Department of Animal Sciences

Program: M.Sc. in Life Sciences (Specialization: Animal Sciences)

(Academic Session: 2017 - 18)

[Amended through 4th BoS]

Semester – IV

Course Code	Course Title	L (hr)	T (hr)	P (hr)	Cr
	Elective Course (Opt any one)				
LAS.571	Genetic Engineering	**2**	**-**	**-**	**2**
LAS.572	Endocrinology	**2**	**-**	**-**	
	Research*				
LAS.599	Research Project (Part – II)	**-**	**-**	**36**	**18**
	Total Credits				**20**

L: Lectures; T: Tutorial; P: Practical; Cr: Credits; * Compulsory courses

Examination Pattern

A: Continuous Assessment: [25 Marks]

i. Surprise Test (minimum three) - Based on Objective Type Tests (10 Marks)
ii. Term paper (10 Marks)
iii. Assignment(s) (5 Marks)

B: Pre-Scheduled Mid Semester Test-1: Based on Subjective Type Test [25 Marks]

C: Pre-Scheduled Mid Semester Test-2: Based on Subjective Type Test [25Marks]

D: End-Term Exam (Final): Based on Objective Type Tests [25 Marks]

E: **Research Project**: Satisfactory (S) / Unsatisfactory (US) as per the current practice by CUPB

LAS.571: Genetic Engineering **2 Credits**

Learning Objective: The aim of this core-course is to acquaint the students to versatile tools and techniques employed in recombinant DNA technology. A sound knowledge on methodological repertoire allows students to innovatively apply these in basic and applied fields of biological research.

Unit	Syllabus	Lectures
1.	**Tools of Genetic Engineering:** Restriction enzymes, Enzymes in genetic engineering, recombinant cloning vectors & their biology (Plasmid-, Phage-, and yeast-based), transformation and selection, genomic and cDNA library construction & DNA-sequencing techniques, RFLP, RAPD and AFLP techniques.	8
2.	**Recombinant Expression Systems & Mutagenesis:** prokaryotic (Fusion proteins, surface display, removal of selectable marker genes, secretion into periplasm & medium) & eukaryotic (Sachharomyces cerevisiae, Pichia pastoris, Baculovirus-insect, Mammalian cell expression system), oligonucleotide-directed and site-directed mutagenesis.	10
3.	**Molecular Biotechnology of Microbial Systems:** Vaccines (subunit-, peptide-, attenuated-, DNA- and vector-based), Enzymes, Antibiotics, Bioremediation, Gene therapy.	8
4.	**Molecular Biotechnology of Eukaryotic Systems:** Engineering of plants (Ti-based system, Chloroplast engineering, Insect resistance, Salt & Drought stress & Oxidative stress), Transgenic animals (Transgenic mice, Transgenic livestock, Transgenic poultry), Regulation of recombinant DNA technology, Concerns about safety of consuming genetically modified foods, concerns about the impact of genetically modified organisms on the environment.	10

Suggested Reading:

1. Molecular Biotechnology: Principles and Applications of Recombinant DNA by Bernard J. Glick, Jack J. Pasternak, Cheryl L. Patten, 4th edition.
2. Principles of Gene Manipulation by Sandy B. Primrose, Richard Twyman, Bob Old Seventh edition.
3. An introduction to genetic engineering, Third edition by Dr. Desmond S.T. Nicholl.
4. Molecular cloning by R. Green and Joseph Sambrook, 4th Edition, CSHL Press.
5.

LAS.572: Endocrinology **2 Credits**

Learning Objective: The objectives of this course are to review endocrinology briefly and then introduce the field of molecular endocrinology at large. Students shall understand the basic concepts of hormone receptor action, signal transduction and gene regulation, as well as critically read and discuss the current literature in the field.

Unit	Syllabus	Lectures

1.	**Introduction:** History, endocrine glands, hormones as chemical messengers, stimulus for hormone release: change in homeostasis, sensory stimulus and others. **Hormones:** Structure, receptor type, regulation of biosynthesis and release (including feedback mechanism like short, kong and ultra-feedback system). Physiological and biochemical actions and pathophysiology (hyper and hypo secretion).	10
2.	**Reproductive Hormones**: Male and female sex hormones. Hypothalamic hormones: CRH, TRH, GnRH, PRL/PRIH, GHRH/GHRIH. Pituitary hormones - Anterior and posterior pituitary hormones. Molecular mechanism of origin of GnRH cells, migration and site of release, reproductive cycles in females. Role of different guidance molecules involved during early GnRH development and adult GnRH System. Interplay of hormones during reproductive cycle, pregnancy, parturition and lactation: Different pathologies and genes involved. Other organs with endocrine function: heart (ANP), kidney (erythropoietin), liver (angiotensinogen, IGF-1), adipose tissue (leptin, adiponectin).	10
3.	**Hormone Biosynthesis and Mode of Action:** Steroid hormones (estrogens, androgens, progesterone) and their receptors, hormones during aging, hormones and cell death, nuclear receptors and hormones. Thyroid hormones, growth hormones, adrenal hormones and catecholamines, glucocorticoid hormones.	6
4.	**Non-genomic Actions of Steroid Hormones:** Endocrine disrupting compounds and environmental estrogens. Estrogens and breast cancer, androgens and prostate cancer.	6

Suggested Reading:

1. Norris, D. O., and Carr, J. A. (2012). Vertebrate Endocrinology, 5th Edition. Academic Press.
2. Nelson, D. L., and Cox, M.M. (2008). Lehninger Principles of Biochemistry, 5th Edition. WH Freeman & Company, New York
3. Widmaier, E. P., Raff, H., and Strang, K. T. (2013).Vander's Human Physiology, 13th Edition. McGraw-Hill Higher Education
4. Lodish, H., Berk, A., Kaiser, C. A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A., and Scott, M. P. (2012). Molecular Cell Biology, 7th Edition. W.H. Freeman.
5. Goswami, M. P. (2013). Endocrinology and Molecular Cell Biology.
6. Melmed, S., Polonsky, K., and Larsen, P. R. (2016) Williams Textbook of Endocrinology. Elsevier, 13th edition.
7. Negi and Chandra, S. (2009). Introduction to Endocrinology. Prentice Hall India Learning Private Limited.

LAS.599: Research Project (Part – II) **18 Credits**

Course Objective: The objective of research project (dissertation) part II would be to ensure that the student learns the nuances of the scientific research. Herein, the student will carry out the experiments to achieve the objectives as mentioned in the research project outline (synopsis). The data collected as a result of experiments must be meticulously analysed in light of established scientific knowledge to arrive at cogent conclusions.

Updated on: 29-1-2018