	1. Basics of Nucleic Acid: 1.1 Central Dogma of Molecular Biology. 1.2 Structure of DNA, DNA forms, Repetitive DNA. 1.3 Structure and functions of mRNA, tRNA, and rRNA.	8
2	2. DNA replication and repair: 2.1 DNA replication in prokaryotes. 2.2 DNA repair, mismatch repair, Base excision repair (BER), Nucleotide excision repair (NER). 2.3 Difference between prokaryotic and eukaryotic replication (A brief account)	8
3	3. Transcription: 3.1 Mechanism of transcription in prokaryotes. 3.2 Difference between prokaryotic and eukaryotic transcription (A brief account).	6
4	4. Translation: 4.1 Genetic code, degeneracy of genetic code and Wobble hypothesis. 4.2 Structure of ribosomes. 4.3 Mechanism of translation in prokaryotes. 4.4 Difference between prokaryotes and eukaryotes translation (A brief account).	8
<b>TOTAL</b>		<b>30</b>

MJC-13: Molecular Biology (Practical: 2 Credits) 20 hrs		
End Semester Examination		
Time – 3 hours 70		Full Marks-
Sl. No.	Name of Practicals/Experiments	Marks
1	Demonstration of DNA by Feulgen reaction or RNA by Methyl Green Pyronin (MGP) method.	20
2	Isolation of plasmid/genomic DNA or Restriction digestion of DNA.	15
3	DNA gel electrophoresis or Preparation of nucleotide model by beads and sticks.	15
4	Practical/Project report on chick embryo development.	10
5	Viva- voce.	10

**Suggested Books :**

- Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. (2009). *The World of the Cell*. VII Edition. Pearson Benjamin Cummings Publishing, San Francisco.
- Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts, Peter Walter: *Molecular Biology of the Cell*, IV Edition.
- Cooper G. M. and Robert E. Hausman R. E. *The Cell: A Molecular Approach*, V Edition, ASM Press and Sinauer Associates.
- De Robertis, E.D.P. and De Robertis, E.M.F. (2006). *Cell and Molecular Biology*. VIII Edition. Lippincott Williams and Wilkins, Philadelphia.
- Karp, G. (2010) *Cell and Molecular Biology: Concepts and Experiments*. VI Edition. John Wiley and Sons. Inc.

**Major Course 14 (MJC-14)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Research Methodology	5	5	0

Common Syllabus of MJC -14 for all the subjects of the Faculty of Sciences has been separately prepared.

**Major Course 15 (MJC-15)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Immunology and Microbiology	6	4	2

**Course Outcomes:** After the completion of the course, the student will be able:

- CO 1- To explain cells and organs of the immune system, innate and adaptive immunity.
- CO 2- To describe autoimmunity with reference to rheumatoid arthritis and tolerance and AIDS.
- CO 3- To understand antigens and its type, structure and functions of immunoglobulins, antigen-antibody interactions and immunoassays (such as ELISA and RIA).
- CO 4- To explain structure and functions major histocompatibility complex, know the concept of hypersensitivity and vaccines.
- CO 5- To understand the microbial basis of diseases.

MJC-15 : Immunology and Microbiology (Theory: 4 credits) 40 hours		
Unit	Topics to be covered	No. of Lectures
1	1. Basic Concept of immunity: 1.1 Overview of Immune System, Cells and organs of Immune system.	10

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	1.2 Innate and Adaptive Immunity - Anatomical barriers, Inflammation and Phagocytosis, Mechanism of cell and humoral mediated immunity, Active and Passive immunity.	
2	2. Antigen and Immunoglobulin: 2.1 Antigens; Antigenicity vs immunogenicity, Factors influencing immunogenicity, Adjuvants and haptens. 2.2 Immunoglobulins: Structure and functions of different classes of immunoglobulins, Antigen-antibody interactions	8
3	3. MHC and Cytokines: 3.1 Major Histocompatibility Complex: Structure and functions of MHC I and II, Antigen processing and presentation. 3.2 Cytokines – Types and function.	6
4	4. Complement system and Vaccines: 4.1 Complement System: Components and pathways of complement activation. 4.2 Vaccines: Various types of vaccines.	6
5	5. Microbiology: 5.1 Bacteria; Structure, Classification, Growth, Culture and Pathogenicity. 5.2 Virus; Morphology and Pathogenicity. 5.3 A brief outline of endoparasitic diseases.	10
	<b>TOTAL</b>	<b>40</b>

<b>MJC-15 : Immunology and Microbiology (Practical: 2 Credits) 20 hrs</b>		
<b>End Semester Examination</b>		
<b>Time – 3 hours</b>		<b>Full Marks-</b>
		<b>70</b>
Sl. No.	Name of Practicals/Experiments	Marks
1	Determination of ABO blood group using ABD antisera method.	15
2	Study of lymphoid organs: (i) Kidney (ii) Spleen (iii) Bone marrow (iv) Lymph node	15
3	Comment upon working principle of RIA, Flow Cytometry, ELISA.	10
4	Culture and Gram staining of Bacteria	10
5	Practical/Project report on chick embryo development.	10
6	Viva- voce.	10

**Suggested Books:**

- Kindt, T. J., Goldsby, R.A., Osborne, B. A. and Kuby, J (2006). *Immunology*, VI Edition. W.H. Publication.

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- David, M., Jonathan, B., David, R. B. and Ivan R. (2006). *Immunology*, VII Edition, Mosby, Elsevier Edition. Saunders Publication.
- Abbas, K. Abul and Lichtman H. Andrew (2003.) *Cellular and Molecular Immunology*. V
- Owen J A, Punt J, Stanford S A (2013). *Kuby Immunology* W H Freeman & Co;
- Wood P. (2007). *Basic Immunology*. Pearson publication
- Principles of Microbiology, Ronald M. Atlas, Wm. C. Brown Publishers.
- Microbiology by Pelczar, M. J. Pelczar.

**Minor Course 09  
(MIC-09)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Animal Behaviour	3	2	1

**Course Outcomes:** After the completion of the course, the student will be able:

**CO 1-** To understand various pattern of animal behaviours such as stereotyped, instinct, learnt, associative behaviour along with operant conditioning and habituation imprinting and to explain the concept of social and sexual behaviour.

**CO 2-** To provide the concept of biological rhythm, photoperiod and regulation of seasonal reproduction of vertebrates and role of melatonin.

**CO 3-** To understand the relevance of biological clock in terms of chronopharmacology, chronomedicine and chronotherapy.

**CO 4-** To develop the skill in this course by performing practical works such as studying nest and nesting habitat of birds and social insects and other significant experiments.

MIC-09 : Animal Behaviour (Theory: 2 credits) 20 hours		
Unit	Topics to be covered	No. of Lectures
1	Introduction to Animal Behaviour: 1.1 Definition and types of behaviour 1.2 Origin and history of ethology.	5
2	Patterns of Behaviour: 2.1 Instinct behaviours. 2.2 Learned behaviours.	5
3	Biological Rhythm: 3.1 Biological clocks in animals and its adaptive significance. 3.2 Types of biological rhythms- Tidal, Lunar, Circadian and Circannual.	5
4	Social Behaviour: 4.1 Social behaviour in insects (Honey bee). 4.2 Parental care in fishes.	5
<b>TOTAL</b>		<b>20</b>

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Dr. Shri. Shikha Mishra  
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- Understand endocrine system and the basic properties of hormones.
- Appreciate the importance of endocrine system and the crucial role it plays along with the nervous system in maintenance of homeostasis.
- Know the of hormone action and its regulation.
- Know the regulation of physiological process by the endocrine system and its implication in diseases.

MIC-10: Endocrinology (Practical: 1Credits)		10 hrs
End Semester Examination		
Time – 3 hours		Full Marks-70
Sl. No.	Name of Practicals/Experiments	Marks
1	Display of gonads, thyroid, adrenal, pancreas in mammal through videos or virtual dissection.	15
2	Study of the permanent slides of Pituitary, Adrenal, Ovary, Testes, Islets of Langerhan's, Thymus, Thyroid, Parathyroid.	4X5=20
3	Working principles of ELISA/RIA	15
4	Practical/Project report on chick embryo development.	10
5	Viva- voce.	10

MIC-10: Endocrinology (Theory: 3 credits)		20 hrs
Unit	Topics to be covered	No. of lectures
1	1. Overview of the endocrine system – Glands and their hormone.	5
2	2. Hypothalamus: Structure and its functions.	5
3	3. Pituitary: Structure, Hormones and their function.	5
4	4.1 Peripheral Endocrine Glands: Histophysiology of Thyroid, Parathyroid and Adrenal. 4.2. Gonads: Hormones and functions.	5
<b>Total</b>		<b>20</b>

**Suggested Books:**

- J. Larry Jameson Leslie De Groot (2010). Endocrinology. VI Edition.

- David O. Norris. Vertebrate Endocrinology. V Edition, Elsevier Academic press.
- Franklin F. Bolander. Molecular Endocrinology. III Edition, Academic Press, USA.

**Online Tools and Web Resources:**

- <https://www.endocrine.org/topics>

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**Semester VIII**  
**Major Course 16 (MJC-16)**

Course Title	Credit	Credit Distribution	
		Theory	Practical
Instrumentation and Biometry	4	4	0

**Course Outcomes:** After the completion of the course, the student will be able:

- CO1:** To understand the principles and working of various instruments used in biological experimentation.
- CO2:** Gain insight of relationship between mathematics and biology
- CO3:** To present their data in statistically reliable form
- CO4:** To test their hypothesis using different models
- CO5:** To correlate their data with different factors

<b>MJC-16: Instrumentation and Biometry (Theory: 4 credits) 40 hours</b>		
Unit	Topics to be covered	No. of Lectures
1	1. Instrumentation: 1.1 Principle and uses of: pH meter, Colorimeter, Spectrophotometer, Centrifuge. 1.2 Microscopy: Light microscope, Compound microscope, Phase contrast, Fluorescent and Electron Microscope.	10
2.	2. Biological Techniques: 2.1 Electrophoresis - Agarose gel, SDS-PAGE electrophoresis. 2.2 Chromatography - Column, GLC. 2.3 Cell separation by density gradient centrifugation. 2.4 Introduction to different culture medium and tools used. 2.5 PCR 2.6 Recombinant DNA Technology	10
3	3. Introduction to Biometry: 3.1 Concept of data and graphical presentation of data. 3.2 Measures of central tendency: mean, mode and median. 3.3 Measures of dispersion, standard deviation, standard error. 3.4 Types of variables; Poisson, Binomial and Normal distribution. 3.5 Experimental design and hypothesis testing.	10
4	Tests of Significance: 4.1 Test of significance: t-test, F-test, chi square test 4.2 Multiple linear regression – ANOVA (One way and two-way ANOVA). 4.3 Correlation and simple linear regression 4.4 Karl-Pearson correlation coefficient and Ranks correlation coefficient	10
<b>TOTAL</b>		<b>40</b>

**Suggested Books :**

- AB Khanal (2016). Mahajan's Methods in Biostatistics for Medical Students and Research Workers. Jaypee Brothers Medical Publishers.

- Jerrold H. Zar (2009). Biostatistical analysis. Pearson publication.
- RC Elston and WD Johnson (2008). Basic Biostatistics for Geneticists and Epidemiologists. Wiley publication.
- Norman TJ Bailey (2000). Statistical Methods in Biology. Published by: Cambridge University Press
- Biological instrumentation and Methodology, P. K. Bajpai.
- Instrumentation: Theory and Application, S. Sheel.

**Virtual Labs:**

1. <http://www.vlab.co.in>
2. <http://zoologygysan.blogpost.com>
3. [www.onlinelabs.in](http://www.onlinelabs.in)
4. [www.labinapp.com](http://www.labinapp.com)
5. [www.uwlax.edu](http://www.uwlax.edu)
6. [info@premierreeducationaltechnologyies.com](mailto:info@premierreeducationaltechnologyies.com)

Mayank

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