

GOVT.COLLEGE FOR WOMEN PARADE GROUND JAMMU

COURSE STRUCTURE FOR MASTER DEGREE PROGRAMME IN ZOOLOGY

THE COURSE OF STUDY PRESCRIBED FOR Semester 1st to 4th under CBCS session 2020-21 onwards

Semester	Course No.	Course Title	Credits	Nature of Course	
I	PSZOTC-101	Ecology and Environment Biology	4	CORE	
	PSZOTC-102	Fundamentals of Genetics	4	CORE	
	PSZOTC-103	Ichthyology & Aquaculture	4	CORE	
	PSZOTC-104	Immunology	2	CORE	
	PSZOTC-105	Bioinformatics and Biostatistics	2	CORE	
	PSZOPC-106	Lab Course-I	4	PRACTICAL	
	PSZOPC-107	Lab Course-II	4	PRACTICAL	
	Total Credits			24	
PSZOPC-106		Based on theory course no. 101 & 103 & 105			
PSZOPC-107		Based on theory course no. 102, 104			
II	PSZOTC-201	Cell Biology and Research Instrumentation	4	CORE	
	PSZOTC-202	Functional Anatomy of Animals	4	CORE	
	PSZOTC-203	Basic Endocrinology	4	CORE	
	PSZOTC-204	Biotechnology	2	CORE	
	PSZOTC-205	Biodiversity Conservation and Management	2	CORE	
	PSZOPC-206	Lab Course-I	4	PRACTICAL	
	PSZOPC-207	Lab Course-II	4	PRACTICAL	
	Total Credits			24	
PSZOPC-206		Based on theory course no. 201, 203 & 204			
PSZOPC-207		Based on theory course no. 202, & 205			
III	PSZOTC-301	Animal Physiology	4	CORE	
	PSZOTC-302	Fundamentals of Biochemistry	4	CORE	
	PSZOTC-303	Biosystematics, Taxonomy & Evolution	4	CORE	
	PSZOTC-304	Economic Zoology	4	OPEN	
	PSZOTC-305	Lab Course-I	4	PRACTICAL	
	PSZOPC-306	Lab Course-II	4	PRACTICAL	
	Total Credits			24	
PSZOPC-305		Based on theory course no. 301 ,304			
PSZOPC-306		Based on theory course no. 302, 203			
IV	PSZOTC-401	Reproductive and Development Biology	4	CORE	
	PSZOTC-402	An Introduction to Insect Diversity	2	CORE	
	PSZOTC-403	Microbiology	2	CORE	
	<i>Any one of the Following Elective courses</i>				
	PSZOTC-404	Limnology	4	ELECTIVE	
	PSZOTC-405	Fish & Fisheries	4	ELECTIVE	
	PSZOPC-406	Molecular Genetics & Cytogenetics	4	ELECTIVE	
	PSZOTC-407	Entomology	4	ELECTIVE	
	PSZOTC-408	Biological Anthropology	4	OPEN	
	PSZOTC-409	Lab Course-I	4	PRACTICAL	
	PSZOTC-410	Lab Course-II	4	PRACTICAL	
	Total Credits			24	
	PSZOTC-409		Based on theory course no. 401,402 &403		
PSZOTC-410		Based on theory course no. 404/405/406/407			
Total Credits Earned by the students			96		

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited “A” Grade



Semester-I

Course No. PSZOTC-101

CREDITS: 4

Time Duration: 2 hrs 30 Mins

Course Title: Ecology & Environmental Biology

MAXIMUM MARKS : 100

a) Minor Test I : 20

b) Minor Test II : 20

c) Major Test : 60

**Learning Outcome-Based Curriculum Framework (LOCF) for the Examination to be held in
December 2020, December 2021 and December 2022**

Course Learning Objective:

The primary aim of the syllabus is to sensitize the students about the paramount role and importance of nature. The study of Ecology imparts us the knowledge about the judicious use of existing ecological resources for sustainable development. Ecology is the only branch of science which briefs us on the ways and means of living with nature for mutual benefit. Study of ecology will provide students opportunity to understand its practical aspects and helps them to solve many contemporary ecological issues such as global warming, land degradation, habitat loss, desertification and pollution etc. The hands-on experiences of laboratory will also enable students to understand the ecosystem and ecology in a better way.

Course Learning 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.

SYLLABUS

Unit-I **(12 hrs.)**

- 1.1 Concept of eco-system : Ecological habitat, niche & Ecological equivalents
- 1.2 Environmental Biodegradation: Pollution, its types, causes , impacts on Biosphere and its prevention; Global environmental change
- 1.3 Energy flow in an ecosystem & mineral cycling (C,N,P)
- 1.4 Primary & Secondary productivity
 - 1.4.1 Methods of determination of primary productivity
- 1.5 Limiting factors: Law of minimum, Law of tolerance

Unit-II **(13 hrs.)**

- 2.1 **Organization of communities:**
 - 2.1.1 Biotic community concept
 - 2.1.2 Intra-community classification
 - 2.1.3 Patterns in communities

2.2 Ecological dominance, species diversity, Ecotones & Edge effect

2.3 Succession

2.3.1 Types

2.3.2 Mechanism

2.3.3 Concept of climax

2.4 Terrestrial Biota & Permeants

2.5 Soil subsystem

Unit- III

(13 hrs.)

3.1 Characteristics of Population

3.1.1 Size & density

3.1.2 Dispersal & Dispersion

3.1.3 Age structure

3.1.4 Natality & Mortality

3.1.5 Life tables

3.2 Isolation & territoriality

3.3 Biological Invasions

3.4 Species interaction

3.4.1 Negative: Competition, Predation, Parasitism

3.4.2 Positive: Commensalism, Mutualism

Unit – IV

(13 hrs.)

4.1 Sources and Uses of Non-conventional energy

4.2 Remote sensing: Definition, Importance and application

4.3 Bio-indicators

4.4 Bio-remediation

4.5 Sustainable development, natural resources management in changing environment

Unit-V

(12 hrs.)

5.1 Biodiversity

5.1.1 Definition & assessment

5.1.2 Management

5.2 Natural resources

5.2.1 Wild life

5.2.2 Minerals

5.3 Conservation Biology

5.3.1 Principles

5.3.2 Keystone species

5.3.3 Protected Areas

5.3.4 Acts & Related International Conventions

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 Hr.	20
Minor Test II	21% to 40%	1 Hr.	20
Major Test	41% to 100%	2 Hrs 30 mins	60

- Major test shall comprise of two sections A & B.
- **Section A** (All Questions to attempt) shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus and 5 short answer questions of 2 mark each from the entire syllabus. (A Sec = 15 marks)
- **Section B** comprises of 6 questions of 15 marks each from remaining 3 units and candidate has to attempt one question from each unit. (3 x 15 = 45)

Teaching and Learning Process:

The course involves four hours each of classroom teaching and laboratory activity per week. Classroom work would include lectures based on textbook and scientific journal readings. Lectures will consist of traditional board teaching as well as power point presentations. Learning process will also include participatory activities like focused group discussions, presentations by students, experience sharing, brainstorming and project writing. Field trip activities to National parks and Eco-parks would complement and enhance understanding of the course concepts and information about the wildlife and its conservation. Laboratory work will provide students the first hands-on experience for better understanding of the subject.

Assessment Methods:

- Evaluation will determine the extent to which the students demonstrate desired learning outcomes.
- Multiple assessment methods will be used as evaluation criteria which include continuous assessment, assignments, tests, class presentations and mock tests.
- Project writing based on leanings from field trips will also be held for comparative evaluation of students.

Books Recommended:

1. Phillipson, J. 1966. Ecological Energetic, Edward Arnold Ltd. London.
2. Odum, E.P. 1970 . Ecology, Amerind Publ. Co. New Delhi.
3. Odum, E.P. 1971. Fundamentals of Ecology, W.B. Saunders, USA.
4. Kormondy, E.T. 1971. Concept of Ecology. Prentice Hall of India, New Delhi.
5. Ricklefs, R.E. 1973. Ecology. Thomes Nelson and sons ltd.
6. Wiegert, R.G. 1976. Ecological Energetic Dowden, Hutchinson & Ross. Inc. Pennsylvania.
7. Scuthwick, C.H. 1976. Ecology and the quality of our environment. D. Van Nestrland
8. Colinbaux, P.A. 1985 Introduction to ecology. John Wiley & Sons
9. Strinberg, Christian E. 2003. Ecology of humic substances in freshwater, Springer publishers.
10. Scheffer, Marten. 2004. Ecology of shallow lakes.
11. M.P. Sinha, Soma Dey, Bijaj. S. Singh. 2004. Conservation of biodiversity and Natural Resources. Daya Publ. House Delhi.
12. Odum, Eugene P. 2005. Fundamentals of Ecology. Publishers Cenagelearing.
13. Wilkinson, D.M. 2007. Fundamental Resources in Ecology: An Earth System Approach. Oxford Univ. Press. UK.
14. Fahey, J.J, and Knapp, A.K. 2007. Principles and Standards for measuring primary production. Oxford Univ. Press. UK.
15. Grant, W.E. and Swanmack, T.M. 2008. Ecological Modeling. Blackwell Publ. House.
16. Bhatia, S.C. 2008. Ecology and sustainable development, Atlantic Publishers.
17. Arumugar N, 2014. Concept of Ecology, Saras Publishers, year-2014.
18. Ecology & Environment (13th edition) (2 copies) Author- Sharma, P.B. Rastogi- Publishers, year-2018 Molen, Manciel C.1048 Ecology. Publishers- Mc-Grew Hill Year-1048.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited “A” Grade



Semester-I

Course No. PSZOTC-102

CREDITS: 4

Time Duration: 2 hrs 30 Mins

Course Title: Fundamentals of Genetics

MAXIMUM MARKS : 100

a) Minor Test I : 20

b) Minor Test II : 20

c) Major Test : 60

**Learning Outcome-Based Curriculum Framework (LOCF) for the Examination to be held in
December, 2020; December, 2021 and December, 2022**

Course Learning Objective:

Unknown to them, human beings had been applying the principles of genetics by engaging in selective breeding of domesticated animals for many centuries. However, it was only with the work of Mendel and advent of 20th century, that basic principles of the science of genetics were formulated. In about a century of its existence, this field has generated tremendous amount of knowledge through observational and experimental research. The information amassed in the last century has laid the foundation for more discoveries in this important field of life science. This course aims to provide an overview of genetics starting from the work of Mendel to the current understanding of various phenomena like recombination, transposition, sex determination and mutations. The course will help in building sound fundamental knowledge of the principles of genetics, to be used as a stepping stone for higher studies and research in this field.

Course Learning Outcome:

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

- Have a deeper understanding of the varied branches of the biological sciences like microbiology, evolutionary biology, genomics and metagenomics.
- Gain knowledge of the basic principles of inheritance.
- Analyse pedigree leading to development of analytical skills and critical thinking enabling the students to present the conclusion of their findings in a scientific manner.
- Know the mechanisms of mutations, the causative agents and the harmful impact of various chemicals and drugs being used in day to day life.
- Find out the effects of indiscriminate use of various chemicals, drugs or insecticides in nature by studying their effect on various bacterial species in soil and water samples from different industrial or polluted areas.

SYLLABUS

Unit-I Structure and organization of chromosomes

(13 hrs.)

- 1.1 **Structure of chromatin**
 - 1.1.1 Heterochromatin, Euchromatin,
 - 1.1.2 Nucleosome model
- 1.2 **Chromosome structure:**
 - 1.2.1 Prokaryotes
 - 1.2.2 Eukaryotes
 - 1.2.3 Giant chromosome
- 1.3 **Specialized chromosomes:**
 - 1.3.1 Lampbrush chromosomes

- 1.3.2 Polytene chromosomes
- 1.4 Mitochondrial Genome & Chloroplast Genome
- 1.5 Telomere structure

Unit-II Numerical and structural chromosome Variations (13 hrs.)

- 2.1 Numerical Changes and their genetic implications
 - 2.1.1 Polyploidy
 - 2.1.2 Allopolyploidy
 - 2.1.3 Aneuploidy
- 2.2 Numerical Change associated disorders in humans
- 2.3 Structural chromosome alterations
 - 2.3.1 Deletions
 - 2.3.2 Duplications
 - 2.3.3 Inversions
 - 2.3.4 Translocations
- 2.4 Structural changes associated disorders in humans

Unit-III Mutation, DNA repair and transposons (13 hrs.)

- 3.1 **Mutation**
 - 3.1.1 Types, causes and detection
 - 3.1.2 Loss of function, gain of function
 - 3.1.3 Germinal verses somatic mutants
 - 3.1.4 Insertional mutagenesis
- 3.2 DNA Repair and mechanisms
- 3.3 Transposons
 - 3.3.1 Transposons in prokaryotes
 - 3.3.2 Transposons in eukaryotes
- 3.4 Cancer
 - 3.4.1 Oncogenes and Tumor suppressor genes
 - 3.4.2 Cancer and cell cycle
 - 3.4.3 Virus induced Cancer, Metastasis & apoptosis
 - 3.4.4 Therapeutic interventions

Unit –IV Fundamental processes-I (12 hrs.)

- 4.1 DNA replication, Repair and Recombination
 - 4.1.1 Origin of replication, enzymes involved and replication fork
 - 4.1.2 DNA replication in eukaryotes and prokaryotes
 - 4.1.3 Extra chromosomal replicons
 - 4.1.4 Homologous and site specific recombination
- 4.2 RNA synthesis and processing
 - 4.2.1 Transcription factors
 - 4.2.2 Transcription in Prokaryotes and Eukaryotes
 - 4.2.3 RNA processing: RNA splicing, polyadenylation, RNA editing
 - 4.2.4 Types of RNA

Unit-V Fundamental processes-II (12 hrs.)

- 5.1 Protein Synthesis and processing
 - 5.1.1 Ribosome
 - 5.1.2 Formation of initiation complex
 - 5.1.3 Elongation and termination
 - 5.1.4 Genetic Code

- 5.1.5 Activation of tRNA
- 5.1.6 Translational inhibitors
- 5.1.7 Post translation modifications
- 5.2 Control of gene expression
 - 5.2.1 Regulation of gene expression in prokaryotes
 - 5.2.2 Regulation of gene expression in eukaryotes
 - 5.2.2.1 Role of chromatin in gene expression and gene silencing

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 Hr.	20
Minor Test II	21% to 40%	1 Hr.	20
Major Test	41% to 100%	2 hrs 30 Mins	60

- Major test shall comprise of two sections A & B.
- Section A shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus and 5 short answer questions of 2 mark each from the entire syllabus. (A Sec = 15 marks)
- Section B comprises of 6 questions of 15 marks each from remaining 3 units and candidate has to attempt one question from each unit. (3 x 15 = 45)

Teaching and Learning Process:

Lectures, using blackboard and power-point presentations will be delivered by the teachers and the queries of students will be addressed after they have revised the topic. Concepts can be clarified by giving assignments e.g. constructing linkage maps, pedigree analysis, probability calculations etc. As a part of peer learning, regular group discussions will be held amongst the students to enhance their knowledge. In order to develop scientific temperament and hone communication skills of students, power point presentations, paper presentations and debates can be organized on various themes as prescribed in the syllabi, while focusing on the latest development in them. An essential part of learning is through observation and experimentation. Thus, visit of students to laboratories working in the field of Genetics (e.g. *Drosophila*, microbial genetics) can be organized. Also, students can be encouraged to undertake internships in these labs so as to deepen their interest in this field. Lectures of researchers can be organized to update students about the latest developments in this field, so that they get motivation to make a career in this highly versatile field of biological sciences.

Assessment Methods:

Students can be assessed by following methods for proper understanding of the subject.

- Problem solving assignments.
- Assessment of case history projects to prepare pedigrees and find out the probabilities of occurrence of diseases in next generations.
- Power point presentation evaluation on different topics.
- Holding debates and assessment for understanding of the subject.
- Multiple choice questions (Test) for assessing grasping of the topics.
- Laboratory visits to understand the research going on in the field of Genetics and to submit reports.

Online Tools and Web Resources:

- <https://swayam.gov.in/courses/4922-genetics-and-genomics>
- <https://www.coursera.org/learn/genetics-evolution>
- <https://onlinelearning.hms.harvard.edu/hmx/courses/hmx-genetics/>
- <https://learn.genetics.utah.edu/>

Books recommended

1. Sinnott, E.W., Dunn, L.C. and DeBzhanski, Th (1958): Principles of genetics. Kugakusha. Co. Inc. Ltd. Japan.
2. Burnham, C.R. (1962) : Discussions in Cytogenetics Burgess Publ. Co. Minneapolis.
3. Swanson, R.C.P. Mertz, T. and Young, W.J. (1967): Cytogenetics, Prentice Hall of India, Pvt. Ltd.
4. Garber, G.B. (1972): Cytogenetics. McGraw Hill. Pub. Co. Ltd.
5. Strickbarger, M.W. (1976): Genetics. Mc. Millan Publ. Co. Inc. New York.
6. Gardner and Snustad. J.W. & Sons.(1981). Principles of Genetics.
7. A.G. Atherly, J.R. Girton& J.F. McDonald. Saunders College Publ. USA. (1999). The Science of Genetics
8. Miglani. Narosa Publ. House . New Delhi.(2011). Fundamentals of Genetics
9. Terry Brown, Taylor and Francis Group. USA.(2012). Introduction to Genetics: A Molecular Approach
10. Hartl and Ruvolo (2012).Analysis of genes and genomes, 8thedittion.
11. E.J. Gardner, M.J. Simmons and D.P. Srustad. J.W. Sons Publ. Singapore.(2012). Principles of Genetics 8th Ed.
12. William Klug (2016) .Essentials of genetics 9th edition Pearson education ltd

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited "A" Grade



Semester-I

Course No. PSZOTC-103

CREDITS: 4

Time Duration: 2 hrs 30 Mins

Course Title: Ichthyology & Aquaculture

MAXIMUM MARKS : 100

a) Minor Test I : 20

b) Minor Test II : 20

c) Major Test : 60

Learning Outcome-Based Curriculum Framework (LOCF) for the Examination to be held in December, 2020; December, 2021 and December, 2022

Course learning Objective:

Fisheries involve study of both, capturing and culturing of fish. India is a peninsular country with a huge coastline and large inland water bodies. Assisted with such ideal geographical location our nation has outstanding accomplishments in Fish and fisheries. Globally, India is ranked second in Aquaculture and 3rd in Fisheries. In an evolutionary sense, the most successful of the larger aquatic animals are the fishes that are hunted commercially. About 64% of the global marine catch comes from the Pacific Ocean, 28% comes from the Atlantic and 8% from the Indian Ocean. Marine fisheries is a multibillion-dollar industry that is able to fulfil about 20% of the total animal protein requirement of humans, and also produce animal feeds for domestic livestock and poultry, fish oils (for paints and drugs, pet foods) and some food additives. For the increasing human population, there is continuous increase in the demand for high-quality protein. To meet these demands, it is necessary to focus attention on the current stocks from marine as well as freshwater species and create opportunities to increase or at least maintain the amount of harvest. It has become apparent that fisheries management has not always been successful in maintaining fish yields and conserving stocks. This course has been designed to equip the student with a balanced and complete scientific understanding of fisheries and aquaculture concepts and the practices involved.

Course Learning Outcome:

After completion of the course the students will be able to:

- Acquire knowledge of physiology, reproduction etc of fishes.
- Analyse different kinds of water and identify/differentiate different kinds of fishes besides providing the knowledge of various aquaculture practices worldwide.
- Procure pure fish seed by artificial procedures such as artificial and induced breeding which can learn by visiting any fish farm or demonstrated in research labs in college/Departments
- Become aware and gain knowledge of In-land and marine Fisheries in India and how it contributes to Indian economy.
- Know about different kinds of fishing methods and fish preservation which can be employed for export and storage of commercial fishes.
- Find the reasons behind the depletion of fisheries and other aquaculture resources.
- Develop skills for entrepreneurship or self-employment in their own fisheries-related business.

SYLLABUS

- Unit-I Morphology and Classification (13 hrs.)**
- 1.1 Morphological studies
 - 1.1.1 Distinctive characteristics of fishes
 - 1.1.2 Body form and its diversity
 - 1.1.3 Different types of fins and theories of origin of fins.
 - 1.1.4 Structure skeletal support, modification and functions of paired fins
 - 1.1.5 Structure skeletal support, modification and functions of un-paired fins
 - 1.2. Outline classification of fishes with special reference to distinctive features, geographical distributions, classification and typical examples of the following sub-divisions:
 - 1.2.1 Chondrichthyes
 - 1.2.2 Actinopterygii
 - 1.2.3 Crossopterygii
 - 1.2.4 Dipnoi
- Unit- II Sense Organs and some Special features (13 hrs.)**
- 2.1 Scales: types, structure and functions of scales
 - 2.2 Coloration: chromatophores, pigments and biological significance of coloration in fishes
 - 2.3 Bioluminescence in fishes and its significance
 - 2.4 Electric organs: their structure and use in fishes
 - 2.5 Venomous and poisonous fishes
 - 2.6 Sense organs
 - 2.6.1 Eye
 - 2.6.2 Lateral line
 - 2.6.3 Internal ear
- Unit-III Feeding, Respiration, Reproduction & Development (13 hrs.)**
- 3.1 Alimentary canal and its diversity in fishes
 - 3.2 Respiratory organs
 - 3.3
 - 3.3.1 Structure, modifications and functions of gills
 - 3.3.2 Structure and function of swim bladder
 - 3.4 Reproductive organs and Accessory sex organs
 - 3.5 Nest building and parental Care
 - 3.6 Types of eggs and Hatching
 - 3.7 Migration in fishes
- Unit-IV Fish feeding & Breeding technology (10h)**
- 2.1 Nutritional requirement of fish viz. protein, lipids, vitamins & minerals
 - 2.2 Formulation & preparation of supplementary / artificial feed
 - 2.2.1 Feed ingredients
 - 2.2.2 Types of feed
 - 2.2.3 Feed preparation technology
 - 2.2.4 Feed formulation through Pearson's square method
 - 2.3 Induced Breeding Techniques in carps
 - 2.4 Feeding Techniques (manual & mechanical)

- 1.1 Definition, History, Importance and status of aquaculture
- 1.2 Forms of Aquaculture
- 1.3 Carp Culture.
 - 1.3.1 Criteria for Site selection.
 - 1.3.2 Criteria for selection of IMC.
 - 1.3.3 Farm Management. (Control of predatory fishes, Insects, weeds, Liming & Harvesting.)
 - 1.3.4 Feeding, Breeding & Harvesting.
- 1.4 Culture of Fresh water prawn
- 1.5 Trout Culture
- 1.6 Cat fish culture
- 1.7 Types of fishing Gears
- 1.8 Fish seed Transportation.

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 Hr.	20
Minor Test II	21% to 40%	1 Hr.	20
Major Test	41% to 100%	2Hrs 30 Mins.	60

- Major test shall comprise of two sections A & B.
- Section A shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus and 5 short answer questions of 2 mark each from the entire syllabus. (A Sec = 15 marks)
- Section B comprises of 6 questions of 15 marks each from remaining 3 units and candidate has to attempt one question from each unit. (3 x 15 = 45)

Teaching and Learning Process:

There would be a teacher-centered lecture sessions, where students can take notes or absorb information and interact with the teacher. The teacher/student-based lessons would be supported by multimedia presentations (videos/animations). Visit to Field, Fisheries institutes, laboratory or Aquatic research institutes would be useful to students for better understanding of the subject.

Assessment Methods:

- Formative assessment to analyze student's performance during instruction on regular basis throughout the instruction process.
- Summative Assessment to measure a student's achievement at the end of instruction.
- Written tests to analyze their intake on taught lectures.
- Inspiring the students to give talks through power point presentations/submit assignments with emphasis on recent studies in Fish and Fisheries.

Books Recommended:

1. S.F. Harmer, W.A Herdman, T.W. Bridge, G.A. Boulenger. Discovery Publishing House New Delhi (1999). Classification of fishes, Volume
2. Lynwood, S. Smith. Narendra Publ. House, Delhi. (2003). Introduction to the fish physiology.
3. Albert C.L.G Gunther, Arihant Publishing House, Jaipur (2004). Study of Fishes
4. Arvind Kumar and Pushaplata Dubey. Daya Publ. House, Delhi. (2006). Fish Management and Aquatic Environment.

5. Lagler, Bardock, Miller & Possino, John Wiley & Sons, N.Y., London: (2012).
Ichthyology, 2nd Ed.
6. K.C Badapanda Narendra Publishing House, Delhi (2012). Fishery Biology
7. Vasanth Kumar, Daya Publ. House, New Delhi. (2013). Advances in Aquatic Ecology.
8. B N Yadav. Daya Publishing House, Delhi (2016). Fish and Fisheries.
9. KC Jayaram. Narindra Publishing House, Delhi (2017). Fundamentals of fish taxonomy.
10. Bardack edition, (1979), Aquaculture-The faring and Husbandry of freshwater and marine organisms John Wiley and Sons New York.
 11. Boyd, (1982), Water quality management for land fish culture, CE Elsevier Scientific Publishing company.
 12. Pillay, T.V.R. (1993), Aquaculture principles and practices.
 13. Robert R. Stickney, (1994), Principles of Aquaculture, John Wiley and sons Inc.
- De Silva, S.S, Anderson, T.A, (1994), Springer Netherlands. Rath R.K,(2002), Freshwater aquaculture.
14. Srivastava, C.B.L. (2006), A text book of Fishery Science and Indian Fisheries.
15. Ayyapan, T.V.R (1993) Aquaculture principles and practices.
16. John S. Lucas, (2013), Aquaculture farming aquatic animals and plants, Fishing new books

17. . Handbook of fisheries and Aquaculture 2nd edition (2013), ICAR New Delhi.
18. . R.R. Sticking, (2017), Aquaculture introductory (3rd edition), CAB International U.K.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited "A" Grade



Semester-I

Course No. PSZOTC-104

CREDITS: 2

Time Duration: 2 Hrs

Course Title: Immunology

MAXIMUM MARKS : 50

a) Minor Test I : 10

b) Minor Test II : 10

c) Major Test : 30

**Learning Outcome-Based Curriculum Framework (LOCF) for the Examination to be held in
December, 2020; December, 2021 and December, 2022**

Course Learning Objective:

The aim of the course in immunology is to apprise the student with the working of the immune system in normal health and how it fights the disease and may sometimes contribute to disease. The immune system is incredibly complex. This course is hence designed to enable understanding the molecular and cellular basis of the development and function of the immune system and identification of its biological, clinical and therapeutic implications.

Course Learning Outcome:

After completion of the course the students will be able to:

- Describe the basic mechanisms, distinctions and functional interplay of innate and adaptive immunity
- Define the cellular/molecular pathways of humoral /cell-mediated adaptive responses including the role of Major Histocompatibility Complex
- Explain the cellular and molecular aspects of lymphocyte activation, homeostasis, differentiation, and memory
- Understand the molecular basis of complex, humoral (Cytokines and Complement) and cellular processes involved in inflammation and immunity, in states of health and disease
- Describe basic and state-of-the-art experimental methods and technologies
- Integrate knowledge of each subsystem to see their contribution to the functioning of higher-level systems in health and disease including basis of vaccination, autoimmunity, immunodeficiency, hypersensitivity and tolerance

SYLLABUS

UNIT-I Introduction to immune system (12 hrs.)

- 1.1 Innate and adaptive immunity
- 1.2 Immune cells:
 - 1.2.1 Type of cells
 - 1.2.2 Role of Immune cells in immunity
- 1.3 B-Lymphocyte and T-Lymphocyte
- 1.4 General Properties of Cytokines and Chemokines
- 1.5 Antibody: Type, Structure and Function

UNIT-II Humoral Immunity (13 hrs.)

- 2.1 Antigen, Antigenicity and Immunogenicity.
- 2.2 Signal Transduction:

- 2.2.1 B-Cells
- 2.2.2 T-Cells
- 2.3 T-cell Receptors and types
- 2.4 Monoclonal antibodies
- 2.5 Antibody engineering

UNIT-III Cell mediated immunity (13 hrs.)

- 3.1 B-cell and T-cell Activation, Differentiation and Memory
- 3.2 Major Histo-Compatibility complex and Antigen presentation
- 3.3 Allergy and Hypersensitivities:
 - 3.3.1 Allergy type I, II,III, IV Hypersensitivities
 - 3.3.2 Tolerance, Autoimmunity and Transplantation
- 3.4 Role of Immune system in Cancer
- 3.5 Immunological Techniques
 - 3.5.1 ELISA
 - 3.5.2 Immunoprecipitation

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 Hr.	10
Minor Test II	21% to 40%	1 Hr.	10
Major Test	41% to 100%	2Hrs	30

- Major test shall comprise of two sections A & B.
- Section A shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus of 3 units and 5 very short answer questions of 1 mark each from the entire syllabus. (A Sec = 10 marks)
- Section B comprises of 4 questions from remaining 2 units and candidate has to attempt one question from each unit. (2 x 10 = 20)

Teaching and Learning Process:

The course on immunology has been structured to develop the requisite knowledge, skills and learning attitude of the student. The process is extremely student-oriented and includes details of cells and organs of the system, antigens, antibodies, autoimmunity, immunodeficiency, hypersensitivity and other important aspects. The practical exercises are accordingly designed to enhance the interest of the students. A variety of approaches to teaching-learning process, including lectures, seminars, power point presentations, workshops, peer teaching/learning, assignments, problem-based learning, project-based learning, simulation videos, group or co-operative learning, book reviews, research colloquium will be adopted to achieve this.

Problem-based learning skills and higher-order skills of reasoning and analysis will be encouraged through research based pedagogical tools. The students must be given sufficient support by faculty to apply their learning and acquire knowledge from real life situations.

Assessment Methods:

The assessment of students' achievement in immunology will be aligned with the course/program learning outcomes.

- Continuous evaluation of learning by formative and diagnostic evaluation should be followed at the University.
- Efforts should be made to measure cognitive as well as applied learning.
- Project work, quiz, problem solving exercise, classroom assessment methods, closed-book and open-book tests, problem-solving exercises, practical assignment, laboratory reports, seminar presentation, *viva-voce*, interviews, computerized adaptive testing, literature surveys and summative evaluations by end-semester examination etc. constitute the different components of the overall assessment.
- Moreover, students should be provided with feedback on their work with the aim of improving their academic performance.

Online Tools and Web Resources:

- E-content on e-PG Pathshala portal of Government of India:
<https://epgp.inflibnet.ac.in> Fundamentals of Immunology; <https://www.coursera.org/specializations/immunology>

Books Recommended

1. William E. Paul. (1984). Fundamental Immunology.
2. Janis Kuby, Barbara A. Osborne, (1992). Immunology.
3. Abul K. Abbas and Andrew H. Lichtman, (2001). Basic Immunology: Functions and Disorders of the Immune System.
4. Lauren Sompayrac, (2001). How the immune system works.
5. Matthew Helbert and Roderick Nairn, (2002). Immunology for Medical Students
6. Kenneth Murphy, Paul Travers, Mark Walport. (2008). Janeway's Immunobiology, 7th edition
7. Arumugan N, Dulsy Fatima (2015). Immunology. Saras Publications.
8. Abul K Abbas, Andrew H Lichtman and Shiv Pillai. (2018). Cellular and Molecular Immunology. Elsevier.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited “A” Grade



Semester-I

Course No. PSZOTC-105

Course Title: **Bioinformatics and Biostatistics**

CREDITS: 2

Time Duration: 2 Hrs

MAXIMUM MARKS : 50

a) Minor Test I : 10

b) Minor Test II : 10

c) Major Test : 30

**Learning Outcome-Based Curriculum Framework (LOCF) for the Examination to be held in
December, 2020; December, 2021 and December, 2022**

Course Learning Objective:

The aim of incorporating “Bioinformatics and Biostatistics” as a paper is to introduce the students to the myriad applications of these fields in modern biology. The digitalisation of biological methods is at an all-time high and the students of biology must be acquainted with the emergence of technology so that they are well prepared to take up research in a better way. Bioinformatics has already established itself as a backbone of the modern research and diagnostics and no research is possible without making use of bioinformatics in modern times. The bio-statistical methods also need to be studied in order to approach future research holistically.

Course Learning Outcomes:

- Students studying this course will be able to perform the data analysis using the statistical tools available on any computer such as excel as well the programs for big and complex data. They will be able to handle high throughput proteomic and genetic data. They will be able to understand the maintenance of computers, server and big data files. This course will make them suitably knowledgeable to undertake the computer jobs in the offices in the hospitals, scientific academies, funding agencies in addition to the teaching institutions.

SYLLABUS

UNIT-I: Basic Concepts of Bioinformatics

(10 Hrs)

- Goals, scope and applications of Bioinformatics
- History of Bioinformatics, Genome sequencing projects, Human Genome Project
- Basic molecular concepts: Types of Nucleotide Sequence: Genomic DNA, Complementary DNA (cDNA), Recombinant DNA (rDNA), Expressed sequence tags (ESTs), Genomic survey sequences (GSSs). Gene expression data.

Unit-II: Applications of Bioinformatics

(10 Hrs)

- Biological Databases; Primary, Secondary & Composite databases.
- Nucleotide Sequence Databases; GenBank, EMBL, DDBJ, NCBI Data Model.
- Protein Sequence Databases; SWISS-PROT protein sequence database, Translated EMBL (TrEMBL), UniProt, PROSITE, Pfam
- Retrieval Systems: SRS, ENTREZ. NCBI Search, Sequence Similarity Search: BLAST, FASTA, CLUSTALW.

Unit III: Computers in Biostatistics:**(10 Hrs)**

- Statistical software: types and applications
- Basic bio-statistical analysis using SPSS
- Introduction to R
- Phylogenetic analysis:
 - Phylogenetic tree
 - Construction of a Phylogenetic tree
- Simple correlation and regression
- Analysis of variance –one way and two-way.

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	Upto 20%	1 Hr.	10
Minor Test II	21% to 40%	1 Hr.	10
Major Test	41% to 100%	2Hrs	30

- Major test shall comprise of two sections A & B.
- Section A shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus of 3 units and 5 short answer questions of 1 mark each from the entire syllabus. (A Sec = 10 marks)
- Section B comprises of 4 questions from 2 units and candidate has to attempt one question from each unit. (2 x 10 = 20)

Teaching and Learning Process:

Classroom lectures using Power point presentations enabled with related photographs of insect vectors will clarify the concepts related to insects. Group discussions on various unique physiological processes in Insects will develop interest among students to pursue higher studies in the field. Observations based on actual handling of insects and their body parts, visits to observe insects in their natural environment and entomology museum will develop curiosity among learners about insect diversity

Assessment Method:

The learners/ students can be assessed in many different ways.

- Formative feedback throughout the course and summative feedback as mid-semester and semester-end evaluation.
- Presenting the topics in the class *via* blackboard teaching/presentations, group discussions etc.
- Students would be provided feedback on their work with a view to improve their academic performance.
- From time to time, learners will be given practical problems and neuroimages to test their theoretical skills and promote practical knowledge.
- They would be provided feedback on their work with a view to improve their academic performance.

Books recommended:

1. **Introduction to Bioinformatics** by Teresa Attwood, David Parry-Smith, 1999, 1st edition; Prentice Hall
2. Baxevanis, A.D. and Francis Onellete, B.F. (2001). Bioinformatics. Wiley Interscience. John Wiley and Sons Inc. New York.
3. Biostatistics: A Manual Of Statistical Methods For Use In Health, Nutrition And Anthropology. K. VisweswaraRao. Jaypee Brothers Medical Publishers (P) Ltd.
4. Fundamentals of Biostatistics. byIrfan A Khan.
5. An introduction to Biostatistics. by PSS Sunder Rao.
6. Introduction to the Practice of Statistics by Moore and McCabe
7. Principles of Biostatistics. Marcello Pagano.
8. Veer BalaRastogi (2006) Fundamentals of Biostatistics, New Delhi, Ane Books India.
9. Dhar, M.K. and Kaul, S. (1997). Statistics in Biology. Malhotra Brothers, Jammu.
10. Snedecor, G.W. and Cochran, W.G. (1989). Statistical methods. Iowa State University Press, Ames.
11. Ye, Q. S. (2008). Bioinformatics: A practical approach. Champman& Hall/ CRC.
12. Tramontano Anna (2008). Introduction to Bioinformatics. Chapman & hall/ CRC.

Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for the Examination to be held in December 2020, December 2021 and December 2022

LAB COURSE-I

**Semester-I
PRACTICAL**

Course No. PSZOPC-106

Course Title: Ecology & Environmental Biology & Ichthyology

CREDITS: 4

1. To determine water colour, atmospheric and water temperature and pH of a pond.
2. To determine the depth and transparency of a pond.
3. To study the Physical and chemical characteristics of soil.
4. To determine an amount of dissolved O_2 in the given water sample.
5. To determine the amount of chlorides from the given water sample.
6. To determine an amount of dissolved CO_2 in the given water sample.
7. To determine the hardness (amount of Ca^{++} and Mg^{++}) in the provided water sample.
8. To estimate the amount of carbonates and bicarbonates present in the given water sample.
9. Identification of Indian common fish faunal resources from cold water, warm water, brackish water, marine water and ornamental fishes.
10. To study various body forms in fishes.
11. To study the various modification of Dorsal, Pectoral, anal, and caudal fins in fishes.
12. To study the modification of Scales in fishes.
13. To study the lateral line system in fishes.
14. To study the specimens of Sub-class Dipnoi.
15. To study different types of Venomous and poisonous fishes.
16. To study different types of swim bladder in fishes.
17. To study various accessory respiratory organs in fishes.
18. To study various gill rakers in fishes.
19. To study various hill stream fishes.
20. To study various deep sea fishes.
21. To extract the internal ear of fishes from common available carps.
22. To extract the pituitary gland of common
23. Morphometry of locally available carps and cat fishes.
24. Visit to Mansar/Surinsar
25. Visit to fish market and Fish Farm
26. Introduction to the statistical software like R and SPSS
27. Use of excel sheet and graph pad Prism for data processing.
28. Use of search engines like Pub-Med, Scopus, Science direct for reference material collection and management.
29. Nucleic acid and protein sequence databases.
30. Primer designing for gene amplification and gene cloning.
31. Software to study protein structure.
32. Viva-voce

Note: There will be one practical paper of 50 marks. 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 60 % (15 marks i:e 7 marks for internal test and 8 marks for day-to-day performance.) In case of regular students internal assessment received from the college from the college will be added to the marks obtained by them in the university examination and in case of private candidates marks obtained by them in the university examination shall be increased proportionately in accordance with the statutes/regulations

**Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for the Examination to be held
in December, 2020; December, 2021 and December, 2022**

Lab Course- II

Semester-I

Course No. PSZOPC-107

PRACTICAL

Course Title: Genetics, Immunology & Insect diversity

CREDITS: 4

1. To study the parts and working principle of compound microscope.
2. To prepare various chemicals required for the chromosome study.
3. Preparation of human karyotype and study of chromosomal aberrations with respect to number, translocation, deletion etc. from the pictures provided and to study various Autosomal and Sex chromosomal syndromes through karyotypes.
4. To study the structure of X and Y chromosome.
5. To study meiosis from the gonads of Grasshopper.
6. Chromosome Banding (C ,G ad H Banding)
7. To study the morphology of chironomous larva and the extraction of its salivary glands.
8. To carry out the preparation of different chemicals required for the DNA extraction from stored blood sample.
9. To carry out the extraction of DNA from stored blood sample using Organic/PCA method.
10. To prepare a temporary mount and to study the salivary gland chromosome (Polytene chromosome)of chironomous larva.
11. To study the bar body as one of the heterochromatized x chromosome in females.
12. To study the various types of cells involved in immune response.
13. To study different types of the blood groups.
14. To prepare blood smear and to study the polymorphs by Arneith's count of polymorphs.
15. Estimation of TLC & DLC from the blood sample.
16. Viva-Voce

Note: There will be one practical paper of 50 marks. 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 60 % (15 marks i:e 7 marks for internal test and 8 marks for day-to-day performance.) In case of regular students internal assessment received from the college will be added to the marks obtained by them in the final examination (Major test) and in case of private candidates the internal assessment marks shall be added proportionately to the marks obtained by them in the major examination in accordance with the statutes/regulations.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited "A" Grade



Semester-II

Course No. PSZOTC-201

CREDITS: 4

Time Duration: 2 hrs 30 mins.

Course Title: Cell Biology and Research Instrumentation

MAXIMUM MARKS : 100

a) Minor Test I : 20

b) Minor Test II : 20

c) Major Test : 60

**Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for Examination
Under CBCS to be held in May 2021, May 2022 and May 2023**

Course Learning Objective:

The objective of the course is to help the students to learn and develop an understanding of a cell as a basic unit of life. This course is designed to enable them to understand the functions of cellular organelles and how a cell carries out and regulates cellular functions.

Course Learning Outcome:

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

- Understand fundamental principles of cell biology.
- Explain structure and functions of cell organelles involved in diverse cellular processes.
- Appreciate how cells grow, divide, survive, die and regulate these important processes.
- Comprehend the process of cell signalling and its role in cellular functions.
- Have an insight of how defects in functioning of cell organelles and regulation of cellular processes can develop into diseases.
- Learn the advances made in the field of cell biology and their applications.

UNIT-1. Cell membrane and Function.

1.1 Cell membrane.

1.1.1 Structure and models of membrane organization.

1.1.2 Composition of cell membrane.

1.1.3 Functions of cell membrane.

1.2 Transport across membranes.

1.2.1 Active and passive transport.

1.2.2 Endocytosis and exocytosis.

1.2.3 Membrane transport Proteins.

1.3 Transport of macromolecules; semi permeability, osmosis.

1.4 Membrane potential.

UNIT-2. Cell cycle, cell communications and cell signaling.

1.1 Cell cycle

1.1.1 Cell cycle Regulation.

2.2 Cell Communication.

2.2.1 General Principles of cell communication.

2.2.2 Cell adhesion and role of different adhesion molecules.

2.2.3 Gap junctions.

2.2.4 Extracellular matrix, integrins.

2.3 Cell signaling

2.3.1 Cell surface receptors.

2.3.2 Cell signaling through G-Protein receptors.

2.3.3 Enzyme linked receptor signaling.

UNIT-3. Cell Death; Apoptosis

3.1 Cell Death in Mammals.

3.1.2 Bcl₂ family proteins.

3.1.3 Intrinsic and extrinsic pathways.

3.2. Cell Death in C. elegans.

3.3 Cell Death in Drosophila.

3.4 Apoptosis and Cancer; Role of P₅₃.

3.5 Cell surface of cancer cells.

UNIT-4. Research Instrumentation-I

4.1 Electrophoretic techniques.

4.2 Chromatography techniques.

4.2.1 Liquid and gas chromatography

4.2.2 Thin layer chromatography.

4.2.3 Planar/ paper chromatography.

4.2.4 Ion exchange chromatography.

4.2.5 Size exclusion chromatography.

4.2.6 Affinity Chromatography.

4.3 Centrifugation: Principles and Types.

UNIT-5. Research Instrumentation-II

5.1 Bright Field Microscopy, Dark Field Microscopy.

5.1.2 Electron Microscopy TEM & SEM.

5.1.3 Fluorescence Microscopy, (Principle & Types)

5.2 DNA Sequencing and Techniques.

5.2.1 Sanger sequencing.

5.2.2 Chemical Degradation method.

5.2.3 Introduction to NGS.

5.3 Polymerase chain reaction.

5.4 Southern Blotting, Western Blotting, Northern Blotting.

NOTE FOR PAPER SETTING:-

Examination Theory	Syllabus to be covered in Examination	Time allotted for Examination	%age of marks
Minor Test – I	Upto 20%	1 Hr	20
Minor Test – II	Upto 21% to 40%	1 Hr	20
Major Test	41% to 100%	2 hrs & 30 mins.	60

- Major test shall comprise of two sections A & B.
- **Section A** (All Questions to attempt) shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus and 5 short answer questions of 2 mark each from the entire syllabus. (A Sec = 15 marks)
- **Section B** comprises of 6 questions of 15 marks each from remaining 3 units and candidate has to attempt one question from each unit. (3 x 15 = 45)

Teaching and Learning Process:

- The teaching strategy will emphasize on problem-based learning to develop the requisite knowledge, skills and learning attitude of the student.
- A variety of approaches to teaching-learning process, including lectures, seminars, power point presentations, workshops, peer teaching/learning, assignments, project-based learning, simulation videos, group or co-operative learning, book reviews, research colloquium will be adopted to achieve this.
- Laboratory sessions will constitute an important part of the course along with its theoretical background. The laboratory sessions will include pre-lab questions and post-lab questions on start and completion of experiment. The experiments will be presented in the form of laboratory reports, which will train the students to write and formulate scientific text.

Assessment Methods:

The assessment of students' achievement in Cell Biology and research instrumentation will be aligned with the course learning outcomes.

- Continuous evaluation of learning by diagnostic and formative methods.
- Project work, quiz, problem solving exercise, classroom assessment methods, closed-book and open-book tests, problem-solving exercises, practical assignment, laboratory reports, seminar presentation, *viva voce* interviews, computerized adaptive testing, literature surveys and summative evaluations by end-semester examination etc. will constitute the different components of the overall assessment.

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>

BOOKS RECOMMENDED

1. Avers c.j. (1976) Cell Biology. D.V. Nostrand. Co. New York.
2. De Robertis, E.DF & De Robertis. E.M.F(1981). Cell & Molecular Biology.
3. Alberts (1983) Molecular Biology of Cell.
4. G. Karp, Cell & Molecular Biology.
5. Smith & E.J. Wood, Cell Biology.
6. PK Gupta, Rastogi Publication.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited “A” Grade



Semester-II

Course No. PSZOTC-202

CREDITS: 4

Time Duration: 2 hrs 30 mins.

Course Title: Functional Anatomy of Animals

MAXIMUM MARKS : 100

a) Minor Test I : 20

b) Minor Test II : 20

c) Major Test : 60

**Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for Examination
Under CBCS to be held in May 2021, May 2022 and May 2023**

Course Learning Objective:

Functional anatomy is the study of life, specifically, how cells, tissues and organ function. It is a core and fundamental scientific discipline that defines the health and well-being of living organisms. Besides satisfying a natural curiosity about how our body systems function, it gives us knowledge about the functions of all the parts and systems of the body. It is also of central importance in medicine and health sciences. The course has been designed to apply the theoretical concept to the laboratory exercises for acquiring skills. The fundamental or coherent understanding of the subject will be extended to related disciplinary areas/subjects through understanding of normal body functions, enabling effective treatment of abnormal or diseased states. The students will be equipped with skill-based knowledge to help them undertake further studies in physiology and related areas as well as in multidisciplinary subjects.

Course Learning Outcome:

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

- Have a clear knowledge of basic fundamentals and understanding of advanced concepts so as to develop a strong foundation that will help them to acquire skills and knowledge to pursue advanced degree courses.
- 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.

UNIT-1. Movement and Locomotion.

- 1.1 Amoeboid movement, theories of Amoeboid movement.
- 1.2 Mechanism of Ciliary and Flagellar movement.
- 1.3 Hydrostatic skeleton and its principles.
Locomotion based on Hydrostatic skeleton in
 - a. Coelenterates
 - b. Nemertina
 - c. Echinoderms
- 1.4 Skeletal elements in amniotes with reference to
 - a. Skull
 - b. Girdles
 - c. Limbs
- 1.5 Concept of Cranial Kinesis.

UNIT-2. FOOD AND FEEDING

- 2.1 Mechanism of Food intake
 - 2.1.1 Mechanism of liquid feeding

- 2.1.2 Particulate solid feeding mechanism
- 2.1.3 Filter feeding in Polychaetes and Molluscs
- 2.2 Basic digestive mechanisms
 - 2.2.1 Intracellular digestion
 - 2.2.2 Extracellular digestion

2.3 Basal metabolic rate

UNIT-3. FUNCTIONAL ASPECTS OF PHYSIOLOGICAL ACTIVITIES

- 3.1 Respiratory mechanisms
 - a. Branchial
 - b. Tracheal
 - c. Pulmonary
- 3.2 Concept of Haemodynamics in vertebrates.
- 3.3 Thermoregulation in vertebrates
- 3.4 Osmoregulation in vertebrates.

UNIT-4.

4.1 Primitive Nervous system

- 4.1.1 Nerve net in coelenterate
- 4.1.2 Nervous system in Echinodermata

4.2 Advanced Nervous system

- 4.2.1 Metameric nervous system in Annelids
- 4.2.2 Nervous system in Arthropods
- 4.2.3 Nervous system in Mollusca
- 4.2.4 Nervous system in vertebrates with reference to brain. of Man

UNIT-5. DEVELOPMENT AND ADAPTATION

- 5.1 Larval forms and their functioning in:
 - 5.1.1 Crustacean
 - 5.1.2 Insects
 - 5.1.3 Echinodermata
- 5.2 Metamerism and its significance in movement
- 5.3 Principles of flights in:
 - 5.3.1 Insects
 - 5.3.2 Birds
 - 5.3.3 Mammals

NOTE FOR PAPER SETTING:-

Examination Theory	Syllabus to be covered in Examination	Time allotted for Examination	%age of marks
Minor Test -I	Upto 20%	1 Hr	20
Minor Test-II	Upto 21% to 40%	1 Hr	20
Major Test	41% to 100%	2 hrs & 30 min	60

- Major test shall comprise of two sections A & B.
- **Section A** (All Questions to attempt) shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus and 5 short answer questions of 2 mark each from the entire syllabus. (A Sec = 15 marks)
- **Section B** comprises of 6 questions of 15 marks each from remaining 3 units and candidate has to attempt one question from each unit. (3 x 15 = 45)

Teaching and Learning Process:

The Learning Outcomes-Based Approach to curriculum planning and execution requires that the teaching learning processes are oriented towards enabling students to attain the defined learning outcomes relating to the courses within a programme. This, particularly in the context of undergraduate studies, requires a significant shift from teacher centric to learner/ student centric, pedagogies and from passive to active /participatory pedagogies. Therefore, planning for teaching becomes critical. Practical skills, including an appreciation of the link between theory and experiment, will constitute an important aspect of the teaching-learning process. Teaching methods will include:

- Lectures supported by group tutorial work; invited lectures
- Practical and field-based learning;
- The use of prescribed textbooks and e-learning resources and other self-study materials;
- Project work
- Assignments, seminars, oral presentations
- Activities designed to promote the development of generic/transferable and subject specific skills;
- Internships and visits to field sites and hospitals or other research facilities
- Guidance by the 'mentors' and specialists in the field etc.

Assessment Methods:

A variety of assessment methods will be used to assess progress towards the course learning outcomes. Priority will be accorded to formative assessment. Progress towards achievements of learning outcomes will be assessed using the following:

- Theory and practical examinations, Problem based assignments;
- Practical assignment, laboratory exercises and reports; observation of practical skills;
- Individual project reports (case-study reports); team project reports;
- Oral presentations, including seminar presentations; viva voce interviews;
- Peer and self-assessment, literature survey evaluations etc.

Online Tools and Web Resources:

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

BOOKS RECOMMENDED:

1. Federic martini (1986). Prentice-Hall Publishing House. Fundamentals of Anatomy & Physiology.
2. Karelilium William Bemis etal (2000) Functional Anatomy of Vertebrates, an evolutionary perspectives.
3. Gerald, I. tertora, Sandra R & Bonnie (2000), Principles of Anatomy and Physiology.
4. R. Mc Neil Alexandar (2006), Principles of animal locomotion.
5. R.K. Saxana, Sumitra sexana, (2015), Viva Books Pvt. Ltd. Comparative Anatomy vertebrates.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited "A" Grade



Semester-II

Course No. PSZOTC-203

CREDITS: 4

Time Duration: 2 hrs 30 mins.

Course Title: Basic Endocrinology

MAXIMUM MARKS : 100

a) Minor Test I : 20

b) Minor Test II : 20

c) Major Test : 60

Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for Examination
Under CBCS to be held in May 2021, May 2022 and May 2023

Course Learning Objective:

The main goal of this Discipline Specific Elective (DSE) paper is to provide students with a basic understanding of human endocrine glands, neuro-endocrine glands and their structure, function and signalling pathways. Students will also study the influence of biological rhythm on hormones secretion. In addition, the course will facilitate the understanding of the biosynthesis and biochemistry of hormones. Also, emphasis would be laid on understanding the maintenance of homeostasis by the hormones. The course will also try to integrate the basic and clinical aspects of endocrinology to enhance the understanding of students about the consequences due to hyposecretion, hypersecretion and absence of hormones leading to various diseases and metabolic disorders.

Course Learning Outcome:

After completion of the course the students will be able to:

- 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.
- Gain insight into the molecular mechanism of hormone action and its regulation.
- Know the regulation of physiological process by the endocrine system and its implication in diseases.
- Gain knowledge about the prevalent endocrine disorders and critically analyze their own and their family's health issues.

UNIT-1. Crustacean and insect Endocrinology

- 1.1 Neural versus hormonal co-ordination.
- 1.2 Morphology and physiology of Neuroendocrine system in crustacean.
 - 1.2.1 The X-organ sinus gland complex (XO-SG) and Y-organs.
 - 1.2.2 Role of Neuroendocrine secretions on growth, reproduction and metabolism.
- 1.3 Neuroendocrine system in insects – cephalic neuroendocrine system and ventral nerve cord neurosecretory system.
 - 1.3.1. Neurosecretory cells – corpora cardiac, corpora allatum and prothoracic gland.
 - 1.3.2 Neuroendocrine control of growth, reproduction and metabolism in insects.

UNIT-2.

- 2.1 Structure and function of Putative Glands
 - 2.1.1 Pineal gland
 - 2.1.2 Thymus gland
 - 2.1.3 Urophyses
 - 2.1.4 Corpuscle of stannius
- 2.2 Pheromones and allomone glands
 - 2.2.1 Insect Pheromones and allomones, Type, Structure and function.
- 2.3 Hormone Assays techniques
 - 2.3.1 Ablation
 - 2.3.2 Bio-assays
 - 2.3.3 Radio-Immuno Assays

UNIT-3. COMPARATIVE VERTEBRATE ENDOCRINOLOGY

- 3.1 Hypothalamo-hypophysial system.
 - 3.1.1 General organization of Hypothalamus: Localization, Chemistry and action of Hypophysiotropic hormones.
 - 3.1.2 Pituitary gland
 - 3.1.2.1 Localization chemistry and Physiological roles of Adenohypophyseal hormones and neurohypophyseal hormones.
 - 3.1.2.2 Neural and Vascular supply of Hypophysis.
- 3.2 Thyroid Gland : comparative morphology, Anatomy and Histology of gland.
 - 3.2.1 Biosynthesis of thyroid hormones.
 - 3.2.2 Physiological roles.
- 3.3 Parathyroid Gland : Comparative morphology anatomy and histology of gland.
 - 3.3.1 Role of Calcitonin, PTH & Vit. D in Classism Homeostasis.
- 3.4 Gastro-intestinal hormones

UNIT-4.

- 4.1 Adrenal Gland: comparative morphology, Anatomy functions of hormones released.
 - 4.1.1 Morphology and Histology of Adrenal cortex.
 - 4.1.2 Biosynthesis of corticosteroids
 - 4.1.3 Biosynthesis and Role of Adrenal medullary hormones. (Catholamines)
 - 4.1.4 Renin-Angiotensin system.
- 4.2 Pancreas Islet, Role and Regulation of Insulin and Glucagon.

UNIT-5.

- 5.1 Release and transport of hormones.
- 5.2 Homeostasis and Feedback mechanism.
- 5.3 Mechanism of hormone action
- 5.4 Hormonal deficiency diseases – pituitary , thyroid, parathyroid, adrenal, pancreas

NOTE FOR PAPER SETTING:-

Examination Theory	Syllabus to be covered in examination	Time allotted for examination	%age of marks
Minor Test – I	Upto 20%	1 Hr	20
Minor Test – II	Upto 21% to 40%	1 Hr	20
Major Test	41% to 100%	2 hrs & 30 min	60

- Major test shall comprise of two sections A & B.
- **Section A** (All Questions to attempt) shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus and 5 short answer questions of 2 mark each from the entire syllabus. (A Sec = 15 marks)
- **Section B** comprises of 6 questions of 15 marks each from remaining 3 units and candidate has to attempt one question from each unit. (3 x 15 = 45)

Teaching and Learning Process:

Lecture using Power Point and chalk-blackboard method will clarify the concepts of endocrinology. Use of ICT facility and survey based short projects as assignments will create interest among students to explore further. Visit to Prominent endocrinology laboratory will help students to learn about basic techniques.

Assessment Methods:

- Formative assessment in the form of quizzes, multiple choice questions, fill in the blanks and short answers
- Student presentation
- Take-home Assignments
- Summative assessment in the form of end of term Theory and Practical examination

Online Tools and Web Resources:

- <https://sites.google.com/site/openmeded/specialties/endocrinology>
- <https://www.endocrine.org/topics>

BOOKS RECOMMENDED

1. Chandler & Gulbert (1962) Hormones & Neuro secretions (State University New York)
2. Tombs A.S. (1970) Introduction to invertebrate endocrinology.
3. Bantley P.J (1976) Comparative vertebrate endocrinology Cambridge, University Press U.K.
4. Norman Anthony (1997), Hormones (Academy Press)
5. Books, Chales & Marshall, (2000) essential endocrinology.
6. D.B. Tembhane; invertebrate endocrinology.

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited "A" Grade



Semester-II

Course No. PSZOTC-204

CREDITS: 2

Time Duration: 2 Hrs

Course Title : Biotechnology.

MAXIMUM MARKS : 50

a) Minor Test I : 10

b) Minor Test II : 10

c) Major Test : 30

Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for Examination
Under CBCS to be held in May 2021, May 2022 and May 2023

Course Learning Objective:

The syllabus of Generic elective course/ paper on "Animal Cell Biotechnology" is revised to cater to the needs of Choice Based Credit System (CBCS). The changing scenario of higher education in India and abroad is taken into consideration to make this syllabus more oriented towards current need of modern research and industrial sectors. The revised and updated syllabus is based on a basic and applied approach with vigor and depth. Empowerment of students to face research and industrial outlets by nurturing independent thinking, initiating scientific enquiry and developing their entrepreneurship skills is at the centre of this syllabus. The units of the syllabus are well defined, taking into consideration the level and capacity of students.

Course Learning Outcome:

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

- Get a clear concept of the basic principles and applications of biotechnology.
- Know the basic techniques used in genetic manipulation helping them continue with higher studies in this field.
- Acquire knowledge of the basic principles, preparations and handling required for animal cell culture.
- Understand principles underlying the design of fermenter and fermentation process and its immense use in the industry.
- Design small experiments for successful implementation of the ideas and develop solutions to solve problems related to biotechnology keeping in mind safety factor for environment and society.
- Apply knowledge and skills gained in the course to develop new diagnostic kits and to innovate new technologies further in their career.
- Enhance their understanding of the various aspects and applications of biotechnology as well as the importance of bio-safety and ethical issues related to it.

SYLLABUS

UNIT I Basics of Biotechnology

(10h)

1.1 Origin, history and scope of Biotechnology

1.2 Recombinant DNA Technology & Gene cloning

1.2.1 Plasmids, bacteriophage, phagemids, cosmids, artificial

- chromosomes (YAC and BAC)
- 1.2.2 Recombinant DNA Technique.
- 1.2.3 Screening of recombinant DNA
- 1.3 Generation of genomic and cDNA libraries
- 1.4 Restriction enzymes, types, classifications and examples.
- 1.5 Isolation and purification of:
 - 1.5.1 RNA,
 - 1.5.2 DNA (genomic and plasmid)
 - 1.5.3 Proteins.

UNIT II Animal cell and tissue culture

(10h)

- 2.1 Laboratory facilities for Animal Tissue culture
- 2.2 Primary culture, cell line and cloning
 - 2.2.1 Disaggregation of tissue.
 - 2.2.2 Maintenance of cultured-cell lines
 - 2.2.3 Large scale cell culture
- 2.3 Tissue and organ culture
 - 2.3.1 Tissue culture: Slides, flasks, test tube culture
 - 2.3.2 Organ culture
 - 2.3.3 Whole embryo culture
- 2.4 Somatic cell Hybridization
- 2.5 Tissue engineering: Artificial skin and artificial cartilage.

UNIT III Applied Biotechnology

(10h)

- 3.1 Analysis of Nucleic acids and proteins.
 - 3.1.1 One and two dimensional gel electrophoresis.
 - 3.1.2 Isoelectric focusing gels.
- 3.2 Environmental Biotechnology
 - 3.2.1 Sewage treatment
 - 3.2.2 Biosensors
- 3.3 Medical Biotechnology
 - 3.3.1 Molecular approaches to diagnosis
 - 3.3.2 Gene Therapy
- 3.4 Biophysical methods
 - 3.4.1 X-Ray crystallography
 - 3.4.2 NMR
- 3.5 Transgenic Animals
 - 3.5.1 Gene construct
 - 3.5.2 Vectors
 - 3.5.3 Transfection methods

Note for Paper Setting

Examination Theory	Syllabus to be covered in examination	Time allotted for Exam	% weightage (marks)
Minor Test I	upto 20%	1 Hr.	10
Minor Test II	21% to 40%	1 Hr.	10
Major Test	41% to 100%	2Hrs.	30

- Major test shall comprise of two sections A & B.
- Section A shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus of 3 units and 5 short answer questions of 1 mark each from the entire syllabus. (A Sec = 10 marks)
- Section B comprises of 4 questions from remaining 2 units and candidate has to attempt one question from each unit. (2 x 10 = 20)

Teaching and Learning Process:

As the students of Generic Elective papers are from different and unrelated discipline (s) the revised syllabus is framed with a basic introduction to the concept of genetic engineering, scientific techniques and applications. Effective teaching involves aligning the three major components of instruction: learning objectives, assessments, and instructional activities. To increase the participation of students and in turn develop their interest in the topic; more discussions/ Quizzes will be included. Brain storming sessions will be held to help students march towards scientific excellence, the recent research activities/trends. Open Learning Resources like SWAYAM, MOOC etc. will be shown. Field trips/visits to Institute/Industry will be planned to provide better exposure and more practical view of studying science and applying it judiciously. Students understanding will be assessed at frequent intervals throughout the learning process. Continuous evaluation of learning will be carried out and efforts will be made to measure cognitive as well as applied learning. Project work, quiz, problem solving exercise, classroom assessment methods, end-semester examination, etc. will constitute the different components of the overall assessment. Extra efforts and time slots will be given to students facing difficulty in understanding any topic/concept etc.

Assessment Methods:

- Regular class tests with objective/subjective questions.
- Oral presentation on regular basis by students.
- Group discussion: Dividing the class into groups and assign each group a topic or latest development/scientific finding in the field of biotechnology.
- Small projects can be designed by students (a group of 3 students) to enhance their critical thinking, improving scientific writing and honing their skills.
- Assignment work.

Online Tools and Web Resources:

- <https://epgp.inflibnet.ac.in/>
<https://swayam.gov.in/Home>
- <https://swayam.gov.in/courses/5178-molecular-biology-genetic-engineering-and-plant-tissue-culture> Module no.: 14 to 21, 23 & 24
- <https://nptel.ac.in/courses/102103041/2> Gene Therapy
- <https://nptel.ac.in/courses/102103013/49> Genetic Engineering & Applications (Web)
- <https://nptel.ac.in/courses/102107058/6> Biomedical nanotechnology (Video)
- <https://nptel.ac.in/courses/102107028/40> Analytical Technologies in Biotechnology (Video) Electrophoresis, PCR, DNA sequencing methods
- https://www.edx.org/course?search_query=biotechnology
- <https://www.coursera.org/courses?query=biotechnology&>

Govt. College For Women Parade Ground Jammu
An Autonomous College
NAAC Accredited "A" Grade



Semester-II

Course No. PSZOTC-205

CREDITS: 2

Time Duration: 2 Hrs

Course Title : Biodiversity Conservation & Management.

MAXIMUM MARKS : 50

a) Minor Test I : 10

b) Minor Test II : 10

c) Major Test : 30

**Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for Examination
Under CBCS to be held in May 2021, May 2022 and May 2023**

Course Learning Objective:

The Discipline Specific Paper on Biodiversity Conservation and Management is designed to acquaint students with varied aspects of wildlife conservation, including its importance, major threats, management of their habitats and populations. The emphasis will be on developing interest and invoking a sense of responsibility among students towards wildlife conservation. The course also explores different techniques, perspectives, and approaches to both identify and achieve wildlife management goals. This course will motivate students to pursue career in the field of wildlife conservation and management.

Course Learning Outcome:

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

- Become aware about the importance of wildlife in general, and its conservation and management in particular.
- Comprehend the application of the principles of ecology and animal behaviour to formulate strategies for the management of wildlife populations and their habitats.
- Understand the management practices required to achieve a healthy ecosystem for wildlife population along with emphasis on conservation and restoration.
- Know the key factors for loss of wildlife and important strategies for their *in situ* and *ex situ* conservation.
- Recognize the techniques for estimation, remote sensing and Global Position Tracking for wildlife.
- Gain knowledge about the wildlife diseases and the quarantine policies.
- Know about the Protected Area Networks in India, Ecotourism, Ecology of perturbation and Climax persistence.
- Perform critical thinking, literature review; scientific writing as well as presentations; and participation in citizen science initiatives with reference to wildlife.

UNIT-1. Biodiversity, concepts, definition scope and constraints

- 1.1 Composition and levels of Biodiversity. (Genetic, Species & Ecosystem)
- 1.2 Patterns of diversity.
- 1.3 Bio-geographic Classification of India as Mega-diversity nation.
- 1.4 Biodiversity and human welfare.

UNIT-2. Indian Biodiversity

- 1.1 Bio-Diversity Hot-Spots.
- 1.2 Major Protected areas (National Parks Wildlife Sanctuaries & their importance)
- 1.3 Endangered and Endemic Spp. of India.
- 1.4 Strategies for Biodiversity conservation.
- 1.5 Values of Biodiversity, utilitarian value and their categories.
 - 1.5.1 Direct use value.
 - 1.5.2 Non-consumptive use value. (Indirect)

UNIT-3. Threats to Biodiversity

- 3.1 Cause, Patterns and consequences of biodiversity of major land and aquatic systems and organisms.
- 3.2 Ecosystem and Extinction, Types of Extinction, Processes responsible for species extinction current and Future extinction rates.
- 3.3 IUCN Threatened categories and endangered animals.
- 3.4 Conservation of Wild life.
- 3.5 Threats for wild life.
- 3.6 Significance of Gene Banks and Germ Plasm conservation.

NOTE FOR PAPER SETTING:-

Examination Theory	Syllabus to be covered in examination	Time allotted for examination	%age of marks
Minor Test – I	Upto 20%	1 Hr	10
Minor Test – II	Upto 21% to 40%	1 Hr	10
Major Test	41% to 100%	2 Hrs	30

- Major test shall comprise of two sections A & B.
- Section A shall comprise of five (5) multiple choice question of 1 mark each covering the entire syllabus of 3 units and 5 very short answer questions of 1 mark each from the entire syllabus. (A Sec = 10 marks)
- Section B comprises of 4 questions from remaining 2 units and candidate has to attempt one question from each unit. (2 x 10 = 20)

Teaching and Learning Process:

The case study approach with real-life examples from the field will give a better understanding of the subject and its applications. The traditional chalk and talk method will be supplemented with LCD projection system and use of visualizer for theory classes. Projection of videos or short movies available on the subject will enhance the understanding

of the subject. Digital collection of pictures of pugmarks, hoof marks, bird's nests, wild fauna and flora will facilitate observation of their characteristic features with ease. Group discussions, book reviews, paper presentations, videos, animations, are some methods that can be employed for effective teaching. Project based reports, assignments and E-posters can also form an important part of learning regime. Field-based research projects will develop interest in the subject and motivate students to peruse research as a career in

future. Laboratory visits to renowned institutions like WII, Dehradun and Field visits to various conservation sites like Jim Corbett National Park, Aravali Biodiversity Park and National Zoological Park will provide students a practical or hands on knowledge of the subject. Students should participate in citizen science initiatives related to wildlife such as bird counts and uploading of the data on E-bird.org.

Assessment Methods:

Students will be assessed using the following methods:

- Formative/ Continuous assessment: This will be done through problem solving exercises, oral and written examinations, closed-book and open book tests, practical assignment laboratory reports, observation of practical skills, individual project reports, seminar presentation, viva voce interviews, computerized adaptive testing, literature surveys and evaluations, outputs from collaborative work etc. to assess the retention abilities of students.
- Summative assessment: Semester-end written and practical examinations will be an indicator of student's learning throughout the semester and analyses comprehensive knowledge gained by the students.

Online Tools and Web Resources:

- <https://swayam.gov.in/courses/4687-july-2018-wildlife-conservation>
- <https://swayam.gov.in/courses/5364-jan-2019-wild-life-ecology>
- <https://papaco.org/mooc-on-species-conservation/>
- <https://www.iucn.org/theme/protected-areas/our-work/capacity-development/moocs>
- <https://www.zsl.org/united-for-wildlife-free-conservation-courses>
- <https://wildlife.org/next-generation/career-development/online-courses/>
- <https://www.openlearning.com/umtmooc/courses/wildlife-management>

Books Recommended

1. Odum. E.P. (1971) – Fundamentals of Ecology.
2. Karmonday, concepts of Ecology.
3. M.P. Sinha, Soma Dey, Conservation of biodiversity and Natural resources.
4. Wilkinson. Fundamental Research in Ecology.
5. S.K. Singh. Text Book of Wild life management.

LAB COURSE-I

Learning Outcome-Based Curriculum Framework (LOCF) Syllabus for Examination Under
CBCS to be held in May 2021, May 2022 and May 2023

Course No. PSZOPC-206

PRACTICAL

Course Title: Cell Biology & Endocrinology

CREDITS: 4

1. To study the anatomy of Pituitary Gland.
2. To study various endocrine glands Viz. Pituitary , Thyroid, Parathyroid, Adrenal, Pancreas, Ovary and Testis.
3. To study the Neuro-edocrine system in crustaceans.
4. To study various endocrine related abnormalities/disorders in humans.
5. To study the principle of working of PCR.
6. To study the principle of working of Spectrophotometer.
7. To study the principle and working of paper Chromatography.
8. To study the structure of a typical Prokaryotic & eukaryotic cell. Order to
9. Visit to Endocrinology deptt. of GMC Jammu to study the patients having endocrine related disorders as a part of report submission for small project.
10. Isolation of Geomic DNA
11. Isolation of Plasmid DNA
12. Plasmid preparation.
13. Restriction digestion of DNA
14. To carry out the agarose gel electrophoresis of the provided DNA Sample.
15. Visit to IIM Jammu .
16. Viva-Voce.

Note: There will be one practical paper of 50 marks. 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance, 20% (5 marks) for viva and 60 % (15 marks i:e 7 marks for internal test and 8 marks for day-to-day performance.) In case of regular students internal assessment received from the college will be added to the marks obtained by them in the final examination (Major test) and in case of private candidates the internal assessment marks shall be added proportionately to the marks obtained by them in the major examination in accordance with the statutes/regulations.

Lab Course II

Course No. PSZOPC-207

PRACTICAL

Course Title: Functional Anatomy, Biotechnology & Biodiversity

CREDITS: 4

1. To study various types of locomotary organs in animals.
2. To study filter feeding in Annelids and molluscs.
3. To expose the nervous system of Pila & Nereis.
4. To determine the community by quadrat method by determinacy and density of different present in the community.
5. To study some of the national parks in India.
6. To study the biosphere reserves in India.
7. To study and calculate the diversity indices (Shannon diversity and Simpsons diversity) from the given biological data set.
8. To study the protected area network and its significance with reference to Kashmir division of UT of J&K.
9. To study the different types of skull in vertebrates.
10. To study the Axial and appendicular skeleton with special reference to man.
11. To study the structure and principle of working of a sarcomere.
12. To study the various biodiversity hotspots of India.
13. Visit to Gharana wet land.
14. Visit To Biodiversity park.
15. Viva-Voce

Note: There will be one practical paper of 50 marks. 50% (25 marks) shall be reserved for internal assessment including 20% marks (5 marks) for attendance , 20% (5 marks) for viva and 60 % (15 marks i:e 7 marks for internal test and 8 marks for day-to-day performance.) In case of regular students internal assessment received from the college will be added to the marks obtained by them in the final examination (Major test) and in case of private candidates the internal assessment marks shall be added proportionately to the marks obtained by them in the major examination in accordance with the statutes/regulations.