COURSE PROFILE

B.Sc., BIOTECHNOLOGY

From 2019 batch onwards

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
I	PART I	TAMIL / HINDI / FRENCH	TH	6	-	3 or 4		ALLM	TAM / ENG / FRE
	PART II	ENGLISH	TH	6	-	3 or 4		ALLM	ENG
	BTE1303FT	CELL BIOLOGY	LT	3	1	3	AZ 2017	SUBTE	BTE
	BTE1402CT	**ANIMAL DIVERSITY**	**LT**	**3**	**2**	**4**		**SUBTE**	**BTE**
		ALLIED COURSE	TH	5		4		SUBTE	CHE
	BTE1201FS	ENGLISH THROUGH BIOLOGY	TH	2		2	BA2018	SUBTE	BTE
	VBC1101FV	HEALTHY TRANSITION FROM ADOLESCENCE TO ADULTHOOD	TH	2		1	BA2018	ALLM	Centre for VE
	UIV1101FI	BIBLICAL ESSENTIALS FOR EMERGING ADULTS						AUCH/ SUCH	
		Total		**30**		**20 / 22**			
II	PART I	TAMIL / HINDI / FRENCH	TH	6		3 or 4			TAM / ENG / FRE

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
II	PART II	ENGLISH	TH	6		3 or 4			
	BTE2402CM	BIOCHEMISTRY	TH	4		4	AV2014	SUBTE	BTE
	BTE2202CP	BIOCHEMISTRY LAB	LA		4	2	BA2018	SUBTE	BTE
		ALLIED COURSE		5		4		SUBTE	CHE
	BTE2201FS	ANALYTICAL BIOLOGY	TH	2		2	BA2018	SUBTE	BTE
	BTE2201NI	ENVIRONMENTAL BIOLOGY	TH	2		2	AV2014	SUBTE	BTE
	VBC0102FV/ VBC0103FV	CIVIC EDUCATION / FAMILY LIFE EDUCATION	TH	1		1	AV2014	ALLM	Centre for VE
	UIV2101FI	BIBLICAL FOUNDATION FOR FAMILY LIFE					BA2018	AUCH/ SUCH	
		Total		**30**		**21 / 23**			

From 2018 batch onwards

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
III	BTE3402CM	PHYSIOLOGY	TH	4		4	BA2018	SUBTE	BTE
	BTE3403CM	MICROBIOLOGY	TH	4		4	BA2018	SUBTE	BTE
	BTE3502CM	DEVELOPMENTAL BIOLOGY	TH	5		5	AZ2017	SUBTE	BTE
	BTE3201CP	MICROBIOLOGY LAB	LA		4	2	AZ2017	SUBTE	BTE
	BTE3203CP	DEVELOPMENTAL BIOLOGY AND PHYSIOLOGY LAB	LA		3	2	AZ2017	SUBTE	BTE
		ALLIED COURSE	TH	5		4		SUBTE	MAT
		NON-MAJOR ELECTIVE	TH	2		2		ALLM	ALLM
		VOCATIONAL COURSE				2			
		LIBRARY		2				SUBTE	BTE
	VBC0102FV / VBC0103FV	CIVIC EDUCATION / FAMILY LIFE EDUCATION	**TH**	**1**		**1**	AV2014	ALLM	**Centre for VE**
	UIV3101FI	**CIVICS AND THE BIBLE**						**AUCH/ SUCH**	
		Total		**30**		**26**			

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
	BTE4401CM	IMMUNOLOGY	TH	4		4	AV2014	SUBTE	BTE
	BTE4501CM	PRINCIPLES OF GENETICS	TH	5		5	AV2014	SUBTE	BTE
	BTE4502CM	MOLECULAR BIOLOGY	TH	5		5	AV2014	SUBTE	BTE
	BTE4201CP	GENETICS LAB	LA		3	2	AV2014	SUBTE	BTE
	BTE4202CP	MOLECULAR BIOLOGY LAB	LA		4	2	AZ2017	SUBTE	BTE
	BTE4203CP	IMMUNOLOGY LAB	LA		3	2	AV2014	SUBTE	BTE

IV	NON-MAJOR ELECTIVE			2		2			
	BTE4201SP	LAB IN AQUARIUM MAINTENANCE	LA	2		2	AV2014	SUBTE	BTE
	VBC0202FV / VBC0203FV	HUMAN RIGHTS AND DUTIES / FOUNDATION COURSE ON WOMEN'S STUDIES	TH	2		2	AV2014 / AY2016	ALLM	Centre for VE
	UIV4201FI	HUMAN RIGHTS IN THE BIBLE						AUCH/ SUCH	
		Total		**30**		**26**			
V	BTE5401CM	IMMUNOTECHNOLOGY	TH	4		4	AW2015	SUBTE	BTE
	BTE5403CM	EVOLUTION	TH	5		4	AZ2017	SUBTE	BTE
	BTE5502CM	rDNA TECHNOLOGY AND BIOSAFETY	TH	5		5	AY2016	SUBTE	BTE
	BTE5201CP	rDNA AND IMMUNOTECHNOLOGY LAB	LA		4	2	AW2015	SUBTE	BTE
		INTERDISCIPLINARY COURSES	TH	4		4			
	BTE5201CM	INTRODUCTION TO RESEARCH METHODOLOGY	TH	2		2	AW2015	SUBTE	BTE
	BTE0601LM	SOLID WASTE MANAGEMENT	PR	4			AW2015	SUBTE	BTE
	VBC0202FV / VBC0203FV	HUMAN RIGHTS AND DUTIES / FOUNDATION COURSE ON WOMEN'S STUDIES	**TH**	**2**		**2**	AV2014 / AY2016	ALLM	**Centre for VE**
	UIV5201FI	**BIBLICAL PERSPECTIVES ON WOMEN**					**AUCH/ SUCH**		
			Total	**30**		**23**			

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
VI	BTE6202CP	INDUSTRIAL BIOTECHNOLOGY LAB	LA		4	2	AZ2017	SUBTE	BTE
	BTE6301CP	PLANT AND ANIMAL BIOTECHNOLOGY LAB	LA		5	3	AW2015	SUBTE	BTE
	BTE6401CM	PLANT BIOTECHNOLOGY	TH	4		4	AW2015	SUBTE	BTE
	BTE6402CM	ANIMAL BIOTECHNOLOGY	TH	4		4	AW2015	SUBTE	BTE
	BTE6403CM	INDUSTRIAL BIOTECHNOLOGY AND IPR	TH	4		4	AW2015	SUBTE	BTE
	BTE0601LM	SOLID WASTE MANAGEMENT	PR	**4**		6	AW2015	SUBTE	BTE
		INTERDISCIPLINARY COURSES	TH	4		4			
	VBC6101FV	**ENHANCING SOCIAL GRACE**	**TH**	**1**		**1**		**ALLM**	**Centre for VE**
	UIV6101FI	**BIBLICAL PERSPECTIVES ON LEADERSHIP**						**AUCH/ SUCH**	
			Total	**30**		**28**			

COURSES OFFERED TO STUDENTS OF OTHER DEPARTMENTS

NON-MAJOR ELECTIVE

Sem.	Course Code	Course Title	Course Type	Hrs. / Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
III	BTCB3201EI	FOOD SAFETY AND CONSUMERISM	TH	2		2	BA2018	SUALLM	BTE & COM
	BABT3201EI	MARKET DEVELOPMENT FOR BIOTECHNOLOGY PRODUCT	TH	2		2	AZ2017	SUALLM	BTE & BBA
IV	BTFD4201EI	SILK REARING AND PROCESSING TECHNOLOGY	TH	2		2	BA2018	SUALLM	BTE & FDS
	BTMA4201EI	DEMOGRAPHY AND VITAL STATISTICS	TH	2		2	BA2018	SUALLM	BTE & MAT

INTERDISCIPLINARY COURSES

Sem.	Course Code	Course Title	Course Type	Hrs. / Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				TH	LA				
V	BTIT5402DT	COMPUTATIONAL BIOLOGY	LT	3	1	4	AZ2017	SUBTE & SUITM	BTE & ITM
	BTMA5401DM	APPLICATION OF STATISTICS IN GENETICS	TH	4		4	AW2015	SUBTE & SUMAT	BTE & MAT
VI	BTPH6402DM	BIOMEDICAL INSTRUMENTATION	TH	4		4	BA2018	SUBTE & SUPHY	BTE & PHY
	BTIT6401DT	CLINICAL INFORMATICS	LT	3	1	4	BA2018	SUBTE & SUITM	BTE & ITM

Sem.	Course Code	Course Title	Course Type	Credits	Passed in Academic Council	Offered to	Offered by
II / III / IV / V / VI	BTE0401CD	AQUARIUM MAINTENANCE	TH	4	AU2013	ALLM	BTE
	BTE0403CD	BIOMATERIALS	TH	4	AQ2009 as BTE0321E	ALLM	BTE
	BTE0404CD	MOLECULAR TECHNIQUES	TH	4	AQ2009 as BTE0421E	ALLM	BTE
	BTE0406CD	**THE SCIENCE OF STEM CELLS**	**TH**	**4**		**ALLM**	**BTE**
	BTE0407CD	**BLUE BIOTECHNOLOGY**	**TH**	**4**		**ALLM**	**BTE**

SELF-LEARNING COURSES

BTE1303FT CELL BIOLOGY

(Lab cum Theory)

LEARNING OUTCOME : **3T + 1L Hrs/Wk**.

On successful completion of the course, the student will be able to

- relate the basic structure and function of a cell
- describe the structural organization of cells under microscopic observation
- apply techniques for the measurement and sectioning of cell

COURSE OUTLINE :

UNIT-I : FUNDAMENTALS OF A CELL AND BIO-MEMBRANES

10 Hrs.

Basic structure of prokaryotic and eukaryotic cells – structure and function of plasma membrane: models, peripheral and integral proteins– membrane transport mechanisms – passive transport (simple diffusion, facilitated diffusion & osmosis) and active transport (ion channels, exocytosis and endocytosis)

UNIT-II : SUBCELLULAR ORGANIZATION OF EUKARYOTIC CELLS

10 Hrs.

Subcellular organization: nucleus – nuclear pore complex – nucleoplasm-chromosomal organization, special chromosomes – polytene and lampbrush chromosomes (morphology & functional significance) – structure and function of mitochondria (Electron transport chain and ATP synthesis) and plastids

UNIT-III : INTRACELLULAR ORGANIZATION OF CELLS

8Hrs.

Intracellular membrane compartments – structure and function of ribosomes – endoplasmic reticulum – Golgi complex and lysosomes

UNIT-IV : CYTOSKELETAL STRUCTURES AND CELL MOTILITY

8Hrs.

Cytoskeletal structures – actin filaments– intermediate filaments-microtubules and centriole (structure and function) – the extra cellular matrix and cell to cell interactions – cell mobility: amoeboid, cell crawling – cilium– ultra structure and ciliary movement

UNIT-V : REGULATION OF THE EUKARYOTIC CELL CYCLE

9Hrs.

Cell division – stages and significance mitosis – mitotic apparatus – meiosis – cell cycle – phases – regulation and check points

EXPERIMENTS / LAB :

15Hrs

1. Microscope handling – Reading exercise: types – applications – advancements
2. Cell size measurement by Micrometry
3. Buccal epithelial cell measurement
4. Observation of membrane transport (osmosis)

5. Observation of giant chromosomes in chironomous larva
6. Observation of mitotic chromosomes using onion root tip
7. Observation of different stages of meiosis in grasshopper testis (simulation/preserved specimen)
8. Embedding and Sectioning of animal tissue (Demo)

TEXT BOOK(S)

Celis, J.E.(1998). *Cell Biology – A Laboratory Handbook*(2nd ed.). Volumes I, II, III and IV, UK, London: Academic Press Limited,. Print.

Alberts, B. and Lewis, B.D.J. Raff, M. Roberts, K. and Watson, D.(1989). *Molecular Biology of the Cell* (2nd ed.). New York: Garland Publisher,. Print.

Cooper, G. M. and Hausman (2007). *The Cell – A Molecular Approach* (4th ed.), Washington D.C: ASM Press,. Print.

Johnson, K.E. (1991).*The Medical Series for Independent Study- Histology and Cell Biology*, 2nd Ed, Maryland, Williams and Wilkins, Print.

Karp, G. (2005). *Cell and Molecular Biology – Concepts and Experiments* (4th ed.) USA, New Jersey: John Wiley and Sons Inc.Print.

Pappas, G.S. (1994). *Laboratory Manual of Histology*(2nd ed) England: Oxford,Wm. C.Brown Publishers,Print.

Sumner, A.T. and Sumner, B.E.H. (1969). *A Laboratory Manual of Microtechnique and Histochemistry*, Oxford: Blackwell Scientific Publications, Print.

John Davey and Michael Lord, J.(2003). *Essential Cell Biology: Cell Structure*: *(Practical Approach Series)* Vol 1 – OUP Oxford: Publisher, Print.

BTE1402CT ANIMAL DIVERSITY

(LAB CUM THEORY)

LEARNING OUTCOME:

3T + 2L hrs. / wk.

On successful completion of the course the student will be able to

- recognize the significance of biodiversity in the sustenance of ecosystems
- probe the diversity spectrum of animals
- create an awareness on basic aspects relevant to biodiversity

COURSE CONTENT:

UNIT I: Diversity 10 hrs.

Basic levels: Genetic diversity – species diversity – ecosystem diversity – agro-biodiversity – biodiversity at global level – India as a mega diversity country – biodiversity hot spots – loss of biodiversity – reasons for loss – habitat fragmentation – human population explosion – deforestation – pollution – conservation strategies – zoogeographical distribution.

UNIT II: Invertebrates 15 hrs.

Classification of animal kingdom – general characteristics of invertebrates – symmetry in animal organization – Phylum Protozoa – general characteristics – life cycle of *Plasmodium vivax* – Phylum Porifera – general characteristics – canal system in sponges – coral reefs – Phylum Coelenteratra – general characteristics – polymorphism in coelenterates – general characteristics of Phylum Platyhelminthes – Aschelminthes – parasitic adaptation of helminthes – general characteristics of Phylum Annelida (Earthworm) and Arthropoda (cockroach) – Echinodermata (Star fish) – water vascular system – general characteristics of Phylum Mollusca – economic importance of invertebrates.

UNIT III: Chordates I

10 hrs.

General characteristics of Chordates – classification – general characteristics of subphylum Hemichordata (Balanoglossus – tongue worm) – subphylum Urochordata and Cephalochordata and subphylum Vertebrata - general characteristics of Class

Amphibia (parental care in Amphibians) – Class Pisces (types of scales) and Class Reptilia (poisonous and non-poisonous snakes) – classification up to orders – economically important forms.

UNIT IV: Chordates II

10 hrs.

General characteristics – Class Aves – different modes of flight – flight adaptations – beak and feet modifications in birds – Class Mammalia (kinds of teeth) – adaptive radiation in mammals (aquatic and terrestrial) – classification of Aves and Mammalia up to order – economically important forms.

LAB: 30 hrs.

1. A study representative species from each phylum of the animal kingdom
2. Group work- Mounting of setae in earthworm
3. Group work- Appendages of prawn
4. Group work- Placoid scales in Shark.
5. Visit to a National Park/Zoo/Sanctuary/Hot spots/industrial vist to study diversity and conservation strategies.

TEXT BOOK(S):

Ayyar, E and Ananthakrishnan, T.N, (2002). *Manual of Zoology, Vol II Part II (Chordata)*, (4th ed.), Chennai: Viswanathan Publishers Ltd. Print.

Jordan, E.L and Verma, P.S, (1983). *Invertebrate Zoology*, (5th ed.), New Delhi: S. Chand and Company Ltd. Print.

Kumar, U and Asija. M.J. (2000). *Biodiversity – Principles and Conservation*, Jodhpur: Agrobios, Print.

Jordan, E.L and Verma, P.S, (1983). *Chordate Zoology*, (5th ed.), New Delhi: S. Chand and Company Ltd. Print.

REFERENCE BOOK(S):

Agarwal, K.C, (1996). *Biodiversity*, New Delhi: Agro Botanical Publishers, India. Print.

Bhamrah, K.J, (2001). *An introduction to birds*, (2nd ed.), New Delhi: Anmol publication Pvt Ltd. Print.

Grimmett, R., Inskpipp, C., Inskipp, T, (1999). *Birds of India Pakistan, Nepal, Bangladesh, Bhutan, Srilanka and the Maldives*, New Jersey: Princeton University Press, Print.

Kumar, H.D, (1999). *Biodiversity and Sustainable Conservation*, New Delhi: Oxford and IBH Publishing Private Ltd, Print.

Khan, T.I, (2001). *Global Biodiversity and Environmental Conservation*, Jaipur: Pointer Publishers, Print.

Kenneth, V and Kardong, G, (2007). *Vertebrates Comparative Anatomy, Function, Evolution*, (4th ed.), New Delhi: Tata McGraw- Hill Publishing Company Ltd, Print.

Raven, P.H., Johnson, G.B., Losos, J.B and Singer, S.R, (2005). *Biology,* (7th ed.), New Delhi: Tata McGraw- Hill Publishing Company Ltd, Print.

Rawlin, S.O, (1988). *Birds of Lady Doak Campus and Tallakulam area of Madurai*, Madurai: Lady Doak College Publication, Print.

Rajendran, P, (2008). *Butterflies of Lady Doak College campus*, Madurai: Lady Doak College Publication, Print.

Singh, M.P., Soma Dey, G and Bilay, S.S., (2004). *Conservation of Biodiversity and Natural Resources,* New Delhi: Daya Publishing House, Print.

Sinha, R.K. and Singh, D., (1999). *Global Biodiversity*, Jaipur: Ina Shree Publishers, Print.

Salim Ali, (2002). *The Book of Indian Birds*, (13th ed.), New Delhi: Oxford University Press. Print.

BTE1201FS ENGLISH THROUGH BIOLOGY

(Theory)

LEARNING OUTCOME:

2 hrs./wk.

On successful completion of the course the student will be able to

- develop her Vocabulary
- frame grammatically correct sentences
- improve her speaking and writing skills

COURSE CONTENT:

10 hrs.

UNIT I:

Vocabulary building: New words through prefix, suffix, antonyms and synonyms. Finding out the new words, its meaning from a suitable passage through solving a word grid and cross word puzzles.

UNIT II:

10 hrs.

Listening and speaking skills: Comprehending biographies of Naturalists and answering objective questions. Listening Activities (Pre and post listening; giving same questions before and after listening) Oral presentation of observed and compiled information of the flora and fauna of the campus with audio visual aids.

UNIT III:

10 hrs.

Reading and writing skills: Grammar exercises on articles, prepositions, tenses, active and passive voice, subject – verb agreement – Identify grammatical Errors. Read and understand poems on Nature, biographies of scientists and Discoveries and inventions in biology. Describing and Note making on animal diversity in the college, or Bird / Butterfly / Insect watchers Diary.

BOOKS FOR READING:

Taylor.G, (1992). *English conversation Practice*, New Delhi: Tata Mc Graw Hill Pub. Co. Ltd, Print.

Dr. Ravi chopra, (1992). *Vocabulary tests for Compettitions*, New Delhi: Cosmos Bookhive (Pvt.) Ltd., Print.

Gilmark. G.J,(1983). *Building your vocabulary*, Bombay: D.B.Taraporevala Sons & Co Private Ltd., Print.

Kamalesh Sadanand and Susheela Punitha, (2010). *Spoken English – A foundation course*, Part – I & II, Chennai: Orient Black Swan, Print.

Arlon P., (2011). *Animal Encyclopedia, First reference for young readers and writers*, London: Dorling Kindersely Ltd., Print.

Salim Ali, (2002). *The Book of Indian Birds*, (13th ed.), New Delhi: Oxford University Press, Print.

Rawlin S O., (1988), *Birds of Lady Doak Campus and Tallakulam area of Madurai*. Madurai: Lady Doak College Publication, Print.

Mohandoss P., (2005). *Trees of Lady Doak College Campus*, Madurai: Lady Doak College, Print.

Rajendran P., (2008). *Butterflies of Lady Doak College campus*, Madurai: Lady Doak College Publication, Print.

BTE2402CM BIOCHEMISTRY

(Theory)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- acquire a fundamental knowledge of the chemistry and functioning of the biomolecules
- recognize the mechanism of molecular interaction
- analyze the properties and significance of biomolecules

COURSE OUTLINE :

UNIT-I : CARBOHYDRATES **12 Hrs.**

Introduction to biomolecules - Structure, occurrence, and classification (review), physical

and chemical properties of monosaccharide, disaccharides and polysaccharides (Homo and Heteropolysaccharides), biological significance of carbohydrate-Glycolysis, TCA cycle, Pentose Phosphate pathway and Electron transport chain, oxidative phosphorylation

UNIT-II : AMINO ACIDS AND PROTEINS **12 Hrs.**

Structure and classification of amino acids (review). Physical and chemical properties of aminoacids, peptide bond formation, Ramachandran plot, role of amino acids in living system.Classification and structure of protein (review). Biological role of proteins-Urea cycle

UNIT-III : ENZYMES, COENZYMES AND COFACTORS **14 Hrs.**

Enzymes- classification, properties, nomenclature (IUB). Models on specificity of enzyme action, kinetics and factors affecting enzyme activity. Michaelis-Menten equation, Line Weaver-Burk Plot. Enzyme inhibition. Allosteric and feedback regulation. Vitamins as coenzymes, minerals as cofactors

UNIT-IV : LIPIDS **10 Hrs.**

Structure and functions of phospholipids, physical and chemical properties of fatty acid,classification of lipids-cholesterol, glycolipids and calciferol. Role of lipids in living system-ß-oxidation &□ -oxidation

UNIT-V : NUCLEIC ACIDS **12 Hrs.**

General Properties, structure and composition of nucleic acids. Conformation of DNA and RNA. Role of nucleic acid in biological system

TEXT BOOK(S)

Conn E.E., Stumpf P.K., Bruening G and Doi R.H, **Outlines of Biochemistry**, 5th Ed, Singapore, John-Wiley and Sons, 2004.

REFERENCE BOOK(S)

David L. Nelson and Michael M. Cox, **Lehninger Principles of Biochemistry**, 5th Ed, New York, W.H.Freeman and Company, 2004.

Donald Voet and Judith Voet, **Fundamentals of Biochemistry**, New Jersey, John Wiley Publications, 2006.

Jain J.L, **Fundamentals of Biochemistry**, New Delhi, S.Chand and Company Ltd, 2002.

Jeremy M. Berg, **Biochemistry**, New York, USA, W.H. Freeman & Company, 2007.

Lehninger L.A., Nelson D.L and Cox M.M, **Principles of Biochemistry**, 4th Ed, New York, Worth Publishers, 2005.

McKee T and McKee J.R, **Biochemistry-the Molecular Basis of Life**, 3rd Ed, U.S.A, Wm.C.Brown Publishers, 2003.

Murray K.R., Granner D.K., Mayer A.P and Rodwell V.W, **Harper's Biochemistry**, 25th Ed, California, Appleton and Lange, 2000.

Nicolas C. Price, **Fundamentals of Enzymology**, New York, Oxford Press, 2006.

Stryer L, **Biochemistry**, 5th Ed, New York, W.H.Freeman Publishers, 2003.

West E.S., Todd W.R., Mason H.S and Bruggen J.T.V, **Text Book of Biochemistry**, New Delhi, Oxford and IBH Publishing Co. Pvt. Ltd, 1995.

BTE2202CP BIOCHEMISTRY LAB

(LAB)

LEARNING OUTCOME: **4 hrs. / wk.**

On successful completion of the course, the student will be able to

- develop skills in the detection and estimation of various biochemical components
- adapt hands on skills on working principles of certain basic instruments
- apply vital testing procedures that can be carried out in clinical laboratories

COURSE CONTENT:

EXPERIMENTS / LAB: **60 hrs.**

1. Preparation of solutions–Reading Exercise
2. Measurement of pH – titration curve of Acetic acid

3. Qualitative analysis of amino acids
4. Estimation of Protein–Bradford's method
5. Qualitative analysis of Carbohydrates
6. Estimation of blood glucose level – O –Toluidine method
7. Separation of amino acids – Paper chromatography/TLC
8. Qualitative analysis of lipids
9. Assay of enzyme activity – Amylase
10. Estimation of nucleic acids–Diphenylamine method

REFERENCE BOOK(S):

Jayaraman. J., (2011). *Laboratory Manual in Biochemistry*, (2nd ed.), New Delhi: New Age International Publishers. Print.

Palanivelu. P., (2001). *Analytical Biochemistry and Separation Techniques – A Laboratory Manual for B.Sc. and M.Sc. Students*, (3rd ed.), Madurai: Kalaimani Printers. Print.

Palanivelu, (2004). *Analytical Biochemistry and Separation Techniques – A Laboratory Manual for B.Sc. and M.Sc., Students*, (4th ed.), Madurai: Kalaimani Printers. Print.

Plummer T. D, (1990). *An Introduction to Practical Biochemistry*, Europe: McGraw Hill Book Company. Print.

Ranjna Chawla, (2014). *Practical Clinical Biochemistry Methods and Interpretations,* (4th ed.), Jaypee Brothers Medical Publishers. Print.

Sadasivam. S, (1996). *Biochemical Methods*, New Age International. Print.

BTE2201FS ANALYTICAL BIOLOGY

(Theory)

LEARNING OUTCOME: **2 Hrs./Wk.**

On successful completion of the course, the student will be able to

- develop problem solving and analytical skills.

- write a good lab report based on observations.
- appropriately interpret and represent a biological data.

COURSE CONTENT:

UNIT I: PREPARATION OF SOLUTIONS 10 hrs.

Nomenclature used in preparation of chemical solutions – conversions in basic units of measurements (Percentage solution, normality, molarity, molality and parts per million. pHcalculation & buffers) -Solving simple problems.

UNIT II: QUANTITATIVE BIOLOGY 10 hrs.

Inheritance in Human traits– observation and recording of dominant & recessive traits, learn to draw a pedigree chart, understanding polygenic inheritance through - punnet square.

UNIT III: DATA INTERPRETATION IN BIOLOGY 10 hrs.

Measures of Central tendency - mean, median, mode, standard deviation and standard error. Graphical representation of biological data –line diagram,bar diagram, pie chart & histogram Survey and recording of data.

REFERENCE BOOK(S):

Hema Senivasan, Alamelu Ramakrishnan, and Valli Arunachalam, (2008). *Communicative Skills – a pratical approach*, New Delhi: Frank brothers and Co. Pub. Ltd., Print.

Misra B.N and Misra M.K, (1983). *Introduction to Practical Biostatistics*, Calcutta: Naya Prokash, Print.

Palanivelu P., (2004). *Analytical Biochemistry and Separation Techniques A laboratory manual for B.Sc. & M.Sc. students*, (4^{th} ed.), Madurai: Kalaimani Printers, Print.

BTE2201NI ENVIRONMENTAL BIOLOGY

(Theory)

LEARNING OUTCOME: **2 Hrs./Wk.**

On successful completion of the course, the student will be able to

- relate the basic concepts and principles of interrelationships between organisms and their environment
- describe the transfer of energy through ecosystems and material cycles
- predict the impacts of population growth, pollution and their management

COURSE OUTLINE:

UNIT-I : **7 Hrs.**

Introduction- Concepts and types of an ecosystem. Energy transfer patterns. Physical and chemical factors, biogeochemical cycles, resources-use and abuse

UNIT-II : **8 Hrs.**

Biological communities and species interactions: Community properties-critical factors, tolerance limits, niche, habitats, succession, species interaction- predation, competition, symbiosis and keystone species

UNIT-III : **7 Hrs.**

Population and related issues: Dynamics of population growth and factors influencing population. Pollution- types, sources, hazards and management. Types and sources of waste, management strategies (the three R's)

UNIT-IV : **8 Hrs.**

Biomes-Terrestrial biomes and aquatic ecosystems, ecotones and edge effect. Restoration and management- tools of restoration, principles and goals of ecosystem management

TEXT BOOK(S)

Cunningham W.P. and Saigo B.W, **Environmental Science**, 5th Ed, New York, WCB McGraw – Hill Publishers, 1999.

REFERENCE BOOK(S)

Cunningham W. P and Saigo B. W, **Environmental Science – A Global Concern**, 3rd Ed, London, Wm.C.Brown Publishers, 1995.

Kormondy E.J, **Concepts of Ecology**, New Delhi, Prentice-Hall of India Pvt. Ltd, 1989.

Miller T.G (Jr.), **Living in the Enviroment – Principles**, 9th Ed, USA, Connections and Solutions Wadsworth Publishing Company, 1996.

Odum E.P, **Fundamentals of Ecology**, 3rd Ed, London, W.B. Saunders Company, 1971.

Pathade G.P and Goel P.K, **Environmental pollution and management of waste waters by microbial techniques**, Jaipur, En, ABD Publishers, 2001.

BTE3402CM PHYSIOLOGY

(Theory)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- recall the various functions of the organ systems
- discuss the importance of homeostasis in living organisms
- demonstrate the interdependence of various organ system

COURSE OUTLINE :

UNIT-I : DIGESTION **11 Hrs.**

Nutrition – (Review), Physiology of digestion and digestive glands in human, regulation of blood glucose level

UNIT-II : RESPIRATION **12 Hrs.**

Mechanism – Transport and Exchange of gases - Control of respiration. Circulatory – Cardiovascular system –Blood, Blood vessels, Heart, Vascular circuitry- Blood pressure- lymphatic system.

UNIT-III : EXCRETION **11 Hrs**.

Excretion and Water balance- Kidney and its function- Urine formation, hormonal regulation

UNIT-IV : ENDOCRINE SYSTEM **13 Hrs.**

Endocrine system – Pituitary- Hypothalamus- Endocrine glands – structure and functions. Deficiency disorders (Goitre, cretinism), Hormonal regulation in Reproduction – Reproductive organ (male and female)

UNIT-V : NEUROMUSCULAR SYSTEM **13 Hrs**.

Central nervous system- peripheral and autonomous nervous system - neuron & impulse conduction, neurotransmitters-neuromuscular junction. Receptors - Types-sensory and motor, skeletal muscles - contractile machinery. Thermoregulation.

TEXT BOOK(S)

Strand F.L, Physiology – A Regulatory Approach System, Macmillan Meerut, (Chapters 7-12, 14-18, 21,22, 25), Meerut, Publishing Company, 1983.

REFERENCE BOOK(S)

Curtis H and Barnes N.S, Biology of organisms –Part –II, 5th Ed, New York, worth publishers, 1968.

Gray A T., Kevin T., Mosby P, Anatomy and Physiology, 6th Ed., Elsevier, USA, 1987.

Knut Schmidt-Nielson, Animal Physiology – Adaptation and Environment, New Delhi, Manas Saikia for Cambridge Univeristy Press India PVT. LTD, 1997.

Rastogi SC, Essential of Animal Physiology, 4th Ed, New Delhi, New Age International Pvt. Ltd publishers, 2010.

Sherwood L., Klandorf H and Yancey P.H, Animal Physiology, Singapore, Thomson Books /Cole, A division of Thomson Learning, 2005.

Swart I F, Human Physiology, WMC brown Communications, USA, Dubuque, 1984.

Veena Mehata Ahuja, Text book of Medical Physiology, 2nd Ed, New Delhi, Ane books Pvt. Ltd, 2011.

BTE3403CM MICROBIOLOGY (Theory)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- describe the classification of microorganisms
- appraise the diversity of microbial structures and their role
- analyse the importance of microbes in human health

COURSE OUTLINE :

UNIT-I : INTRODUCTION TO MICROBIOLOGY **12 Hrs.**

History, scope of microbiology. Systematic nomenclature, identification of microbes, Photosynthetic bacteria. Ultra structure of prokaryotic cell, flagella and cell wall structure, peptidoglycan synthesis, inclusion bodies – endospore

UNIT-II : MAINTENANCE OF MICROBIAL CULTURE **12 Hrs.**

Sterilization techniques – Physical and chemical methods. Antimicrobial agents: General characteristics, mechanism of action – antibacterial (penicillin, tetracycline, sulfonamides), antifungal, antiviral drugs, drug resistance- MDR.

UNIT-III : MICROBIAL NUTRITION AND GROWTH **12 Hrs.**

Nutritional requirements, culture media, isolation of pure culture, growth curve – measurement of microbial growth, factors affecting growth: Batch, fed batch and continuous culture; Microbial metabolism- ED pathway, Fermentation, Nitrogen fixation, Photosynthesis

UNIT-IV : VIROLOGY **12 Hrs.**

General characteristics and Classification of viruses- life cycle of Bacteriophages; T4, Lambda & M13, Plant viruses (TMV, CMV) and animal viruses (Retroviruses, Hepatitis virus) - Viroids and Prions.

UNIT-V : MICROBIAL DISEASES **12 Hrs.**

Normal microflora in human, microbial diseases: Typhoid, tuberculosis, leprosy, hepatitis and AIDS. Food Microbiology: Microbial growth and food spoilage, food borne diseases (Botulism, Salmonellosis) and control of food spoilage

TEXT BOOK(S)

Pelczar M.J., Schan E.C and Krieg N.R, Microbiology Concepts and Applications, 5th Ed, Boston, Mc Graw Hill Inc, 2004.

Prescott L.M., Harley K.P and Klein D.A, Microbiology, 7th Ed, Boston, Mc Graw Hill Inc, 2008.

REFERENCE BOOK(S)

Alcamo I.E, Microbiology, , New Delhi, Tata McGraw – Hill Publishing Company Limited, 1998.

Banwart G. J, Basic Food Microbiology, 2nd Ed, New Delhi, CBS Publishers, 1998.

Caldwell D.R, Microbial Physiology and Metabolism, USA, W.M.C. Brown Publishers, 1995.

Ingraham J. L, Introduction to Microbiology, 2nd Ed, Bangalore, Thomson Books, 2000.

Nayudu M.V, Plant Viruses, New Delhi, Tata McGraw – Hill Publishing Company Limited, 2008.

Persing D.H., (editor), Molecular Microbiology – Diagnostic Principles and Practice, Washington, ASM Press, 2003.

Shimeld L. A, Essentials of Diagnostic Microbiology, London, Delmer Publishers, 1999.

Talaro K.P and Talaro, Foundation in Microbiology, 4th Ed, Boston, A Mc Graw Hill Inc, 2002.

Tauro P., Kapoor K.K and Yadav K.S, An Introduction to Microbiology, New Delhi, Wiley Eastern Ltd, 1996.

BTE3502CM DEVELOPMENTAL BIOLOGY

(Theory)

LEARNING OUTCOME: 5 Hrs/Wk.

On successful completion of the course, the student will be able to

- describe the various stages during development
- evaluate the orchestral link in the developmental process
- interpret the principle behind abnormalities in the developmental biology

COURSE OUTLINE:

UNIT-I: GAMETOGENESIS AND FERTILIZATION 15 Hrs.

Introduction: Historical perspectives – Scope – Classical and Modern Embryology – model organisms; Gametogenesis: primordial germ cells – spermatogenesis and oogenesis – previtallogenesis. Fertilization: types – metabolic changes during fertilization – cortical reaction – amphimixis.

UNIT-II: CLEAVAGE AND FATE MAP 15 Hrs.

Types of cleavage- based on types of oocytes – amount, distribution of yolk – polarity in egg – and morula. Factors affecting cleavage and changes in the cleaving cells – Fate map of frog and its significance.

UNIT-III: GASTRULATION 15 Hrs.

Process of gastrulation – types of morphogenetic movements and their mechanism – Signal transduction. Wing signaling in *Drosophila* – Notch signaling – Organizer concept with experimental evidences – molecular mechanisms of action.

UNIT-IV: ORGANOGENESIS **15 Hrs.**

Morphogenetic movements – organizers and inducers. Neurogenesis – formation of notochord and derivatives of germ layers – Organogenesis in mammal – Eye, heart and limb.

UNIT-V: PLACENTATION AND DEVELOPMENTAL DISORDERS **15 Hrs.**

Placentation – Types of placenta – extra embryonic membranes & significance – Polyembryony & twinning. Teratology – Congenital and neonatal disorders – In vitro fertilization – Germ bank – GIFT – test tube baby.

TEXT BOOK(S)

Balinsky B.I.(2012), *An Introduction to Embryology*, (5th ed.) Philadelphia: Holt-Saunders International. Print.

REFERENCE BOOK(S)

Berril, N.J. (1980). *Developmental Biology.* New Delhi, India:Tata McGraw Hill Company Ltd. Print.

Bradley, P.M. (1925). *The Early Embryology of the Chick,* (3rd ed.). Toronto: The Blakiston Company. Print.

Browder, L.W., Erickson, C.A. and Jeffery W.R. (1991). *Developmental Biology* (3rd ed.). London: Saunder College. Print.

Gilbert, S.F. (2010). *Developmental Biology* (4th ed.). Massachusetts, Sinauer Associates Inc, Sunderland. Print.

Wolpert, L. (2002). *Principles of Development* (2nd ed.). New York: Oxford University Press. Print.

BTE3203CP DEVELOPMENTAL BIOLOGY AND PHYSIOLOGY LAB

LEARNING OUTCOME: **3 Hrs./Wk.**

On successful completion of the course, the student will be able to

- evaluate the laboratory experiments in physiology
- demonstrate basic understanding of developmental mechanisms
- infer the process of development in vertebrates including frog and rat

COURSE OUTLINE:

EXPERIMENTS / LAB: **45 Hrs.**

1. Observation of live chick embryo – 24hrs, 48hrs, 72hrs & 96 hrs.

2. Observation of sperm motility of grasshopper testis.

3. Study of the developmental stages of live frog / Planaria / Earthworm.

4. Placentation type and the developmental stages of / rat / mouse / Zebra fish embryo.

5. Tadpole tail regeneration.

6. Analysis of nitrogenous wastes (ammonia, urea & uric acid).

7. Estimation of haemoglobin.

8. Determination of bleeding and clotting time, and ESR (Erythrocyte Sedimentation Rate).

9. Preparation and observation of haemin crystals.

10. Rate of oxygen consumption in fresh water fish.

11. Measurement of blood pressure by Sphygmomanometer.

REFERENCE BOOK(S)

Balinsky, B.I. (2012). *An Introduction to Embryology* (5^{th} ed.). Philadelphia: Holt-Saunders International. Print.

Bradley, P.M. (1925). *The Early Embryology of the Chick* (3rd ed.). Toronto: The Blakiston Company. Print.

Carlson, B.M. (1998). *Patten's Foundation of Embryology* (5th ed.). New Delhi: McGraw Hill Inc. Print.

Cruz, Y.P.(1993). *Laboratory Exercises in Developmental Biology* USA: Academic press. Inc. Print.

Keibel F, Mall F. P(1912). *Manual of Human Embryology* (2nd ed.). Philadelphia: Lippincott Company. Print.

Mukherjee, K. L.(1988). *Medical Laboratory Technology – a procedure manual for routine diagnostic tests* (3rd ed.). Volume 1. Tata McGraw Hill publishing company limited. Print.

Nigam, S.C. and Omkar. K. (2003). *Experimental Animal Physiology and Biochemistry* (1st ed.).India: New Age International (P) Limited. Print.

Pappas, G.S. (1994). *Laboratory Manual of Histology* (2nd ed). Oxford, England: Wm. C. Brown Publishers. Print.

Rastogi S.C. (1982). *Experimental Physiology* (2nd ed.).Wiley Eastern Limited. Print.

Sumner A.T. and Sumner B.E.H. (1969). *A Laboratory Manual of Microtechnique and Histochemistry*,
(1st.).Oxford, England: Blackwell Scientific Publications. Print.

BTE3201CP MICROBIOLOGY LAB

(Lab)

LEARNING OUTCOME : **3Hrs./Wk**.

On successful completion of the course, the student will be able to

- acquire the basic skills needed in microbiology lab

- describe techniques involved in the identification and growth of microbes
- employ the assay techniques in their research work

COURSE OUTLINE : **45Hrs.**

EXPERIMENTS / LAB :

1. Usage of lab accessories and its importance (pipetteman, eppendorf tubes, tips, screw cap vials)
2. Aseptic handling and storage (bottles, flasks, culture vessels, pipetting, pouring)
3. Maintenance and disposal of microbial strains
4. Media preparation for microbial culture
5. Isolation of pure culture – broth, agar slants, stab, plating and streaking
6. Sterilization methods – physical and chemical
7. Staining techniques (simple, Gram staining and endospore staining)
8. Estimation of growth – turbidometric method
9. Biochemical characterization of pure culture- IMViC test
10. Antibiotic sensitivity test

REFERENCE BOOK(S)

Brown.A, Benson's Microbiological Applications, Laboratory Manual in General Microbiology, 10th Ed, McGraw-Hill, 2006.

Cappucino J.G and Sherman N, Microbiology - A Laboratory Manual, 7th Ed, South Asia, Pearson Education Inc. and Dorling Kindersley Publishing Inc, 2008.

Garrity G.M, Bergey’s Manual of Systematic Bacteriology, 2nd Ed, New York, Springer Verlag, 2001.

Gunasekaran P, Laboratory Manual in Microbiology, New Delhi, New Age International (P) Ltd Publishers, 2002.

Holt J.G., Kreig N.R., Peter H.A., Stanley S.J.T and Williams S.T, Bergey's Manual of Determinative Bacteriology, Williams and Wilkins, A Maverly Company, Philadelphia, 1994.

Prescott L.M., Harley K.P and Klein D.A, Microbiology, 7th Ed, Boston, Mc Graw Hill Inc, 2008.

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BABT3201EI MARKET DEVELOPMENT FOR BIOTECHNOLOGY PRODUCT

(Theory)

LEARNING OUTCOME : **2 Hrs./Wk.**

On successful completion of the course, the student will be able to

- identify the commercial aspects of biotechnology
- develop themselves as effective professionals
- apply the management principles to sciences of biotechnology

COURSE OUTLINE :

UNIT-I : ENTREPRENEURSHIP IN BIOTECHNOLOGY CONTEXT

8 Hrs.

National & international status of biotechnology industries, Products – SCP – Spirulina, Biofertilizer – Azolla, herbal formulations, vermicomposting etc., – recycling and value addition

UNIT-II : BIOTECH ENTREPRENEUR BASICS

7 Hrs.

Qualities of a biotech entrepreneur, Industry trends, Raising capital – Financial Assistance by Government sectors- DST, DSIR, DBT, MSME, NSIC, special schemes to women entrepreneur - TREAD, Bank loans - The Small Industries Development Bank of India (SIDBI) – Mahila Udyam Nidhi & Mahila Vikas Nidhi, Venture capitalists (VC) and Private equity (PE) Ethical Issues – Regulation of Biotech industry

UNIT-III : BASIC MANAGEMENT PRINCIPLES

8 Hrs.

Introduction - Managerial Functions - Planning, Organizing, Staffing, Directing & Controlling; Levels of Management – Strategic, Tactical & Operational Managers; Managerial Roles, Qualities & Skills; Management Trends - Business Ethics

UNIT-IV : MARKETING MIX

7 Hrs.

Marketing – Meaning, Definition, Need & Significance – Marketing Mix – Product / Service – Characteristics; Pricing, Place – Channels of Distribution; Promotion

REFERENCE BOOK(S)

Harold Koontz, Heinz Weihrich & Ramachandra Aryasri A, **Principles of Management**, New Delhi, Tata McGraw-Hill Education, 2006.

Hine D., Kapeleris J, **Innovation and Entrepreneurship in Biotechnology, an International perspective-Concepts, theories & cases**, USA, Edward Elgar publishing Ltd, 2006.

Moussalli C and the staff of vault, **Vault career guide to biotech**, New Delhi, New Age International Publishers, 2006.

Philip Kotler, **Marketing Management**, New Delhi, Prentice Hall India, 2004.

Pisano G.P, **Science Business: The Promise, the Reality, and the Future of Biotech**, Boston, Harvard Business School Press, 2006.

Sherlaker S.A, **Marketing Management**, New Delhi, Himalaya Publishing House, 2004.

Tripathi P.C., Reddy P.N, **Principles of Management**, New Delhi, Tata McGraw Hill Publishing House Ltd, 2008.

WEBSITE(S) :

- http://www.dcmsme.gov.in/
- http://www.msmedi-chennai.gov.in/MSME/
- http://india.smetoolkit.org/india/en
- http://nenonline.org/
- http://shodhganga.inflibnet.ac.in/bitstream/10603/367/12/12_chapter4.pdf

BTCB3201EI FOOD SAFETY AND CONSUMERISM

(THEORY)

LEARNING OUTCOME: **2 hrs./wk.**

On successful completion of the course, the student will be able to

- evaluate the food safety and hazards
- propose the various types of food hazards
- apply the food safety and management systems

COURSE CONTENT:

UNIT I: FOOD SAFETY AND HAZARDS

7 hrs.

Definition, types of hazards – physical, chemical & biological with examples, management of hazards – temperature control, food storage & product design, factors affecting food safety – Importance of safe foods – impact on health, identification of food ad Ulterants

UNIT II: FOOD HYGIENE **8 hrs.**

Principles of hygiene and its relation to food preparation, sources of contamination – control methods using physical and chemical agents, personal hygiene, food handling habits, maintaining sanitation and quality of foods, food safety measures

UNIT III: CONSUMERS‟ CONCERNS ON FOOD

7 hrs.

Food safety and consumers‟ concerns – implications – Significance, Issues and Challenges – HACCP – Good Practices – Food Safety Education for Consumers- Consumer rights – Certifications mandatory for products – Case studies

UNIT IV: REGULATORY BODIES AND PRACTICES

8 hrs.

Regulatory bodies and practices – Food Safety and Standards Act of 2006 – Prevention of Food Adulteration Act, 1954 – Fruit Products Order, 1955 – The Food Safety and Standards Authority of India(FASSI) – Role of food and Consumer Protection Department – Role of Food industries, Food service sector, Government and NGOs – ethical consumerism – green consumerism. Identification of food marking – Case studies

REFERENCE BOOK(S):

Forsythe, S J, Microbiology of Safe Food, USA, Blackwell Science, Oxford,2000&Sons, 1987. Print.

Lawley, R., Curtis L. and Davis,J, The Food Safety Hazard, UK,, Guidebook , RSC publishing,

Cambridge, 2004. Print.

Mann J and Trueswell S.A, Essentials of human nutrition, 3rd Ed, USA, Oxford university press, 2002. Print.

Shakuntala M. N and Shadaksharaswamy M, Foods –Facts and Principles, 2nd Ed, New Delhi, New Age International Publishers, 2001. Print.

Suitor C.W and Crowley M. F, Nutrition –Principles and application in health promotion, 2nd Ed,

Philadelphia, J. B. Lippincott Co, 1984. Print.

WEBSITE(S):

http://www.fssai.gov.in/

BTE4401CM IMMUNOLOGY

(Theory)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- acquire the basic principles of Immunology
- relate the cellular and molecular bases of immune response
- analyze the role of immune system in enhancing human health

COURSE OUTLINE :

UNIT-I : ELEMENTS OF IMMUNITY **12 Hrs.**

Introduction to Immune system - innate and acquired immunity –humoral and cellular immunity; lymphoid organs – primary and secondary; immunogens and antigens, Antibody – structure characterization, and properties. Kinetics of antibody response

UNIT-II : BIOLOGY AND ACTIVATION OF B AND T **12 Hrs.**

LYMPHOCYTES

Identification and characterization of B & T cells. Organization and structure of MHC, antigen processing and presentation - MHC restriction, diversity, association of disease – activation of CD4 T cells – T&B cell cooperation; B cell activation, activation of CD8 cytotoxic T cells, cytokines, super antigens

UNIT-III : CONTROL MECHANISMS IN THE IMMUNE RESPONSE AND COMPLEMENT **12 Hrs.**

Classical and alternate pathways, biological activity, receptors, activation; Complement deficiencies

UNIT-IV : HYPERSENSITIVITY AND AUTOIMMUNITY **12 Hrs.**

Detailed study on Type I, II , III & IV –hypersensitivity reactions. Autoimmune diseases and immune deficiency disorders

UNIT-V : TRANSPLANTATION IMMUNOLOGY **12 Hrs.**

Transplantation – relationship between donor and recipient, allograft rejection; bone marrow transplantation, Graft Vs Host reactions, fetal-maternal relationships

TEXT BOOK(S)

Benjamini E., Sunshine G and Leskowitz S, **Immunology: A short course**, 5th Ed, New York, John Wiley &Sons - Inc, 2003.

REFERENCE BOOK(S)

Abbas A.K and Lichtman A.H, **Cellular and Molecular Immunology**, 5th Ed, Philadelphia, Saunder's Publishers, 2003.

Abbas A.K and Lichtman A.H, **Basic Immunology**, 2nd Ed, New Delhi, Elsevier Inc, 2004.

Chakravarthy A.K, **Immunology and Immunotechnology**, New Delhi, Oxford University Press, India, 2006.

Coleman R.M, **Fundamental Immunology**, 3rd Ed, USA, Wm.C.Brown Publishers, 1994.

Delves J.P., Martin J.S and Roitt I.M, **Roitt's - Essential Immunology**, 11th Ed, London,

Blackwellpublishers, 1996.

Goldsby R.A., Kindt T.J., Osborne B.A and Kuby J, **Immunology**, 5th Ed, New York, W.H. Freeman and Company, 2003.

Male D., Brostoff J., Roth D.B and Roitt I, **Immunology**, Canada, Mosby Elsevier Ltd, 2006.

Murphy K., Travers P and Walport M, **Janeway's –Immunobiology**, 7th Ed, London, Blackwell Publishers, 2007.

Murphy K., Travers P and Walport M, **Janeway's–Immunobiology**, 7th Ed, London, Blackwell Publishers, 2007.

Roitt I.M, **Essential Immunology**, 10th Ed, London, Blackwell Scientific Publishers, 2011.

Roitt I.M and Delver P.J, **Essential Immunology**, 10th Ed, London, Blackwell Pub, 2005.

Roitt M.,Brostoff and Male D.K, **Immunology**, 8th Ed, London, Gower Medical Publishing, 2013.

BTE4501CM PRINCIPLES OF GENETICS

(Theory)

LEARNING OUTCOME : **5 Hrs./Wk.**

On successful completion of the course, the student will be able to

- acquire knowledge about the basic principles of heredity
- assess the practical application of genetics
- review the various genetic disorders in man and animals

COURSE OUTLINE :

UNIT-I : CLASSICAL GENETICS **15 Hrs.**

Introduction to Mendelism: Mono and Di-hybrid ratios. Deviation from Mendelian ratios, gene interaction. Polygenic inheritance: Skin pigmentation on man, ear length in maize/wheat; Spotting in mice. Multiple alleles: Blood grouping in man; Coat color in rabbits; Pseudoallelism- Eye colour in Drosophila-Related problems.

UNIT-II : SEX DETERMINATION **15 Hrs.**

Bipotential nature of organisms, Role of external and internal environment, Chromosomal mechanisms, Gynandromorphism. Sex-linked inheritance: In man - color blindness and hemophilia. Linkage and crossing over, Genetic map. Maternal inheritance- coiling of shell, kappa particles, milk factor and plastid inheritance

UNIT-III : HUMAN GENETICS **18 Hrs.**

Simple Mendelian traits in man. Human pedigree: symbols applied- inheritance patterns. Chromosomal aberrations: their variation in number and structures. Inborn errors of metabolism; Hereditary disorders: their mode of inheritance and diagnosis

UNIT-IV : MICROBIAL GENETICS **15 Hrs.**

Mutation: Molecular basis of gene mutation; Types of gene mutation; Mutagens: types and their mode of action. Genetic recombination in Bacteria – Transformation, Conjugation and Transduction

UNIT-V: POPULATION GENETICS **12 Hrs.**

Hardy-Weinberg Law, factors affecting gene frequencies, congenital diseases Eugenics and Genetic counseling

TEXT BOOK(S)

Alice Marcus, **Human Genetics- An Overview**, New Delhi, Narosa publishing house Pvt LTD, 2010.

P.S Verma and V. K Agarwal, **Genetics**, New Delhi, S. Chand & company LTD, 2009.

Sinnot E. W., Dunn L.C and Dobzhansky T, **Principles of Genetics**, 4th Ed, New Delhi, Tata Mc Graw Hill Pub. Co. Ltd, 1973.

REFERENCE BOOK(S)

Brooker R, **Genetics: Analysis and Principles**, McGraw Hill International, 4th Ed, New York, 2008.

Busk D, **Molecular Genetics**, London, Collier- Macmillan Ltd, 1968.

Gardner E, **Principles of Genetics**, 5th Ed, Canada, John Wiley and Sons Inc, 1975.

Gardner E.H., Simmons M.J and Snustad D.P, **Principles of Genetics**, 8th Ed, Singapore,

John Wiley and Sons, 2007.

Hancock J.T, **Molecular Genetics**, 1st Ed, UK, Scion Publishing Limited, 2008.

Hartl D and Jones E.W, **Genetics - Principles and Analysis**, 4th Ed, London, Jones and Barlett Publishers, 1998.

Jorde L.B., Carey J.C., Bamshad M.J and White R.L, **Medical Genetics**, 3rd Ed, Missour, Elsevier Publications, 2007.

Maloy S.R., Cronan J.E and Freifelder D, **Microbial Genetics**, 2nd Ed, London, Jones and Barlett Publishers, 1994.

Snyder L and Champness W, **Molecular Genetics of Bacteria**, 3rd Ed, Washington, American Society for Microbiology, 2007.

Stent G.S and Calendar R, **Molecular Genetics - An introductory narrative**, 2nd Ed, New York, CBS Publishers and Distributors, 2004.

Strickberger W, **Genetics**, 5nd Ed, Boston, Macmillan Pub. Co. Inc, 1991.

BTE4502CM MOLECULAR BIOLOGY

(Theory)

LEARNING OUTCOME : **5 Hrs./Wk.**

On successful completion of the course, the student will be able to

- relate the central dogma of life at the molecular level
- interpret the various DNA damage and its safeguarding mechanisms
- evaluate the regulatory mechanisms in the flow of genetic information

COURSE OUTLINE :

UNIT-I : GENOME ORGANISATION **15 Hrs.**

Introduction –DNA as genetic material- Experimental evidences, structure of nucleic acids- Types –DNA and RNA, Genetic code. Prokaryotic and eukaryotic genome - C-value paradox, Structural organization of chromosome -Histones, Nucleosome – Cot kinetics, functional elements at molecular level, DNA Sequencing Methods.

UNIT-II : TRANSCRIPTION **15 Hrs.**

Basic principles – Process of transcription – Regulation of transcription – Positive & Negative control – lac operon and trp operon. Transcription in Eukaryotes– transcription by RNA Pol I, II & III. Transcriptional modifications of mRNA (5'CAP-3'Poly (A) tail

and splicing), t RNA and rRNA.

UNIT-III : TRANSLATION **15 Hrs.**

Process of Translation – Genetic code Initiation, Elongation and Termination, Eukaryotic protein synthesis and post translational modifications.

UNIT-IV : DNA REPLICATION **15 Hrs.**

Replication – Types- conservative, semi conservative and dispersive. Stages in Replication - Origin, termination– Enzymes involved in Replication, Mechanism in Replication-rolling circle, D-loop. Eukaryotic replication.

UNIT-V : REPAIR AND RECOMBINATION **15 Hrs.**

DNA Repair – types of DNA damage – causes direct reversal of DNA damage – Light repair and dark repair – Excision repair – Mismatch and recombination repair. Recombination – Models of Homologous recombination, Types of recombination.

TEXT BOOK(S)

Friefelder D, **Molecular Biology**, 2nd Ed, New Delhi, Narosa Publishing House, 1993.

REFERENCE BOOK(S)

Becker W.M., Kleinsmith L.J and Jeff Hardin, **The World of the Cell**, 4th Ed, San Francisco, The Benjamin/Cummings Publishing Company, 2000.

Cooper G. M and Hausman, **The Cell – A Molecular Approach**, 4th Ed, Washington D.C, ASM Press, 2007.

Karp G, **Cell and Molecular Biology – Concepts and Experiments**, 4th Ed, USA,, John Wiley and Sons Inc., New Jersey, 2005.

Lodish D.J and Baltimore D, **Molecular Cell Biology**, 2nd Ed, New York, Sci. American Books, W.H. Freeman & Comp, 1990.

Lodish H., Berk A., Zipursky S.L., Matsudaira P., Baltimore D and Darnell J, **Molecular Cell Biology**, 4th Ed, USA, W.H. Freeman & Company, 2000.

Malacirski G. M and Freifelder D, **Essentials of Molecular Biology**, 3rd Ed, Boston, Jones & Bartlett Pub. Inc, 1998.

Wolfe S.L, **An Introduction to Cell and Molecular Biology**, New York, Wadsworth

Publishing Company, 1995.

BTE4201CP GENETICS LAB

(Lab)

LEARNING OUTCOME : **3 Hrs./Wk.**

On successful completion of the course, the student will be able to

- explain the mechanism of inheritance and its practical applications
- identify the concept of basic Bacterial Genetics
- evaluate the Mendelian traits in population Genetics

COURSE OUTLINE :

EXPERIMENTS / LAB : **45 Hrs.**

DROSOPHILA GENETICS

1. Culture of Drosophila
2. Study of Drosophila- Isolation of virgin flies and observation of life cycle
3. Inheritance of eye color

HUMAN GENETICS

4. Simple Mendelian trait and pedigree analysis
5. Multiple alleles -blood grouping
6. Verification of Hardy-Weinberg's law using beads
7. Human karyotyping – analysis of Karyogram
8. Polygenic inheritance with reference to height and weight –statistical

MICROBIAL GENETICS

9. Bacterial mutagenesis-Chemical (NTG) and Physical (UV)-Survival Curve
10. Plasmid encoded antibiotic resistance in different strains
11. Conjugation and gene mapping
12. Phage titration using M13 phages

RREFERENCE BOOK(S)

Gardner E.H., Simmons M.J and Snustad D.P, **Principles of Genetics**, 8th Ed, Singapore,

John Wiley and Sons, 2007.

Jayaram K and Jayaraman R, **Laboratory Manual in Molecular Genetics**, New Delhi, Wiley Eastern Ltd, 1979.

Jayaraman K and Krishnaswamy S, **Genetics – Experiments with Drosophila**, Printed at Galaxy, Madurai, 1986.

Miller H.J, **A Short Course in Bacterial Genetics – A laboratory manual and handbook for E.coliand related Bacteria**, New York, Cold Spring Harbor Laboratory Press, 1992.

Sambrook J., Fritsch E.F and Maniatis T, **Molecular Cloning – A Laboratory Manual**, 2nd Ed, New York, CSH Pub, 1999.

Sambrook J., Fritsch E.F and Maniatis T, **Molecular Cloning, [3 volumes]**, New York, Cold Spring Harbor, 2012.

Tamarin R.H, **Principles of Genetics**, 7th Ed, New Delhi, Tata McGraw Hill Publishing Company Ltd, 2004.

BTE4202CP MOLECULAR BIOLOGY LAB

(Lab)

LEARNING OUTCOME : **4 Hrs/Wk.**

On successful completion of the course, the student will be able to

- relate the principles and protocols of various isolation techniques
- acquire hands on training in basic molecular separation techniques
- apply the skills in the field of research

COURSE OUTLINE :

EXPERIMENTS / LAB :

60 Hrs.

1. Cell fractionation by differential centrifugation
2. Isolation of genomic DNA from prokaryotic cells – *E. coli*
3. Isolation of genomic DNA from eukaryotic cells – mammalian tissues / plant cells
4. Isolation of total RNA from mammalian tissue/ yeast
5. Electrophoretic separation of DNA
6. Electrophoretic separation of RNA
7. Spectrophotometric estimation of DNA and RNA

8. Determination of Tm value of isolated DNA
9. Separation of macromolecules - sephadex chromatography (group work)
10. PCR (demo)

REFERENCE BOOK(S):

Boyer, R. (2000).*Modern Experimental Biochemistry (* 3rd ed.). New Jersey,US: Pearson Education Inc. Print.

Gardner, E.H, Simmons, M.J and Snustad, D.P, (2007). *Principles of Genetics* (8th ed.). Singapore: John Wiley and Sons. Print.

Glover, D.M and Hames, B.D. *(*1995). *DNA Cloning, Volumes I, II, III*, (2nd ed.). New York: IRL Press at Oxford University Press. Print.

Palanivelu, P. (2004). *Analytical Biochemistry and Separation Techniques – A laboratory manual for B.Sc. & M.Sc. students* (3rd ed.). Madurai: Kalaimani Printers. Print.

Plummer, T.D. (1990). *An Introduction to Practical Biochemistry* (4th ed.). Europe: Mc Graw Hill Book Company. Print.

Sawhaney, S.K and Singh Randhir. (2001). *Introductory Practical Biochemistry.* New Delhi: Narosa Publishing House. Print.

BTE4203CP IMMUNOLOGY LAB

(Lab)

LEARNING OUTCOME : **3 Hrs./Wk.**

On successful completion of the course, the student will be able to

- describe the basic principles and procedures of immunological techniques
- develop skills in basic immunological techniques
- design approaches for diagnosis and therapy

COURSE OUTLINE :

EXPERIMENTS / LAB : **45 Hrs.**

1. Animal handling - procedures (rearing & maintenance
2. Demonstration of repetitive bleeding technique and injection routes in fish
3. Preparation of antigens-soluble and cellular
4. Agglutination assay – direct and passive agglutination
5. Total RBC count

6. WBC differential count
7. Separation of lymphocytes from peripheral blood and counting in haemocytometer
8. Density gradient centrifugation of T and B-lymphocytes and separation by nylon wool column method
9. Hypersensitivity – footpad thickening in mice
10. Hemolysis – Complement Mediated

REFERENCE BOOK(S)

Garvey J.S., Cremer N.E and Sussdorf D.H, **Methods in Immunology**, 3rd Ed, London, Benjamin Cummins Publishing, 1983.

Hay F.C and Westwood M.R, **Practical Immunology**, 4th Ed, UK, Blackwell Publishing Company, 2008.

Hudson L and Hay F.C, **Practical Immunology**, 3rd Ed, London, Blackwell Publishing, 1989.

Talwar, G.P., Gupta, S.K, **A Handbook of practical and Clinical Immunology**, 2nd Ed, (Vol- I), New Delhi, CBS, 2008.

BTE4201SP LAB IN AQUARIUM MAINTENANCE

(Lab)

LEARNING OUTCOME:

2 Hrs./Wk.

On successful completion of the course, the student will be able to

- develop the techniques of rearing ornamental fishes
- investigate the factors influencing fish health
- apply the acquired knowledge in becoming an entrepreneur

COURSE OUTLINE :

EXPERIMENTS / LAB :

30 Hrs.

1. Introduction to setting up an aquarium
2. Identification of ornamental fishes -visit to an aquarium (packaging and transportation)
3. Aquarium plants and their types
4. Study on the Biology and behavior of the fish of interest
5. Natural fish feed- Culture and collection
6. Preparation of Artificial fish feed
7. Study on the factors influencing life in aquarium - Aeration and filtration
8. Handling of fish for laboratory studies

REFERENCE BOOK(S)

Axelord H.R and Vorderwinkler W, **Encyclopedia of Tropical Fishes – with special emphasis on techniques of breeding**, 28th Ed, USA, TFH Pub. Inc., New Jersey, 1988.

Bhamrah H.S Kavitha J, **An Introduction to Fishes**, 2nd revised Ed, New Delhi, AnmolPublicationPvt Ltd, 2001.

Biswas. S.P., J.N.Das, U.K.Sarkar and Lakra W.S, **Ornamental fishes of North East India : An Atlas**, Lucknow, NBFGR publication, 2007.

Escobal, Pedro Ramon, **Aquatic Systems Engineering: Devices and How They Function**, Ireland, Dimension Engineering Press, 2000.

Hemdal, Jay, **Advanced Marine Aquarium Techniques**, California, TFH Publications, 2006.

Noga, Edward, **Fish Disease: Diagnosis and Treatment**, UK, Wiley-Blackwell, 2000.

Saxena A, **Aquarium Management**, New Delhi, Daya Pub. House, 2003

Shammi Q.J and Bhatnagar S, **Applied Fisheries**, Jodhpur, Agrobios (India), 2002.

Srivastava C.B.C, **Aquarium – Fishkeeping**, 1st Ed, Allahabad, KitabMahal, 2002.

Vierke J, **Your Home Aquarium**, USA, TFH Publishing Inc.,New Jersey, 1991.

BTFD4201EI SILK REARING AND PROCESSING TECHNOLOGY

(THEORY)

LEARNING OUTCOME:

2 hrs. / wk.

On successful completion of the course, student will be able to

- acquire knowledge on the types of silk
- appraise the biology and process of rearing silkworm
- apply the technology and make fabric from silk
- appreciate the role of silk in fashion industry

COURSE CONTENT:

UNIT I: INTRODUCTION TO SERICULTURE

7 hrs.

History– types of silk: Tussar – Muga – Eri – recombinant silk – uses of silk. *Bombyx mo*ri – morphology – life cycle – silk gland – Mulberry – cultivation – pruning and harvesting – optimum conditions – diseases of mulberry.

UNIT II: SILK REARING TECHNOLOGY

8 hrs.

Rearing house – rearing appliances, rearing operations – optimum conditions for rearing – rearing methods – Filature operations – sorting cocoons – softening the sericins – cocoon marketing –byproducts of defective cocoon waste – classification of silk thread waste – filature – charka waste – spun silk – recombinant silk protein genes.

UNIT III: MANUFACTURING AND WET PROCESSING OF SILK

8 hrs.

Reeling the filaments – Manufacturing of silk yarn – throwing of silk – degumming of thrown silk – spun silk. Physical and chemical properties of silk yarn – Preparatory process of silk – degumming – bleaching – Dyeing – Yarn dyeing – fabric dyeing – tie and dye – dyes used for silk – Printing – Block printing and screen printing – Finishes of silk.

UNIT IV: SILK IN FASHION INDUSTRY

7 hrs.

Identification and Analysis of Silk Quality – Silk Mark – Silk clusters in India – Uniqueness of silk clusters – Accessories and silk products – Care and maintenance of silk– marketing strategies for silk products.

TEXT BOOK(S):

Ganga, G. and Sulochana Chetty, J., (2012). *An Introduction to Sericulture*. (2nd ed.), New Delhi: Oxford & IBH publishing Co. (P) Ltd. Print.

REFERENCE BOOK(S):

Krishna swami, S., Narasimhanna Suryanarayan and S.K., Kumararaj, S, (1998). *Silkworm Rearing*, New Delhi: Oxford & IBH publishing Co. (P) Ltd. Print.

Sonwalkar, T.N, (1992). *Handbook of silk technology*, New Delhi: Wiley eastern Ltd. Print.

Rangaswami, G., Narasimhanna, M.N. Kasiviswanathan, K. and Sastry, C.R, (1991). *Mulberry cultivation Sericulture manual* 1, New Delhi: Oxford & IBH publishing Co. (P) Ltd. Print.

Bernard, P. Corbman, (1983). *Textiles: Fiber to Fabric*. (6th ed.), International ed., Singapore: Print.

Koshy, T.D. (1993). *Silk exports and Development.* New Delhi: Ashish publishing house Print.

Roland Kilgus. (*2008). Clothing Technology from Fibre to Fashion.* (5th ed.), Neckartenzlingen: Print.

Staff and Students of SSMITT, (1991). *Fibre Science*. (5th ed.), Komarapalayam, Tamil Nadu: Print.

BTMA4201EI DEMOGRAPHY AND VITAL STATISTICS

(THEORY)

LEARNING OUTCOME **2 hrs. / wk.**

On successful completion of the course, the students will be able to

- identify appropriate methods of finding the fertility rate, reproduction rate and death rate
- analyze typical demographic patterns and their comparability across populations
- interpret the concept of demographic transition and its related effects on population expansion

COURSE CONTENT:

UNITI: POPULATION, DEVELOPMENT AND ENVIRONMENT

7 hrs.

Introduction – Concepts– definitions– relevance and measurement of population – Population trends in the twentieth century– Concepts of stable population– Population explosion – Threatened or real– distant or imminent – international aspects of population growth and distribution– Pattern – determinants and demographic effects of sex and age structure– Age pyramids and projections –Individual aging and population aging.

UNIT II: EFFECT OF POPULATION GROWTH AND HEALTH

8 hrs.

Concepts – impact and measures of components of population –Nuptiality– Fertility – mortality and morbidity. Life expectancy– Women empowerment and its demographic consequences–Reproductive Health – physiology of human reproduction – reproductive– importance of the study fertility in population dynamics – prevalence of RTI (reproductive tract infection)– STDs and HIV / AIDS; estimated levels and interventions. **Family Planning Methods–**Advantages / disadvantages– effectiveness- Survey on health status of College (critical analysis of data, correlation of factors and report preparation.

UNIT III: VITAL STATISTICS – FERTILITY RATE

8 hrs.

Introduction to vital statistics– importance of vital statistics– methods of obtaining vital statistics–Population census method– Registration method– Analytic method– measurement of fertility– crude birth rate– general fertility rate– specific fertility rate– total fertility rate.

UNIT IV: VITAL STATISTICS – REPRODUCTION RATE AND DEATH RATE 7 hrs.

Reproduction rate – gross reproduction rate – net reproduction rate – measurement of mortality –crude death rate – specific death rate – standardized death rate – life tables.

TEXT BOOK(S):

Odum, E. P., and Barrett, G. W. (1971). *Fundamentals of ecology* (Vol. 3). Philadelphia: Saunders Chicago. Print.

Park, J. E., and Park, K. (1997). *Textbook of social and preventive medicine*. Jabalpur: Banarsidas Bhanot Publishers. Print.

Manoharan .M, (2004). *Statistical methods*, Palani Paramount Publications Print. Chapter 15.

REFERENCE BOOK(S):

Ehrlich, P. R., and Ehrlich, A. H, (1972). *Population, Resources, Environment: Issues in Human Ecology*. San Francisco: WH Freeman. Print.

Hannan, M. T., and Freeman, J, (1977*). The Population Ecology of Organizations*. *American journal of sociology*, *82*(5), 929–964. Print.

Jhingan, M. L. Bhatt, B.K. and Desai, J.N, (2003). *Demography*. New Delhi: Vrinda Publications. Print.

Jones, M. L., and Swartz, S. L, (1984). *Demography and phenology of gray whales and evaluation of whale–watching activities in Laguna San Ignacio*. Baja California Sur, Mexico. Print.

Lee, Ronald D, (1994). *The Formal Demography of Population Aging, Transfers, and the Economic Life Cycle*. Demography of aging: 8–49. Print.

Sharma, R. K, (2004). *Demography and Population Problems*. Atlantic Publishers and Distributors. Print.

BTE5401CM IMMUNOTECHNOLOGY

(Theory)

LEARNING OUTCOME: **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- understand the aspects of clinical diagnostics and therapeutics based on immune reactions
- relate the technological application of immunological principles
- interpret the diagnostic outcome of immunological techniques based on antigen-antibody interactions

COURSE OUTLINE: **12Hrs**

UNIT-I: IMMUNOASSAY BASED ON ANTIGEN-ANTIBODY INTERACTIONS

Agglutination – haemagglutination, passive agglutination and bacterial agglutination. Precipitation –

Ouchterlony double diffusion, Mancini's Single Radial Immunodiffusion. Isolation of antibodies - Assays for complement, Immunoelectrophoresis, RIA, ELISA, Immunoblotting.

UNIT-II: IMMUNOCHEMICAL ASSAY: 12 Hrs.

Immunofluorescence – Direct and indirect fluorescent microscopy, Flow cytometry – T cell subset analysis , B cell analysis. Cell assays – Isolation of lymphocyte by density gradient, Effector cell assays – PFC, Lymphocyte stimulation test, C-M lympholysis, ELISPOT.

UNIT-III: HYBRIDOMA AND VACCINE TECHNOLOGY: 12 Hrs.

Monoclonal antibody production and enrichment, Chimeric antibody, Abzymes, Plantibodies, Immunotoxins and T cell hybridoma. Vaccine Technology: Types of vaccines – Classical and Modern, Anti-idiotypic and genetically engineered vaccines, DNA vaccines, Designer vaccines

UNIT-IV: EXPERIMENTAL ANIMAL MODEL 12 Hrs.

Types of Animal models – Inbred strains, SCID mice – Human mice, Congenic mice. Knock out and knock in technology- Adoptive transfer systems.

UNIT-V: IMMUNODIAGNOSTICS AND THERAPEUTICS 12 Hrs

Immunodiagnosis – infectious diseases, specific antibodies in the serum (eg) Anti HIV antibodies, Tumor diagnosis (eg) - fetoprotein. Immunotherapy – Passive immunization , specific and non specific immunostimulation , Immunotargetting for cancer therapy. Immunosuppression and Immunomodulation

TEXT BOOK(S)

Benjamini E., Sunshine G and Leskowitz S, *Immunology: a short course*, 3rd ed., New York: John Wiley& Sons, 1996.Print

Hay F.C and Westwood M.R Talwar G.P., and Gupta S.K, *Practical immunology*, *Handbook of Practical and clinical immunology*, 4th ed,2nd ed, UK: Blackwell Publishing Company, CBS Publishers & Distributors, New Delhi, 2006,2006. Print

REFERENCE BOOK(S)

Abbas A.K and Lichtman A.H, *Basic Immunology*, 2nd ed, New Delhi, Elsevier Inc, 2004. Print Austen F.K., Burkoff S.J., Rosen F.S and Strom B.T, *Therapeutic Immunology*, 2nd ed, USA, Blackwell Scientific Publishers, 2001. Print

Benny K.C.L, *Antibody Engineering – Methods and Protocols, Vol. 238*, New Jersey, Press

Inc, 2004. Print

Hudson L and Hay F.C, *Practical Immunology*, 3rd ed, London, Blackwell Publishing, 1989. Print Kuby J, *Immunology*, 3rd ed, New York: W.H. Freeman and Company, 1997. Print

Naga S and Narain R, *Immunobiotechnology*, New Delhi: Dominant Publishers and Distributors, 2004. Print

Rao C.V, *Immunology – A Text Book*, New Delhi:Narosa Publishing House, 2006. Print Roitt I. M., Brostoff and Male, *Immunology*, 2nd, 3rd and 4th ed, London, Gower Medical Publishing, 1989, 1994, 1995. Print

Roitt I.M and Delver P.J, *Essential Immunology*, 10th ed, London, Blackwell Pub, 2005. Print Stites D.P., Terr A.L and Parslow T.G, *Basic and Clinical Immunology*, Prentice Hall Publishing, Canada, 1994. Print

BTE5403CM EVOLUTION

(Theory)

LEARNING OUTCOME : **5 Hrs./Wk**.

On successful completion of the course, the student will be able to

- relate the concept of origin of life through the fossil records.
- analyze the evolutionary changes in a population
- apply the molecular phylogenetic tools in evolutionary studies

COURSE OUTLINE :

UNIT-I : ORIGIN OF LIFE **15 Hrs.**

The big bang and formation of Earth crust- continental drift-- geological time scale .Fossil: types and formation of fossils -radiometric and paleomagnetic dating- Origin of life: Theories- Urey &Miller's experiment- formation of coacervates, microspheres and macromolecules -origin of prokaryotes and eukaryotes.

UNIT-II : MECHANISM OF EVOLUTION **15 Hrs.**

Theories of organic evolution- Lamarckism- Neo Lamarckism- Darwinism- mutation theory- modern synthetic theory: Basic forces of evolution- primary and accessory- gene flow- random genetic drift - Bottle neck effect- Founder's effect –Isolating mechanisms : geographical and reproductive isolation- speciation-types, mechanism -patterns.

UNIT-III : VARIATION **15 Hrs.**

Genetic variation in population- polymorphism- types- genotype frequency- allelic frequency- - principle and application of Hardy Weinberg equilibrium- factors affecting Hardy Weinberg equilibrium -: Adaptive coloration and mimicry in animals. Co-evolution - plant- herbivore interaction, pollinator-flower interaction.

UNIT-IV : EVOLUTION OF SELECTED ANIMALS **15 Hrs.**

Levels of evolution Micro, macro , mega evolution and adaptive radiation in animals-. Evolution of Horses - Apes - Human Evolution- Biological and cultural evolution - Human line- up to Homo sapiens.

UNIT-V : MOLECULAR EVOLUTION: **15 Hrs.**

Phylogenetic analysis- tools for assessment of molecular evolution, DNA phylogeny: Molecular clock -Cytochrome C, Mitochondria, Protein phylogeny: Haemoglobin - Phylogenetic analysis-dendrogram.

TEXT BOOK(S)

Chattopadhyay, S. LIFE: Evolution, Adaptation and Ethology. 3rd ed. Kolkata: Books and Allied Pvt. Ltd, 2012.Print.

Hall, B.K. and Hallgrimsson, B. Strickberger's Evolution. 5th e., New Delhi: Jones and Barlett India. 2014Print.

REFERENCE BOOK(S)

Arora, M.P. Evolutionary Biology, 1st ed. New Delhi: Himalaya Publication House,1990.Print.

Futuyma, D.J. Evolution, 2nd ed. USA: Sinaer Associates. INC. Publishers, 2009. Print.

Jha, A.P. Genes and Evolution, 1st ed. New Delhi: MacMillan India Ltd, 1993. Print.

Ridley M, Evolution, 2nd ed. UK: Oxford university press, 2007. Print.

Ajay Paul, Text book genetics from genes to genome, 1st ed. NewDelhi: Chand publications, 2011. Print.

Savage, R.J.G. Mammal Evolution: An illustrated guide, Facts on file Inc, 1st ed. London: 1986. Print.

BTE5502CM rDNA TECHNOLOGY AND BIOSAFETY

(Theory)

LEARNING OUTCOME : **5 Hrs./Wk.**

On successful completion of the course, the student will be able to

- integrate the knowledge of gene cloning and expression
- apply rDNA technology in life science research.
- state the concept of bio safety in gene manipulation

COURSE OUTLINE :

UNIT-I : MOLECULAR TOOLS OF rDNA TECHNOLOGY: **15 Hrs.**

History- enzymes used in gene manipulation- restriction enzymes (types and nomenclature), DNA modifying enzymes- polynucleotide kinase, methyl transferase, Alkaline phosphatase, polymerases (DNA, RNA & Reverse transcriptase) and DNA ligases.

UNIT-II : VECTORS AND CLONING TECHNIQUES **15 Hrs.**

Salient features of an ideal vector- Plasmid derived cloning vectors- pBR322, pUC18/19, Phage derived vectors- lambda (Insertional and replacement vectors) & filamentous –

Advanced vectors - Cosmid, phagemid; expression vectors, pET based vectors, artificial chromosome vectors (BAC & YAC), shuttle vector

UNIT-III : CLONING STRATEGIES **15 Hrs.**

Construction of genomic and cDNA libraries, PCR and its applications. Construction of recombinant vector- ligation - cohesive ends, blunt end - linkers and adaptors, TA cloning. Introduction to host cell – transformation and in vitro packaging. Screening – immunochemical, hybridization techniques.-southern, northern, western

UNIT-IV : SEQUENCING METHODS **15 Hrs.**

Sanger's chain termination and Gilbert's chemical cleavage method of sequencing, Automated DNA sequencing, , Pyro sequencing, whole genome and Shot gun approach.

UNIT-V : BIOSAFETY FOR rDNA TECHNOLOGY: **15 Hrs.**

Bio safety – Risk groups (categories - I,II,III & IV) and safety guidelines - The Cartegena protocol - AIA - LMO - The Miami's group - compromise group - LMG. Regulatory bodies in India - RDAC,IBSC, RCGM, MEC, GEAC.

REFERENCES:

TEXT BOOK(S)

Brown, T.A. Gene Cloning and DNA Analysis, 5th ed, UK: Blackwell Scientific Publications, 2006. Print. Richard, J.Reece. Analysis of genes and genomes –: John Wiley and sons, 2004.Print

REFERENCE BOOK(S)

Channaraayappa. Molecular Biotechnology - Principles and Practices, Universities Press. India: Private Limited, 2006. Print.

Department of Biotechnology, Ministry of Science & Technology, Revised Recombinant DNA Safety Guidelines, New Delhi: Government of India, 1994. Print.

Mickloss, D.A and Frever, G.A. DNA Science - A First Course, New York: Cold Spring Harbor Laboratory Press, 2003. Print.

Primrose, S.B. and Twyman, R.M. Principles of Gene Manipulation and Genomics, 7th ed, New York: Blackwell Scientific Publications, 2006. Print.

Rateledge, C. and Kristiansen, B. Basic Biotechnology, New Delhi: Cambridge University Press, 2006. Print.

Sambrook, J. and Russell, D.W. A Laboratory Manual, New York: Cold Spring Harbor Laboratory Press, 2001. Print.

Walker, J.M. and Gingold, E.B. Molecular Biology and Biotechnology, 3rd ed, New Delhi: Panama Publishing Corporation, 2001. Print.

Young, M. and Howell, R. Comprehensive Biotechnology, 2nd ed Volumes I, II, III & IV Elsevier Publications.1985.Print.

Reference Websites

http://www.nature.com

http://www.neb.com/tools and resources/

http://www.genomenewsnetwork.org

http://www.science.org

http://www.highwirepress.org

http://www.ncbi.nlm.nih.gov/pubmed

http://dbtbiosafety.nic.in/

BTE5201CP rDNA AND IMMUNOTECHNOLOGY LAB

(Lab)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- develop skills related to gene cloning

- provide exposure with the gene cloning method and screening of recombinant clones
- understand the concepts of immunological techniques.

COURSE OUTLINE :

EXPERIMENTS / LAB : 60 Hrs.

1. Immunodiffusion and Immunoelectrophoresis
2. Gene cloning by PCR
    a. Isolation of plasmid DNA
    b. Restriction analysis –Agarose gel electrophoresis
    c. Preparation of competent cell
    d. Transformation & Blue white screening
3. Non - specific humoral assay – Lysozyme activity
4. Non-specific - Cellular assays
    a. Isolation of peripheral blood leucocytes
    b. Measurement of intracellular reactive oxygen species
    c. Measurement of intracellular reactive nitrogen species
    d. Measurement of peroxidase production
5. Dot blot
6. ELISA - Antibody response against a common fish pathogen

REFERENCE BOOK(S)

Garvey J.S., Cremer N.E and Sussdorf D.H, Methods in Immunology, 3rd ed, London:Benjamin /Cummins Publishing, 1983.Print

Glover D.M and Hames B.D, DNA Cloning, Volumes I, II, III, 2nd ed, New York: IRL Press at Oxford University Press, 1995.Print

Goldsby R.A., Kindt T.J., Osborne B.A and Kuby J, Immunology, 6th ed, New York:W.H. Freeman and Company, 2007.Print

Hay F.C and Westwood M.R, Practical Immunology, 4th ed, UK, Blackwell Publishing Company, 2006.Print
Hudson L and Hay F.C, Practical Immunology, 3rd ed, London:, Blackwell Publishing, 1989.Print
Miller J.H, A Short Course in Bacterial Genetics – A Laboratory Manual and Handbook for Escherichia coli and Related Bacteria, USA, Cold Spring Harbor Laboratory Press, 1992.Print
Sambrook J and Russel D.W, Molecular Cloning – A Laboratory Manual, Volumes I, II, III, 3rd ed, New York:Cold Spring Harbor Laboratory Press, 2001.Print

BTE5201CM INTRODUCTION TO RESEARCH METHODOLOGY

(Theory)

LEARNING OUTCOME : **2 Hrs./Wk.**

On successful completion
of the course, the student will be able to

- understand the basic concepts of research
- apply the theoretical knowledge of research in their project
- develop statistical to analyze the data while doing the research

COURSE OUTLINE :

UNIT-I : HISTORY OF RESEARCH **6 Hrs.**

Types of Research, Significance and criteria for good research - Research methods vs

Methodology; Research process – selecting a problem - designing the methodology of work – Research proposal.

UNIT-II : LITERATURE REVIEW 6 Hrs.

Primary, secondary and tertiary sources, modern developments in library services, Author card, Title card and subject card - e resources for research; Research Design - Experimental design - Hypothesis and null- hypothesis – Basic principle of experimental designs - Informal and formal experimental designs.

UNIT-III : SAMPLING TECHNIQUE 8 Hrs.

Random - non random sampling; Collection of data – Primary, secondary; survey - Questionnaire – schedule – Interview; Presentation of data - classification – types of data – tabulation – components of table - kinds of tables – Diagrammatic representation of data - bar, pie, picto and cartogram – graphs of frequency distribution – histogram, ogives.

UNIT-IV : ANALYSIS OF DATA 6 Hrs.

Descriptive measures – Measures of central tendency – Mean, Median, Mode; Measures of dispersion – Range – variance – standard deviation – coefficient of variation - coefficient of dispersion.

UNIT-V : RESEARCH REPORT PREPARATION 4 Hrs.

Sample title page, Acknowledgement, Table of contents, List of table, Main body of the report, reference materials.

TEXT BOOK(S)

Kothari C.R, *Research Methodology – Methods and Techniques*, Revised 2nd ed,

New Delhi: Wiley Eastern Ltd, 2004.Print

REFERENCE BOOK(S)

Adiseshiah W.T.V and Sulochana Sekar, *Educational and Social Research*, Coimbatore: Velan Pathipagam, 1977.Print

Bailey N.T.J, *Statistical Methods in Biology*, 3rd ed, UK, Cambridge University Press, 1994.Print

Ghosh B.N, *Scientific Method and Social Research*, 3 rd ed, New Delhi: Sterling Pub. Pvt. Ltd, 1992.Print

Gurumani, *Research Methodology for Biological Sciences*, Chennai, MJB Publishers, 2006.Print

Khan and Khanum, *Fundamentals of Biostatistics*, 2nd ed, Hyderabad: Ukaaz Publications, 2004.Print

Kurien C.T, *A Guide to Research in Economics*, Coimbatore, Rainbow Publications, 1985.Print

Mackenzie A, *Mathematics and Statistics for Life Scientists*, 1st ed, Noida, S.P.Printers, 2005.Print

Medawar P.B, *Advice to a Young Scientist*, Basic Books, USA, A Division of Harper Collins Publishers, 1979.Print

Saravanavel P, *Research Methodology*, Allahabad: Kitab Mahal, 1987.Print

Thanulingam N, *Research Methodology*, New Delhi: Himalaya Publishing House, 2000.Print

Vijayalakshmi M.N and Shenbagarathai R, *Research Methodology*, (ed.), Lady Doak College, Madurai, 2005.Print

Zar J.H, *Biostatistical Analysis*, 4th ed, Singapore, Pearson Education Pvt. Ltd, 1999.Print

BTIT5402DT COMPUTATIONAL BIOLOGY

(Lab cum Theory)

LEARNING OUTCOME: 3T + 1L Hrs. / Wk.

On successful completion of the course, the student will be able to

- recognize the concepts of genome and gene structure for developing algorithms in biological data mining
- acquire knowledge on basic programming skills in developing biological databases
- gain hands on skills in bioinformatics and implement them in analyzing biological sequences

COURSE OUTLINE:

UNIT-I: HIERARCHICAL CLASSIFICATION AND NUCLEIC ACIDS 12 T Hrs.

Hierarchical classification –binomial nomenclature –genomic organization in prokaryotes and eukaryotes –central dogma of life –Introduction to nucleic acid: DNA –genes (prokaryotic and eukaryotic gene structure) –RNA types and structure –role of rRNA in molecular phylogeny

UNIT-II: PROTEINS12 T Hrs.

Amino acids –classification –single letter code –peptide bonds –different levels of protein structure: primary, secondary, tertiary and quaternary –protein interactions (hydrophobic and hydrophilic, protein denaturation) –Introduction to protein structure determination (X-ray and NMR) –significance of protein structure prediction –Ramachandran plot

UNIT-III: INTRODUCTION TO PYTHON 7T + 5L Hrs.

Python and Biopython introduction-basic data types –operator and variables –error handling –classes and objects –Strings and numbers –reading and writing files –condition test –control flow –dictionary –regular expression –biopython packages

Lab:

1. Reading and parsing sequence files

2.Manipulating Biopython objects in sequence analysis

3.Writing sequences to file

4.Converting sequence file formats

5.Interacting with various sequence alignments and perform sequence analysis

6. Sequence similarity search

UNIT-IV: DATABASE CONNECTION –PYTHON7T + 5L Hrs. Interfacing with database –creating database –Insert, read, update and delete operations –Performing transactions with databaseLab:Designing Web page and Integrating with Database

UNIT-V: IMPLEMENTATIONOF BIOLOGICAL DATABASES 7T + 5L Hrs.

Designing a biological database –web site to access biological data –sequence analysis –interpretation –multiple sequence alignment

TEXT BOOK(S)

Attwood, T, Smith P.D.Jand Phukan S. (2007). Introduction to Bioinformatics (1sted.). New Delhi: Pearson Education Pvt. Ltd. Print.

Martin Jones. (2015) Python for Biologists: A Complete Programming Course for Beginners, Wiley publication. Print

REFERENCE BOOK(S)

Baxevanis, A.D and Ouellette B.F.F. (2006). Bioinformatics–A Practical Guide to the Analysis of Genes and Proteins,(3rded.). New York: John Wiley & Sons Inc. Pub. Print.

Gautham, N (2006). Bioinformatics Databases and AlgorithmsChennai: Narosa Publishing House. Print.

WEBSITE(S):

www.coursetalk.com/courses/fundamentals-of-perl-programming
nptel.ac.in/downloads/106108101/
http://www.nou.edu.ng/NOUN_OCL/pdf/edited_pdf3/CIT%20215%20Intro%20to%20Programming%20Languages.pdf http://www.digitalbiologist.com/2011/04/code-tutorial-getting-started-with-python.htmlhttp://biopython.org/DIST/docs/tutorial/Tutorial.html#htoc10http://pythonforbiologists.com/https://www.tutorialspoint.com/python/python_database_access.html

BTMA5401DM APPLICATIONS OF STATISTICS IN GENETICS

(Theory)

LEARNING OUTCOME: **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- comprehend the basic concepts in Statistics for biological data
- apply statistical science to solve the biological problems
- analyze data and interpret the results

COURSE OUTLINE:

UNIT-I : BASICS OF GENETICS 12 Hrs.

Genetics as a discipline in biology, Definition- phenotype, trait, inheritance, genotype, gene, loci, dominant, recessive, forward and reverse genetics Simple Mendelian traits and inheritance pattern- monohybrid and dihybrid ratio-Punnet Square method.

UNIT-II : PROBABILITY AND HEREDITY 12 Hrs.

Basic definitions and rules of probability– Laws of coincidence happening with reference to albinism- fraction, binomial and combination of two methods with respects to genetic variations- eye colour of drosophila, coat colour in rabbit.

UNIT-III : SAMPLING DATA &TESTING FOR GOODNESS OF FIT 12 Hrs.

Types of biological data- quantitative and qualitative data, nominal, ordinal and time series - discrete and continuous data.Introduction to sampling and hypothesis testing- Chi-square test- assumptions of validity of chi square test, Applications of Chi-square test- based on Hardy-

Weinberg equilibrium, linkage and recombination of genes- gene frequency, multiple alleles in blood grouping of man.

UNIT-IV : TEST OF SIGNIFICANCE (t- TEST) 12 Hrs.

Introduction, comparison of means of two small samples- student's t –test (paired and unpaired).Examples based on experimental biostatistics- comparing the varieties of two gamma irradiation effect on seed growth etc.

UNIT-V : TEST OF SIGNIFICANCE (ANOVA) 12 Hrs.

Multiple sample comparison by Analysis of variance (ANOVA) one and two way classification- case studies related to solving genetics problems.

TEXT BOOK(S)

Gurumani N., An introduction to Biostatistics, 2nd revised edition, Chennai: M.J.P Publishers, 2005. Print.

Khan and Khanum, Fundamentals of Biostatistics, 2nd edition, Hyderabad: Ukaaz Publications, 2004, Chapters: Unit III - 8.1, 8.2, 8.3, 8.4(8.4.2 – 8.4.4), Unit II - 9.1, 9.2(9.2.2- 9.2.4), Unit V - 9.3 & 9.4. Print.

Verma P.S and Agarwal V. K,Genetics, 9th edition, New Delhi: S. Chand & company LTD, 2009, Chapters: Unit I - 9, 10 & 11, Unit II - 16, 17 & 18, Unit III - 19 & 20. Print.

Sinnot E. W., Dunn L.C and Dobzhansky T, Principles of Genetics, 4th edition, New Delhi: Tata Mc Graw Hill Pub. Co. Ltd, 1973. Print.

Winchester A. M., Genetics, 3rd edition, Newyork: Oxford and IBH, 1967, Chapters: Unit I - 4, 5 & 6 , Unit II - 7 & 14. Print.

Zar J.H, Biostatistical Analysis, 4th edition, Singapore: Pearson Education Pvt. Ltd, 1999. Print.

REFERENCE BOOK(S)

Bailey N.T.J, Statistical Methods in Biology, 3rd edition, UK: Cambridge University Press, 1999. Print. Daniel WW, Biostatistics, 2nd Edition, New York: John Wiley & Sons, 1978. Print.

Lewis AE, Biostatistics, Chennai: Affiliated East West Press, 1971. Print.

Mackenzie A, Mathematics and Statistics for Life Scientists, 1st edition, Noida: S.P.Printers, 2005. Print.

Naren.KR.Dutta, Biostatistics, Practical approach, NewDelhi: 110002: Kanishka publisher, 2001. Print. Wardlaw A.C, Practical statistics for experimental biologists, 2nd Ed. London:Wiley, 2000. Print.

Garvey J.S., Cremer N.E and Sussdorf D.H, **Methods in Immunology**, 3rd Ed, London, Benjamin Cummins Publishing, 1983.

Hay F.C and Westwood M.R, **Practical Immunology**, 4th Ed, UK, Blackwell Publishing Company, 2008.

Hudson L and Hay F.C, **Practical Immunology**, 3rd Ed, London, Blackwell Publishing, 1989.

Talwar, G.P., Gupta, S.K, **A Handbook of practical and Clinical Immunology**, 2nd Ed, (Vol- I), New Delhi, CBS, 2008.

BTE4201SP LAB IN AQUARIUM MAINTENANCE

(Lab)

LEARNING OUTCOME:

2 Hrs./Wk.

On successful completion of the course, the student will be able to

- develop the techniques of rearing ornamental fishes
- investigate the factors influencing fish health
- apply the acquired knowledge in becoming an entrepreneur

COURSE OUTLINE :

EXPERIMENTS / LAB :

30 Hrs.

9. Introduction to setting up an aquarium
10. Identification of ornamental fishes -visit to an aquarium (packaging and transportation)
11. Aquarium plants and their types
12. Study on the Biology and behavior of the fish of interest
13. Natural fish feed- Culture and collection
14. Preparation of Artificial fish feed
15. Study on the factors influencing life in aquarium - Aeration and filtration
16. Handling of fish for laboratory studies

REFERENCE BOOK(S)

Axelord H.R and Vorderwinkler W, **Encyclopedia of Tropical Fishes – with special emphasis on techniques of breeding**, 28th Ed, USA, TFH Pub. Inc., New Jersey, 1988.

Bhamrah H.S Kavitha J, **An Introduction to Fishes**, 2nd revised Ed, New Delhi, AnmolPublicationPvt Ltd, 2001.

Biswas. S.P., J.N.Das, U.K.Sarkar and Lakra W.S, **Ornamental fishes of North East India : An Atlas**, Lucknow, NBFGR publication, 2007.

Escobal, Pedro Ramon, **Aquatic Systems Engineering: Devices and How They Function**, Ireland, Dimension Engineering Press, 2000.

Hemdal, Jay, **Advanced Marine Aquarium Techniques**, California, TFH Publications, 2006.

Noga, Edward, **Fish Disease: Diagnosis and Treatment**, UK, Wiley-Blackwell, 2000.

Saxena A, **Aquarium Management**, New Delhi, Daya Pub. House, 2003.

Shammi Q.J and Bhatnagar S, **Applied Fisheries**, Jodhpur, Agrobios (India), 2002.

Srivastava C.B.C, **Aquarium – Fishkeeping**, 1st Ed, Allahabad, KitabMahal, 2002.

Vierke J, **Your Home Aquarium**, USA, TFH Publishing Inc.,New Jersey, 1991.

BTFD4201EI SILK REARING AND PROCESSING TECHNOLOGY

(THEORY)

LEARNING OUTCOME:

2 hrs. / wk.

On successful completion of the course, student will be able to

- acquire knowledge on the types of silk
- appraise the biology and process of rearing silkworm
- apply the technology and make fabric from silk
- appreciate the role of silk in fashion industry

COURSE CONTENT:

UNIT I: INTRODUCTION TO SERICULTURE

7 hrs.

History– types of silk: Tussar – Muga – Eri – recombinant silk – uses of silk. *Bombyx mo*ri – morphology – life cycle – silk gland – Mulberry – cultivation – pruning and harvesting – optimum conditions – diseases of mulberry.

UNIT II: SILK REARING TECHNOLOGY

8 hrs.

Rearing house – rearing appliances, rearing operations – optimum conditions for rearing – rearing methods – Filature operations – sorting cocoons – softening the sericins – cocoon marketing –byproducts of defective cocoon waste – classification of silk thread waste – filature – charka waste – spun silk – recombinant silk protein genes.

UNIT III: MANUFACTURING AND WET PROCESSING OF SILK

8 hrs.

Reeling the filaments – Manufacturing of silk yarn – throwing of silk – degumming of

thrown silk – spun silk. Physical and chemical properties of silk yarn – Preparatory process of silk – degumming – bleaching – Dyeing – Yarn dyeing – fabric dyeing – tie and dye – dyes used for silk – Printing – Block printing and screen printing – Finishes of silk.

UNIT IV: SILK IN FASHION INDUSTRY

7 hrs.

Identification and Analysis of Silk Quality – Silk Mark – Silk clusters in India – Uniqueness of silk clusters – Accessories and silk products – Care and maintenance of silk– marketing strategies for silk products.

TEXT BOOK(S):

Ganga, G. and Sulochana Chetty, J., (2012). *An Introduction to Sericulture*. (2^{nd} ed.), New Delhi: Oxford & IBH publishing Co. (P) Ltd. Print.

REFERENCE BOOK(S):

Krishna swami, S., Narasimhanna Suryanarayan and S.K., Kumararaj, S, (1998). *Silkworm Rearing*, New Delhi: Oxford & IBH publishing Co. (P) Ltd. Print.

Sonwalkar, T.N, (1992). *Handbook of silk technology*, New Delhi: Wiley eastern Ltd. Print.

Rangaswami, G., Narasimhanna, M.N. Kasiviswanathan, K. and Sastry, C.R, (1991). *Mulberry cultivation Sericulture manual* 1, New Delhi: Oxford & IBH publishing Co. (P) Ltd. Print.

Bernard, P. Corbman, (1983). *Textiles: Fiber to Fabric.* (6^{th} ed.), International ed., Singapore: Print.

Koshy, T.D. (1993). *Silk exports and Development.* New Delhi: Ashish publishing house Print.

Roland Kilgus. (*2008). Clothing Technology from Fibre to Fashion.* (5^{th} ed.), Neckartenzlingen: Print.

Staff and Students of SSMITT, (1991). *Fibre Science*. (5^{th} ed.), Komarapalayam, Tamil Nadu: Print.

BTMA4201EI DEMOGRAPHY AND VITAL STATISTICS

(THEORY)

LEARNING OUTCOME **2 hrs. / wk.**

On successful completion of the course, the students will be able to

- identify appropriate methods of finding the fertility rate, reproduction rate and death rate
- analyze typical demographic patterns and their comparability across populations
- interpret the concept of demographic transition and its related effects on population expansion

COURSE CONTENT:

UNITI: POPULATION, DEVELOPMENT AND ENVIRONMENT

7 hrs.

Introduction – Concepts– definitions– relevance and measurement of population – Population trends in the twentieth century– Concepts of stable population– Population explosion – Threatened or real– distant or imminent – international aspects of population growth and distribution– Pattern – determinants and demographic effects of sex and age structure– Age pyramids and projections –Individual aging and population aging.

UNIT II: EFFECT OF POPULATION GROWTH AND HEALTH

8 hrs.

Concepts – impact and measures of components of population –Nuptiality– Fertility – mortality and morbidity. Life expectancy– Women empowerment and its demographic consequences–Reproductive Health – physiology of human reproduction – reproductive– importance of the study fertility in population dynamics – prevalence of RTI (reproductive tract infection)– STDs and HIV / AIDS; estimated levels and

interventions. **Family Planning Methods–**Advantages / disadvantages– effectiveness-Survey on health status of College (critical analysis of data, correlation of factors and report preparation.

UNIT III: VITAL STATISTICS – FERTILITY RATE

8 hrs.

Introduction to vital statistics– importance of vital statistics– methods of obtaining vital statistics–Population census method– Registration method– Analytic method– measurement of fertility– crude birth rate– general fertility rate– specific fertility rate– total fertility rate.

UNIT IV: VITAL STATISTICS – REPRODUCTION RATE AND DEATH RATE 7 hrs.

Reproduction rate – gross reproduction rate – net reproduction rate – measurement of mortality –crude death rate – specific death rate – standardized death rate – life tables.

TEXT BOOK(S):

Odum, E. P., and Barrett, G. W. (1971). *Fundamentals of ecology* (Vol. 3). Philadelphia: Saunders Chicago. Print.

Park, J. E., and Park, K. (1997). *Textbook of social and preventive medicine*. Jabalpur: Banarsidas Bhanot Publishers. Print.

Manoharan .M, (2004). *Statistical methods*, Palani Paramount Publications Print. Chapter 15.

REFERENCE BOOK(S):

Ehrlich, P. R., and Ehrlich, A. H, (1972). *Population, Resources, Environment: Issues in Human Ecology*. San Francisco: WH Freeman. Print.

Hannan, M. T., and Freeman, J, (1977*). The Population Ecology of Organizations*. *American journal of sociology*, *82*(5), 929–964. Print.

Jhingan, M. L. Bhatt, B.K. and Desai, J.N, (2003). *Demography*. New Delhi: Vrinda Publications. Print.

Jones, M. L., and Swartz, S. L, (1984). *Demography and phenology of gray whales and evaluation of whale–watching activities in Laguna San Ignacio*. Baja California Sur, Mexico. Print.

Lee, Ronald D, (1994). *The Formal Demography of Population Aging, Transfers, and the Economic Life Cycle*. Demography of aging: 8–49. Print.

Sharma, R. K, (2004). *Demography and Population Problems*. Atlantic Publishers and Distributors. Print.

BTE6202CP INDUSTRIAL BIOTECHNOLOGY LAB

(Lab)

LEARNING OUTCOME: **4 Hrs/Wk.**

On successful completion of the course, the student will be able to

- learn the basic principles of fermentation techniques
- develop skills in isolation of commercially important microbial cultures and enzymes
- apply basic analytical techniques to screen industrially important microorganisms

COURSE OUTLINE:

EXPERIMENTS / LAB:

60 Hrs

1. Isolation of commercially important bacteria (soil/cereals/bagasse).

2. Primary screening of amylases producing microorganisms.

3. Secondary screening of the selected microorganism.

4. Batch fermentation (demonstration).

5. Cell lysis by physical and chemical method.

6. Estimation of amylase enzyme.

7. Effect of pH and temperature on amylase enzyme activity.

8. Immobilization of amylase enzyme.

9. Detection of amylase activity by Zymogram.

REFERENCE BOOK(S)

Mansi, E.M, Bryce, C.F.A, Demain, A.L. and Allman, A.R. (2007). *Fermentation Microbiology and Biotechnology* (2nd ed.). New York: CRC press. Print.

Belter, P.A, Cussler, E.L. and Wei-Houhu H.U. (1998). *Bio separations – Downstream Processing for Biotechnology* (1st ed.). New York: Wiley Interscience Pub. Print.

Peter, F.S, Hall, S.J. and Whitaker (1995). A. *Principles of Fermentation Technology* (2nd ed.). London: Butterworth-Heinemann publishers Print.

Scopes, R.K. (1992). *Protein Purification - Principles and Practice (3rd ed.).* New York:Springer Print

Wiseman, A. (1999). *Handbook of Enzyme Biotechnology* (3rd ed.).Hemstead: Ellis Horwood Publications. Print.

BTE6301CP PLANT AND ANIMAL BIOTECHNOLOGY LAB

(Lab)

EARNING OUTCOME: **5 Hrs./Wl**

n successful completion of the course, the student will be able to

- understand the basic principles of aseptic techniques
- develop skills in the tissue culture techniques
- integrate applications of tissue culture with molecular biology

COURSE OUTLINE:

EXPERIMENTS/LAB: **75 Hrs.**

a) Plant Tissue Culture

1. Preparation of tissue culture media, sterilization and storage
2. Callus induction
3. Organogenesis, Micropropagation
4. Agro bacterium mediated gene transfer technique
5. Cell suspension culture
6. Extraction of secondary metabolites
7. Separation of secondary metabolites using TLC Animal Cell culture

b) **Animal Cell Culture**

8. Preparation of tissue culture media, sterilization and storage
9. Culturing of adherent and suspension cell lines.
10. Passaging of adherent and suspension cell lines.
11. Enumeration of cells – Determination of culture cell density using haemocytometer (trypan blue)

REFERENCE BOOK(S)

Freshney R.I, *Culture of Animal Cells – A Manual of Basic Techniques*, 6th ed, New Jersey, John Wiley & Sons, 2010. Print

Keshavachandran R and Peter K.V, *Plant Biotechnology – Methods in Tissue Culture and Gene Transfer*, Hyderabad: India, Universities Press (India) Private Limited, 2008. Print

Leach C.K, *In vitro cultivation of Animal cells*, 5th ed, New york, Butterworth and Heinnmamm Ltd, 1994. Print

Narayanaswamy S, *Plant Cell & Tissue Culture*, New Delhi, Tata McGraw– Hill Publishing Company, 1999. Print

Pareek L.K, *Trends in Plant Tissue Culture & Biotechnology*, Agrobios, Jodhpur, 2002. Print

Portner, R, *Animal Cell Biotechnology: Methods and Protocol*, 2nd Edition, New york, Humana Press, 2007. Print

Seidman LA & Moore CJ, *Basic Laboratory Methods for Biotechnology*, 2nd edition, Benjamin Cummings,San Francisco, 2009. Print

BTE6401CM PLANT BIOTECHNOLOGY

(Theory)

LEARNING OUTCOME: **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- understand the basic principles and techniques in tissue culture and plant genetic transformation.
- execute the gained knowledge in the conservation of indigenous and transgenic plants.
- integrate the applications of tissue culture techniques in the field of horticulture and seed industry.

COURSE OUTLINE :

UNIT-I : PLANT TISSUE CULTURE **12 Hrs.**

Historical outline – plant genome structures - plant tissue culture – media composition: Types of tissue culture - vegetative tissue culture: leaf, shoot and root culture – reproductive tissue culture: anther & ovary culture, embryo culture.

UNIT-II : METHODS OF PLANT TISSUE CULTURE **12 Hrs.**

Caulogenesis – organogenesis – embryogenesis – micropropagation - synthetic seeds– somaclonal and gametoclonal variation. Protoplast isolation– somatic hybridization– cybridization — agricultural applications.

UNIT-III : GENE TRANSFER TECHNOLOGY **14 Hrs.**

Direct gene transfer – particle bombardment, electroporation, microinjection; indirect gene transfer – Agrobacterium mediated gene transfer (Ti plasmid), viral vectors-properties of plant viral vectors (CaMV). Screening procedures, marker genes & reporter genes with reference to plant system and pCambia vector

UNIT-IV : PRODUCTION OF TRANSGENIC PLANTS **10 Hrs.**

Biotic stress - herbicide and pest resistance and abiotic stress tolerance- drought and salt tolerance. Applications of GM crops- Golden rice, Bt cotton: Current status of GM crops

in India (hopes and threats). Plant as a bioreactor for secondary metabolites- taxol, ginseng- Edible vaccine.

UNIT-V : PRESERVATION AND STORAGE **12 Hrs.**

Cryopreservation, confirmation of viability, stability of cryopreserved tissues and its implications in conservation of plant genetic resource. Germplasm storage- establishment of gene banks.

TEXT BOOK(S)

Chawla H.S, *Introduction to Plant Biotechnology*, 3rd Ed, New Delhi: Oxford and IBH Publishing, 2009.Print

Slater A., Scott N. W and Fowler M.R, *Plant Biotechnology – The Genetic Manipulation of Plants*, 2nd edition, UK: Oxford University Press, 2008.Print

REFERENCE BOOK(S)

Chawla H. S, *Introduction to Plant Biotechnology*, 2nd Ed, New Delhi, Raju Primlani for Oxford & IBH Publishing Co. Pvt Ltd, 2002.Print

Keshavachandran R and Peter K.V, *Plant Biotechnology – Methods in Tissue Culture and Gene Transfer*, Hyderabad, India, Universities Press (India) Private Limited, 2008, .NA Print

Narayanaswamy S, *Plant Cell & Tissue Culture*, New Delhi:Tata McGraw – Hill Publishing Company, 1999,NA.

Pareek L.K, *Trends in Plant Tissue Culture & Biotechnology*, Jodhpur, Agrobios, 2002,NA.Print

Trivedi P.C, *Plant Biotechnology – Recent Advances*,, New Delhi:Panima Publishing Corporation, 2000.Print

WEBSITE(S) :

http://www.amazon.in/Production-Agricultural-Improvement-Muhammad-Ashraf-ebook/dp/B00A27DMD8#reader_B00A27DMD8(ebook)

http://onlinelibrary.wiley.com/doi/10.1002/9780470282014.fmatter/pdf (ebook)

BTE6402CM ANIMAL BIOTECHNOLOGY

(Theory)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- infer the various cell culture techniques and its significance.
- review the use of transgenic animals in biotechnology research
- appraise the ethical and regulatory issues of biotechnology.

COURSE OUTLINE :

UNIT-I : CELL CULTURE TECHNIQUES **12 Hrs.**

Definition – history – principles – biology of cells in culture - cell markers – cellular morphology – Types of cells (adherent and suspension) , Cell culture – tissue culture – organ culture – cell lines & cell strains – Types, isolation and culturing of primary and secondary cell lines - sub culturing - growth kinetics of cells (specific growth rate). Source of cells – cell banks – Mechanical & biochemical equipments – Media. stock maintenance – safety guidelines.

UNIT-II : GENE TRANSFER AND EXPRESSION SYSTEM **12 Hrs.**

Methods of gene transfer techniques – Transfection – lipofection – electroporation, biolistic, microinjection – targeted gene transfer. Vectors– SV_{40} ,retroviral, and expression vector- baculoviral vector system. Screening and expression of transgenes-reporter genes for transient expression-marker genes.

UNIT-III : PRODUCTION OF TRANSGENIC ORGANISM **13 Hrs.**

Transgenic animal production and Assisted Reproductive Techniques (ARTs)-Transgenic cattle, chick, fish production and applications . Somatic cell nuclear transfer - Artificial insemination, embryo transfer, IVF, ICSI,embryo sex determination, embryonic stem cell transfer

UNIT-IV : RECOMBINANT PROTEIN PRODUCTION **12 Hrs.**

Insulin, interferon, factor VIII, tissue plasminogen activator, human serum albumin, erythropoietin, calcitonin. Medical applications – gene pharming – Gene therapy.

UNIT-V : BIOETHICS **11 Hrs.**

Principle, need for bioethics – ELSI - social, ethical, legal and religious barriers. Programs and organizations relating to bioethics.

TEXT BOOK(S)

Freshney R.I, *Culture of Animal Cells – A Manual of Basic Techniques*, 6th ed, New Jersey: John Wiley & Sons, 2010.Print

Shrivastava, A.K., Singh, R.K and Yadav, M.P, *Animal Biotechnology*, New Delhi: Oxford and IBH publishing co. pvt. Ltd, 2005.Print

Yadav, P.R, *Text Book of Animal Biotechnology*, 1st ed, New Delhi: DPH pvt. Ltd, 2009.Print

REFERENCE BOOK(S)

Glick B.R and Pasternack J.J, *Molecular Biotechnology, Principles and Applications of Recombinant DNA*, 3rd ed, U.K., Blackwell Science, 2003.Print

Purohit S. S and Mathur S.K, *Biotechnology – Fundamentals and Applications*, New Delhi, Agro Botanica Pub, 1999.Print

Ramadass.P, *Animal Biotechnology: Recent concepts and Developments*, India, MJP Publications, 2008.Print

Ranga MM, *Animal Biotechnology*, 3rd ed, Agrobios India , Jodhpur.India., 2007.Print

Sathyanarayanan U, *Biotechnology,* Kolkata: Books and Allied (P) Ltd, 2006.Print

Stanley S.A, *Bioethics*, Chennai:Wisdom Educational Service, 2008.Print

Yagasaki, K., Y. Miura, M. Hatori and Y. Nomura, *Animal Cell Technology: Basic and Applied Aspects,* Vol. 13, New York:Springer-Verlag, 2008.Print

BTE6403CM INDUSTRIAL BIOTECHNOLOGY AND IPR

(Theory)

LEARNING OUTCOME : **4 Hrs./Wk.**

On successful completion of the course, the student will be able to

- acquire knowledge on the industrial production of metabolites
- realize the importance of microorganisms in industries
- comprehend the concept of legal aspects regarding Intellectual Property Rights

COURSE OUTLINE :

UNIT-I : FERMENTATION PROCESS AND BIOREACTOR: **12 Hrs.**

Role of microorganisms in fermentation. Isolation, preservation and improvement of industrially important organisms. Upstream processing of fermentation Bioreactors– types, design, applications.

UNIT-II : Production of primary and secondary metabolites : **12 Hrs.**

Production of commercially important organic acids -citric acid and lactic acid,; amino acids- glutamic acid and Lysine, and alcohols- ethanol. Secondary metabolites: Antibiotics – penicillin, streptomycin, vitamins- B_{12}, riboflavin,β-carotene and steroids.

UNIT-III : Production of enzymes and other bioproducts: **12 Hrs.**

Production of industrial enzymes -proteases, amylases, biopesticides-*Bacillus thuringenesis,* biofertilisers-Rhizobium, biopolymers- xanthan gum.

UNIT-IV : Scale up and Downstream Processing: **12 Hrs.**

Strategy and applications Flocculation.flotation, filtration, centrifugation, chromatography, crystallization and precipitation, Fermentation.

UNIT-V : IPR **12 Hrs.**

Invention & creativity – importance, basic types of property (movable, immovable and intellectual), different kinds of protection system (patents, designs, labels, copyright, trademark, geographical indications). International convention acts – GATT, WTO, TRIPS, WIPO, and UPOV.

TEXT BOOK(S)

Presscott, Dunn, **"***Industrial Microbiology***"**, Agrobios (India), 2009.

REFERENCE BOOK(S)

Ganguli P, *Intellectual Property Rights Unleashing the Knowledge Economy*, New Delhi: Tata McGraw – Hill Publishing Company Ltd, 2001.Print

Mansi E.M.T.E.L, *Fermentation Microbiology & Biotechnology*, London, Taylor and Francis Group, 2002.Print

Murrey Moo and Young, **"***Comprehensive Biotechnology***"**, Pergamon. Second Edition, 2011.Print

Stanbury P.F and Whitaker A, *Principles of Fermentation Technology*, New Delhi: Volumes I, II, III & IVElsevier Publications, 1995.Print

Subbaram N.R, *Handbook of Indian Patent Law and Practice*, Chennai: S.Viswanathan (Printers & Publishers) Pvt. Ltd, 1998.Print

Wang D.K., Corney C.L., Demain A.L., Dunnil P., Humphrey A.E and Lilly M.D, *Fermentation and Enzyme Technology*, New York: John Wiley & Sons, 1980.Print

Cruger W and Crueger A,**"***Biotechnology: A Textbook of Industrial Microbiology***",**New Delhi**:** Panima Publishing Corporation, 1991.Print

BTIT6401DT CLINICAL INFORMATICS

(LAB CUM THEORY)

LEARNING OUTCOME: **3T+1L hrs. / wk.**

On successful completion of the course, the student will be able to

- acquire knowledge on basic programming skills in drug designing
- apply docking skills through open source software
- implement their knowledge in analyzing biological data

COURSE CONTENT:

UNIT I: CLINICAL INFORMATICS

9 hrs.

Data – data generation – generation of large scale molecular biology data – genome sequencing. Protein sequencing - NMR spectroscopy – X-ray diffraction and microarray(Review). Introduction – associated disciplines and recent advances – system biology – interactomics (PPI) – fluxomics – biomics – metagenomics – immunoinformatics – stemformatics – Scope – applications – limitations – Pathway database – KEGG – reactome – PANTHER – concept of pharmacogenomics.

UNIT II: BASIC PRINCIPLES IN DRUG DESIGNING

9 hrs.

Tools for drug discovery – chemical structure representation (SMILE and SMART) – Chemical databases – CSD – ACD – WDI – ChemBank – Drug Bank - hazardous chemical database and PUBCHEM – Molecular modeling of small molecules – introduction – molecular modeling functions – structure generation – structure visualization – conformation generation – molecular superposition – Pharmacology and toxicology – Pharmacodynamics and kinetics.

UNIT III: COMPUTER AIDED DRUG DESIGNING

9 hrs.

Introduction to CADD – rational drug design – factors contributing to drug design – drug design process – software for drug design – computers in drug design – computer simulation for drug design – drug design theory – success and failure of using computers in drug design – RACHEL software package.

UNIT IV: PHARMACOPHORE MODELLING AND DOCKING

9 hrs.

Introduction – pharmacophore modeling in Schrodinger – docking using open source software – Autodock suite overview – features – Installation – AutoDock tools – applications – macromolecule preparation – ligand preparation – AutoDock Steps – docking using AutoDock Vina – other docking algorithms – protein –protein docking.

UNIT V: APPLICATIONS OF PyRx

9 hrs.

Installation – environment – tools – configure PyRx to AutoDock – load a molecule and perform the following operations – hide a molecule – hide a particular chain – label a particular protein residue – add module in Isosurface – bounding Box – docking log files – creating clustering histogram –AutoDock ligand – dock using lead molecules (anti cancer, *Plasmodium falciparum* dihydrofolate reductase,human topoisomerase I).

EXPERIMENTS / LAB:

15 hrs.

1. Nucleic acid sequence analysis – promoter, terminator, ORF identification and detection of SNP
2. Protein sequence analysis: Hydrophobicity, amphipathicity, Transmembrane and secondary structure prediction – ExPAsy tools
3. Homology modeling – SWISSMODEL
4. Target identification and active site prediction – CASTp
5. Small molecule building – ChemSketch
6. Molecular Visualization – RasMol 2.7.5.2, SwissPDB viewer 4.10
7. Molecular docking using AutoDock 4
8. Molecular docking using PyRx

TEXT BOOK(S):

Andrew, R. L, (2001). *Molecular Modeling Principles and Applications* (*2nd* ed.). Pearson Education Limited. Print.

Cohen, N. C, (1996). *Guidebook On Molecular Modeling in Drug Design*. Academic Press. Print.

Karthikeyan, M. and Vyas, R, (2014). *Practical chemoinformatics*. Springer. Print.

Nag, A. and Dey, B, (2011). *Computer–aided drug design and delivery systems*. McGraw–Hill. Print.

REFERENCE WEBSITE(S):

http://www.acdlabs.com/resources/freeware/index.php

https://www.ncbi.nlm.nih.gov/orffinder/

https://molbiol–tools.ca/Promoters.htm

https://swissmodel.expasy.org/

http://www.acdlabs.com/products/draw_nom/draw/chemsketch/

http://sts.bioe.uic.edu/castp/

https://www.expasy.org/spdbv/

http://autodock.scripps.edu/faqs–help/tutorial

https://faculty.missouri.edu/~gatesk/Docking_Assignment.pdf

BTPH6402DM BIOMEDICAL INSTRUMENTATION

(THEORY)

LEARNING OUTCOME: **4 hrs./wk.**

On successful completion of course, student will be able to

- know the physiology of human system
- inquire the basic principle and mechanism of biomedical instruments
- relate the use of biomedical devices in monitoring the diseases

COURSE CONTENT:

UNIT I: CELLULAR MEASUREMENTS AND SURFACE CHARACTERIZATION **12 hrs.**

Cell structure and components – microscopy – light, resolution & magnification – light and dark field microscopy electron microscopy – cellular markers – confocal laser scanning microscopy – two photon excitation microscopy –image processing – single cell measurement – oculometer and fluorescence activated cell sorting (FACS).

UNIT II: MEDICAL IMAGING OF NEURO-MUSCULAR SYSTEM

12 hrs.

Anatomy and function of brain and neuron – resting and action potential – impulse conduction – brain waves – electroencephalography (EEG) – evoked potential – brain imaging – X ray, CT (Computed Tomography), magnetic resonance imaging (MRI) – nuclear imaging – muscular system – types of muscles – mechanism of muscle contraction and its types (isotonic and isometric) – neuromuscular junction – electromyography (EMG).

UNIT III: SENSORY AND BEHAVIORAL MEASUREMENTS

12 hrs.

Structure and function of eye (rods and cones, mechanism of photoreception & rhodopsin cycle) – visual field – eye pressure – ophthalmoscope – potential acuity meter (PAM) – vision enhancers (lens): anatomy of ear – mechanism of hearing and equilibrium – audiometry – otoscopy.

UNIT IV: ASSISTING AND THERAPEUTIC EQUIPMENTS IN CIRCULATORY SYSTEM 12 hrs.

Structure of heart – mechanism and conduction of heart beat – stethoscope – electrocardiogram (ECG) – ECG monitoring – electrograms – Blood vessels – types – circulation – blood pressure: direct and indirect measurement – vessel distension.

UNIT V: PULMONARY FUNCTION ANALYSER IN RESPIRATORY SYSTEM

12 hrs.

Structure of respiratory organ–lungs –principle of gas exchange – artificial respiration – heart – lung machine (HLM) – cardiac – pulmonary volume – measurement of pulmonary volume – spirometry – body plethysmograph – impedance plethysmography – inductance plethysmography.

TEXT BOOK(S):

Ahuja V.M., (2011). *Textbook of Medical Physiology*, (2nd ed.) New Delhi: Ane Books Pvt. Ltd. Print.

Guyton A.C., Hall J.E., (2001). *Textbook of Medical Physiology*, (10th ed.), New Delhi: W.B. Saunders company. Print.

Webster J.G., (2004). *Bioinstrumentation,* Singapore: John Wiley & Sons. Print.

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BTE0601LM SOLID WASTE MANAGEMENT

LEARNING OUTCOME:

On successful completion of the course, students will be able to

- analyze the existing environmental issues in the community

- apply related theoretical concepts to solid waste management
- becomes conscious and sensitive on the proper waste management, healthy environment and recycling of solid wastes.
- develop life skills to manage the current issues

PROJECTED BENEFITS OF THE COMMUNITY PARTNERS:

- People could live in a cleaner and healthier environment due to increased knowledge and awareness regarding impact of waste generation in the environment.
- Positive impacts can be observed in the transformation of their traditional habit of accumulating solid waste inside their houses to disposing of it at proper place.

SECTION II–THEMATIC CONCEPT: 15 Hrs.

THEORETICAL CONCEPT:Sources of Solid waste, Biodegradable an Non- biodegradable , Mode of disposal, Reduce reuse, recycle, restore ,renew and replenish the waste.

CLASSIFICATIONAL / ANALYTICAL CONCEPT: Analysis of generated solid waste, waste collection and storage, designing of suitable disposal methods, processing of waste for energy, resource recovery and recycling.

CO-RELATIONAL CONCEPT: The proposed idea will be analyzed by monitoring cleanliness of the environment, health status of the community and ground water contamination.

ACTIVITY MODULE:

1. Survey on waste generated in canteen, juice corner, animal house, and hostels
2. Focused group discussion and preparation of questionnaire
3. Treatment of solid waste – composting
4. Gardening
5. Art from waste
6. On the Spot Study

SECTION III: COMMUNITY ENGAGEMENT PROCESS - 105 Hrs.

The needy community will be identified based on the population, literacy and the students comfort to travel during the first phase of study. Guidance from the Corporation, Panchayat Union will be taken for identification process. Based on the need of the community, the research design for integrated waste management will be evolved with the help of guide, experts in the field and the local people. According to the research design, data will be collected in the form of survey, door to door inqui ry, local body meeting and personal communication. Appropriate statistical tools will be used. Suitable strategy will be executed for the benefit of the community. Final reflection of the student's service to community will be recorded and documented as photographs, videos, drafts. The final report will be presented for evaluation based on the suggested rubrics