Department of Botany & Microbiology

2018 – 2021 Batch – ODD and EVEN Semester (UG)

Sem.	Courses	Course Code	Course Title	Nature of the course (Theory / Lab / Lab cum theory)	Hrs./Wk.	Credits	Passed in
I	Foundation in Major	BOT1302FT	Algae And Fungi	L/T	3T + 1L	3	AV2014
	Core Course	BOT1402CT	Bryophytes, Pteridophytes and Gymnosperms	L/T	4T + 1L	4	AV2014
	Support Courses	BOT1403AT	Fundamentals of Botany	L/T	4T + 1L	4	BA2018
		ZOO1401AT	Animal Diversity	L/T	4T+1L	4	AV2014
	Core Communicative Skills	BOT1201FS	Communication Skills for Botany - I	T	2	2	AV2014
II	Core Course	BOT2502CM	Plant Systematics	T	5	5	AV2014
		BOT2202CP	Lab For Plant Systematics	L	3	2	AV2014
	Support Courses	CHE2403AT	Fundamentals of Chemistry for Biologist	L/T	3T+2L	4	AU 2013 as CHE2403SA
	Core Communicative Skills	BOT2201FS	Communication Skills For Botany - II	T	2	2	AV2014
	Environmental Elective	BOT2201NI	Biodiversity – Conservation and Management	T	2	2	AV2014
III	Core Course	BOT3401CM	Fundamentals of Microbiology	T	4	4	AW2015
		BOT3402CM	Biofertilizers and Plant Pathology	T	4	4	AW2015
		BOT3403CM	Plant Anatomy	T	4	4	BA2018
		BOT3404CM	Cell Biology	T	4	4	BA2018
		BOT3204CP	Lab for Fundamentals of Microbiology, Biofertilizers & Plant Pathology	L	3	2	BA2018
		BOT3203CP	Lab for Plant Anatomy and Cell biology	L	3	2	AW2015
	Support Courses	BOT3505CM	Biological techniques & Computer applications	L/T	4T+1L	4	AW2015
	Non Major Elective	BOCO3201EI	Green Practices in Production and Marketing	T	2	2	AV2014
		BOEN3201EI	Ecology and Literature	T	2	2	AV2014

		BOTA320IEI	Tamil and Botany	T	2	2	AV2014
	Vocational courses (only semester long programme if any)	BOT3203VI	Paper Recycling		2	2	AY2016
		BOT3202VI	Kitchen Garden and Organic Food Products		2	2	AY2016
IV	Core Course	BOT4405CM	Biochemistry	T	4	4	AW2015
		BOT4406CM	Plant Physiology	T	4	4	AW2015
		BOT4407CM	Horticulture	T	4	4	AW2015
		BOT4501CM	Developmental Botany & Plant Breeding	T	5	5	AW2015
		BOT4203CP	Lab for Biochemistry and Plant Physiology	L	4	2	AW2015
		BOT4204CP	Lab for Horticulture, Developmental Botany & Plant Breeding	L	3	2	AW2015
	Non Major Elective	BOMA4201EI	Mathematics in Plant Science	T	2	2	AV2014
		BOSS4201EI	Ecology and Society	T	2	2	AV2014
		BOEC4201EI	Nutrition Economics	T	2	2	BA2018
	Skill Based Subject	BOT4201SS	Herbal Cosmetics	T	2	2	AV2014
V	Core Courses	BOT5401CM	Genetics	T	4	4	AW2015
		BOT5402CM	Evolution & Palaeobotany	T	4	4	AW2015
		BOT5501CM	Environmental Biology & Applied Microbiology	T	6	5	AY2016
		BOT5202CP	Lab for Environmental biology & Applied Microbiology	L	4	2	AY2016
	Interdisciplinary Courses	BOZO5401DM	Biosafety & Bioethics	T	4	4	AW2015
		BOCH5401DT	Medicinal Phytochemistry	L/T	3T+1L	4	AW2015
	Introduction to Research Methodology	BOT5201CM	Introduction to Research Methodology	T	2	2	AW2015
	Life Frontier Engagement	BOT0602LM	Plants, Environment and Health		4		BA2018
		BOT0501PR	Academic Project				
VI	Core Courses	BOT6401CM	Applied Botany	T	4	4	AW2015
		BOT6501CM	Molecular	T	5	5	AY2016

			Biology				
		BOT6502CM	Biotechnology	T	5	5	AY2016
		BOT6201CP	Lab for Applied Botany	L	3	2	AW2015
		BOT6202CP	Lab for Molecular biology & Biotechnology	L	4	2	AW2015
	Interdisciplinary Course	BOZO6401DM	Forest & Wildlife Management	T	4	4	AW2015
		BOMA6401DM	Mathematical Applications in Life Sciences	T	4	4	BA2018
	Life Frontier Engagement	BOT0602LM	Plants, Environment and Health		5	6	BA2018
		BOT0501PR	Academic Project			5	
					Total =	**128/131**	

List of SELF-LEARNING COURSES offered in different semesters for the 2017 batch of students

Sem.	Course Code	Course Title	Credits	Passed in	Remarks (if any)
II, III, IV, V & VI	BOT0401CD	Interior Decoration	4	AU2013	
	BOT0402CD	Man and Microbes	4	AU2013	
	BOT0403CD	Plant and Universe	4	AU2013	

BOT1303FT ALGAE & FUNGI

LAB CUM THEORY

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

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

- describe the structure and reproduction of different forms of algae & fungi.
- understand the diversity, complexity and the economic value of algae & fungi
- prepare suitable microslides of selected life forms in algae & fungi

COURSE OUTLINE:

UNIT I : CLASSIFICATION (UPTO ORDER LEVEL) OF ALGAE, GENERAL CHARACTERISTICS AND ECONOMIC IMPORTANCE **10T hrs**

Classification of algae based on Fritsch, General characteristics of algae

Economic importance of Algae - food, medicine, biofertilizer, alginic acid and agar, Diatomite. Harmful effects of algae – Algal blooms & Cyanotoxins.

UNIT II : STRUCTURE AND LIFE CYCLE OF THE FOLLOWING **12T hrs**

Cyanophyceae – *Oscillatoria*

Chlorophyceae – *Volvox, Oedogonium*

Bacillariophyceae – Diatoms

Phaeophyceae – *Sargassum*

Rhodophyceae – *Gracilaria*

UNIT III : CLASSIFICATION (UP TO ORDER LEVEL) OF FUNGI, GENERAL CHARACTERISTICS AND ECONOMIC IMPORTANCE **10T hrs**

Classification of fungi by Alexopolous, General characteristics of fungi

Economic importance of fungi

Role of fungi in Medicine, Industry, Agriculture & food

Mycotoxins - Aflatoxins, mushroom toxins

UNIT IV: SALIENT FEATURES, STRUCTURE AND LIFE CYCLE OF THE FOLLOWING **13T hrs**

Phycomycetes - *Albugo*

Ascomycetes - *Saccharomyces*

Basidiomycetes - *Agaricus*

Deuteromycetes - *Cercospora*

Lichen:classification based on habitat, thallus, thallus structure – homothallic & heterothallic, reproduction – types, *Usnea*

UNITV: LAB **15hrs**

Microscopic observation of

Cyanophyceae – *Oscillatoria*

Chlorophyceae – *Volvox, Oedogonium*

Bacillariophyceae – Diatoms

Phycomycetes - *Albugo*

Ascomycetes - *Saccharomyces*

Deuteromycetes - *Fusarium*

Micropreparation of thallus of

Phaeophyceae – *Sargassum*

Rhodophyceae – *Gracilaria*

Basidiomycetes - *Agaricus*

TEXT BOOK:

Pandey B.P. (2010). *College Botany.* Volume I, New Delhi: S, Chand & Company Ltd. Print.

REFERENCE BOOKS:

Alexopolus, C.J. & Mims, C.W. (1979). *Introductory Mycology.* New Delhi: Wiley Eastern Limited. Print.

Pandey, S.N. & Trivedi, P.S. (2001). *A text book of Algae*. New Delhi: Vikas Publishing House Pvt. Ltd. Print.

Sharma, O.P. (2011). *Textbook of Algae*. New Delhi: Tata Mc Graw Hill- Publishing Co. Ltd. Print.

Smith G.M. (1986). *Cryptogamic Botany - Algae and Fungi* – (I). New Delhi: Tata Mc Graw Hill Publishing Co. Ltd, Print.

Vashishta, B.R., Sinha, A.K. & Singh, V.P. (2010). *Algae*. New Delhi: S, Chand & Company Ltd. Print.

Vashishta, B.R. & Sinha, A.K. (2010). *Fungi*. New Delhi: S, Chand & Company Ltd. Print.

BOT1402CT BRYOPHYTES, PTERIDOPHYTES & GYMNOSPERMS

LAB CUM THEORY

LEARNING OUTCOME: **4T+1L hrs / wk**

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

- recognize the diversity
- interpret the complexity and
- illustrate the economic importance of Bryophytes, Pteridophytes and Gymnosperms
- prepare suitable micropreparations of selected life forms in Bryophytes, Pteridophytes and Gymnosperms

COURSE OUTLINE:

UNIT I: GENERAL CLASSIFICATION of the following (upto order level) **12 hrs**

Bryophytes - Engler & Rothmaler (1951)

Pteridophytes - Smith (1955)

Gymnosperms - Sporne (1965)

Economic importance of the Bryophytes, Pteridophytes & Gymnosperms

UNIT II: BRYOPHYTES 18hrs

Structure & life history of the following

Marchantia

Anthoceros

Polytrichum

UNIT III: PTERIDOPHYTES 15hrs

Structure & life history of the following

Psilotum

Lycopodium

Selaginella

Stelar evolution in Pteridophytes

UNIT IV: GYMNOSPERMS 15hrs

Structure & life history of the following

Pinus

Gnetum

No developmental studies in Bryophytes, Pteridophytes and Gymnosperms.

UNIT V: LAB 15hrs

Marchantia - Thallus,Gemma cup, archegoniophore, antheridiophore, sporophyte

Anthoceros- Thallus , capsule(Sporophyte)

Polytrichum: Thallus , capsule(Sporophyte)

Lycopodium-Root, strobilus

Selaginella – Stem, rhizophore, root and strobilus

Pinus - Pollen grain, ovule, male flower, *Gnetum* -Ovule

TEXT BOOK:

Pandey, B.P. (2001). *College Botany.* Volume II, New Delhi: S. Chand & Company Ltd. Print.

REFERENCE BOOK(S)::

Sharma, O.P. (1992). *Pteridophytes***.** New Delhi: S. Chand & Co., Print.

Smith, G.M. (1989). *Cryptogamic Botany - Bryophytes and Pteridophytes (II)*. New Delhi: Tata Mc Graw Hill Publishing Co. Ltd. Print.

Sporne, K.R. (1965). *The Morphology of Gymnosperms*. London: Hutchinson University Lib. Print.

Vashishta, B.R. Sinha, A.K. & Kumar Adarsh. (2011). *Bryophytes*. New Delhi: S.Chand & Co. Print.

Vashishta, B.R., Sinha, A.K. & Kumar Anil. (2010). *Pteridophyta*. New Delhi: S.Chand & Co. Print.

Vashishta, B.R., Sinha, A.K.& Kumar Anil. (2006). *Gymnosperms*. New Delhi: S.Chand & Co. Print.

BOT1402AT FUNDAMENTALS OF BOTANY

SEMESTER I

LAB CUM THEORY

LEARNING OUTCOME : **4T + 1L Hrs./Wk.**

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

- understand the diversity of plants
- describe the floral organization and economic importance of selected families
- predict the internal structure, organization of plant parts & plant functioning
- develop skills in sectioning and designing simple experiments.

COURSE OUTLINE :

UNIT-I : PLANT DIVERSITY **15 hrs.**

Classification of plant kingdom – general characteristics, thallus structure and reproduction of the following.

Algae –*Chlorella, Sargassum*

Fungi – Rhizopus, *Agaricus*

Bryophyte – *Marchantia*

Pteridophyte – *Selaginella*

Gymnosperms – *Pinus*

UNIT-II : MORPHOTAXONOMY **15 hrs.**

Bentham &Hooker classification. Study of selected families.

Polypetalae – Caesalpinaceae

Gamopetalae – Acanthaceae

Monoclamydae – Euphorbiaceae

Monocot – Poaceae

UNIT-III : PLANT ANATOMY **15hrs.**

Tissues (simple & complex), primary structure of stem (dicot – *Tridax*, monocot - Grass), root (Dicot – Bean, monocot – Grass) and leaf (dorsiventral – *Hibiscus*, isobilateral - Grass)

UNIT-IV : PLANTPHYSIOLOGY **15hrs.**

Water absorption (Passive), Ascent of sap (cohesion tension theory),

Transpiration (stomatal), Mineral nutrition –macro nutrients (NPK & their physiological role)

Photosynthesis (light & dark reactions) Respiration (Glycolysis & Kreb's cycle)- Oxidative Phosphorylation

Physiological role of phytohormones (Auxin – cytokinin – GA – ethylene - ABA)

UNIT V: LAB **15hrs**

1. Microscopic observation of the following forms

   Algae –*Chlorella, Sargassum*

   Fungi –Rhizopus, *Agaricus*

   Bryophyte – *Marchantia*

   Pteridophyte – *Selaginella*

   Gymnosperms – *Pinus*
2. Morphological observation of dicot and monocot root – stem – leaf – flower - fruit
3. Dissection & technical description of floral parts of the following families

   Polypetalae – Caesalpinaceae

   Gamopetalae – Acanthaceae

Monoclamydae – Euphorbiaceae

Monocot – Poaceae

4. Microscopic observation of permanent slides of dicot and monocot stem – root - leaf.
5. Osmosis, Ringing experiment (Demo), Effect of light intensity, wavelength and CO_2 concentration on photosynthesis.

TEXT BOOKS:

Devlin R.M and Witham F.H, **Plant Physiology**, New Delhi, CBS Publishers and Distributors, 1986.

Narayanaswamy R.V., Rao. K.N and Raman. A, **Outlines of Botany**, Madras, S.Viswanathan Pvt Ltd, 1992.

REFERENCE BOOKS:

Pandey B.P, **College Botany**, I, New Delhi, S, Chand & Company Ltd, 2010.

Pandey B.P, **Taxonomy of Angiosperms**, New Delhi, S.Chand & Co Ltd, 2007.

Pandey B.P,**College Botany**, II, New Delhi,, S, Chand & Company Ltd, 2010.

Pandey S.N., & Misra S.P, **Taxonomy of Angiosperms**, New Delhi, Ane Books India, 2008.

Pandey, B.P, **Plant Anatomy**, New Delhi, S.Chand & Company Ltd, 2010.

BOT1201FS COMMUNICATION SKILLS FOR BOTANY – I

SEMESTER I

THEORY

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

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

- enhance her vocabulary
- apply functional grammar in Botany
- use correct pronunciation
- improve her communication skills

COURSE OUTLINE :

UNIT-I : FUNCTIONAL GRAMMAR THROUGH BOTANY **7 Hrs.**

Essential rules of English grammar and usage. Use of articles, prepositions, adjectives, adverbs, verbs, nouns, singular, plural, modals, words often confused.

UNIT-II : BOTANICAL VOCABULARY **7 Hrs.**

Words commonly misspelt, word formation using prefix and suffix, synonyms and antonyms, Substitution of words, Pronunciation of botanical terms and scientific terms

UNIT-III : SENTENCE SKILLS

Tenses, sentence improvement, sentence arrangement, sentence completion , sentence fill ups and spotting errors. **8 Hrs.**

UNIT-IV : COMMUNICATION SKILLS **8 Hrs.**

Basics of communication – Communicative process, Seven C's of communication, types of communication -Verbal, non verbal, Barriers to effective communication, etiquette and mannerism.

REFERENCE BOOKS:

Jack. C.R, **Language and Communication**, Chennai,, Orient Longmann Ltd,, 1987..

Jain B.B, **A Comparative book on English Grammars**, Agra Sep, Upkar Prakashan, 2010.
Judith Verity, **Succeeding at Interviews**, Chennai,, Viva Books Pvt. Ltd, 2000.
Krishna Mohan, **Developing Communication Skills**, New Delhi, Macmillan India Ltd, 1998.
Shalini Agarwal, **Essential communication skills,** Ane Books Pvt. Ltd, New Delhi, 2013.
Gopalan R and V Rajagopalan, **English for Competitive Examination,**Vijay Nicole Imprint Private limited. Chennai, 2007.

WEBSITES:

http://botanydictonary.org
www.botany.com/index.16.htm
http://ontologi.es/biol/botany.htm/

BOT2502CM PLANT SYSTEMATICS

SEMESTER II

THEORY

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

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

- explain the principles of systematics
- describe the distinctive features of selected families
- recall the economic value of the plants in the cited families

COURSE OUTLINE :

UNIT-I : : MORPHOLOGY OF PLANT PARTS AND HISTORY OF CLASSIFICATION **15Hrs.**

Morphology of root, stem, leaf, inflorescence flower and fruit, History of classification – Theophrastus, Linnaeus, Bentham and Hooker, and Engler and Prantle

UNIT-II : PRINCIPLES OF TAXONOMY **15Hrs.**

Principles of Taxonomy – Minor and Major categories, rules and recommendations, ICBN, author citation scientific naming of plants.

Dichotomous key preparation – indented key – Field and herbarium techniques.

Numerical taxonomy & Chemotaxonomy

UNIT-III : STUDY OF THE LOCALLY AVAILABLE FLORA OF POLYPETALAE WITH THEIR ECONOMIC

IMPORTANCE AND PHYLOGENETIC RELEATIONSHIP **15Hrs.**

Study of the locally available flora of Polypetalae

Polypetalae – Annonaceae, Rutaceae Caesalpiniaceae, Rosaceae & Cucurbitaceae

UNIT-IV : STUDY OF THE LOCALLY AVAILABLE FLORA OF GAMOPETALAE WITH THEIR ECONOMIC IMPORTANCE AND PHYLOGENETIC RELEATIONSHIP **15Hrs.**

Study of the locally available flora of Gamopetalae

Gamopetalae – Asteraceae,Asclepiadaceae, Convolvulaceae,Acanthaceae & Lamiaceae

UNIT-V : STUDY OF THE LOCALLY AVAILABLE FLORA OF MONOCHLAMYDEAE AND MONOCOTYLEDONS WITH THEIR ECONOMIC IMPORTANCE AND PHYLOGENETIC RELEATIONSHIP **15Hrs.**

Study of the locally available flora of Monochlamydeae and Monocot families

Monochlamydeae –Amaranthaceae, Euphorbiaceae

Monocot – Orchidaceae, Liliaceae & Poaceae.

TEXT BOOKS:

Narayanaswamy R.V., Rao. K.N and Raman. A, **Outlines of Botany**, Madras, S.Viswanathan Pvt Ltd, 1992.

Pandey B.P, **Taxonomy of Angiosperms**, New Delhi, S.Chand & Co Ltd, 2007.

Pandey S.N & Misra S.P, **Taxonomy of Angiosperms**, New Delhi, Ane Books India, 2008.

Verma B.K., **Introduction to Taxonomy of Angiosperms**, PHI Learning Pvt. Ltd., New Delhi, 2011.

REFERENCE BOOKS:

Gamble J.S and Fischer C.E.C, **Flora of the Presidency of Madras**, (I – III), Adlard & Son Limited, W.C.London, 2011.

Gamble J.S and Fischer C.E.C, **Flora of the Presidency of Madras**, Botanical Survey of India, (I – III), Calcutta, 1957.

Jeffrey C, **An introduction to Plant taxonomy**, Allied publishers Private Limited, New Delhi, 1982.

Lawrence G.H.M, **Taxonomy of Vascular plants**, The Mac Milan Co., New York, 1965.

Sambamurty A.V.S.S, **Taxonomy of Angiosperms**, I.K. International Pvt. Ltd, New Delhi, 2005.

BOT 2202CP LAB FOR PLANT SYSTEMATICS

SEMESTER II

LAB

LEARNING OUTCOME: **3hrs / wk**

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

- describe the distinctive features of selected families
- collect & prepare plant herbarium following a standard format
- assign plants to their respective families and prepare a dichotomous key

COURSE OUTLINE: **45 hrs**

1. Morphology of root , stem , leaf , inflorescence , flower and fruit – Observation, identification and recording the above mentioned plant parts
2. Dissection of floral parts of families mentioned in the theory syllabus.

3. Identification of their respective families and their economic importance.
4. Identification of families using Gamble.
5. Preparation of indented key
6. Submission of 20 herbarium sheets of weed plants available in the college campus.

REFERENCE BOOKS:

Gamble J.S and Fischer C.E.C, **Flora of the Presidency of Madras**, (I – III), Adlard & Son Limited, W.C.London, 2011.

Gamble J.S and Fischer C.E.C, **Flora of the Presidency of Madras**, Botanical Survey of India, (I – III), Calcutta, 1957.

Jeffrey C, **An introduction to Plant taxonomy**, Allied publishers Private Limited, New Delhi, 1982.

Lawrence G.H.M, **Taxonomy of Vascular plants**, The Mac Milan Co., New York, 1965.

Sambamurty A.V.S.S, **Taxonomy of Angiosperms**, I.K. International Pvt. Ltd, New Delhi, 2005.

BOT2201FS COMMUNICATION SKILLS FOR BOTANY – II

SEMESTER II

THEORY

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

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

- acquire basic skills in listening, speaking, reading & writing
- apply the language effectively in describing the botanical concepts
- develop interpersonal skills.

COURSE OUTLINE :

UNIT-I : GROUP COMMUNICATION & LISTENING SKILLS **8 Hrs.**

Application of English language in learning Botany, fluency development, conversation, idea generation techniques – creative thinking, brain storming, idea generating tools- Listening skills-listening process, barriers to effective listening & guidelines for effective listening.

UNIT-II : PRESENTATION SKILLS **8 Hrs.**

Bioconversation – dialogues, role play, public speaking, thematic letter writing, paragraph, essay, précis writing, note taking tips, reflective, critical thinking, problem solving& substitution of words. Preparation and presentation of PPT.

UNIT-III : REPORT PREPARATION & INTERVIEW SKILLS **7 Hrs.**

Lab, OSS, field trip report, learning of concepts, writing methodology for an experiment, observation and interpretation. Preparation for an interview & writing an impressive resume.

UNIT-IV : FOUNDATION SKILLS IN SCIENTIFIC WRITING AND INTERPRETATION 7 Hrs.

Description of laboratory glassware, cells, tissues, organelles, sectioning skills and preparation of lab records.

TEXT BOOK:

Shalini Agarwal, **Essential communication skills,** Ane Books Pvt. Ltd, New Delhi, 2013.

REFERENCE BOOKS:

Agarwal R.S., **Quantitative Aptitude**, New Delhi, S. Chand & Co, 2003.

Agathe Ravet. Haevermans, **The art of Botanical drawing**, An introductory guide, USA, Timber Press, 2008.

Day R.A, **Scientific English: A guide for scientists and other professionals**, University Press, New York, 1995.

Fry.R, **Your first interview**, New Delhi, Pearson Education, 2003.

Jack. C.R, **Language and Communication**, Chennai, Orient Longmann Ltd, 1987.

Judith Verity, **Succeeding at Interviews**, Chennai, Viva Books Pvt. Ltd, 2000.

Krishna Mohan, **Developing Communication Skills**, New Delhi, Macmillan India Ltd, 1998.

BOT2201NI BIODIVERSITY – CONSERVATION AND MANAGEMENT

SEMESTER II

THEORY

LEARNING OUTCOME: 2 hrs/ wk

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

- familiarize students with the essential components and concepts of biodiversity
- recognize the threats and challenges of biodiversity
- explain the various methodologies adopted for biodiversity conservation
- provide knowledge on international and legal policies on environmental protection

COURSE OUTLINE:

UNIT I : INTRODUCTION TO BIODIVERSITY 7 hrs

Genetic diversity, species diversity, ecosystem diversity, agrobiodiversity. Biodiversity in India – India as a mega diversity nation

UNIT II: LOSS OF BIODIVERSITY& ITS CONSERVATION 8 hrs

Causes, factors, severe threats to biodiversity – hot spots, endangered plants & animal species, endemic species, vulnerable, rare, threatened. Objectives, Importance & value of biodiversity conservation, India's efforts for conservation of biodiversity – *insitu* and *ex-situ* conservation of biodiversity, afforestation.

UNIT III: ENDANGERED ENVIRONMENT 7 hrs

Population growth and its impact on environment (Air, Water& Soil) greenhouse effect & climate change, acid rain, ozone depletion, disasters (natural & man-made)

UNIT IV:ENVIRONMENT PROTECTION LAWS AND MOVEMENT. 8 hrs

Environmental Protection Act - Air act, Water act,Pollution Control Act (State) Wildlife Protection act, Forest Conservation act, Biodiversity Act, 2002, Significance & Organizations associated with Environmental Movement.

TEXT BOOKS:

Arvind Kumar, **A text book of Environmental Science**, APH Publishing corporation, New Delhi, 2009.

Bharucha E., **Text book of Environmental Studies for Undergraduate courses** Universities Press (India) Pvt. Ltd., Hyderabad, 2005.

KrishnamurthyK.V., **Textbook of Biodiversity**, Science Publishers, USA, 2003.

Sharma P.D., **Ecology &Environmental Studies** .Rastogi Publications, Meerut, 2004

REFERENCE BOOKS:

Agarwal K.C., **Environmental Biology**, Nidi publication Ltd., Bikaner, 2001

Heywood V.H. and Waston R.T., **Global Biodiversity Assessment**. Cambridge University. Press New York, 1995.

Jadhav H. and Bhosale V.M., **Environmental Protection and Laws**. Himalaya Publication House, Delhi 1995.

Kumar U. and Asija M.J., **Biodiversity – Principles and Conservation**, Agrobios, Jodhpur, India. 2000.

BOT0401CD INTERIOR DECORATION

(Self-Learning - Theory)

LEARNING OUTCOME :

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

- acquire basic skills needed to decorate a home
- gain knowledge about interior renovations

COURSE OUTLINE :

UNIT-I : INTRODUCTION

Importance of good taste – Fundamentals of Design - Harmony – Proportion – Balance – Rhythm and Emphasis – Home making – Plan & allocation of space in the house, Living and reception rooms, Bed rooms, Dining room, Store room, Bath room, Kitchen - illumination.

UNIT-II : COLOR SCHEMES

Prang color system – color combinations – Harmony of related and contrasting colors – Balance, Rhythm, Emphasis and proportion in colors – use of colors in the house.

UNIT-III : DECORATING THE ROOM

Decorating with suitable pictures – Framing, Location and Hanging of pictures, Choices of Curtains, Cushions, Rugs, Carpets and other articles used for decorating the room.

UNIT-IV : DECORATING THE HOME WITH CREATIVE CRAFTS

Fabric – Patchwork, fabric fun and ribbon crafts, Paint and paper – Paper crafts, Pottery painting, needle work crafts – Embroidery, Knitting & Crochet and flower crafts.

UNIT-V : USE OF PLANTS AND FLOWERS AS DECORATIVE ITEMS

Uses of flowers for interior decoration – containers – Selection and storing of flowers – flower holders –flower arrangement and indoor gardening.Use of furniture in interior decoration: Selection and arrangement of furniture.Interior Renovations: Renovating kitchens and bathrooms. Cleanliness and care of home.

REFERENCE BOOK(S)

Reader's Digest Home Improvements manual, **The Reader's Digest Association INC – Pleasantville**, New York, Readers Digest Association,, 1982.

Stelle Soundararaj, **A Text Book of household arts**, New Delhi, Orient Longman Limited, 1996..

Vishu Swarup, **Indoor Gardening**, New Delhi, Indian Council of Agricultural Research, 1996.

BOT0402CD MAN AND MICROBES

(Self-Learning - Theory)

LEARNING OUTCOME :

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

- understand the distribution and different types of microorganisms.
- understand and appreciate the role of microorganisms in everyday life.

COURSE OUTLINE :

UNIT-I : HIGHLIGHTS IN THE HISTORY OF MICROBIOLOGY

Contributions of Anton Von Leeuwen Hoek (1632), Spallanzani (1765), Louis Pasteur (1822), Robert Koch (1876) and Petri

UNIT-II : TYPES, OCCURRENCE AND GENERAL CHARACTERISTIC FEATURES OF MICROORGANISMS

Algae, Fungi, Bacteria, Protozoa and Virus.

UNIT-III : NUTRITIONAL REQUIREMENTS

Nutritional Requirements of Microbes and Factors affecting growth of microbes.

UNIT-IV : ROLE OF MICROBES IN DAY TO DAY LIFE

Beneficial Aspects:

1. Preparation of Curd, Cheese, Idly, Bread, Wine, Vinegar. Single Cell Protein (Chlorella, Spirulina, Yeast), Amylase,Penicillin,VitaminB12.

2.Microbes as Scavengers.

3. Soil Fertility – with special reference to Symbiotic and Asymbiotic nitrogen fixation (bacteria and BGA).

4. Microbes and Water – Polluted water can kill you. *E.coli* as indicator. Role of Algae and Bacteria in sewage treatment.

Negative Aspects:

1. Spoilage of some common foods – Milk, Egg, Fruits and Vegetables by microbes.

2. Microbes as disease causing organisms – TB, Leprosy, Cholera, AIDS.

TEXT BOOK(S)

Philip L. Carpenter, **Microbiology**, London, W. B. Saunders CompanyPhiladelphia, 1972..

REFERENCE BOOK(S)

Frazier W. C., **Food Microbiology**, New York, Mc Graw Hill Book Co, 1989..
Frobischer M. Hindsall R. D. & Co., **Fundamentals of Microbiology**, 9th Edition, Philadelphia, W. B. Saunders Co, 1974..
Lakshmanan M. ,, **Laboratory Experiments in Microbiology & Molecular Biology**, 1974..
Pelczar J. M, Reid, Chan & Kriegn R, **Microbiology, Concepts and Applications**, Mc Graw Hill Book Co, 2000.
Wedberg S.E,,**Microbes and You**, NewDelhi, Oxford & IBH publishing Co, 1974.

BOT0403CD PLANT AND UNIVERSE

(Self-Learning - Theory)

LEARNING OUTCOME :

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

- acquire the basic knowledge needed for the proper understanding of the plants.
- appreciate the wonders in plant world.
- understand the role of plants in day-to-day life.

COURSE OUTLINE :

UNIT-I : PLANTS AS PRODUCERS, PURIFIERS & INDUSTRIALISTS

Fossil fuels and Plants as

1. Food makers (primary producers), 2. Scavengers (decompositions), 3. Purifiers (air, water), 4. Industrialists (antibiotics, vaccines, vitamins, beverages, biofertilizers).

UNIT-II : ECONOMIC IMPORTANCE OF PLANTS

Food (cereals, millets, pulses, vegetables and fruits), Timber (teak, rosewood, sandal), Fibre (cotton, jute), oil (sunflower oil, castor oil, palm oil), Latex (*Hevea* and *Ficus elastica*), Medicine (Tulsi, Pepper, Ginger, Eucalyptus, Kilanelli and Turmeric)

UNIT-III : WONDER PLANTS

Tree fern, Tallest tree (Sequoia), Century plant (Agave), Bamboo, Largest flower (Rafflesia,) Largest leaf (*Victoria regia*), Kurinji, , Sensitive plant (*Mimosa pudica*), orchids, insectivorous plants.

UNIT-IV : PLANT ANIMAL INTERACTION

Symbiosis, myrmecophily, lac insect, pollination mechanism and honey.

UNIT-V : PLANT AND ENVIRONMENT

Human impact on natural ecosystems – Habitat destruction and Ecosystem imbalance – Environmental Quality, Pollution in brief, Green house effect and Global warming, Conservation, Positive solutions – Revegetation and environmental repair. Plant and Religion.

REFERENCE BOOK(S)

Albert L. Lehninger, **Principles of Biochemistry**, Delhi, CBS Publishers and Distributors, 1982..
Charles Darwin,,**Insectivorous Plants**, London, John Murray, 1908..
D. K. Northington, E. L. Schneider., **The Botanical World**, Wm. C. Brown Publishers, 1996.
Eugene P. Odum, **Fundamentals of Ecology**, III edition, London, W. B. Saunders Company, 1971..
G. Brum, L. Mc Kane and G. Karp., **Biology Fundamentals**, Canada, John Wiley & Sons, Inc., 1995.
Hendry N. Andrews, JR., **Studies in Paleobotany**, New York, London, John Wiley & Sons INC, 1961..
L. E. Casida JE., **Industrial Microbiology**, Chennai, Wiley Eastern Limited, 1986..

BOT3401CM FUNDAMENTALS OF MICROBIOLOGY

(Theory)

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

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

- recall the history of Microbiology
- describe and differentiate the various types of microbes.
- explain the structure, reproduction and growth of bacteria and viruses
- categorize the techniques used in control, isolation, and identification of microbes

COURSE OUTLINE :

UNIT-I : HISTORY & CLASSIFICATION OF MICROBES **12 Hrs.**

Early developments (Anton Van Leeuwenhoek, John Needham, Robert Koch, John Tyndall, Louis Pasteur, Georg Schroeder, Oscar Brefeld, Julius Richard Petri, Walther & Fanne Hesse, Sergei Winogradsky, Martinus Beijerink, Alexander Fleming, Selman Waksman, Edward Jenner, Joseph Lister, Francesco Redi). General characteristics - Bacteria & Archaea, Cyanobacteria, Mycoplasma, Actinomycetes [Classification – Bergey`s (IX edition- upto order level] and virus.

UNIT-II : STRUCTURE & REPRODUCTION OF VIRUS **12 Hrs.**

Virus – General characteristics, structure, classification, symmetry, lytic and lysogenic cycles – λ phage.

UNIT-III : ULTRA STRUCTURE OF BACTERIA & REPRODUCTION **12 Hrs.**

Ultra structure of bacterial cell - Gram +ve & Gram –ve. Staining – mechanism of staining, Simple, Differential (Gram stain & Acid- fast) Negative staining, Endospore staining. Bacterial growth- continuous & synchronous culture– Factors affecting growth, Determination of bacterial growth – Direct method - Haemocytometer, Viable

plate count - Indirect method – Turbidity, Motility-hanging drop technique, Reproduction – Fission and Sporulation.

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

Sterilization – Disinfectant, sanitizer – ideal disinfectant, mechanism of action and application of Physical agents (temperature – dry heat- incineration and hot air oven, wet heat- boiling, pasteurization, tyndallisation, autoclave, dessication, osmotic pressure) radiation – UV, gamma rays and filtration, Chemical agents (Phenol, Alcohol, Halogens, Mercuric chloride& Formaldehyde)

UNIT-V : CULTIVATION OF MICROBES **12 Hrs.**

Nutritional requirements, nutritional types, Media – types and preparation, culture methods – pour plate, spread plate, streak and broth. maintenance of pure culture – four way streak, slant and stab. Cultivation of algae, fungi and virus.

TEXT BOOK(S)

Pelczar J.M., Chan E.C.S. and Kreig. R.N, **Microbiology**, 13thReprint, New Delhi, Tata Mc Graw Hill Publishing Company Ltd,, 2008.

REFERENCE BOOK(S)

Atlas R.M, **Microbiology - Principles of Microbiology**, Mosby Year Book Inc, Missouri,2000.
Black J, **Microbiology - Principles and Explorations**, Prentice Hall International, Inc, New York, 2007, 7thedition.
Brock T.D, **Biology of Microorganisms**, Southern Illinois University, Carbondale,2000, 9th edition.
Prescott L.M., Harley J.P. and Klein D.A, **Microbiology**, W.M.C. Brown Publishers, Chicago,1996, 3rd edition.
Salle A.J, **Fundamental Principles of Bacteriology**,Tata Mc Graw Hill Publishing Company Ltd, New Delhi 1997, 7th edition.

BOT3402CM BIOFERTILIZERS AND PLANT PATHOLOGY

(Theory) **4 Hrs/ Wk**

LEARNING OUTCOME :

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

- relate the various microbes used as biofertilizers
- identify their role in the maintenance of soil fertility
- illustrate the various methods of mass cultivation and quality control involved in biofertilizer production
- discuss the etiology, symptoms and transmission of plant diseases
- understand the knowledge about plant protection and biological control

COURSE OUTLINE :

UNIT-I : FREE LIVING & SYMBIOTIC NITROGEN FIXERS **12 Hrs**

Introduction of biofertilizer, Isolation, Identification, Characterization, Nitrogen fixing mechanism & Assimilation, Mass Production, Quality control & applications of *Azotobacter, Rhizobium & Nostoc*

UNIT-II : NON SYMBIOTIC NITROGEN FIXERS **12 Hrs**

Isolation, Identification, Characterization and Cultivation of
Associative symbiont – *Azospirillum*
Arbuscular mycorrhizae – types, taxonomy, occurrence and distribution

UNIT-III : MICROBIAL DISEASES OF CROPS **12 Hrs**

Causative organism, Transmission (Direct and indirect methods), Symptoms and control measures for

Bacterial disease: Citrus canker.

Fungal disease: Tikka disease of groundnut

Viral disease: Tobacco mosaic.

Mycoplasmal disease: Little leaf of Brinjal

Algal disease: Red rust of Guava

Nematode infection: Root knot

UNIT-IV : PLANT PROTECTION **12 Hrs**

Exclusion, eradication, chemical methods, immunization

UNIT-V : BIOLOGICAL CONTROL **12 Hrs**

Biopesticides (Bacterial, Fungal and Viral), Biological control of weeds.

TEXT BOOKS

Mehrotra R.S, **Plant Pathology**, Tata Mc Graw Hill Publishing Company Limited, New Delhi, 2003.

Sambamurthy A.V.S.S, **Text book of Plant Pathology**, I.K. International Pvt. Ltd, New Delhi, 2009.

Subba Rao N.S, **Biofertilizers in Agriculture and Forestry**, Oxford & IBH Publishing Co Pvt Ltd, New Delhi, 1997, 3 revised edition.

REFERENCE BOOKS

Agrios G.N**. Plant Pathology.** Har Court Asia PTE Ltd, Singapore, 1997.

Mahanta, **Fundamentals of Agricultural Microbiology**, Oxford & IBH Publishing Co, New Delhi, 1994.

Postgate J, **Nitrogen Fixation**, Cambridge University Press, Cambridge,1998, 3rd edition.

Sharma K.A, **Biofertilizers for sustainable Agriculture**, Agrobios, Jodhpur,2003.

Sharma R.A., Totawat K.L., Maloo S.R. & Somani L.L, **Biofertilizer technology**, Agrotech Publishing company, Udaipur, 2004.

Subba Rao N.S, **Bioferilizers in Agriculture**, Oxford & IBH Publishing Co Pvt Ltd, New Delhi, 1988, 2nd edition.

Subba Rao N.S, **Soil Micro organisms and Plant Growth**, Oxford & IBH Publishing Co.Pvt Ltd, New Delhi, 1977.

Subba Rao N.S, **Soil Microbiology**, Oxford & IBH Publishing Co Pvt Ltd, New Delhi, 2000.

BOT3403CM PLANT ANATOMY

(THEORY)

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

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

- understand the organization of meristem, tissues, and relate them to their function
- describe the primary, secondary and anomalous growth of root and stem
- relate the anatomical modifications to the habitat

COURSE CONTENT:

UNIT I: MERISTEM & TISSUES **12 hrs.**

Classification, organization in root and shoot apices – Apical cell & Tunica carpus theories – Simple – complex tissues – structure – functions – Epidermis – stomatal types – hydathode – trichomes – Secretory tissues – Laticifers – glandular tissues – oil glands – nectaries – digestive glands .

UNIT II: PRIMARY STRUCTURE OF LEAF, STEM & ROOT **12 hrs.**

Basic structure of dorsiventral – Isobilateral leaves – dicot stem – monocot stem – Dicot root – monocot root – explanation with examples.

UNIT III: SECONDARY STRUCTURE OF ROOT & STEM **12 hrs.**

Secondary growth in dicot root – formation of cambium – development of secondary tissues – periderm – secondary growth in dicotyledonous stem – cambium – secondary xylem – distribution of wood parenchyma – annual rings – tylosis – sap wood – hard wood – secondary phloem – periderm – rhytidome – lenticels

UNIT IV: ANOMALOUS SECONDARY GROWTH **12 hrs.**

Causes – anomalous position of cambium – abnormal behaviour of cambium – accessory cambium – extra stelar cambium – scattered vascular bundles – medullary – cortical bundles (explanation & examples) secondary growth in Monocots – *Dracaena.*

UNIT V: ECOLOGICAL ANATOMY **12 hrs.**

Anatomical adaptations in hydrophytes – xerophytes – mesophytes – epiphytes – halophytes

TEXT BOOK(S):

Pandey, B.P, (2011). *Plant Anatomy,* New Delhi, India: S.Chand & Company Ltd. Print.

REFERENCE BOOK(S):

Eames, A. J. & Mac Daniels, L. M, (1953). *An Introduction to Plant Anatomy,* New York: Mc Graw Hill Book Company Ltd. Print.

Esau, K, (1962). *Plant Anatomy,* New York: John Wiley & Sons. Inc. Print.

Fahn, A, (1989). *Plant Anatomy,* Oxford, UK: Pergamon Press. Print.

Lolury, A.G. & Sie Kevitz, P, (1969). *Cell Structure and Function,* New Delhi, India: Oxford & IBH Publishing Co. Print.

Mauseth, J.D, (1988). *Plant Anatomy*, California: The Benjamin/ Cummings Publishing Company. Ltd. Print.

Pandey, S.N. & Chadha, A, (1996). *Plant Anatomy & Embryology,* New Delhi, India: Vikas Publishing house Pvt. Ltd. Print

BOT3404CM CELL BIOLOGY

(THEORY)

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

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

- learn the structural organization of cell wall and cell membrane
- understand the structure and function of living and non-living cell inclusions in plants
- identify the stages of mitosis and meiosis with reference to chromosome movement

COURSE CONTENT:

UNIT I: CELL WALL **12 hrs.**

Plant cell and its parts – primary and secondary cell wall – ultrastructure – chemical composition – plasmodesmata pits – simple and bordered pits.

UNIT II: CELL MEMBRANE & PROTOPLASM **12 hrs.**

Chemical composition – various models for membrane structure – membrane function – cytosol – composition – physical – chemical properties – functions.

UNIT III: LIVING INCLUSIONS **12 hrs.**

Origin – functions of the following cell inclusions:

Mitochondria – Plastids – protoplastids – leucoplastids – amyloplast, proteoplast and elaioplast chloroplasts – chromoplasts – microbodies – peroxisome – spherosome – glyoxysomes – lysosome dictyosome – endoplasmic reticulum – ribosomes

UNIT IV: NON – LIVING INCLUSIONS **12 hrs.**

Ergastic substances – food products – secretory products – excretory products (waste products)

Excretory substances – organic acids – alkaloids – essential oils – mineral crystals – cystolith – raphides – druses – sand crystals – tannin – gum

UNIT V: NUCLEUS **12 hrs.**

Origin – structure of various parts of nucleus – nuclear membrane – annuli – nucleolus – chromosomes – functions of nucleus – cell cycle – mitosis and meiosis

TEXT BOOK(S):

Devasena, T, (2012). *Cell Biology,* U.P, India: Oxford University Press. Print.

Powar, C.B, (2008). *Cell Biology,* Mumbai, India: Himalaya Publishing House. Print.

Rastogi, S.C, (1988). *Cell Biology,* New Delhi, India: Tata Mc Graw Hill Publishing Company Limited. Print.

Verma, P.S. & Agarwal, V.K, (2012). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology,* New Delhi, India: S. Chand & Company LTD. Print.

REFERENCE BOOK(S):

De Robertis, E.D.P, Seez, F.A. & De Robertis, E.M.F, (1988). *Cell and Molecular Biology,* International Edition, Philadelphia: Lea & Febiger. Print.

Karp, G, (1984). *Cell Biology,* New York: Mc Graw Hill Book Company. Print.

Lolury, A.G. & Sie Kevitz, P, (1969). *Cell Structure and Function,* New Delhi, India: Oxford & IBH Publishing Co. Print.

BOT3203CP LAB FOR PLANT ANATOMY & CELL BIOLOGY

(Lab)

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

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

- understand the structure and function of living and non living cell inclusions in plants
- appreciate the architecture of plant tissues.
- understand the tissue organization in plant parts.
- identify the stages of mitotic and meiotic cell divisions
- relate the anatomical modifications to the habitat

COURSE OUTLINE :

EXPERIMENTS/LAB : **45 Hrs.**

1. Maceration and observation of cell types.
2. Dermal tissue – mounting of epidermal peeling and observation of Trichomes and stomatal types
3. Primary and secondary structure of dicot and monocot plant parts
   A. Leaf – *Hibiscus*& Grass
   B. Stem- *Tridax*& Grass
   C. Root – Bean & Grass
4. Nodal anatomy- Trilacunar node (*Azadirachta*)
5. Secondary structure of dicot stem (Sunflower) and dicot root (Bean)
6. Anomalous secondary growth in *Boerhaevia* / *Bougainvillea*
7. Anatomical adaptations of
   Hydrophytes (*Hydrilla* stem)
   Xerophytes (*Nerium* leaf)
8. Observation of ergastic substances
   Starch grains - potato, rice

Cystolith – *Ficus* leaf

Raphides – *Colocasia* leaf

9. Mitosis – Onion root tip smear
10. Meiosis – *Tradescantia* anther smear

REFERENCE BOOKS

Pandey B.P, **Plant Anatomy**, S. Chand & Company Ltd, New Delhi, 1991.

Rastogi S.C, **Cell Biology**, , Tata McGraw Hill Publishing Company Limited, New Delhi 1988.

BOT3204CP LAB FOR FUNDAMENTALS OF MICROBIOLOGY, BIOFERTILIZERS AND PLANT PATHOLOGY

(Lab)

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

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

- demonstrate the basic techniques involved in handling of glassware
- prepare media for cultivation of bacteria, fungi and algae & identification of bacteria and fungi through staining
- isolate and identify the various bioinoculants
- isolate and biocontrol of phytopathogens

COURSE CONTENT:

EXPERIMENTS / LAB: **45 hrs.**

1. Laboratory precautions, Cleaning and Handling of glassware
2. Sterilization –moist heat – dry heat – radiation.
3. Preparation of media – medium for the cultivation of
    - Bacteria – Nutrient broth & Nutrient Agar
    - Fungi – Potato Dextrose Agar
    - Actinomycetes – Kuster's Agar
4. Isolation of microbes from air – water – soil
5. Culture methods – spread plate – pour plate – streak plate – stab – slant culture
6. Staining techniques: Simple – Gram's staining
7. Isolation of *Azotobacter – Rhizobium – Azospirillum*
8. Effect of commercially available bioinoculants (*Azospirillum*) on plant growth (Morphometric analysis of plants)
9. Collection of infected plants and observation of general symptoms
10. Isolation of phytopathogen from infected seeds / plant parts
11. Biocontrol of pathogen by *Trichoderma viride* (Dual culture)

REFERENCE BOOK(S):

Aneja, K.R, (2009). *Experiments in Microbiology, Plant Pathology and Biotechnology*, (Revised 4th Edition), New Delhi, India: New age international Ltd. Print

Cappuccino, J.G. & Sherman, N, (2009). *Microbiology - A Laboratory Manual,* California: The Benjamin/ Cummings Publishing Company, Inc. Print.

Cappuccino, J.G. & Sherman, N, (1992). *Microbiology – A Laboratory Manual*, California: The Benjamin/ Cummings Publishing Company, Inc. Print.

Claws, C.W, (1988). *Understanding Microbes: Laboratory Text Book for Microbiology*, New York: W.H. Freeman Co. Print.

Gunasekaran, P, (2007). *Laboratory Manual in Microbiology*, New Delhi, India: New Age International (P) Limited. Print.

Jha, D.K, (2004). *Laboratory Manual on Plant Pathology*, Jaipur, India: Pointer publishers. Print.

Seeley, H.W, Lee.J.J. & Vandemark, P.J, (1990). *Microbes in Action,* New York: W.H. Freeman Co. Print.

BOT3505CM BIOLOGICAL TECHNIQUES AND BIOINFORMATICS

(Theory)

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

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

- describe the basic principles & working mechanism of various instruments
- analyse biological data using bioinformatic tools
- construct three dimensional graphs using Libre Office

COURSE OUTLINE :

UNIT-I : MICROSCOPY **15 Hrs./Wk.**

Bright field (Review) – Phase Contrast – Dark field – fluorescence microscope and Electron microscopy - (Transmission and Scanning) – scanning probe – atomic force microscope

UNIT-II : SEPARATION & CHROMATOGRAPHIC TECHNIQUES **15 Hrs./Wk.**

Counter Current Distribution – partition adsorption chromatography – Paper Chromatography (Ascending – Descending & circular) - Thin layer & Column chromatography – Gas chromatography – Electrophoresis (Agarose gel – Polyacrylamide).

UNIT-III : pH METRY & COLORIMETRY **15 Hrs./Wk.**

pH metry:- pH indicators – Buffer – Calomel and glass electrode – Henderson – Hasselbach equation – related problems – Colorimetry:- Beer and Lambert's law – Absorption spectrum – spectrophotometer – UV-Visible, Fluorescence spectrophotometer.

UNIT-IV : CENTRIFUGATION & SPECTROSCOPY **15 Hrs./Wk.**

RCF – Sedimentation coefficient – Types of Rotors – Differential – Ultra & density gradient – Zonal & isopycnic centrifugation – Flame photometer & Atomic Absorption Spectroscopy.

UNIT-V : BIOINFORMATICS **15 Hrs./Wk.**

Definition – Databases and its types – DNA sequence databases – Protein databases - Sequence analysis pair wise alignment - PSI – BLAST (FASTA, BLAST) – Multiple sequence alignment – Neighbour Joining Plot — Phylogenetic analysis (Clustal W) – Protein secondary structure prediction: Ramachandran plot – Swiss PROT – RASMOL – use of Bioedit software.

LibreOffice: Calc – (Review)

Working with Calc – Creating and saving documents – Formatting data – creating charts – Formatting 3D Charts – Working with graphs and tables using Pivot Tables.

TEXT BOOK(S):

Boyer, R.F, (2000). *Modern Experimental Biochemistry*, California, USA: the Benjamin/ Cummings Publishing Company, Inc. Print.

Mansfied, R, (1994). *The Compact Guide to Microsoft and Office applications*, New Delhi, India: Tata McGraw Hill Publications. Print.

REFERENCE BOOK(S):

Gube, J. and Cheung, G, (2006). *Straight to the point, Microsoft Excel 2003*, New Delhi, India: Firewall Media. Print.

Gurumani, N, (2005). *An Introduction to Biostatistics*, (2nd ed.), Chennai, India: HJP publishing Pvt. Ltd. Print.

Jayaraman, J, (1999). *Laboratory Manual in Biochemistry*, New Delhi, India: New Age International Publishers Pvt. Ltd. Print.

Keith Wilson, and John Walker, (2005). *Practical Biochemistry- Principles & techniques*, New York: Cambridge University Press. Print.

Mani, K. and Vijayaj, N, (2002). *Bioinformatics for Beginners,* (1st ed.), Coimbatore, India: Kalaikathir Achagam. Print.

Mount, D.W, (2001). *Bioinformatics*, Newyork: Cold Spring Harbor Laboratory Press. Print.

Palanivelu, P, (2000). *Laboratory Manual for Analytical Biochemistry & Separation Techniques.* Madurai, India: School of Biotechnology, Madurai Kamaraj University. Print.

Plummer, D.T, (1999). *An Introduction to Practical Biochemistry*, New Delhi, India: Tata Mc Graw Hill Publishing Company Ltd. Print.

BOEN3202EI ECOLOGY AND LITERATURE

(Non Major Elective)

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

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

- know the interdependence in the web of life
- differentiate between nature and environment (issues and concerns)
- interpret the importance of intrinsic value as opposed to instrumental value

COURSE CONTENT

UNIT – I: ECOLOGICAL PRINCIPLES AND ASSOCIATED CONCEPTS **8hrs.**

Ecology – Ecosystem – Biosphere – Diversity – Keystone Species – Energy flow – Growth and Development – Regulation

The Banyan Tree- E.H. Aitkin from A Naturalist on the Prowl.

Unit – II: INTRODUCTION TO ECO-LITERATURE **7hrs.**

Interactions of Ecology & Literature – Shades of Nature – Wilderness – Scenic sublime – Country side – Domestic Picturesque.

1. '*With Green Thumbs'* by Ruskin Bond
2. '*Trees'* by Alfred Joyce Kilmer

UNIT – III: ECO-CRITICISM IN LITERATURE/ ECO-LITERARY CONCEPTS **8hrs.**

1. *'Walk on the Wild Side'* by Ravi Agarwal and Iqbal Malik
2. Poem from '*How Fear Came'* by Rudyard Kipling

UNIT – IV : HABITAT ECOLOGY **7hrs.**

Deep ecology and earth's wisdom – Physical environment – biological diversity – habitat modification – global environmental culture – Pollution and Climate Change.

Excerpt from – *The Silent Spring* by Rachel Carson

REFERENCE BOOK(S)

Bond's, Ruskin. *Green Book*, New Delhi: Roil Books Pvt. Ltd. 2003.Print.

Dash, M.C., *Fundamentals of Ecology*. New Delhi: Tata McGraw Hill Publishing Company Ltd, 2001. Print

Kormondy J. Edward, *Concepts of Ecology*, 4, New Delhi: Prentice Hall of India Pvt. Ltd, 2007. Print

OdumP.Eugene., Ecology, second edition, New Delhi: Oxford & IBH Publishing Co.Pvt.Ltd., 1975.Print

Russell, Peter J,Wolfe, Stephen L,Hertz, Paul E,Starr, Cecie, McMillan, Beverly, *Ecology,* New Delhi:Cengage Learning India Pvt. Ltd, 2008. Print

Selvamony,Nirmal, Nirmaldasan, Rayson, K, Ale. Eds., *EcoCriticism,*New Delhi:Sarup and Sons, 2007.Print.

Rachel Carson, *Silent Spring*, USA: Houghton Mifflin Publishers, 1962. Print

Vandhana Shiva, Earth Democracy, London: Zed Books Ltd,. 2005. Print

Vandhana Shiva, *Making Peace with the Earth*, London: Pluto Press.2013. Print

BOTA3201EI தமிழும் தாவரவியலும்

2 மணி / வாரம்

கற்றலின் பயன்கள்:

இப்பாடத்தை முழுமையாகக் கற்றபின் மாணவியர் பெறும் திறன்கள்

- தமிழ் இலக்கியங்களிலுள்ள தாவரவியல் செய்திகளை அறிதல்
- தாவர இன வகைகள், தாவர வாழ்வியல் குறித்த தமிழர் சிந்தனைகளை அறிதல்.
- தமிழரது மரபுவழிப்பட்ட தாவரவியல் பார்வைகளை மீட்டெடுத்தல்.

அலகு - 1 : தாவரவியல் அறிமுகம் : - 4மணிநேரம்

மனிதனும் இயற்கையும் - தாவர இனமும் மனித இனமும் - தாவர வகைப்பாடு

அலகு - 2 : தொல்காப்பியம் காட்டும் தாவரவியல் : - 8மணிநேரம்

தொல்காப்பியர் குறிப்பிடும் தாவரப் பெயர்கள் - மரம் - செடி - கொடி - புதல் - புல்

உள்ளமைப்பியல் வகைப்பாடு:

புல் வகை (ஒரு வித்திலைத்தாவரம் - Monocotyldons) - புறவயிர்ப்புடையன - புல்லினத்தின் இலையுறுப்புப்பெயர்கள் - பனை (*Borassus flabellifer*), தென்னை (*Cocos nucifera*)

மரவகை (இரு வித்திலைத்தாவரம் - Dicotyldonous) - மர வகை - அகவயிர்ப்புடையன - மரத்திற்குரிய உறுப்புப்பெயர்கள் - இல்லம் (*Strychnos potatorum*), ஆல் (*Ficus bengalensis*).

வளரியல்பு நோக்கிலான வகைப்பாடு மற்றும் பூவின வகைப்பாடு :

மரத்தாவரம் - மருதம் (*Terminalia arjuna*) - கோட்டுப்பூ - மருதம்

கொடித்தாவரம் - முல்லை (*Jasminum auriculatum*) -கொடிப்பூ - முல்லை

நிலத்தாவரம் - குறிஞ்சி (*Strobilanthes Kunthiana*) - நிலப்பூ - குறிஞ்சி

நீர்த்தாவரம் - தாமரை (*Nelumbium speciosum*) - நீர்ப்பூ - தாமரை

அலகு - 3 : சங்க இலக்கியம் காட்டும் தாவரவியல் : - 10 மணிநேரம்

வளரியல்பு அடிப்படையிலான மரங்கள் :

வன்மரம் (இருவித்திலை - Dicotyldons) - அகக்காழ் உடையன - வேம்பு (*Azadirachta indica*),

மென்மரம் (ஒருவித்திலை - Monocotyldons) - புறக்காழுடையன - மூங்கில் (*Bambusa arundinacea*),

புல்லுருவித் தன்மையுடைய மரம் (Parasite) - சந்தன மரம் (*Santalum album*).

வளரியல்பு அடிப்படையிலான கொடிகள் :

வேர்க்கொடி - மிளகுக்கொடி (*Piper nigrum*),

படர்க்கொடி (1) படர்க்கொடி (Creeper) - அடும்பு (*Ipomoea pescaprae*)

(2) ஏறுகொடி (Climber) - அதிரல் (*Jasminum angustifolium*),

பற்றுக் கம்பிக்கொடி (Tendril) - பீர்க்கு (*Luffa aegyptiaca*)/ காந்தள் (*Gloriosa superba*),

சுற்றுக்கொடி (Twiner) - அவரை (*Lablab purpureus*),

பெருங்கொடி - அறுகம்புல் (*Cynodon dactylon*).

வளரியல்பு அடிப்படையிலான செடிகள் :

நிலத்தாவரம் :

தரைத்தாவரம் - நெருஞ்சி (*Tribulus terrestris*),

செடி - ஆவிரை (*Cassia auriculata*),

குறுமரம் - காயா (*Memecylon edule*),

நீர்த்தாவரம் - ஆம்பல் (*Nymphaea pubescens*)

நீரில் மிதப்பவை (Plankton) - பாசி (Algae)

சாறுண்ணி (Saprophyte) - காளான்

அலகு – 4 : பிற இலக்கியங்களில் தாவரவியல் : - 8 மணிநேரம்

மனித நடத்தைகளும் தாவர இயல்புகளும் - வற்றல் மரம் (திருக்.7), பயன்மரம் (திருக்.216), பழுமரம் (நாலடி. 21:2), மருந்தாகித் தப்பா மரம் (திருக். 217), நச்சு மரம் (திருக். 1008), கூழ்மரம் (பழ. 272), முள்மரம் (திருக். 879), மனைமரம் (பழ.52), இடையன் எறிந்த மரம் (பழ.314)

ஓரணுத் தாவரங்கள் - பாசி (வெற்றி வேற்கை 33), காளான்

தாவர வளர்ச்சியின் இன்றியமையாத கூறுகள் - வேர், நீர், காற்று, சூரிய ஒளி ஆகியவற்றின் அவசியம் - (திருக். 16, நான். 64, நான். 41, நான். 30, பழ. 97, பழ.83, பழ. 311, பழ. 13,)

தாவரங்கள் இடம் பெயர்வுத் தன்மை அற்றன - மூதுரை 17

விதைத்தாவரத்தின் இயல்பு - வெற்றி வேற்கை. 17, 34

ஒரு பருவத் தாவரங்கள் (Annual) - நெல், வாழை, (நான். 2, நான். 82)

பாடநூல் :

தமிழர் கண்ட தாவரவியல் - வே.நெடுஞ்செழியன், உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 2005

துணைநூல்கள் :

கடிகாசலம்.ந., **தமிழும் பிற துறைகளும்,** உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை,1994.

காஞ்சனா.இரா**., சங்க இலக்கியத்தில் நிலையியல் உயிர்கள்**, மதுரை காமராசர் பல்கலைக்கழகம், மதுரை, 1998.

சாமி.பி.எல்., **சங்க நூல்களில் செடி கொடிகள்**, திருமுடி பதிப்பகம், புதுச்சேரி, 1991.

சீநிவாசன்.கு., **சங்க இலக்கியத் தாவரங்கள்,** தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர், 1987.

சுந்தர சோபித ராஜ்.கே.கே., **தமிழில் தாவரச் செய்திகள்**, சோபிதம் பதிப்பகம், நாகர் கோவில்

BOT3203VI PAPER RECYCLING

Learning Outcomes **2hrs/week**

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

- adopt the technology of paper recycling
- make stationery and gift articles for various occasions
- create paper jewellery
- start their own ventures

COURSE OUTLINE

Unit I: **24 hrs**

Rationale for recycling - Role of an individual in prevention of pollution - Paper making as small scale industry - Collection of waste paper - Segregation of waste paper - Quantum assessment of paper waste - Pulping and moulding of paper into value added products - Packaging and marketing of finished paper products - Eco-awareness programme on waste paper management

Unit II: Entrepreneurship **6 hrs**

Concept of Entrepreneurship – Qualities of Entrepreneurs – Product Selection – Institutional Support – DIC, MSME DI – Infrastructural support schemes - Sources of Finance – Government Assistance – skill development – Skill India, NSDC- Start Ups- Angel Investors - Preparation of cash book and statement of cost and profit – Advertising and sales promotion for small business

Reference Books

- R. McKinney, **Technology of Paper Recycling**,Springer Netherlands, 2012
- R.V. Badi, N.V. Badi, **Entrepreneurship**, Vrinda Publications (P) Ltd. New Delhi, 2005

BOT3202VI KITCHEN GARDEN AND ORGANIC FOOD PRODUCTS

Learning Outcomes **2hrs/week**

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

- prepare a layout of kitchen garden and set a garden
- produce organic products
- Start their own venture

COURSE OUTLINE

Unit I: 24 hrs

Kitchen garden – Site selection, site analysis, crop selection, Layout - preparation and maintenance (planting, irrigation, manuring (organic manure / vermi compost / biofertilizer), plant protection) harvesting and marketing - Methods of green manufacture, products of green manufacture - organic farming, eco friendly green products - Organic products - Food - Fruit and vegetables, Nuts and seeds, Flour and Grains, Herbs - Processed foods - Organic juice, canned goods, frozen vegetables, Organic coffee, and Organic baby food – Terrace Gardening

Unit II: Entrepreneurship 6 hrs

Concept of Entrepreneurship – Qualities of Entrepreneurs – Product Selection – Institutional Support – DIC, MSME DI – Infrastructural support schemes - Sources of Finance – Government Assistance – skill development – Skill India, NSDC- Start Ups- Angel Investors - Preparation of cash book and statement of cost and profit – Advertising and sales promotion for small business

Reference Books

- William D. Adams, Tom LeRoy, **The Southern Kitchen Garden: Vegetables, Fruits, Herbs and Flowers Essential for the Southern Cook,** Taylor Trade Publishing, 2007
- Richard Bird, **Growing fruit & vegetables: the complete practical guide to kitchen gardening, from planning and planting to care and maintenance**, Hermes House, 2003
- R.V. Badi, N.V. Badi, **Entrepreneurship**, Vrinda Publications (P) Ltd. New Delhi, 2005

BOT4405CM BIOCHEMISTRY

(Theory)

LEARNING OUTCOME : 4Hrs./Wk.

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

- acquire a deeper understanding of the structure and functioning of the biomolecules
- apply the concepts of thermodynamics in the biological system
- relate the basic concepts and designs of metabolic reactions that take place in the biological systems

COURSE OUTLINE :

UNIT-I : THERMODYNAMICS AND CARBOHYDRATES 12 Hrs.

Introduction-basic concepts of laws of thermodynamics, Concept of free energy - biological oxidation reduction reactions - high energy compounds – ATP. Monosaccharides – Classification, structure, isomerism, ring structure of glucose – physical and chemical properties of monosaccharides. Disaccharides – Structure of sucrose, Oligo and polysaccharides – Starch, homo and hetero polysaccharides and hydrolysis of starch

UNIT-II : PROTEINS 12 Hrs.

Structure , classification and properties of aminoacids Formation and structure of peptides, Conformation of proteins. Classification and types of proteins, their structure and role, denaturation

UNIT-III : LIPIDS **12 Hrs.**

Structure, classification and properties of fatty acids and their derivatives. Fats-structure, Phospholipids-types, structure and occurrence, Non - phosphorylated lipids – types, structure and occurrence.

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

Structure of bases, nucleosides and nucleotides. Structure – Watson and Crick model of DNA and its properties. Structure and types of RNA.

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

Nomenclature, classification and properties of enzymes Enzyme catalysis – mechanism & co-factors in enzyme catalysis Enzyme inhibition- Competitive , Non competitive , Allosteric and Feedback inhibition. Enzyme kinetics - Michaelis-Menton Kinetics.

TEXT BOOK(S)

Ambika Shanmugam, **Fundamentals of Biochemistry for Medical students**, Nagaraj and Company Pvt. Ltd., Chennai, 2005. revised edition.

Lehninger L.A., Nelson K.L., Cox M.M, **Principles of Biochemistry**, Worth Publishers, New York, 2010,5.

REFERENCE BOOK(S)

Devlin M. Thomas, **Text book of Biochemistry with clinical correlations**, A John Wiley & Sons Inc. Publication, USA, 2006.

Elliot W.H., Elliot D., **Biochemistry and Molecular Biology,** Oxford University Press, USA. 1997,

McKee Trudy and McKee.R.James,, **Biochemistry and Introduction**, Wm. C. Brown Publishers, USA,1996.

Stryer L, **Biochemistry**, W.H. Freeman Publishers,, New York, 2007.

Voet Donald, Voet G. Judith, **Biochemistry**, A John Wiley & Sons Inc. Publication, USA, 2004. 3rd edition.

BOT4406CM PLANT PHYSIOLOGY

(Theory)

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

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

- relate the role & movement of water and solutes in plants
- explain the mechanism & the role of photosynthesis in plants
- analyze the mechanism & the role of respiration
- relate the effects of plant movements and phytohormones on the growth & development of plants

COURSE OUTLINE :

UNIT-I : WATER RELATIONS **12 Hrs.**

Diffusion, gaseous exchange, Osmosis, Plasmolysis, absorption of water, ascent of sap (cohesion-tension theory), Transpiration – types, mechanism of stomatal movements, factors affecting transpiration, Mineral nutrition- role of macro & micro nutrients(Review), passive & active transport of ions, translocation of organic solutes – Munch hypothesis.

UNIT-II : PHOTOSYNTHESIS IN PLANTS **12 Hrs.**

Photosynthetic pigments, action & absorption spectra, Red drop, Emerson enhancement effect. Photosystems I and II, Light reaction – cyclic & non cyclic photophosporylation, dark reaction, C4 cycle – photorespiration, factors affecting photosynthesis.

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

Respiratory substrates, RQ, Glycolysis, Kreb's cycle, fermentation, Pentose phosphate pathway, factors affecting respiration.

UNIT-IV : PLANT MOVEMENTS & PHYTOHORMONES **12 Hrs.**

Plant growth – definition, phases of growth of plant, Plant movements – autonomous and paratonic. Phytohormones and their role – Auxins, Gibberellins, Cytokinins(Review)

UNIT-V : REPRODUCTIVE GROWTH AND PHYSIOLOGY OF SEEDS **12 Hrs.**

Flowering - Photoperiodism and Vernalization, morphological and physiological changes that occur during fruiting. Seed dormancy & germination – causes, methods of breaking dormancy, physiological changes that occur during germination and Senescence

TEXT BOOK(S)

Noggle and Fritz, **Introductory Plant Physiology**, Prentice Hall of India Private Limited, New Delhi, 2010,2nd edition.

Srivastava H.N., **Plant Physiology**, Pradeep Publications, Jalandhar, 1994.

REFERENCE BOOK(S)

Devlin R.M and Witham, **Plant Physiology**, F.H CBS Publishers and Distributors, New Delhi, 1986. Leopald Carl A, **Plant Growth and Development**, Mc Graw Hill Book Company, New York, 1964. Salisbury B. and Ross F, **Plant Physiology**, CBS Publishers and Distributors, New Delhi, 2007, 4th edition.

BOT4407CM HORTICULTURE

(Theory)

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

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

- identify the basic concepts of horticulture
- illustrate the techniques involved in plant growing
- develop the skills in plant growing and maintenance

COURSE OUTLINE :

UNIT-I : BASIC PRACTICES IN HORTICULTURE **12 Hrs**

Horticulture - scope and importance. Plant containers, Preparation of pot mixture - individual and group. Irrigation - surface, sub, spray and drip irrigation - Objectives and effects. Methods of pruning – heading back, thinning out. Training - open centre, central leader and espalier. Transplanting methods and factors influencing the plant recovery.

UNIT-II : PROPAGATIONf **12 Hrs**

Propagation by seed - Seed testing & sowing. Vegetative propagation – Cuttage, layerage (simple, & air), grafting (tongue,), budding (T).

UNIT-III : ORNAMENTAL GARDENING **12 Hrs**

Garden implements – uses. Ornamental gardening– principles of garden making, ornamental garden and its parts. Lay out of an ornamental garden. Establishment and maintenance of lawn, Rockery.

UNIT-IV : OLERICULTURE **12 Hrs**

Principles, climate, soil and site selection, manuring, irrigation, Cultivation of *Amaranthus*. Kitchen garden– simple plan. Pomology – planning, lay out and planting of orchards.

UNIT-V : PLANT PROTECTION **12 Hrs**

Weeding – common weeds of a home garden, effects of weeds on plant growth, methods of weeding (hand weeding, hoeing, tillage, digging, cheeling, sickling). Use of herbicides in controlling weeds. Manuring – organic - green manure, vermicompost, biofertilizers, common pests and diseases of garden plants

TEXT BOOKS

Kumar N., **Introduction to Horticulture**, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 2010, 7th edition.

REFERENCE BOOKS

Philip M., **Plant Propagation**, Mitchell Beazley Publishers Ltd., New York, 1992.

Veeraragavathatham D., Jawaharlal M,. Jeeva S,. Rabindran R and. Umapathy G, **Scientific Fruit Culture**, Suri Associates, 2004.

Walls I.G., **The Complete Book of the Green House**, Ward Lock, Ltd, London, 1983, 3rd Edition

BOT4501CM DEVELOPMENTAL BOTANY AND PLANT BREEDING (Theory)

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

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

- illustrate the structure, function of the reproductive organs and changes associated with seed development
- discuss the procedures of plant breeding programmes
- assess the practical achievements in the development of new crop varieties

COURSE OUTLINE :

UNIT-I : MICROSPOROGENESIS AND MEGASPOROGENESIS **15 Hrs.**

Microsporangium – T.S of a tetrasporangiate anther – Anther Wall – Structure , Nuclear behaviour in tapetal Cells, Sporogenous tissue Male Gametophyte – Vegetative and Generative Cell, Formation of Sperm, Pollen Wall – Palynology, NPC system. Megasporangium – Types of Ovules – Integuments, Nucellus, Megasporogenesis – Female Gametophyte, Types of Embryosac, – Nutrition of Embryo sac. Pseudo embryosac & perisperm.

UNIT-II : POLLINATION AND FERTILIZATION **15 Hrs.**

Pollination – Anther dehiscence, Pollen transfer. Fertilization – Pollen germination, Pollen tube growth, Entry of pollen tube into the embryosac, Pollen tube discharge, Fusion of gametes, Double fertilization

UNIT-III : ENDOSPERM, EMBRYO AND POLY EMBRYONY **15 Hrs.**

Endosperm - origin, types- free nuclear (coconut), cellular, helobial and ruminate endosperm, function of endosperm. Embryo: Embryogeny, Development and structure of dicot (*Ceratocephalus falcatus*)and monocot (*Triticum*) embryo,suspensor, nutrition of embryo. Polyembryony – causes, experimental induction, classification. Apomixis, Parthenocarpy – genetic, environmental & chemically Induced.

UNIT-IV : SCOPE OF PLANT BREEDING AND METHODS OF CROP IMPROVEMENT **15 Hrs.**

Scope of Plant breeding, Plant Introduction and acclimatization –, Plant quarantine measures, present organizations and their functions, utilization of introduced materials. Selection – Mass, Pureline & Clonal selection – Definition, characters, production, importance, field technique, advantages & disadvantages, achievements.

UNIT-V : METHODS OF BREEDING **15 Hrs.**

Hybridization – emasculation, bagging, crossing, labeling, harvesting hybrid seeds, raising F_1 generation, back cross method, single cross, double cross, three way cross, top cross, multiple cross and synthetic cross, effect of hybridization on cross pollinated crops, Heterosis, Mutation breeding – role of mutants in improvement of crop – artificial induction of mutation, gamma garden. Achievements in crop breeding in India with reference to Rice.

TEXT BOOK(S)

Bhojwani S.S. and Bhatnagar S.P, **The Embryology of Angiosperms**, 5th revised, New Delhi, Vikas Publishing House Pvt. Ltd, 2008.

Chaudhari H. K, **Elementary Principles of Plant Breeding**, New Delhi, Oxford & IBH Publishing Co Pvt Ltd,

1992.

REFERENCE BOOK(S)

Maheswari, P, **An Introduction to the Embryology of Angiosperms**, New York, McGrawHill, 2002.

Pandey, B.P, **Embryology of Angiosperms**, New Delhi, S. Chand & Company Ltd, 1995.

Poehlman. J. M and Borthakur. D, **Breeding Asian Field Crops**, New Delhi, Oxford & IBH Publishing Co, 1969.

Sharma J.R, **Principles and Practice of Plant Breeding**, New Delhi, Tata Mc Graw Hill Publishing Co Ltd, 1994.

BOT4203CP LAB FOR BIOCHEMISTRY AND PLANT PHYSIOLOGY

(Lab)

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

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

- prepare solutions used in experiments accurately
- design simple experiments, collect the data, scientifically interpret and extrapolate the obtained data
- apply the various techniques and skills to understand the biochemical aspects of plants

COURSE OUTLINE :

60 Hrs.

EXPERIMENTS / LAB :

BIOCHEMISTRY

1. Preparation of solutions – Molar, Molal, Normal, & Percentage solution
2. pH metry – measurement of pH of different solutions using pH meter.
3. Colorimetry – Complementary colour. Verification of Beer's law.
4. Qualitative and quantitative estimation from plant samples for the following:
    A. Glucose - Anthrone method
    B. Protein - Biuret method
    C. Amino acid - Ninhydrin method
    D. Lipid - Gravimetric method, Sudan III
5. Chromatographic techniques – paper (circular - dye mixture; Ascending-Aminoacid mixture), TLC– separation of dye mixture. Column chromatography – Separation of chlorophyll pigments (Demonstration)

PLANT PHYSIOLOGY

6. Potato osmoscope
7. DPD – Plasmolytic method
8. Stomatal frequency
9. Ringing experiment
10. Determination of RQ using respirometer and Smith Fermentation experiment.
11. Effect of light intensity, CO_2 concentration and wavelength on the rate of photosyhnthesis, Absorption spectrum.

REFERENCE BOOK(S)

Jayaraman. J, **Laboratory Manual in Biochemistry**, Wiley Eastern Limited, New Delhi, 1992.

Palanivelu P, **Laboratory Manual for Analytical Biochemistry & Separation Techniques**, School of Biotechnology, Madurai Kamaraj University, Madurai, 2000.

Palvannan T, Shanmugam S. and Sathish Kumar T, **Laboratory manual on Biochemistry, Bioprocess & Microbiology**, Scitech publications (India) Pvt. Ltd, Chennai & Hyderabad, 2005..

Plummer D.T, **An Introduction to Practical Biochemistry**, Tata Mc Graw Hill Publishing Company Limited, New Delhi, 1999.
Sadasivam S. and Manickam A, **Biochemical Methods for Agricultural Sciences**, Wiley Eastern Ltd, New Delhi, 1992.

BOT4204CP LAB FOR HORTICULTURE, DEVELOPMENTAL BOTANY & PLANT BREEDING

Lab

LEARNING OUTCOME **3 Hrs / Wk**

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

- understand the basic concepts of horticulture
- appreciate the applied aspects of horticulture
- illustrate the various aspects in experimental embryology
- apply the techniques of emasculation and bagging in the development of a new variety

HORTICULTURE **45 hrs**

1. Garden implements
2. Preparation of pots, transplanting, pruning
3. Propagation – cuttage, layerage, grafting & budding
4. Ornamental gardening – flower bed, hanging pots
5. Kitchen garden – Layout
6. Effect of herbicide on weed growth

DEVELOPMENTAL BOTANY

1. Microscopic observation of C.S. of anther*(Datura)*
2. Embryo mounting (*Tridax* / *Achyranthes*)
3. Microscopic observation of permanent slides of different types of ovules

PLANT BREEDING

1. Emasculation
2. Bagging & Labelling

REFERENCE BOOKS

Bhojwani, S.S., Bhatnagar, S.P., **The Embryology of Angiosperms**, Vikas Publishing House Pvt. Ltd, New Delhi., 2001.
Chaudhari H. K., **Elementary Principles of Plant Breeding**, Oxford & IBH Publishing Co Pvt Ltd, New Delhi, 1992
Maheswari, P. **An Introduction to the Embryology of Angiosperms.**McGrawHill ,New York 1950.
Prasad S., and Kumar U., **A Handbook of Floriculture**, Agrobios, 2010.
Prasad S., and Kumar U, **A Handbook of Fruit Production**, Agrobios, 2010
Philip M., **Plant Propagation**, Mitchell Beazley Publishers Ltd., New York, 1992.
Sharma J.R., **Principles and Practice of Plant Breeding**, Tata Mc Graw Hill Publishing Co Ltd, New Delhi, 1994.

BOEC4201EI NUTRITION ECONOMICS

(THEORY)

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

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

- understand the essentials of nutrition and fitness
- overcome fitness barriers and make healthier choices
- choose and sustain the healthy lifestyle
- assess the economic aspects of nutrition

CONTENT CONTENT:

UNIT I: BASIC PRINCIPLES OF NUTRITION **7 hrs.**

Nutrition – essential nutrients – food groups (Basic five) – nutritional guidelines – balanced diet – Nutrition for healthy living – changing body composition – calculation of BMI.

UNIT II: HEALTH ISSUES AND RELATED DIET PLANNING **8 hrs.**

Significance of nutrition in treatment – management of obesity – underweight – anaemia – peptic ulcer – typhoid – diabetics – cardiovascular disease – Irregular menstrual cycle – cancer – Stress – definition – analysis of stressors – stress responses – strategies for managing – Counseling.

UNIT III: ECONOMIC ASPECTS OF NUTRITION **7 hrs.**

Food grains – organic foods – Navdanya movement – Production Process –Traditional and Modern Process – Fast Food Culture - Dietary Transition – Food Budget – Regular vs Nutritional Budget – Economic Cost.

UNIT IV: GOVERNMENT PROGRAMMES AND SCHEMES IN INDIA **8 hrs.**

Current Scenario on Nutrition – National Nutrition Policy – Mid day Meals - **National Policy for Children –** GM crops – issues – challenges – Nutrition Programme for Adolescent Girls – Public Distribution System – Integrated Child Development Services Scheme.

REFERENCE BOOK(S):

Suresh Babu Shailendra N. Gajanan J. Arne Hallam, (2016). Nutrition Economics: Principles and Policy Applications, USA: Academic Press. Print.

Ramachandra Guha, (2000). Environmentalism: A Global History, New York: Addison Wesley Longman. Print.

Hales, D, (2001). *An Invitation to Fitness and Wellness,* Belmont, CA :Wadsworth Publishers. Print.

Leeds, M. J, (1998). *Nutrition for Healthy Living,* Boston: Mc Graw Hill Publishers. Print.

Puri, V. K. & Misra, S. K, (2017). *Indian Economy,* (35th Revised Edition), New Delhi, India: Himalaya Publishing House. Print.

Williams, M, (1998). *Nutrition for Fitness and Sport,* **(**5th Edition), Madison: Brown & Benchmark. Print.

BOSS4201EI ECOLOGY AND SOCIETY

LEARNING OUTCOME:

On successful completion of the course, the student will be able to **2hrs/wk**

- define the various concepts in ecology
- understand the ecological principles & derive conclusions.
- evaluate the interdependency of human beings & nature.

- learn new initiatives for sustainable green living.

COURSE OUTLINE:

Unit I: BASIC CONCEPTS 7hrs

Concept of Ecology – Characteristics of living systems, levels of organization, flow of energy, interconnectedness of ecosystem.

Concept of Social Ecology - Definition, Ecological wisdom, Ecological Justice, Ecological balance, Ecological democracy, Eco feminism, Ecological concerns, Ecological crisis.

Unit II: ECOLOGICAL CONCEPTS & PRINCIPLES 8hrs

Levels of biological Organization, Nature of species, Keystone species, Population viability/threshold, Ecological resilience, Disturbance, Ecological principles for Conservation of biodiversity – protection of species, maintenance of habitat, disturbance, influence of climate on ecosystem.

Unit III: CULTURAL ECOLOGY – CONCEPTUAL VIEWS OF CULTURE & SOCIETY 7hrs

Human species, Ecology of human species, Impact on Nature, Ecology and consumption – Cultural materialism – theoretical principles, Epistemological principle, Changing face of Earth – Earthquakes, wind, glaciers, Erosion, Volcanoes, Relationship in 21st Century.

Unit IV: GREEN ENVIRONMENTALISM 8hrs

Sustainable Living – Green living & thinking (dark green, light green and bright green) Green garden, Green food, Green energy, Green market, Green Economy.

REFERENCE BOOKS:

Chata Heller, **Ecology of Everyday life**, Black Rose Book publishers, New York, 1999.

Dash M.C, **Fundamentals of Ecology**, Tata McGraw – Hill Publishing house Ltd., New Delhi, 2001.

Elizabeth Rogens, Thomas M. Rostigen, Cameron, **The Green book: Everyday guide to saving the planet one simple step at a time**, Peace Rivers Press, Crown Publishing group, New York, 2007.

Eugene P. Odum, **Ecology: The link between the natural & social sciences,** Saunder Collge publishing house, 1975.

Murray Bookehin, **Remaking Society**, Black Rose Book Publishers, New York, 1989.

Murray Bookehin, **Philosophy of Social Ecology**, Black Rose Book Publishers, New York, 1994

Peter J. Russel, Stephen L. Wolfe, Paul E. Hertz & Cecie Starr, **Ecology**, Beverly Macmillan Cengage Learning India Pvt. Ltd., New Delhi, 2009.

Steffen Alex, **World changing,** A User's guide for the 21st century Abrams Publisher, NewYork, 2011.

WEBSITES:

http: Beyond penguins.che.osu.edu/issue/earth

BOT4201SS HERBAL COSMETICS

(Theory)

LEARNING OUTCOME : 2 Hrs./Wk.

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

- record the significance of plants in beauty therapy
- identify the useful effect of and natural products in maintaining a healthy body
- prepare herbal beauty formulations

COURSE OUTLINE :

UNIT-I : Principles and features of herbs **7 Hrs.**

basic principles, unique features of herbs, useful herbs, botanical name of herbs.

UNIT-II : Basic anatomy of skin and hair, type of skin & hair, diseases of skin and hair **8 Hrs.**

- Pimples
- Dry skin
- Dark circle
- Hyper pigmentation
- Hypo pigmentation
- Dandruff

UNIT-III : Methods of preparation of herbal formulation **8 Hrs.**

- herbal hair oil
- scrubs
- face packs
- hair packs

UNIT-IV : Traditional methods of preparation of herbal formulation **7 Hrs.**

Traditional methods of preparation of herbal formulation – kajal, kumkum, face packs, hair pack, hair oil.

TEXT BOOK(S)

Asha Ram, **Herbal Indian perfumes and cosmetics**, Delhi, India, Sri Satguru publications, 2002.
Parvesh Handa, **Be your own beautician**, New Delhi, Pustak mahal, 2011.

BOT5201CM INTRODUCTION TO RESEARCH METHODOLOGY

THEORY

LEARNING OUTCOME: **2 hrs / wk**

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

- improve skills in the search for information
- identify & define a problem to be solved or an hypothesis to be tested
- analyze the research data using statistical analysis
- develop skills in the preparation of research report

COURSE OUTLINE:

UNIT-I : INTRODUCTION TO RESEARCH **8 Hrs.**

Research – Definition, Characteristics. Types of research-Pure, Applied, Action, Microlevel and Macrolevel, Inductive and Deductive research. Qualities of a good researcher. Methods of collection of literature, Types and maintenance of catalogues. Modern developments in library science

–Microfiche, Microfilm, E –Journals.

UNIT-II : METHODS OF RESEARCH **7 Hrs.**

Scientific methods and steps in doing scientific research. Experimental, Case study and Survey methods. Collection of Data, Sampling techniques - Interviews, Questionnaires. Classification of data and Tabulation of data.

UNIT-III : PREPARATIONOF RESEARCH PROPOSAL & REPORT **8 Hrs.**

Sources, Selection, and Evaluation. Preparation of a research proposal

–Title of research topic, Hypothesis, Defintion, Significance, Assumption and Limitation, Review of Literature, Methodology, Time schedule, Budget and Bibliography. Preparation of a research report. Plagiarism

–Basics and types of plagiarism

UNIT-IV : STATISTICAL ANALYSIS OF DATA **7 Hrs.**

Mean,Median, Mode, Mean Deviation and Standard Deviation. Graphical Representation of data –Line Graphs, Bar Graphs; diagrammatic representation of data –Simple, Sub divided and Multiple bar diagrams, Pie diagram. Frequency Distribution –Histograms. Demonstration using Excel in a computer to draw graphs for the given data

TEXT BOOKS:

Gurumani N, **Research Methodology of Biological Sciences**, MJP Publishers, Chennai, 2006.

Gurumani N, **An Introduction to Biostatistics**, MJP Publishers, Chennai, 2005.

Nirmala J, **Introduction to Research Methodology**, Lady Doak College Publications, Madurai, 2008

REFERENCE BOOKS:

Arora P.N and P.K.Mathan. **Biostatistics**. Himalaya Publishing House, Bombay., 2009.

Anderson J., B.H.Durston and M.Poole. **Thesis and Assignment Writing**. Wiley Eastern Ltd, New Delhi., 2008.

Khan I.A. and A.Khanum. **Fundamentals of Biostatistics**. Ukazz publications, Hyderabad, 2010.

Kothari C.R., **Research Methodology, Methods & Techniques**. New age International Publishers, New Delhi, 2006.

BOT5401CM GENETICS

THEORY

LEARNING OUTCOME: **4 hrs / wk**

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

- understand Mendelian law's of inheritance, modification of Mendelian ratio due to factor interaction, codominance, incomplete dominance and lethal genes
- predict the outcome of crosses using Punnett square
- describe and explain multiple alleles, multiple gene, cytoplasmic inheritance
- explain the chromosomal basis of sex determination, define sex linked inheritance and differentiate sex limited & sex influenced traits

UNIT I: HISTORY & MENDELISM **12 hrs**

A brief review of the history of genetics. Monohybrid, Dihybrid cross – Punnet's checker board method, test cross, back cross, modification of Mendelian ratio 3 : 1 due to incomplete dominance and codominance , lethal genes.

UNIT II: GENE INTERACTION 12hrs

Epistasis, duplicate dominant genes, duplicate genes with cumulative effect, Dominant and recessive interaction, non epistatic interaction, pleiotropic effect

UNIT III: LINKAGE & CROSSING OVER 12hrs

Linkage: Sutton's view of linkage , coupling and repulsion hypothesis- kinds of linkage: complete linkage ,Incomplete linkage ; Linkage groups ; significance of linkage

Crossing over – Types- Mitotic, Meiotic crossing over; Mechanism of Meiotic crossing over; Kinds of crossing over; significance of crossing over

UNIT IV: NON MENDELIAN INHERITANCE 12 hrs

Polygenic inheritance – Kernel colour in wheat, multiple alleles – blood group, self sterility in *Nicotiana,* Extra chromosomal inheritance – plastids, kappa particles and chromosomal aberration – variations in chromosome number, size and arrangement.

UNIT V:SEX- LINKED INHERITANCE AND SEX DETERMINATION 12 hrs

Inheritance of X- linked genes, Y- linked genes, and X-Y linked genes. Sex influenced genes: sex limited genes .Genetically controlled sex determining mechanism –Heterogametic male and Female. Genic balance mechanism. Sex determination in Human beings –Turner's syndrome, Klinefelter syndrome. Sex determination in plants- *Melandrium.*

TEXT BOOKS

Tamarin. H. R., **Principles of Genetics**, Tata McGraw Hill Publishing Company Limited, New Delhi, 2002, 7th Edition

Verma.P.S and Agarwal.V .K, **Genetics**, S.Chand and Company Ltd. New Delhi, 2009, 9Th edition

REFERENCE BOOKS

Klug. S. William and Cummings. R. M, **Concepts of Genetics**, Pearson Education Pvt. Ltd., Singapore, 2003, 7th Edition

Russell J. P. and Genetics, **A Molecular Approach**, Pearson Education Pvt. Ltd, Singapore, 2006, 2nd Edition

Snustad D. P. and Simmons J. M., **Principles of Genetics**, John Wiley & Sons Inc, United States of America, 2012, 6th Edition

Stansfield D.W., **Theory and Problems of Genetics**, Tata McGraw Hill Publishing Company Limited, New Delhi, 1986. 2nd Edition.

Strickberger W., **Genetics**, MacMillan Publishing Co, Inc, New York, 2000.

BOT5402CM EVOLUTION AND PALEOBOTANY

THEORY

LEARNING OUTCOME: 4hrs / wk

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

- trace the history of evolution of organisms
- analyse the significance of evolution
- interpret the theories and evidences of evolution
- understand the geological time scale and fossilization of plants

UNIT I: ORIGIN OF PROKARYOTIC AND EUKARYOTIC ORGANISM 12 hrs

Origin of basic biological molecules, abiotic synthesis of organic monomers and polymers; concept of Oparin and Haldane; experiment of Urey & Miller, Evolution of Prokaryotic and Eukaryotic cell.

UNIT II: HISTORY AND THEORY OF EVOLUTION 12 hrs

Historical account. Theories of Evolution- Darwinism, Lamarckism, Weismanism and Hugo de-Veris, Modern theory of evolution.

UNIT III: EVIDENCES OF EVOLUTION 12 hrs

Morphological and Anatomical, Embryological, Biochemical, Physiological, Palaeontological, Taxonomical, Biogeographical and Genetical evidences of evolution.

UNIT: IV FACTORS INFLUENCING EVOLUTION 12 hrs

Elemental forces of evolution, gene pool, gene frequency; Hardy-Weinberg law; migration and random genetic drift; adaptive radiation and modifications, isolating mechanisms, speciation; allopatricity and sympatricity.

UNIT: V PALAEOBOTANY 12 hrs

General classification of geological time scale, Brief study of the methods of formation of fossils. Kinds of fossils - Compression, incrustation, casts and moulds, petrifaction, impression, Dating of fossils – carbon dating. Rocks as a source of plant fossils. Study of the following types of fossils - a) Psilotales - *Rhynia* b) Lepidodendrales- *Lepidodendron.* c) Cycadofilicales-*Lyginoptera.*

TEXT BOOKS

Renganathan, T.K., **Evolution**, Rainbow Printers, Palayamkottai, 1994, 7th edition

Tyagi A.P and Rao G.S., **Introduction to Paleobotany**, Chand and Co, New Delhi,1972.

Verma, P.S., Agarwal, V.K., **Cell Biology, Genetics, Molecular Biology, Evolution and Ecology**, S. Chand & Company, LTD., New Delhi, 2012.

REFERENCE BOOKS

Ashok C.Shukla, Shital P.Mishra., **Essentials of Paleobotany**, Vikas Publishing House, Delhi, 1975.

Herbert H.Ross .**Understanding Evolution**, Library of Congress Catalog card number. USA. 1966

Holt . Rinehart and Winston, **Morphology & Evolution of fossil plant**. , USA,1963

Theodosius Dobzhansky, Max K.Hecht William C. Steere., **Evolutionary Biology,** New York. 1970.

BOT5501CM ENVIRONMENTAL BIOLOGY AND APPLIED MICROBIOLOGY

THEORY

LEARNING OUTCOME: 6 hrs / wk

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

- analyze the ecosystem and appreciate the different types of interaction seen among plants and microbes
- analyze and evaluate their role in eco sustainability in the light of national and global environmental issues and learn about the distribution, sampling devices and control measures of air microflora
- understand the various factors influencing microbial spoilage of food and food borne diseases and analyze the process involved in the production of fermented products
- recognise the role of microbes in disease establishment and their control

Unit I: ECOSYSTEM AND ECOLOGICAL FACTORS: 18 hrs

Definition, branches, scope, historical background –special focus on Indian ecosystem-abiotic and biotic components of aquatic and terrestrial ecosystem, Ecological pyramids, food chain, food web, energy flow. Classification, climate, topographic, edaphic and biotic factors, effects of the factors on plants at optimal and supra optimal levels.

UNIT II. BIOGEOCHEMICAL CYCLES AND POPULATION INTERACTION: 18 hrs

Characteristics and structure of communities, Process of succession - Hydrosere, Xerosere. Biogeochemical cycles – Definition, classification, Carbon, Water, Oxygen, Nitrogen, Sulphur and Phosphorus cycle. Neutralism, Commensalism, Synergism, Mutualism, Competition, Amensalism, Antagonism,Parasitism and Predation

UNITIII: : CLIMATE CHANGE –GLOBAL AND ISSUES IN INDIA 18 hrs

Climate change- Causes and effects, Natural disasters- Earthquakes, cyclones, floods. Carbon sinks, Ecological footprint, Climate change and loss of biodiversity, Sustainable development- Global and issues in India, Solid waste management – Composting, Sewage treatment. Pollution , Aerobiology- Air borne biological materials, Air sampling devices - Impactors (Slit Sampler, Cascade impactor, Hirst trap,Anderson sampler, Rotorod, Vertical cylinder trap), Impingers

UNIT IV: FOOD AND INDUSTRIAL MICROBIOLOGY 18 hrs

Classes of foods - Perishable, Semiperishable and Non-perishable, Food as a substrate for microbes, Factors (Intrinsic and Extrinsic). sources of food contamination , Food spoilage – Milk, Meat and Canned food , Food infection and food intoxication. Screening and preservation of industrially important microorganisms, and fermentation media. Batch fermentor. Microbial production of industrially important products [Penicillin & Citric acid)

UNITV: MEDICAL MICROBIOLOGY and IMMUNOLOGY 18 hrs

Types of immunity – innate immunity and its mechanism, Acquired immunity – vaccines. Antigens – essential features, Antibodies – properties, Immunoglobulins – structure, Antigen – antibody reactions – precipitation, agglutination, Hypersensitivity – classification, mechanism & manifestation, Host – pathogen relationship – normal microbial flora of human body, Antibiotic test for potency – Kirby – Bauer test, MIC test. Causative organism, symptoms, diagnosis and control of the following diseases: AIDS, Tuberculosis, Malaria

TEXT BOOK(S):

Abdul K. Abbas and Andrew H. Litchman, **Basic Immunology – Functions and disorders of the immune system,** 2nd edition, Elsevier India Pvt Ltd, New Delhi, 2006.

Arvind Kumar, **A Text Book of Environmental Science**, A P H Publishing Corporation, New Delhi, 2009

Frazier W.C., Westhoff D.C., **Food Microbiology**, Tata Mc Graw Hill, New Delhi, 2001, 4th edition New Delhi, 2009.

Patel A. **Industrial Microbiology**, McMillan India Ltd., New Delhi, 2006.

Shetty N. **Immunology – Introductory Text Book**. New Age International Publishers, New Delhi., 2006.

Shukla, **Ecology**, S.Chand & Company Ltd, Ram Nagar, New Delhi, 1996.

Tilak S.T., Basumatary, S.K. **Aerobiology,** Vivek Mudranalaya, Aurangabad, 1982.

REFERENCE BOOK(S) :

Adams M.R and Moss M.O., **Food Microbiology,** New Age International (P) Limited Publishers, New Delhi, 1996.

Atlas. R.M and Bartha. R, **Microbial Ecology: Fundamentals and Applications**, The Benjamin / Cummings Publishing Company, Inc, California, 2000.

Bhachura E, **Text book of Environmental studies for under graduate students**, Universities Press(India) Pvt Ltd, Hyderabad, India, 2005.

Casida , J.E., **Industrial Microbiology,** Wiley Eastern Ltd, New Delhi, 1968.

Crueger W and Crueger A., **A textbook of Industrial Microbiology**, Panima Publishing Corporation, New Delhi, 2000

Das. R. R, **Environmental Studies**, Paragon International Publishers, New Delhi, 2006.

Greenwood D., Slack R.C.B and Peuther, J.F., **Medical Microbiology**, 15th Edition, ELST Publishers, Hong kong, 1997.

Levinson W.E and Jawetz E, **Medical Microbiology & Immunology**, 4th Edition, Prentice Hall international Inc, New york, 1996.

Misra. S. P and Pandey.S. N, **Essential Environmental studies**, Ane Books India, New Delhi, 2008.

Misra. D.D, **Fundamental concepts in Environmental studies**, S. Chand & company Ltd, New Delhi, 2009.

Roitt I., **Essential Immunology**, 11th Edition. Blackwell Science Inc., U.S.A., 2006.

Singh. H.R, **Environmnetal Biology**, S. Chand and company Ltd, New Delhi, 2009.

Tizard I.R., **Immunology : An Introduction,** 2nd Edition, W.B. Saunders, Philadelphia. 1998.

BOT5203CP LAB FOR ENVIRONMENTAL BIOLOGY AND APPLIED MICROBIOLOGY

(LAB)

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

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

- determine the concentration of pollutants in the atmosphere
- analyse and categorize the ecological data
- isolate and identify microbes causing food spoilage

COURSE CONTENT: **60 hrs.**

1. Physical parameters of water – Temperature – Turbidity
2. Chemical parameters of water – pH – Acidity – Alkalinity – Dissolved oxygen
3. Measurement of CO_2 and CO concentration in air
4. Study of vegetation in the campus by – Quadrat method – Line transect.
5. Isolation and Enumeration of microorganisms from spoiled food.
6. Dye reduction test – Methylene blue & Resazurin test – Quality assessment of milk
7. Biological analysis of water samples – Test for coliforms – Presumptive – Confirmed – Completed test
8. Screening of microbes for the production of antibiotics – Crowded plate technique
9. Antibiotic sensitivity test – Kirby-Bauer test
10. Starch hydrolysis test for the production of amylase by bacteria
11. Antigen-antibody reaction – Blood grouping

REFERENCE BOOK(S):

Cappucino, J.G. and Sherman, N, (2009). *Microbiology – A Laboratory Manual, (7*th ed.), South Asia: Pearson Education, Inc & Dorling Kindersley Publishing Inc. Print.

Gunasekaran, P, (1995). *Laboratory Manual in Microbiology, New Delhi, India:* New Age International (P) Limited Publishers. Print.

Harrigan, W.F, (1998). *Laboratory Methods in Food Microbiology,* (3rd ed.), UK: Academic Press Ltd. Print.

Kannan, N, (1996). *Laboratory Manual in General Microbiology,* Palani, India: Palani Paramount Publications. Print.

Manivasakam, N, (1987). *Industrial Effluents – Origin, Characteristics, Effects, Analysis & Treatment,* Coimbatore, India: Sakthi Publications. Print.

Rajan, S. and Selvi Christy, R, (2010). *Experimental Procedures in Life Sciences,* Chennai, India: Anjanaa Book House. Print.

Reddy, S.M. and Ram Reddy, S, (2000). *Microbiology – A Laboratory Manual,* Revised ed., Hyderabad, India: BSC Publishers & Distributors. Print.

Sharma, P.D, (2014). *Ecology and Environment*, (12th Revised ed.), Meerut, India: Rastogi Publications. Print.

Trivedi, P.R. and Raj, A, (1992). *Environmental Water and Soil Analysis,* New Delhi, India: Adshadeep Publishing house. Print.

BOZO5401DM BIOSAFETY AND BIOETHICS

THEORY

4 hrs / wk

LEARNING OUTCOME:

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

- identify the difference between Class I, Class II& Class III biosafety cabinets.
- appreciate the importance of biosafety in science experimentation
- follow the ethical guidelines in her research

UNIT I: BIOSAFETY **12 hrs**

Introduction, biosafety guidelines: laboratory practices, basic requirements, cleanliness, personal safety - biohazardous agent – risk groups & biosafety levels – safety protocols.

UNIT II: BIOSAFETY CONTAINMENT **12 hrs**

Basic and essential biosafety equipments - disposal of biohazardous waste. Safety in handling genetically modified organisms – safety in handling laboratory animals.

UNIT III: BIOETHICS I **12 hrs**

Animal ethics: Need of animals for research - Animal ethical committees - Guidelines for use of animals in research - Animal welfare measures; Housing and environment - Organisations: Animal Welfare Board of India - Blue Cross Society- People For Animals (PFA) – Buddha Society for Animal Welfare (BSAW)-Cultural concerns: animal sacrifices – vegetarianism.

UNIT IV: BIOETHICS II **12 hrs**

Medical ethics: Historical aspects, Indian Medical Council - Cultural concerns
Reproductive ethics: Sex determination - embryonic stem cell research and embryo donation.
Biotechnology and ethics – benefits and risks of genetic engineering, GM crops and GMO's - Human genome projects (ELSI)

UNIT V: INTELLECTUAL PROPERTY RIGHTS **12 hrs**

Protection of IPR in India – Patents: filing, types, process - copy right- trade mark - design - geographical indication - biopiracy.

TEXT BOOKS

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

REFERENCE BOOKS

Broady B.A., Engelhardt H.T., **Bioethics- Reading & cases**, Dorling Kinderslay , New Delhi

Ojha S., **Encyclopedia of Bioethics**, Dominant Publishers and Distributors, Tamil Nadu, 2011

Kreuzer H and Massey A**., Biology & Biotechnology Science: Applications & Issues**, ASM Press, Washington DC, 2005

Sathyanarayana U., **Biotechnology,** Books & Allied Pvt. Ltd., Kolkata, 2008.

Sateesh M.K., **Bioethics & Biosafety**, I.K. International Publishing House Pvt. Ltd, New Delhi, 2008.

WEBSITES:

www.icmr.nic.in

www.dbt.nic.in

BOCH5401DT MEDICINAL PHYTOCHEMISTRY

LAB CUM THEORY

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

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

- trace the history of pharmocognosy and Indian traditional medicine and their sources
- identify the specific plants used for drug preparation
- develop the skill to prepare drugs
- analyze the chemical properties of the secondary metabolites
- critically evaluate the beneficial effect of plant drugs

UNIT I: INTRODUCTION TO PHARMOCOGENESIS AND SOURCES OF DRUGS 10 Hrs.

Definition of pharmocognosy, history of pharmocognosy, scope and importance of pharmacognosy. Indian system of Medicine in brief - Ayurvedic, Siddha, Unani, Homeopathy, Aromatherapy. Natural sources of drugs from plants – lower plants, higher plants, marine organisms, microbes – Classification of crude drugs – morphological, taxonomical, chemical and pharmocological.

UNIT II: PLANTS USED AS MEDICINE, THERAPEUTIC USES AND DRUG ADULTERATION15 Hrs.

Geographical distribution, morphology of the useful part, chemical constituents and therapeutic uses of the following plants:

Underground plant parts - Curcuma longa L.(Turmeric), Zingiber officinale Roscoe(Ginger), Alpinia officinarum Hance (Chitharathai), Acorus calamus L. (Vasambu), Allium cepa(Onion), Allium sativum L.(Garlic), Glycyrrhiza glabra L(Athimathuram).

Leaves – *Azadirachta indica* A. Juss (Vembu), *Adhatoda vasica* Nees .(Adathoda), *Eucalyptus globulus* Labill(*Eucalyptus*), *Ocimum sanctum* L. (Thulasi) & *Solanum trilobatum* Linn (Thoothuvalai)

Flower – *Cassia auriculata* Linn (Avarum) & Hibiscus rosa-sinensis L (Semparuthi)

Fruits & Seeds – Carica papaya L. (Papaya), *Emblica officinalis* Gaertn. (Gooseberry), *Piper nigrum* Linn. (Pepper), Piper longum L (Thipili)

Drug Adulteration- Faulty collection, Imperfect preparation, incorrect storage, deliberate adulteration, substitution of exhausted drugs, confusion of common vernacular nomenclature, and gross substitution by different materials.

UNIT III: PREPARATION OF CRUDE DRUGS 10 Hrs

Methods of collection and harvesting, methods of drying, garbling, packing, storage, processing of crude drugs. Physical method of evaluation, Chemical methods – methods of preparation of decoction,

maceration, infusion, juice extraction, solvent extraction and steam distillation, UV spectrophotometric analysis.Biological method- study of sensory characters – colour, taste, odour, texture, microscopical method – anatomical features, leaf constant, water pores, types of covering hairs and trichomes, observation of powdered drugs, *Lycopodium* spore method. Standardization of drugs (GMP & GAP)

UNIT IV: STRUCTURE AND PROPERTIES OF CHEMICAL CONSTITUENTS IN PLANTS:10Hrs.

Carbohydrates and its derivatives: Carbohydrates – Molish test & Fehling test

Fats, oils & Lipids: Properties for identification of castor oil, sesame oil and volatile oils.

Glycosides: Classification of glycerides – test for anthroquinone; Glycoside – Borntnager's test; cardiac glycosides – Keller-kilian's test.

Tannins – Properties and classification – $FeCl_3$ test; Gelatin test.

Alkaloids – properties and classification – Wagner's reagent; Dragendorff's reagent.

Flavanoids – Lead acetate solution test; Alkali test.

UNIT V: LAB **15 Hrs**

1. Collection and preparation of dried powder of selected medicinal plants.
2. Extraction of secondary metabolites using the dried powder with soxhlet extraction using selected solvents.
3. Qualitative analysis of the following:
    - Secondary metabolites present in the extracts
    - Carbohydrates and its derivatives: Carbohydrates – Molish test & Fehling test
    - Fats, oils & Lipids: Identification of castor oil, sesame oil and volatile oils.
    - Glycosides: Test for anthroquinone; Glycoside – Borntnager's test; cardiac glycosides – Keller-kilian's test.
    - Tannins – $FeCl_3$ test; Gelatin test.
    - Alkaloids – Wagner's reagent; Dragendorff's reagent.
    - Flavanoids – Lead acetate solution test; Alkali test.
4. UV spectrophotometric analysis of the extract
5. Lab visit – Aryavaidhya nillaiyam, Nagarjuna, INCOPS, Chennai with the help of Dr. J. Jeyavenkatesh.

TEXT BOOK

Mohammed Ali., **Text book of Pharmacognosy**, CBS publishers & Distributors, Delhi, 1994. 1st edition

REFERENCE BOOK

Rosaline A., **Pharmacognosy,** MJP Publishers, Chennai, 2011.

Bhattacharjee S.K., **Handbook of Medicinal Plants**, Pointer Publishers, Jaipur Third edition, 2001.

Mehta, S. C., Ashutosh Kar, **Pharmaceutical Pharmacology**, New Age International Publishers, New Delhi, 2011.

Shah R. M. & Nayak, R. T. **Pharmacognosy** Global Academic Publishers and Distributors, New Delhi, India. 2012

Sukh Dev., **A Selection of Prime Ayurvedic Plants Drugs Ancient – Modern Concordance**, Anamaya Publishers, New Delhi, 2006.

LIFE FRONTIER ENGAGEMENT

Semester V **Total Hours: 4 hrs. / wk.**

Semester VI **Total Hours: 5 hrs. / wk.**

credits: 5

BOT0602LM PLANTS, ENVIRONMENT AND HEALTH

OBJECTIVES:

- To facilitate students to appreciate her academic learning through experiential learning by disciplinary and inter disciplinary community engagements thereby enhancing their civic responsibilities in society
- To empower students with appropriate academic strategies and innovative assessment and evaluation criteria to facilitate joyful experiential learning for students to discover real life values
- To transform each student to be productive caring citizens of our global society through the vibrant community based action research programme

LEARNING OUTCOME:

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

- identify the medicinal and nutritional value of the plants consumed by the community
- bring about changes in environmental issues related to water supply and sanitation
- acquire critical thinking and problem solving skills catering to community needs

Projected benefits of the community partners

- Sensitize the target community on recycling of various house hold waste
- Address problems related to environmental hazards & hygiene

1. LFE Process

SECTION I **15 hrs.**

Common Unit

Understanding Life Frontier Engagement -

a) Service learning and Life Frontier Engagement

b) Principles- engagement, reflection, reciprocity, public dissemination.

c) Meaning of community and understanding of community dynamics.

d) Programme planning in Life Frontier Engagement - stages: Need analysis, Problem identification, Goal setting, Concept finalization, planning for stages of research, research and analysis, reflection and dissemination of results.

e) Ethical concerns in Life Frontier Engagement - Confidentiality, Conflict of interest, Informed consent.

ACTIVITY MODULE FOR SECTION I:

a) (i) Making students understand the concept of Service Learning and Life Frontier Engagement based on the information in the reading material given using student centered learning activities.

(ii) Interaction with any local group in a nearby community (Example: Children, adolescents, adults within or outside college) and identifying community dynamics.

(iii) Need based analysis to be done on the community by framing a questionnaire for base line socio economic survey.

b) (i) Asking students to prepare a programme plan based on the sub – themes and target group identified by the department.

(ii) Presentation by teams by refining the ideas of students based on programme planning stages.

c) Activity based on case studies on relevant to ethical issues in community engagement

Section II – THEMATIC CONCEPTS **15 hrs.**

Nutrition and Health: Conceptual framework

- Classifying nutritionally and medicinally important plants based on the food consumption pattern
- Binomial nomenclature of medicinally and nutritionally significant plants based on Bentham and Hooker's Classification

Correlational concept

- Undesirable food habits can lead to deficiency diseases
- Understand the benefits of traditional medicine over allopathic medicines

Theoretical concept:

- Medicinal and nutritional significance of plants
- Importance of balanced diet and malnutrition

Activity module

- Classification and identification of the plants based on the nutritive value (Vitamins, Proteins etc.)
- Visiting local schools and Anganwadi of the selected sites
- Survey on common nutritional problems in the target community for a healthy food menu
- Awareness creation for a healthy diet pattern

Environment and Hygiene

Classification concept:

- Categorization of various waste materials
- Identification of the types of environmental hazards in the target community
- Preparing a list of environmental risk factors involved in the transmission of communicable diseases

Correlational concept:

- Understand the differences between hygiene, sanitation and environmental health
- Positive and negative impact of ecological factors may affect the nature and distribution of plants in the community

Theoretical concept:

- Recycling of household wastes (leaves, dried twigs, fruits, vegetables, food waste etc.)
- Prevalence of hereditary and communicable diseases

Activity module

- systematic survey using a questionnaire on social, economic and environmental aspects
- checking the households for the proper storage of drinking water
- visiting community and local schools to create awareness on sanitation and hygiene
- industrial visit to the local small scale industries and advising the workers on occupational health hazards
- waste segregation of biodegradable and non-biodegradable wastes

Section III: COMMUNITY ENGAGEMENT PROCESS **105 hrs.**

Preparation of compost from household wastes for gardening

The Department has decided to undertake the LFE programme in a locality based on nutrition, environment health and proximity of distance. The community survey will be carried out using questionnaire which will include basic indicators of nutritional status and environmental hygiene such

as toilet availability, source of drinking water, waste disposal systems, cleanliness of the community, etc. Awareness will be created among the targeted community

In collaboration with NGO's, the students will be able to create awareness on food habits and deficiency diseases.

BOT6201CP LAB FOR APPLIED BOTANY

LAB

LEARNING OUTCOME: **3 hrs / wk**

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

- learn to retrieve Botanical data bases
- recognize the basic garden implements for cultivation of plants
- develop entrepreneurial skills in floral products and mushroom cultivation
- identify and categorise the economic importance of plant products

COURSE OUTLINE: **45 hrs**

1. Review of Botanical Data bases and Botanical Photography.
2. Garden implements, Potting the seedling, Preparation of plants in the Nursery – Bonsai and Terrarium.
3. Conditioning of cut flowers, Preparation of Bouquet, Wreath.
4. Drying, Pressing, dyeing of flowers and foliage.
5. Preparation of greeting cards, wall hangers, potpourris and Dry flower Arrangement.
6. Economic importance of Cereals, Pulses, Millets, oil yielding plants, Beverages, Spices, Fiber yielding plants , Timber yielding plants, Rubber yielding plants and Gums and Resins.
7. Preparation of Mushroom bed for Oyster mushroom and Mushroom recipies (Soup, Omlet and Biriyani).
8. Preparation of Juice, Jam and Pickle.

REFERENCE BOOKS

Narayanaswami R.V. and Rao K.N.1963. **Outlines of Botany**, Chennai.

Nita Bahl, **Handbook on Mushrooms**, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, 1995, 3rd edition

Pandey B.P.1980, **Introduction to Economic Botany**, S.Chand and Company Limited, New Delhi.

Desrosier N.W., and Desrosier J.N., **The Technology of Food Preservation**, CBS Publishers & Distributors, New Delhi, 1987, 4th edition.

Harold Piercy, **Flower arranging**, Sundial Publication, London, 1980.

Hill F. Albert, **Economic Botany**, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi, 1979.

Joanha Sheen, **Pressing flowers**, Merehurst Press, London, 1988.

Pamela westland, **Drying flowers**, New Burlington books, London, 1995.

Sambamurthy A.V.S.S, **Taxonomy of Angiosperms**, , I.K. International Pvt. Ltd, New Delhi, 2005.

Shirley Monckton, **Arranging flowers**, Merehurst Press, London, 1989.

Susan Conder, **Dried flowers**, Merehurst Press, London, 1987.

BOT 6202CP LAB FOR MOLECULAR BIOLOGY & BIOTECHNOLOGY

LAB

LEARNING OUTCOME: **4 hrs / wk**

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

- acquire the basic clinical laboratory skills
- gain hands on training in Plant Tissue culture
- know the techniques involved in tissue culturing and molecular biology

COURSE OUTLINE: **60 hrs**

1. Tissue culture media (MS)preparation and sterilization
2. Preparation of Explant-shoot tip, embryo axis derived leaflet.
3. Callus formation from embryo axis of *Arachis hypogeal*
4. Preparation of stock solution – Rice
5. Callus induction in Rice (*Oryza sativa*)
6. Synthetic seed preparation- mustard seed.
7. Nucleic acid extraction (DNA & RNA) – Spectrophotometry
8. Conjugation (Hfr, F^+,F)
9. Mutant isolation – Replica plating technique (physical mutagens - UV)
10. Demonstration on Agarose gel electrophoresis and PCR.

REFERENCE BOOKS:

Pierik R.L.M**.** ***Invitro*** **culture of Higher plants**. Kluwer Academic Publishers, Netherlands,1997.

Reinert J. & Yeoman M.M. **Plant cell and Tissue culture, A laboratory manual**. Narosa , Publishing house, New Delhi, 1983.

Tejovathi G., Vimala Y. & Bhadauria R. **A Practical manual for Plant Biotechnology**. CBS publishers and distributors, New Delhi, 1996.

Jayaraman K. and Willets N.S., **Laboratory Manual in Molecular Genetics**, COSIP ULP Publications, New Delhi., 1976.

BOT6401CM APPLIED BOTANY

THEORY

LEARNING OUTCOME: **4 hrs / wk**

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

- learn the general concepts and significance of Botany
- use the available space for maintenance of nurseries
- develop skills in floral designs and arrangements
- understand the economic importance of plants and plant products
- apply the various methods of preserving food items

UNIT I : INTRODUCTION AND CONCEPTS OF APPLIED BOTANY **12 hrs**

Botany as a Science, Definition of Botany, Different branches of Botany and their scope, Plants, People and Environment, Famous Botanists ; Botanical gardens of the world. Wonder plants- Largest tree, Leaf, flower and Fruit. Botanical Data bases – Botanical Virtual Library, Local and Global Botanical Institutes and Research Centres, Botanical Photography.

UNIT II : NURSERY MAINTENANCE **12 hrs**

Nursery Maintenance – Establishment and Maintenance: Plant propagation methods, Green house – Types, Management of Mother plants. Types of Nurseries, Management – Potting the seedling, Manuring and Irrigation, Packing of Nursery plants, Indoor gardening, Bonsai, Terrarium.

Landscaping – Principles, Flowering and Designs.

UNIT III : FLORICULTURE **12 hrs**

Cut flowers – Cultivation, Conditioning of flowers, Packing , Preparation of bouquet, wreath, garland, Dried and pressed flowers- Methods of drying, pressing and dyeing, Use of dried and pressed plant materials in the preparation of greeting cards, wall hangers , Dry arrangement , Potpourri.

UNIT IV: Economic Botany **12 hrs**

Study of Morphology, Family and economic uses of the following:

1. Cereals – Maize, Rice, Wheat.
2. Millets – Pearl millet, Finger millet (ragi), Italian millet.
3. Pulses – Pea, Cowpea, Bean, Soya bean, Butterbean, Red gram, Black gram.
4. Oil yielding plants – Coconut, Groundnut, Sunflower, Palm oil, clove oil, *Eucalyptus*
5. Beverages – Coffee, Cocoa and Tea.
6. Spices – Cardamom, Clove and Cinnamon.
7. Fiber yielding plants – Coconut and Cotton.
8. Timber yielding plants – Teak, Sandal wood and Rose wood.
9. Rubber yielding plants – *Hevea* and *Ficus*.
10. Gums and Resins – Gum arabic, Camphor, Turpentine

UNIT V: MUSHROOM CULTIVATION AND FOOD PRESERVATION **12 hrs**

Mushroom Cultivation – Edible and poisonous Mushrooms, Nutritive value, Preparation of Spawn, Methods and cultivation of edible mushroom (Oyster) and mushroom recipies (soup, omlette, briyani), Food preservation – Storage and preservation of fruits and vegetables – Juice, Jam and Pickle.

TEXT BOOKS

Narayanaswami R.V. and Rao K.N. **Outlines of Botany**, Chennai,1963.

Nita Bahl, Handbook on Mushrooms, Oxford and IBH Publishing Co. Pvt. Ltd. New Delhi, 1995, 3rd edition

Pandey B.P.1980, **Introduction to Economic Botany**, S.Chand and Company Limited, New Delhi.

REFERENCE BOOKS

Desrosier N.W., and Desrosier J.N., **The Technology of Food Preservation**, CBS Publishers & Distributors, New Delhi, 1987, 4th edition

Harold Piercy, **Flower arranging**, Sundial Publication, London, 1980.

Hill F. Albert, **Economic Botany**, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi, 1979.

Joanha Sheen, **Pressing flowers**, Merehurst Press, London, 1988.

Pamela westland, **Drying flowers**, New Burlington books, London, 1995.

Sambamurthy A.V.S.S, **Taxonomy of Angiosperms**, New Delhi, I.K. International Pvt. Ltd, 2005.

Shirley Monckton, **Arranging flowers**, Merehurst Press, London, 1989.

Susan Conder, **Dried flowers**, Merehurst Press, London, 1987.

BOT6501CM MOLECULAR BIOLOGY

THEORY

LEARNING OUTCOME: **5 hrs / wk**

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

- understand the genetic principles that contribute to the development and maintenance of an organism
- describe replication of DNA, transcription into RNA & translation to proteins
- understand the genetic code & translation of nucleic acid sequence into amino acid sequence
- analyze the implications of mutation & the ways in which bacteria can exchange genes
- appreciate the regulation of gene expression in prokaryotes

COURSE OUTLINE:

UNIT I: NUCLEIC ACIDS **15 hrs**

DNA and RNA as genetic material. Replication of DNA in prokaryotes-conservative, semi conservative, dispersive, *in vitro* DNA synthesis , mechanism and enzymes of DNA replication, Models of replication - rolling circle replication.

UNIT II: MUTATION **15 hrs**

Types of mutation - Point mutation, induced mutations – chemical – 5 bromo uracil, physical - UV. Applications of mutations, repair mechanisms - photo reactivation, excision repair, SOS & mismatch repair

UNIT III: TRANSCRIPTION **15 hrs**

Mechanism of transcription, post transcriptional processing, regulation of transcription- positive & negative control.

UNIT IV: TRANSLATION, GENE EXPRESSION AND REGULATION **15 hrs**

Translation - Genetic code in Prokaryotes, Wobble hypothesis, Protein synthesis - mechanism and inhibitors of protein synthesis. Operon concept – Lac & Trp., Post translational modification.

UNIT V: GENETIC RECOMBINATION IN BACTERIA **15 hrs**

Properties of plasmids,Types of plasmid – col, R plasmids. Conjugation - F^+ , F^- , Hfr, F` Mechanism, mapping. Transformation - Competance, Mechanisms. Transduction – Types – Generalised, Specialised, Abortive transduction and its mechanisms.

TEXT BOOKS:

Freifelder D., **Essentials of Molecular Biology**, Narosa Publishing House, New Delhi, 1993.

Snustad D. P, and Simmons J. M, **Principles of Genetics**, 6th Edition, John Wiley & Sons, Inc, New York, 2012.

REFERENCE BOOKS:

Clark D.P., **Molecular Biology – Understanding the Genetic Revolution**, Elseiver Academic Press, London, 2005.

Gardner E.J., **Principles of Genetics**, 9th Edition, John Wiley & Sons Inc, New York, 1999.

Hyde R. David., **Genetics and Molecular Biology with Fundamentals of Biostatistics**, TATA McGraw Hill Education Pvt. Ltd., New Delhi, 2010.

Klug. S. William and Cummings. R. M, **Concepts of Genetics**, 7th Edition, Pearson Education Pvt. Ltd., Singapore, 2003,

Lewin B., **Genes VII**. Oxford University Press, New York. 2001.

Pierce. A. B, **Genetics A Conceptual Approach**, W.H. Freeman & Company, New York, 2003.

Snustad D. P, and Simmons J. M, **Principles of Genetics**, 6th Edition, John Wiley & Sons Inc, New York, 2012

BOT6502CM BIOTECHNOLOGY

THEORY

LEARNING OUTCOME: **5 hrs/ wk**

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

- define the principles and applications of biotechnology
- describe the process involved in the regeneration of plant tissue *invitro*
- appreciate the various methods of gene transfer in plants and animals
- understand the basic concepts of nanomaterials and biosynthesis of nanoparticles

COURSE OUTLINE:

UNIT I: HISTORY & ENZYMES OF rDNA TECHNOLOGY **15 hrs**

i) History of Biotechnology – current development and future priorities

ii) Enzymes involved in rDNA technology - Restriction endonucleases I, II, III & ligases. Overview of vectors used in rDNA technology. Vector – Plasmid, Phagemid, Cosmid.

UNIT II: PLANT BIOTECHNOLOGY **15 hrs**

Plant tissue culture, history, principles and methods of tissue culture – Isolation and pretreatment of explant material. Callus culture, organogenesis, somatic embryogenesis, meristem culture, anther culture. Protoplast culture – Isolation and culture methods. Micropropagation in plants – methods and application – somaclonal variation – detection and isolation of variants. Synthetic seeds – Encapsulation and application. GM Plants – Golden rice & BT cotton – Methods and applications, advantages and disadvantages.

UNIT III: METHODS OF GENE TRANSFER **15 hrs**

Direct DNA transfer, Biolistics, Electroporation, *Agrobacterium* mediated. Blotting techniques – Northern, Southern & Western blotting, PCR.

UNIT IV: ANIMAL BIOTECHNOLOGY **15 hrs**

Animal tissue culture – History, organ culture, cell culture, primary culture, animal cell line, Finite and continuous cell line. Gene transfer methods in animals – transfection, microinjection, electroporation, use of polycations, embryo transfer and *in vitro* fertilization.

Transgenic animals – transgenic sheep.

UNIT V: BASICS OF NANOMATERIALS & BIOLOGICAL SYNTHESIS OF NANOPARTICLES 15 hrs

Introduction & biological synthesis of Nanotechnology – Definition, Classification & properties of nanomaterials. Use of bacteria, fungi, actinomycetes for nanoparticle synthesis, magnetotactic bacteria for natural synthesis of nanoparticles; Mechanism of formation: Viruses as a component for the formation of nanostructured materials: Role of plants in nanoparticle synthesis.

TEXT BOOKS

Dubey A.C., **A Text Book of Biotechnology**, S.Chand & Company Ltd., New Delhi., 1993.

Kumar H.D., **A Text Book on Biotechnology**, Affiliated East West Press Pvt. Ltd., New Delhi, 1981.

Florence Periera - Raja., **Animal Biotechnology**, Dominant Publishers and Distributors, New Delhi, 2006.

Ranga M.M., **Animal Biotechnology**, Jodhpur, 2005.

Slater A., Scott N.W. & Fowler M R. **Plant Biotechnology.** Oxford University Press, New York, 2003.

Trivedi P.C., **Nanobiotechnology**, Pointer Publishers, Jaipur, 2008.

REFERENCE BOOKS

Balsubramanian D., Bryce C.F.A, Dharmaliingam K., Green J. and Jayaraman K., **Concepts in Biotechnology**, University Press Ltd, Hyderabad, 1996.

Glick B.R., Pasternak., Jack, J., **Molecular Biotechnology**. Panama Publishing Corporation, New Delhi, 1996.

Old R.W. and Primrose S.B **Principles of Gene Manipulation and Genomics,** Blackwell Publications, Oxford. 2009.

Rao.C.N.R, Muller.A., Cheetham A.K., **The Chemistry of Nanomaterials – synthesis, properties and application**, Volume I & II., Wiley – VCH varlag Gmbh & Co, USA, 2004.

Rao K A. Hornyak, L.G. Dutta, J., Tibbals F.H., **Introduction to Nanoscience**, CRC Press, New York, 2008

Subbiah Balaji, **Nanobiotechnology**, MJP Publishers, Chennai, 2010.

BOMA6401DM MATHEMATICAL APPLICATIONS IN LIFE SCIENCES

(THEORY)

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

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

- understand the basic concepts of heredity and fractals
- interpret the association between the two attributes
- identify the degree of relationship between the two variables

COURSE CONTENT:

UNIT I: BASIC CONCEPTS OF HEREDITY AND FIBONACCI SEQUENCE **12 hrs.**

Phyllotaxy and inflorescence – application of Fibonacci sequence – Cells – chromosomes – genes – alleles – genome – heritability of a given trait – selection – mass selection – family – pedigree selection – progeny test – Mating methods – random mating – positive assortive – negative assortive mating

UNIT II: POPULATON GENETICS **12 hrs.**

Mendelian population – gene pool – gene frequency – Hardy-Weinberg law – calculation of gene frequencies – factors influencing allele frequency – genetic polymorphism

UNIT III: CORRELATION AND REGRESSION **12 hrs.**

Correlation – Introduction – types of correlation – Significance of correlation – Measures of correlation – Scatter diagram method – Karl Pearson's correlation coefficient – Regression – Objectives – Types of regression – Regression – Analysis – regression equations – Regression coefficient. (biological examples)

UNIT IV: THEORY OF ATTRIBUTES **12 hrs.**

Introduction – Notations – Dichotomy – classes – class frequencies – order of classes – class frequencies – relation between class frequencies – class symbols as operators – consistence of data – conditions of consistency of data – Independence of attributes – criterion of Independence – Symbols $(AB)_0$ and δ association of attributes – Yule's coefficient of association – coefficient of colligation.

UNIT V: CHI – SQUARE TEST* **12 hrs.**

Chi-square test – assumptions of validity – applications – Chi-square test as a test of independence – as a test of homogeneity – as a test of detect linkage. *Biological problems

TEXT BOOK(S):

Verma, P.S., & Agarwal, V. K., (2009). *Genetics*, (9th edition), New Delhi: S. Chand and Company Ltd., Print.

Gupta, S.C., &Kapoor, V.K., (2015). *Elements of Mathematical Statistics*, (3rd edition), New Delhi: Sultan Chand & Sons, Print. Chapter 11

Hartl, D.L., & Jones, E.W., (2000). *Genetics Analysis of Genes and Genomes*, chapter 11, (fifth edition), USA: Jones and Bartlett Publishers, Print.

Khan & Khanum, (2004). *Fundamentals of Biostatistics*, Chapter 8.1- 8.4(8.4.2 – 8.4.4) (second edition), Hyderabad: Ukaaz Publications, Hyderabad, Print.

Rastogi, V.B., & Ane's student edition, (2011). *Fundamentals of Biostatistics*, Chapter 10(pages: 210 - 224, 231 – 236) (second edition), New Delhi: Ane Books Pvt. Ltd., Print.

REFERENCE BOOK(S):

Arumugam, S. & Thangapandi Isaac, A, (2013). *Statistics,* Palayamkottai, India: New Gamma Publishing House. Print.

Rastogi, V.B, (2011). *Fundamentals of Biostatistics,* (2nd edition), New Delhi, India: Ane Books Pvt. Ltd. Print.

Stansfield, D.W, (1986). *Theory and Problems of Genetics, (*2nd Edition), New Delhi, India: Tata McGraw Hill Publishing Company Limited. Print.

BOZO6401DM FOREST AND WILDLIFE MANAGEMENT
THEORY

LEARNING OUTCOME: **4 hrs/wk**

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

- appreciate the distribution and significance of types of forest in India
- recognize the threats and challenges to forests and wild life
- explain the various methodologies adopted for management and conservation of forests & wild life

COURSE OUTLINE:

UNIT-I: FORESTS – AN OVERVIEW **12 hrs**

Colonization of land and formation of forest, Forest profile in India- types- coniferous, broad leaf, evergreen, deciduous, thorn and mangrove forests. Renewable and non-renewable resources in forest and their importance.

UNIT II: WILDLIFE - AN OVERVIEW **12 hrs**

History -Wildlife profile in India. Importance of wildlife-economic, medicinal, ecological, aesthetic, ethical importance.

UNIT III: THREATS TO FOREST AND WILDLIFE **12 hrs**

Causes and effects - deforestation, overexploitation, soil erosion, global warming, poaching, hunting for recreation, habitat destruction and fragmentation, loss of biodiversity. Impact of introduced species, Man and animal conflicts. Ministry for Environment and Forest & hotspots of biodiversity. Forest fire.

UNIT IV: CONSERVATION STRATEGIES **12 hrs**

In situ and *ex situ* conservation strategies- national parks, sanctuaries, biosphere reserves, zoos, social forestry, agroforestry, seed banks, gene banks and government launched projects – Role of Organizations and Tribal community on conservation of forest and wildlife.

UNIT V: MANAGEMENT OF FOREST & WILDLIFE **12 hrs**

Indian forest policy-Forest Act, Wildlife Act, Indian Wildlife Board, Red Data book, WWF, CITES- Role of citizens in protection of Forest and Wildlife.

TEXTBOOKS:

Kumar U and Asija M., **Biodiversity -Principles and Conservation**, Agrobios (India). 2000, 2nd edition.
Purohit SS and Agrawal AK, **Ecology and Environmental Biology**, Jodhpur, 2004.

REFERENCE BOOKS:

Miller., **Environmental Science**, Cengage Learning India Private Limited. 2006, 11th edition
Molles M.C., **Ecology concepts and Applications**, WCB MC Graw – Hill Companies. 1999
Owen OS and Chiras DD, **Natural resource Conservation An Ecological Approach**, Macmillan Publishing Company, New York and Collier Macmillan Publishers, London, 1990.
Secretariat of the Convention on Biological Diversity, **Handbook of the Convention on Biological Diversity,** Earth scan Publications, 2006, 1st Edition
Shivana H, **Handbook of Forest Biology**, Discovery Publishing House, Pvt. Ltd., New Delhi, 2012.
Singh M.P and Singh B.S., **Conservation of Biodiversity and Natural Resources**, Daya publishing house. 2004

LIFE FRONTIER ENGAGEMENT

Semester V **Total Hours: 4 hrs. / wk.**

Semester VI **Total Hours: 5 hrs. / wk.**

credits: 5

BOT0602LM PLANTS, ENVIRONMENT AND HEALTH

OBJECTIVES:

- To facilitate students to appreciate her academic learning through experiential learning by disciplinary and inter disciplinary community engagements thereby enhancing their civic responsibilities in society
- To empower students with appropriate academic strategies and innovative assessment and evaluation criteria to facilitate joyful experiential learning for students to discover real life values
- To transform each student to be productive caring citizens of our global society through the vibrant community based action research programme

LEARNING OUTCOME:

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

- identify the medicinal and nutritional value of the plants consumed by the community
- bring about changes in environmental issues related to water supply and sanitation
- acquire critical thinking and problem solving skills catering to community needs

Projected benefits of the community partners

- Sensitize the target community on recycling of various house hold waste
- Address problems related to environmental hazards & hygiene

2. LFE Process

SECTION I **15 hrs.**

Common Unit

Understanding Life Frontier Engagement -

a) Service learning and Life Frontier Engagement

b) Principles- engagement, reflection, reciprocity, public dissemination.

c) Meaning of community and understanding of community dynamics.

d) Programme planning in Life Frontier Engagement - stages: Need analysis, Problem identification, Goal setting, Concept finalization, planning for stages of research, research and analysis, reflection and dissemination of results.

e) Ethical concerns in Life Frontier Engagement - Confidentiality, Conflict of interest, Informed consent.

ACTIVITY MODULE FOR SECTION I:

d) (i) Making students understand the concept of Service Learning and Life Frontier Engagement based on the information in the reading material given using student centered learning activities.

(ii) Interaction with any local group in a nearby community (Example: Children, adolescents, adults within or outside college) and identifying community dynamics.

(iii) Need based analysis to be done on the community by framing a questionnaire for base line socio economic survey.

e) (i) Asking students to prepare a programme plan based on the sub – themes and target group identified by the department.

(ii) Presentation by teams by refining the ideas of students based on programme planning stages.

f) Activity based on case studies on relevant to ethical issues in community engagement

Section II – THEMATIC CONCEPTS **15 hrs.**

Nutrition and Health: Conceptual framework

- Classifying nutritionally and medicinally important plants based on the food consumption pattern
- Binomial nomenclature of medicinally and nutritionally significant plants based on Bentham and Hooker's Classification

Correlational concept

- Undesirable food habits can lead to deficiency diseases
- Understand the benefits of traditional medicine over allopathic medicines

Theoretical concept:

- Medicinal and nutritional significance of plants
- Importance of balanced diet and malnutrition

Activity module

- Classification and identification of the plants based on the nutritive value (Vitamins, Proteins etc.)
- Visiting local schools and Anganwadi of the selected sites
- Survey on common nutritional problems in the target community for a healthy food menu
- Awareness creation for a healthy diet pattern

Environment and Hygiene

Classification concept:

- Categorization of various waste materials
- Identification of the types of environmental hazards in the target community

- Preparing a list of environmental risk factors involved in the transmission of communicable diseases

Correlational concept:

- Understand the differences between hygiene, sanitation and environmental health
- Positive and negative impact of ecological factors may affect the nature and distribution of plants in the community

Theoretical concept:

- Recycling of household wastes (leaves, dried twigs, fruits, vegetables, food waste etc.)
- Prevalence of hereditary and communicable diseases

Activity module

- systematic survey using a questionnaire on social, economic and environmental aspects
- checking the households for the proper storage of drinking water
- visiting community and local schools to create awareness on sanitation and hygiene
- industrial visit to the local small scale industries and advising the workers on occupational health hazards
- waste segregation of biodegradable and non-biodegradable wastes

Section III: COMMUNITY ENGAGEMENT PROCESS **105 hrs.**

Preparation of compost from household wastes for gardening

The Department has decided to undertake the LFE programme in a locality based on nutrition, environment health and proximity of distance. The community survey will be carried out using questionnaire which will include basic indicators of nutritional status and environmental hygiene such as toilet availability, source of drinking water, waste disposal systems, cleanliness of the community, etc. Awareness will be created among the targeted community

In collaboration with NGO's, the students will be able to create awareness on food habits and deficiency diseases.

COURSE PROFILE

M.Sc. Botany

From 2018 batch onwards

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				Theory	Lab				
	PGB1421M	Bioinstrumentation	T	4		4	AZ2017	SPBOT	Botany
	PGB1422M	Microbiology and Plant Pathology	T	4		4	AZ2017	SPBOT	Botany
	PGB1423M	Plant Diversity – I	T	4		4	BA2018	SPBOT	Botany

I	PGB1424M	Plant Diversity – II	T	4		4	BA2018	SPBOT	Botany
	PGB1321P	Lab for Plant Diversity I & II	L		3	3	BA2018	SPBOT	Botany
	PGB1425M	Genetics and Evolution	T	4		4	BA2018	SPBOT	Botany
	PGB1422P	Lab for Microbiology and Plant Pathology	L		4	4	AZ2017	SPBOT	Botany
		V.ED / CEC		2		**1**			
		CLUB		1					
			Total	**30**		**27**			
II	PGB2421M	Biochemistry	T	4		4	AZ2017	SPBOT	Botany
	PGB2422M	Plant Physiology	T	4		4	AZ2017	SPBOT	Botany
	PGB2421P	Lab for Biomolecules and Plant Physiology	L		5	4	AZ2017	SPBOT	Botany
	PGB2521M	Plant Systematics	T	5		5	AZ2017	SPBOT	Botany
	PGB2422P	Lab for Plant Systematics	L		5	4	AZ2017	SPBOT	Botany
	Elective		T	4	-	4			
		V.ED / CEC		2		1			
		CLUB		1		-			
			Total	**30**		**25**			

Sem.	**Course Code**	**Course Title**	**Course Type**	**Hrs./Wk.**		**Credits**	**Passed in Academic Council**	**Offered to**	**Offered by**
				Theory	**Lab**				
III	PGB3521M	Plant Anatomy and Embryology	T	5	-	5	BA2018	SPBOT	Botany
	PGB3321P	Lab for Plant Anatomy and Embryology	L	-	3	3	BA2018	SPBOT	Botany
	PGB3621M	Cell and Molecular Biology	T	6	-	6	BA2018	SPBOT	Botany
	PGB3422P	Lab for Cell and Molecular Biology	L	-	4	4	BA2018	SPBOT	Botany
	PGB3521O / PGB3522O	Research Methodology and Computer Applications/	T	5	-	5	BA2018	SPBOT	Botany
		Medicinal Botany and Phytochemistry	L/T	4	1	5	BA2018	SPBOT	Botany
	PGB3421E	Entrepreneurial skills in Life Sciences	T	4	-	4	BA2018	ALLM	Botany
	PGB0604M	Project	-	-	2	-	BA2018	SPBOT	Botany
	Pgv3101pv/ Pgv3102pv	Basics Tenets Of Major Religions / Cultural Heritage And Values In India	T	1		1	BA2019	ALLM	Centre for VE
	Piv3101pi	Bibilical Ethics						APCH/ SPCH	
			Total	**30**		**28**			
IV	PGB4421M	Plant Biotechnology	T	4	-	4		SPBOT	Botany
	PGB4421P	Lab for Plant Biotechnology	L	-	4	4		SPBOT	Botany
	PGB4521M	Applied Botany	T	5	-	5		SPBOT	Botany
	PGB4422P	Lab for Applied Botany	L	-	5	4		SPBOT	Botany
	PGB4521O / PGB4522O	Biosafety and Bioethics / Preparation for Competitive exams in	T	5	-	5		SPBOT	Botany

		Life Sciences							
	PGB0604M	Project	PR	5	-	6			
	PGV4103PV	In Tune With Nature	T	2		1		ALLM	Centre for VE
	PIV4101PI	Bibilical Perspectives On Gender						APCH/ SPCH	
				30		**28**			

Courses offered to other department students:

Sem.	Course Code	Course Title	Course Type	Hrs./Wk.		Credits	Passed in Academic Council	Offered to	Offered by
				Theory	Lab				
II	PGB2421E	Home Management	T	4		4		ALLM	Botany
	PIS2421E	Fitness and Wellness	T	4		4		ALLM	Botany
III	PGB3421E	Entrepreneurial skills in Life Sciences	T	4		4		ALLM	Botany

PGB1421M BIOINSTRUMENTATION

(Theory)

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

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

- compare and relate the modifications in the parts and applications of different types of microscope
- familiarize with the principles of centrifugation and spectroscopy
- experiment with various chromatographic techniques for separation of biomolecules
- apply the principles of electrophoresis and blotting techniques in the separation of nucleic acids and proteins
- define the techniques of measurement and the hazards of radioactive isotopes

COURSE CONTENT

UNIT – I: MICROSCOPY **12hrs.**

Microscopy – Brightfield microscopy (Review) – Dark field – Phase contrast – Fluorescence microscopy – Confocal microscopy – Electron microscopy (SEM, TEM) – STM – AFM – Micrometer – Microtome.

UNIT – II: INSTRUMENTS & SPECTROSCOPY **12hrs.**

Centrifugation – types – differential – density gradient – ultracentrifugation – preparative and analytical – pHmeter and its biological applications – Instrumentation and applications of Flame Photometer – AAS – FTIR & NMR, DARSS (Diode array rapid scan spectrometer).

UNIT – III: CHROMATOGRAPHY **12hrs.**

Chromatographic separations – Principles – Components – sample preparation and applications of TLC – HPTLC – Column Chromatography – GC – HPLC.

UNIT – IV: GENOMIC AND PROTEOMIC TECHNIQUES **12hrs.**

Agarose gel electrophoresis – SDS PAGE - 2D electrophoresis – PCR: Real time PCR– Blotting techniques – Southern, Northern & Western. MALDI-TOF & Microarray.

UNIT – V: TRACER TECHNIQUES **12hrs.**

Properties of different types of radioisotopes used in biology – Radiation hazards and precautions taken while handling radio isotopes – Measurement of radioactivity – Autoradiography – GM counter and Liquid scintillation counter.

TEXT BOOK(S)

Boyer, R. F. (1999). *Modern Experimental Biochemistry*, (3rd ed.). California: Benjamin/Cummings Publishing Company Inc. Print.

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Jayaraman, J. (2006). *Laboratory manual in Biochemistry.* New Delhi, India: New Age International ltd. Print.

Palanivelu, P. (2000). *Laboratory Manual for Analytical Biochemistry & Separation Techniques.* Madurai, India: School of Biotechnology, Madurai, Kamaraj University. Print.

Plummer, D.T. (1999). *An introduction to Practical Biochemistry.* New Delhi, India: Tata McGraw Hill Publishing Company. Print.

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Wilson, K, & Walker, J.M. (1994). *Principles and techniques of Practical Biochemistry*, (4th ed.). New Delhi, India: Foundation books. Print.

CO/PO	PO						PSO					
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CO1	3	3	3	3	3		3	3	3	3	3	3
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CO3	1	3	3	3	3		3	3	3	3	2	3
CO4	3	3	3	3	3		3	3	3	2	3	3
CO5	3	3	3	2	3		3	3	3	3	3	3

- S – Strongly correlated (3)
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- NC – No correlation (0)

PGB1422M MICROBIOLOGY AND PLANT PATHOLOGY

(Theory)

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

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

- describe and differentiate the various types of microbes
- classify the microbes and explain their growth and metabolism
- demonstrate the techniques used in isolation and identification of microbes
- familiarize the various beneficial and harmful aspects of microbes
- compare and contrast the various methods of plant protection

COURSE CONTENT

UNIT – I: GENERAL ACCOUNT OF MICROBES **12hrs.**

Salient features of Prokaryotic and Eukaryotic microbes – Microbial classification – Bergey's classification up to order level – Modern approach – Base – composition – nucleic acid sequencing (RNA finger print) – ssRNA and rRNA and 16s r RNA) – Microbial Interactions.

UNIT – II: MICROBIAL NUTRITION, REPRODUCTION AND MICROBIOLOGICAL TECHNIQUES 12hrs.

Nutritional types – Transport of nutrients across the membrane (Diffusion – Donnan equilibrium – Transporters - Group translocation) – Photosynthesis – Oxygenic and anoxygenic Sporulation – Reproduction – Bacteria & Virus – Methods of Sterilization – Culture media – types – cultural methods : Slant – Streak – Spread & Pour plate – Staining methods.

UNIT – III: APPLIED MICROBIOLOGY **12hrs.**

Industrial uses of microbes – Fermentation products – Production and recovery – Agricultural uses – Biofertilizers – nitrogen fixers – phosphate solubilisers – Biocontrol agents – Biopesticides – insects – pathogens – weeds – Environmental Microbiology – Bioindicators – Biosensors – Bioremediation of xenobiotics – Food microbiology – Food spoilage – General types with examples – Human diseases – Hepatitis – Cancer & TB.

UNIT – IV: PLANT DISEASES **12hrs.**

Pathogenesis – General symptoms – bacterial leaf spot in paddy – Mildew in grapes (Downy and Powdery) – Bunchy top of banana – Enzymes and Toxins in Plant diseases – Effect of infection on the physiology of the host plants – Defense mechanisms – structural – anatomical and biochemical.

UNIT – V: PLANT PROTECTION **12hrs.**

Plant Quarantine – methods of eradication – chemical, biotechnological and biological control – biocontrol agents – mechanisms – role of breeding for disease resistance – Integrated disease management.

TEXT BOOK(S)

Mehrotra, R.S. (2003). *Plant Pathology.* New Delhi, India: Tata McGraw Hill Publishing Company Limited. Print.

Pelczar, J.M, Chan, E.C.S, & Kreig. R.N. (2008). *Microbiology*, (13th Reprint). New Delhi, India: Tata McGraw Hill Publishing Company Ltd. Print.

Sambamuthy, A.V.S.S. (2009). *Text book of Plant Pathology.* New Delhi, India: I.K. International Pvt.Ltd. Print.

SubbaRao, N.S. (1997). *Biofertilizers in Agriculture and Forestry,* (3rd ed.). New Delhi, India: Oxford & IBH Publishing Co Pvt Ltd. Print.

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Atlas, R.M. (2000). *Microbiology - Principles of Microbiology.* Missouri: Mosby Year Book Inc. Print.

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Brock, T.D. (2000). *Biology of Microorganisms*, (9th ed.). Carbondale: Southern Illinois University. Print.

Mahanta. (1994). *Fundamentals of Agricultural Microbiology.* New Delhi, India: Oxford& IBH Publishing Co. Print.

Postgate, J. (1998). *Nitrogen Fixation*, (3rd ed.). Cambridge: Cambridge University Press. Print.

Prescott, L.M, Harley, J.P, & Klein, D.A. *Microbiology,* (3rd ed.). Chicago: W.M.C. Brown Publishers. Print.

Salle, A.J. (1997). *Fundamental Principles of Bacteriology*, (7th ed.). New Delhi, India: Tata McGraw Hill Publishing Company Ltd. Print.

Sharma, K.A. (2003). *Biofertilizers for sustainable Agriculture.* Jodhpur: Agrobios. Print .

Sharma, R.A, Totawat, K.L, Maloo, S.R, & Somani, L.L. (2004). *Biofertilizer technology.* Udaipur: Agrotech Publishing company. Print.

Singh, R.S. (1980). *Introduction to Principles of Plant Pathology*, (2nd ed.). New Delhi, India: Oxford & IBH Publishing Co. Print.

Subbarao, N.S. (1988). *Biofertilizers in Agriculture,* (2nd ed.). New Delhi, India: Oxford & IBH Publishing Co Pvt Ltd. Print.

Subbarao, N.S. (1977). *Soil Microorganisms and Plant Growth.* New Delhi, India: Oxford & IBH Publishing Co Pvt Ltd. Print .

Subbarao, N.S. (2000). *Soil Microbiology.* New Delhi, India: Oxford & IBH Publishing Co Pvt Ltd. Print.

Venkataraman, G.S. (1972). *Algal Biofertilizers and Rice Cultivation.* New Delhi, India: Today & Tomorrow`s Printers & Publishers. Print.

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PGB1422P LAB FOR MICROBIOLOGY AND PLANT PATHOLOGY

(Lab)

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

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

- demonstrate the basic techniques involved in isolation, cultivation and staining of microbes
- isolate and identify different bioinoculants and its effect on plant growth
- relate the host pathogen interaction
- demonstrate the screening of microbes and production of selected fermentation products
- evaluate the antimicrobial activity of bioactive compounds

COURSE CONTENT

1. Isolation of bacteria : fungi and actinomycetes from soil – water and air samples.
2. Cultural techniques :slant – stab streak – spread and pour plate
3. Staining techniques – Differential staining (Gram, Endospore & Capsular staining)
4. Isolation and characterization of

   Azotobacter - *Free living*

   Azospirillum – *Associative symbiosis*

   Rhizobium -*Symbiosis*
5. Effect of bioinoculants on crop growth (Morphological & biochemical analysis)
6. Isolation of phytopathogen from infected plants – *Alternaria* leaf blight in *Phoenix* palm

7. Effect of infection on seed germination & crop growth – morphological & biochemical analysis
8. Biological control – Biocontrol potential of *Trichoderma* against selected pathogens (dual culture)
9. Production of citric acid using *Aspergillus niger*
10. Detection of antibiotic producers by crowded plate technique
11. Antibiotic assay – Kirby Bauer method

REFERENCE BOOK(S)

Aneja, K.R. (2005). *Experiments in Microbiology, Plant Pathology and Biotechnology.* New Delhi, India: New age international Ltd. Print .

Cappuccino, J.G, & Sherman, N. (2009). *Microbiology - A Laboratory Manual*, (3rd ed.). California: The Benjamin/ Cummings Publishing Company Inc. Print.

Cappuccino, J.G, & Sherman, N. (1992). *Microbiology - A Laboratory Manual,* (3rd ed.). California: The Benjamin/ Cummings Publishing Company Inc. Print.

Claws, C.W. (1988). *Understanding Microbes: Laboratory Text Book for Microbiology.* New York: W.H. Freeman Co. Print.

Gunasekaran, P. (1995). *Laboratory Manual in Microbiology.* New Delhi, India: New Age International (P) Limited Publishers. Print.

Jha, D.K. (2004). *Laboratory Manual on Plant Pathology.* Jaipur, India: Pointer publishers. Print.

Kannan, N. (1996). *Laboratory Manual in General Microbiology.* Palani: Palani Paramount Publications. Print.

Seeley, H.W, Lee, J.J, & Vandemark, P.J. (1990). *Microbes in Action.* New York: W.H. Freeman Co. Print.

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CO4	3	3	3	3	3		3	2	3	3	3	3
CO5	3	3	3	3	3		3	3	3	3	3	3

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PGB1423M PLANT DIVERSITY – I

(Theory)

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

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

- classify algae based on their general characteristics and relate their economic importance
- compare the range of thallus organisation and reproduction in algae
- classify and analyse the general characteristics and economic importance of fungi
- compare the morphology and reproduction of different forms of fungi
- appreciate the dual nature, structure of lichens and their ecological importance

COURSE CONTENT:

UNIT I : CLASSIFICATION (UPTO ORDER LEVEL) OF ALGAE GENERAL CHARACTERISTICS AND ECONOMIC IMPORTANCE 12 hrs.

Classification of algae – Fritsch – General characteristics – thallus organization – reproduction – lines of evolution – origin and evolution of sex – Life cycle patterns – Economic importance of Algae – food – medicine – agriculture – industries – Harmful effects of algae – Algal blooms & Cyanotoxins.

UNIT II: ALGAE 12 hrs.

Comparative study of morphology – thallus organization – cell structure – Reproduction – life cycle in Cyanobacteria – *Oscillatoria* – *Nostoc* – Green algae – *Chlorella* – *Volvox* – *Ulva* – *Chara* – Seaweeds: *Sargassum* – *Gracilaria.*

UNIT III : CLASSIFICATION (UP TO ORDER LEVEL) OF FUNGI, GENERAL CHARACTERISTICS AND ECONOMIC IMPORTANCE 12 hrs.

Classification of fungi – Alexopolous – General characteristics – lines of evolution – thallus organization – reproduction – – asexual and sexual reproductive phase – Heterothallism – Parasexuality – life cycle variations – Economic importance – Role of fungi in Medicine, Industry, Agriculture & food – Mycotoxins – mushroom toxins

UNIT IV: FUNGI 12 hrs.

Comparative study of morphology – cell structure – Reproduction – life cycle in slime molds – *Saprolegnia* – *Phytophthora* – *Rhizopus* –*Aspergillus* – *Claviceps* – *Puccinia* – *Alternaria* – Anatomical study of *Agaricus*

UNIT V: LICHENS 12 hrs.

Lichens – dual nature – habitat – characteristics – classification – structure – nutrition – asexual – sexual reproduction – ecological importance – taxonomic position – salient features of *Usnea* – *Parmelia*

TEXT BOOK(S):

Pandey, B.P, (2010). *College Botany*, Volume I, New Delhi, India: S. Chand & Company Ltd. Print.

Raven, H.P., & Evert, F.R, (1976). *Biology of Plants,* (2nd ed.). USA: Worth Publishers, Inc. Print.

Sharma, O.P. (2011). *Textbook of Algae,* New Delhi, India: Tata McGraw Hill- Publishing Co. Ltd. Print.

Vashishta, B.R, & Sinha, A.K. (2010). *Fungi,* NewDelhi, India: S.Chand & Co. Ltd. Print.

Vashishta, B.R, Sinha, A.K, & Singh, V.P. (2010). *Algae,* New Delhi, India: S.Chand & Co. Print.

REFERENCE BOOK(S):

Alexopolus, C.J,& Mims, C.W.(1979). *Introductory Mycology*. New Delhi, India: Wiley Eastern Limited. Print.

Fritsch, F.E. (1965). *The structure and Reproduction of the Algae.* UK: Cambridge at the University Press. Print.

Lee, R.E. (2008). *Phycology.* UK: Cambridge University. Print.

Pandey, S.N, & Trivedi, P.S. (2001). *A text book of Algae.* New Delhi: Vikas Publishing House Pvt Ltd. Print.

Pandey, S.N, & Trivedi, P.S. (2001). *A text book of Algae.* New Delhi: Vikas Publishing House Pvt Ltd. Print.

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CO4	3	3	3	3	3		3	3	3	3	3	3
CO5	3	3	3	3	3		3	3	3	3	3	3

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- NC – No correlation (0)

PGB1424M PLANT DIVERSITY – II

(Theory)

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

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

- classify the Bryophytes, Pteridophytes and Gymnosperms up to order level and analyse their economic importance
- describe the structure and reproduction of different forms of Bryophytes
- relate the general characteristics, structure and economic importance of Pteridophytes
- explain the diversity, complexity, structure, reproduction in Gymnosperms
- prepare suitable microslides of selected life forms of Bryophytes, Pteridophytes and Gymnosperms

COURSE CONTENT:

UNIT I: GENERAL CLASSIFICATION of the following (upto order level) **12 hrs.**

Bryophytes - Engler & Rothmaler (1951)

Pteridophytes - Smith (1955)

Gymnosperms - Sporne (1965)

Alternation of generations – evolution of sporophyte – Life Cycle Patterns – Economic importance of the Bryophytes, Pteridophytes & Gymnosperms

UNIT II: BRYOPHYTES **12 hrs.**

General characteristics – Morphology and Anatomy – Reproduction – life Cycles in bryophytes: *Riccia – Marchantia – Porella – Anthoceros – Funaria*

UNIT III: PTERIDOPHYTES **12 hrs.**

General characteristics – Morphology and Anatomy of Pteridophytes– Reproduction – life Cycles in Pteridophytes – *Psilotum – Lycopodium – Selaginella – Equisetum – Isoetes – Marselia & Nephrolepis*

UNIT IV: GYMNOSPERMS **12 hrs.**

Morphology and Anatomy of Gymnosperms: General characteristics – Reproduction – life Cycles – Gymnosperms – C*ycas – Pinus – Gnetum*

UNIT V: FOSSIL PTERIDOPHYTES AND GYMNOSPERMS **12 hrs.**

Introduction to evolutionary trends in Plant Diversity – Origin of land plants – Continental land plants – Geological time scale – fossil bryophytes – discovery – classification – salient features – fossil pteridophytes – salient features – reproduction *Rhynia – Lepidodendron – fossil gymnosperns* – salient features – reproduction – *Cycadeoidea – Lyginopteris*

TEXT BOOK(S):

Annie Ragland, Kumaresan, V, (2002). Pteridophytes, Gymnosperms and Palaeobotany, Nagercoil, India: Saras Publication. Print.

Pandey, B.P, (2001). *College Botany,* Volume II. New Delhi, India: S. Chand & Company Ltd. Print.

Raven, H.P., & Evert, F.R, (1976). *Biology of Plants,* (2nd ed.). USA: Worth Publishers, Inc. Print.

Vashishta, B.R, Sinha, A.K, & Adarsh Kumar, (2011). *Bryophytes,* New Delhi, India: S.Chand & Co. Print.

Vashishta, B.R, Sinha, A.K, & Anil Kumar, (2006). *Gymnosperms*, New Delhi, India: S.Chand & Co.Print.

Vashishta, B.R, Sinha, A.K, & Anil Kumar, (2010). *Pteridophyta,* New Delhi, India: S.Chand & Co. Print.

REFERENCE BOOK(S):

Pandey, S.N, & Trivedi, P.S, (2001). *A text book of Algae,* New Delhi: Vikas Publishing House Pvt Ltd. Print.

Sharma, O.P, (1992). *Pteridophytes,* New Delhi: S. Chand & Co. Print.

Smith, G.M, (1989). *Cryptogamic Botany - Bryophytes and Pteridophytes (II),* New Delhi: Tata McGraw Hill Publishing Co. Ltd. Print.

Sporne, K.R, (1965). *The Morphology of Gymnosperms,* London: Hutchinson University Library. Print

Shukla.A.C, Misra . S.P, (1982). *Essential of Paleobotany,* Chennai, India: Vikas Publishing House Pvt. Ltd. Print.

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CO4	3	3	3	3	3		3	3	2	3	3	3
CO5	3	3	3	3	3		3	3	3	2	3	3

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PGB1321P LAB FOR PLANT DIVERSITY I AND II

(Lab)

LEARNING OUTCOME: **3 hrs./wk.**

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

- prepare suitable micropreparations of selected life forms in algae, fungi, Bryophytes, Pteridophytes and Gymnosperms
- compare the morphology of different types of lichens
- compare the external and internal structure of Bryophytes, Pteridophytes & Gymnosperms
- determine the ecological habitat of selected cryptogams
- collect, identify and preserve the specimens

COURSE CONTENT: **45 hrs.**

1. Study micro and macro algal diversity – Green algae: *Ulva – Chara* – Seaweeds: *Sargassum – Gracilaria / Gelidium*

   Micropreparation and identification of fungi from spoiled food items – *Saprolegnia – Phytophthora – Rhizopus –Aspergillus – Claviceps – Puccinia – Alternaria* – Anatomical study of *Agaricus*
2. Morphological identification of types of lichens – structure of apothecium.
3. Study of Morphology – Anatomy & Reproductive structure of various forms of Bryophytes – *Riccia – Marchantia – Porella – Anthoceros – Funaria*
4. Study of Morphology – Anatomy & Reproductive structure of various forms of Pteridophytes – *Psilotum – Lycopodium – Selaginella – Equisetum – Isoetes – Marselia & Nephrolepis*

5. Study of Morphology – Anatomy & Reproductive structure of various forms of Gymnosperms: *Cycas – Pinus – Gnetum.*
6. Field trip & submission of report
7. Collection and submission of specimens – 10 in Algae – Total of five from other groups (Fungi – Bryophyte – Pteridophyte – Gymnosperms)

TEXT BOOK(S)

Pandey, B.P, (2010). *College Botany*, Volume I. New Delhi, India: S, Chand & Company Ltd. Print.

Pandey, B.P, (2001). *College Botany*, Volume II. New Delhi, India: S. Chand & Company Ltd. Print.

Vashishta, B.R, & Sinha, A.K, (2010). *Fungi*, NewDelhi, India: S.Chand & Co. Ltd. Print.

Vashishta, B.R, Sinha, A.K, & Adarsh Kumar, (2011). *Bryophytes,* New Delhi, India: S.Chand & Co. Print.

Vashishta, B.R, Sinha, A.K, & Anil Kumar, (2006). *Gymnosperms,* New Delhi, India: S.Chand & Co. Print.

Vashishta, B.R, Sinha, A.K, & Anil Kumar, (2010). *Pteridophyta,* New Delhi, India: S.Chand & Co. Print.

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Alexopolus, C.J, & Mims, C.W, (1979). *Introductory Mycology,* New Delhi, India: Wiley Eastern Limited. Print.

Fritsch, F.E, (1965). *The structure and Reproduction of the Algae,* UK: Cambridge at the University Press. Print.

Pandey, S.N, & Trivedi, P.S, (2001). *A text book of Algae*, New Delhi, India: Vikas Publishing House Pvt Ltd. Print.

Sharma, O.P, (1992). *Pteridophytes.* New Delhi, India: S. Chand & Co. Print.

Sharma, O.P, (2011). *Textbook of Algae,* New Delhi, India: Tata McGraw Hill- Publishing Co.Ltd. Print

Smith, G.M, (1986). *Cryptogamic Botany - Algae and Fungi – (I),* New Delhi, India:Tata McGraw Hill Publishing Co. Ltd. Print.

Smith, G.M, (1989). *Cryptogamic Botany - Bryophytes and Pteridophytes (II),* New Delhi, India: Tata McGraw Hill Publishing Co. Ltd. Print.

Sporne, K.R, (1965). *The Morphology of Gymnosperms*, London: Hutchinson University Library. Print.

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CO5	3	3	3	3	3		3	3	3	3	3	3

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PGB1426M GENETICS AND EVOLUTION

(Theory)

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

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

- recognize Mendelian law's of inheritance and modifications of Mendelian ratios
- compare and contrast the different types of epistatic interaction
- explain the different concepts of linkage and the mechanism of crossing over
- describe and explain multiple alleles, multiple genes and polygenic inheritance
- interpret the theories and evidences of evolution

COURSE CONTENT:

UNIT I: MENDELIAN PRINCIPLES AND PROBABILITY **12 hrs.**

A brief review of the history of genetics – Mendelian ratio for Monohybrid – Dihybrid cross – forked method – test cross – backcross – modification of Mendelian ratio 3:1 due to incomplete dominance and codominance – lethal genes. Probability distribution – bionomial – normal – poisson distribution – testing genetic ratios using chi square test

UNIT II: EXTENSION OF MENDELIAN PRINCIPLES **12 hrs.**

Epistasis – Comparative study of epistatic interactions – dominant epistasis – recessive epistasis – duplicate – genes with cumulative effect – complementary genes – duplicate dominant genes without cumulative effect – non-epistatic interaction

UNIT III: LINKAGE & CYTOPLASMIC INHERITANCE **12 hrs.**

Linkage – types – groups – crossing over – types – mechanism – theories – mapping of chromosome – sex linked inheritance using pedigree chart – Sex determination in plants – Extra chromosomal inheritance – mitochondria of yeast – male sterility in plants – "iojap" gene in corn

UNIT IV: MULTIPLE ALLELES AND POLYGENIC INHERITANCE **12 hrs.**

Characteristic features of multiple alleles – coat colour in rabbits – skin colour in mice – eye colour in *Drosophila* – self sterility in *Nicotiana* –polygenic inheritance – kernel colour in wheat – ear length in maize – skin colour in human beings – inheritance of blood groups

UNIT V: THEORIES AND EVIDENCES OF EVOLUTION **12 hrs.**

Historical account – Theories of Evolution – Darwinism – Lamarckism – Weismanism – De-Verism – Modern theory of evolution. Morphological and Anatomical, Embryological, Biochemical, Physiological, Palaeontological, Taxonomical, Biogeographical and Genetical evidences of evolution. Elemental forces of evolution – gene pool – gene frequency – Hardy-Weinberg law – migration – random genetic drift – adaptive radiation – modifications – Isolating mechanisms – speciation – allopatricity – sympatricity – Co-Evolution.

TEXT BOOK(S):

Renganathan, T.K, (1994). *Evolution, (7th* ed.). Palayamkottai, India: Rainbow Printers. Print.

Tamarin, H. R, (2002). *Principles of Genetics*, (7th ed.). New Delhi, India: Tata McGraw Hill Publishing Company Limited. Print.

Verma, P.S, and Agarwal, V.K, (2012). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology,* New Delhi, India: S. Chand & Company, LTD. Print.

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George, A, (2007). *Principles of Plant Genetics and Breeding,* USA: Blackwell Publishing House. Print.

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Stansfield, D.W, (1986). *Theory and Problems of Genetics*, (2nd ed.), New Delhi, India: Tata McGraw Hill Publishing Company Limited. Print.

Strickberger, W, (2000). *Genetics,* New York: MacMillan Publishing Co Inc. Print.

Theodosius, D, Max, K.H, and William, C. S, (1970). *Evolutionary Biology*, New York: North Holland *Publishing* Company. Print.

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CO3	3	3	3	3	2		3	3	3	3	2	3
CO4	3	3	3	3	3		3	3	2	3	3	2
CO5	3	3	3	3	3		3	3	3	3	3	3

- S – Strongly correlated (3)
- M – Moderately correlated (2)
- L – Weakly correlated (1)
- NC – No correlation (0)

PGB2422E HOME MANAGEMENT

(THEORY)

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

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

- create an awareness about the various aspects of home environment
- prepare the students as better home makers
- acquire knowledge on the principles of child care

COURSE CONTENT:

UNIT I: INTRODUCTION TO HOME MANAGEMENT **12 hrs.**

The home – its role and functions in a changing world – family types – their advantages and disadvantages – management process – planning – controlling and evaluation.

UNIT II: FAMILY RESOURCES **12 hrs.**

Types (human & nonhuman resources) – Characteristics of resources – management – alternate uses, management of energy (energy requirement – work simplification) – management of money (budget – planning – objectives – savings & investments) – management of food.

UNIT III: INTERIOR DECORATION **12 hrs.**

Cleanliness and care of the home – use of color in the home – choice of pictures – curtains – cushions - furniture – indoor gardening – Etiquettes to be observed Art of serving – table decoration

– napkins, special decoration of plates – preparing the table – western and Indian styles – flower arrangement, vegetable & fruit carving.

UNIT IV: KITCHEN **12 hrs.**

An ideal kitchen – Kitchen equipments & utensils – Methods of cooking – menu planning – some special food preparation (Nutritious flour for children – balanced diet for teenage – low calorific food for adults) disinfection and pest control.

UNIT V: CHILD CARE AND HOME NURSING **12 hrs.**

Needs of children – Habit promotion – recreational activities for children – Food and Immunization Schedule – home accidents – first aid – home medicines.

REFERENCE BOOK(S):

Moorthy, G. (1993). *Home management*, (3rd ed.). New Delhi, India: Arya Publishing House. Print.

Soundararaj, S. (1993). *A text book of house hold arts*, (4th ed.). New Delhi, India: Orient Longman Limited. Print.

Varghese, M.A. (1992). *Home Management.* New Delhi, India: Wiley Eastern Limited. Print.

PIS2421E FITNESS AND WELLNESS

(THEORY)

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

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

- recognize the importance of sound health and fitness principles
- overcome the barriers of making healthier choices
- create awareness on health issues and sanitation

COURSE CONTENT:

UNIT I: NUTRITION **12 hrs.**

Essential nutrients – basic 7 – menu planning – nutritional requirement for children & adults – healthy living – balanced diet – special diets – diabetes (paleodiet) hypertension – pregnancy – weaning food – hazards of fast food – healthiest way to cook – food handling procedures – Hidden hazards of microwave cooking – food safety

UNIT II: PHYSICAL FITNESS **12 hrs.**

Definition – Importance of fitness – components of fitness – Health related fitness – Performance related fitness – Guidelines of Fitness Training – Do's and Don'ts of Fitness Training – Health benefits of physical exercises and yogic practices.

UNIT III: MENTAL HEALTH **12 hrs.**

Definition – mental health disorders – depression – anxiety – addiction – Importance of human relationship – stress – causes – problems – stress busters – stress management – meditation – music – gardening – pets – nature watch – aquarium – emotional intelligence

UNIT IV: GENERAL HEALTH ISSUES **12 hrs.**

Causes – effects on health & management - obesity – underweight – anemia – ulcer – diabetes – cardiovascular diseases – malnutrition – pregnancy – pre-pregnancy & post-pregnancy & prenatal care.

UNIT V: HYGIENE & SANITATION **12 hrs.**

Personal hygiene – importance – home & everyday life hygiene – sanitation – hygienic cleaning – hand washing – food hygiene – respiratory hygiene – hygiene in kitchen – bathroom – toilet – tips for better personal care – medical hygiene – food safety in kitchen

REFERENCE BOOK(S):

Adler, B.R, and Neil, T, (1993). *Looking out/ looking in,* (7th ed.), Orlando: Harcourt Brace and co. Print.

Baron, R.A, and Byrne, D, (2006). *Social Psychology,* (11th ed.), India: Dorling Kindersley Pvt. Ltd. Print.

Chandrasekaran, K, (1999). *Sound Health through Yoga,* Sedapatti, Madurai: Prem Kalyan Publications.

Giri, A. K, (2008). *Self Development and Social Transformations,* New Delhi, India: Rawat Publications. Print.

Hales, D, (2001). *An Invitation to Fitness and Wellness,* Belmont, CA: Wadsworth Publishers. Print.

Hoeger, W.K, and Hoeger, S.A, (1990). *Fitness and Wellness*, Englewood, Morton Publishing Company. Print.

Iyengar, B.K.S, (2000). *Light on Yoga,* New Delhi, India: Harper Collins Publishers. Print.

Leeds, M.J, (1998). *Nutrition for Healthy Living*, Boston: Mc Graw Hill Publishing Company. Print.

Myers, D.G, (1999). *Social Psychology*, (6th ed.), New Delhi, India: McGraw-Hill Companies. Print.

Srilakshmi, B, (2009). *Nutrition Science,* (3rd ed.), New Delhi, India: New Age International Publishers. Print.

Williams, M, (1998). *Nutrition for Fitness and Sport***, (**5th ed.), Madison: Brown & Benchmark. Print.

PGB2421M BIOCHEMISTRY
(Theory)

LEARNING OUTCOME **4hrs./Wk.**

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

- acquire a deeper understanding of the structure and functioning of the biomolecules
- apply the concepts of thermodynamics in the biological system
- relate the basic concepts and designs of metabolic reactions that take place in the biological systems

COURSE OUTLINE

UNIT – I: THERMODYNAMICS AND CARBOHYDRATES **12hrs.**

Introduction-basic concepts of laws of thermodynamics – Concept of free energy – biological oxidation reduction reactions – ATP energetic – Chloroplast energetic – Mitochondria energetic – Monosaccharides – Classification – structure - isomerism – ring structure of glucose – physical and chemical properties of monosaccharides. Disaccharides – Structure of sucrose, Oligo and polysaccharides – Starch – homo and hetero polysaccharides and hydrolysis of starch.

UNIT – II: NUCLEIC ACIDS **12hrs.**

Structure of bases – nucleosides and nucleotides. Biosynthesis of purines and pyrimidines – Structure – Watson and Crick model of DNA and its properties – Structure and types of RNA. Structure of ATP – GTP – CTP and TTP – High energy compounds – intermediary metabolism.

UNIT – III: PROTIENS **12hrs.**

Classification – Structure and properties of aminoacids – Formation and structure of peptides – biosynthesis of amino acids – Conformation of proteins: Primary – Secondary – Tertiary – Quaternary structure – classification and types of proteins – their structure and role – denaturation.

UNIT – IV: BIOCATALYSTS **12hrs.**

Nomenclature, classification and properties of enzymes, Enzyme catalysis – mechanism & co-factors in enzyme catalysis, Co-Enzymes, Enzyme inhibition – Competitive, Non competitive – Allosteric and Feedback inhibition. Enzyme kinetics – Michaelis-Menton equation – Line Weaver – Burke's plot and Eadie Hofstee plot.

UNIT – V:LIPIDS **12hrs.**

Structure – classification – Nomenclature and properties of fatty acids and their derivatives – Biosynthesis of fatty acids – Fats – structure – Phospholipids – types structure and occurrence – Non - phosphorylated lipids – types – structure and occurrence – α & β Oxidation of fatty acids. Intermediary Metabolism.

TEXT BOOK(S)

Ambika Shanmugam. (2005). *Fundamentals of Biochemistry for Medical students*, (revised ed.). Chennai, India: Nagaraj and Company Pvt. Ltd. Print.

Lehninger, L.A, Nelson, K.L, & Cox, M.M. (2010). *Principles of Biochemistry.* New York: Worth Publishers. Print.

REFERENCE BOOK(S)

Devlin, M.T. (2006). Text book of Biochemistry with clinical correlations. USA: A John Wiley & Sons Inc. Publication. Print.

Elliot, W.H, & Elliot, D. (1997). *Biochemistry and Molecular Biology.* USA: Oxford University Press. Print.

McKee, T, & McKee, R.J. (1996). *Biochemistry and Introduction.* USA: Wm. C. Brown Publishers. Print.

Stryer, L. (2007). *Biochemistry.* New York: W.H. Freeman Publishers. Print.

Voet, D, & Voet, G. J. (2004). *Biochemistry, (*3rd ed.). USA: A John Wiley & Sons Inc. Publication. Print.

PGB2422M PLANT PHYSIOLOGY

(Theory)

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

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

- relate the role and movement of water and solutes in plants
- explain the mechanism and the role of photosynthesis in plants
- analyze the mechanism and the role of respiration
- relate the effects of plant movements and phytohormones on the growth & development of plants

COURSE OUTLINE

UNIT – I: WATER RELATIONS **12hrs.**

Diffusion – gaseous exchange – Osmosis – water potential – Plasmolysis – absorption of water – ascent of sap (cohesion-tension theory) – Transpiration – types – mechanism of stomatal movements – physics of small pore diffusion – factors affecting transpiration – anti – transpirants – guttation – water stress and its physiological consequences.

UNIT – II: MINERAL NUTRITION & ASSIMILATION OF INORGANIC NUTRIENTS **12hrs.**

Mineral nutrition – essentiality of macro & micro nutrients in plant system – nutritional disorders in plants – passive & active transport of ions – hydroponics – Assimilation of inorganic nutrients –

nitrogen fixation – nitrogen fixers & mechanism, assimilation of ammonia – sulphate – phosphate – salt stress and its physiological consequences.

UNIT – III: PHOTOSYNTHESIS **12hrs.**

Chloroplast as a unit of photosynthesis – photosynthetic pigments – action & absorption spectra – Red drop – Emerson enhancement effect - Photosystems I and II, Light reaction – cyclic & non cyclic photophosporylation – dark reaction - C2 cycle, C4 cycle – photorespiration – factors affecting photosynthesis – Translocation of organic solutes – Munch hypothesis – Phloem loading and unloading.

UNIT – IV : RESPIRATION **12hrs.**

Respiratory substrates – RQ – Glycolysis - Kreb's cycle, oxidative phosphorylation – respiratory chain – chemiosmotic theory – generation of ATP – respiratory inhibitors – fermentation and its industrial applications – Pentose phosphate pathway – factors affecting respiration.

UNIT – V: PLANT GROWTH SUBSTANCES & REPRODUCTIVE GROWTH **12hrs.**

Plant growth – definition – phases of growth of plant – plant movements – autonomous and paratonic – cell signaling. Phytohormones and their role: Auxins – Gibberellin – Cytokinins – ABA & Ethylene.

Flowering – Photoperiodism – phytochrome, cryptochrome and Vernalization, Rhythm – types –

Fruiting – Seed dormancy & germination – causes – methods of breaking dormancy – physiological changes that occur during germination – seed viability test – Tetrazolium test – Senescence –

types and physiological changes accompanying senescence.

TEXT BOOK(S)

Noggle, & Fritz. (2010). *Introductory Plant Physiology,(* 2nd ed.). New Delhi, India: Prentice Hall of India Private Limited. Print.

Srivastava, H.N. (1994). *Plant Physiology*. Jalandhar: Pradeep Publications. Print.

REFERENCE BOOK(S)

Devlin, R.M, & Witham. (1986). *Plant Physiology.* New Delhi, India: F.H CBS Publishers and Distributors. Print.

Leopaldcarl, A. (1964). *Plant Growth and Development.* New York: Mc Graw Hill Book Company. Print.

Salisbury, B, & Ross, F. (2007). *Plant Physiology*, (4th ed.). New Delhi, India: CBS Publishers and Distributors. Print.

PGB2421P LAB FOR BIOMOLECULES & PLANT PHYSIOLOGY

(Lab)

LEARNING OUTCOME **5hrs./wk.**

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

- estimate qualitatively and quantitatively the biomolecules in plants
- design simple experiments, scientifically interpret and extrapolate the obtained data
- apply the various techniques and skills to understand the biochemical aspects of plants

COURSE CONTENT

1. Qualitative & quantitative estimation of biomoelcules using spectrophotometric techniques
    - Starch - IKI method
    - Sugar - Benedict's reagent / Anthrone method
    - Amino acid - Ninhydrin method
    - Proteins - Lowry' method
    - Lipid - Sudan III / Gravimetric analysis
2. Aminoacid separation using paper and thin layer chromatography
3. Separation of pigments using column chromatography
4. Amylase activity – effect of temperature – pH – enzyme & substrate concentration on enzyme action –determination of Km & Vmax
5. Quantitative estimation of DNA from Cauliflower
6. SDS PAGE for the separation of seed proteins
7. Extraction &Estimation of chlorophyll from leaves of selected C_3 plants
8. Transpiration – Ganong's potometer
9. Effect of various factors (CO_2 concentration – temperature – wavelength & light) on photosynthesis.
10. Hydroponics
11. Osmosis – Demonstration of Exosmosis and Endosmosis using potato osmoscope
12. Determination DPD by Plasmolytic method
13. Stomatal frequency of leaf samples from varying habitat
14. Demonstration of Ringing experiment
15. Determination of RQ value – Respirometer - Respiroscope
16. Assay for Auxins – Cytokinin – GA .
17. Effect of hormones on seed germination and seedling growth
18. Effect of 2,4 – D on weed growth
19. Allelopathic effect of selected plants on crop growth
20. Effect of drought and salinity on seed germination and plant growth

REFERENCE BOOK(S)

Boyer, R.F. (2000). *Modern Experimental Biochemistry*, (3rd ed.). California: The Benjamin/Cummings Publishing Company. Print.

Claus, W. (1989). *Understanding Microbes – A laboratory text book for Microbiology.* NewYorK: Freeman, W. H. & Company. Print.

Plummer, D.T. (1981). *An Introduction to Practical Biochemistry*. Madras, India: Tata McGraw Publishing Private Ltd. Print.

Palanivelu, P. (2000). *Laboratory Manual for Analytical Biochemistry & Separation Techniques.* Madurai, India: School of Biotechnology, Madurai Kamaraj University. Print.

PGB2521M PLANT SYSTEMATICS

(Theory)

LEARNING OUTCOME **5hrs. / wk.**

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

- explain the principles of systematics
- describe the distinctive features of selected families
- recall the economic value of the plants in the cited families

COURSE CONTENT

UNIT – I: SYSTEMS OF CLASSIFICATION 16hrs.

Brief historical account on the classification of angiosperms up to the present day – Detailed study of classification of Linnaeus – Bentham and Hooker – Engler and Prantl – Cronquist – APG de Candolle III system – Merits and demerits. International code of Botanical Nomenclature – methods – Typification – Principles of priority and their limitations – Effective and valid publication – Author citation – retention – Choice and rejection of names.

UNIT – II: SOURCES OF TAXONOMIC INFORMATION 16hrs.

Herbaria – Types – Field Equipments – Herbarium Techniques – Role of Herbarium & Major Herbaria of World – Flora – Monograph and Botanical garden – Modern trends – Evidences from anatomy – Embryology – Palynology – Cytology – Genetics and Chemotaxonomy.

UNIT – III: BIOSYSTEMATICS 16hrs.

Cladistics and biosystematics – Molecular taxonomy – Numerical taxonomy – chemotaxonomy – Computerized identification – Indented key – Dichotomous key – computer stored keys – automated pattern recognizing systems – matrices – online data bases – IPNI – International Plant Nomenclature Index – Index Kewensis.

UNIT – IV: POLYPETALAE AND GAMOPETALAE 16hrs.

Salient features and economic importance of the following families:

Families of Polypetalae – Magnoliaceae – Annonaceae – Nymphaeaceae – Brassicaceae – Capparidaceae – Caryophyllaceae – Meliaceae – Rutaceae – Ceasalpinaceae – Apiaceae.

Families of Gamopetalae – Rubiaceae – Asteraceae – Sapotaceae – Apocyanaceae – Asclepiadaceae Convolvulaceae – Solanaceae – Acanthaceae – Verbanaceae – Lamiaceae.

UNIT – V: MONOCHLAMYDEAE AND MONOCOTYLEDONS 16hrs.

Salient features and economic importance of the following families.

Families of Monochlamydeae – Chenopodiaceae – Piperaceae – Amaranthaceae – Loranthaceae – Euphorbiaceae.

Families of Monocotyledons – Hydrocharitaceae – Orchidaceae – Musaceae – Cannaceae – Liliaceae – Arecaceae – Araceae – Poaceae – Commelinaceae – Cyperaceae.

TEXT BOOK(S)

Lawrence, G.H.M. (1965). *Taxonomy of Vascular plants.* New York: The Mac Milan Co. Print.

Narayanaswamy, R.V, Rao, K.N, & Raman, *A. Outlines of Botany.* Madras, India: S.Viswanathan Pvt. Ltd. Print.

Pandey, B.P. (2007). *Taxonomy of Angiosperms.* New Delhi, India: S.Chand& Co Ltd. Print.

Pandey, S.N, & Misra, S.P. (2008). *Taxonomy of Angiosperms.* New Delhi, India: Ane Books India ltd. Print.

Simpson, M.G. (2010). *Plant Systematics.* USA: Elsevier Academic Press. Print.

Verma, B.K. (2011). *Introduction to Taxonomy of Angiosperms.* New Delhi, India: PHI Learning Pvt. Ltd. Print.

REFERENCE BOOK(S)

Gamble, J.S, & Fischer, C.E.C. (2011). *Flora of the Presidency of Madras.* Volume I – III. W.C.London: Adlard & Son Limited. Print.

Jeffrey, C. (1982). *An Introduction to Plant taxonomy*. New Delhi, India: Allied publishers Private Limited. Print.

Sambamurty, A.V.S.S. (2005). *Taxonomy of Angiosperms.* New Delhi, India: I.K. International Pvt. Ltd. Print.

PGB2422P LAB FOR PLANT SYSTEMATICS

(Lab)

LEARNING OUTCOME **5hrs./wk.**

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

- describe the distinctive features of selected families
- collect & prepare plant herbarium following standard format
- assign plants to their respective families and prepare a dichotomous key

COURSE CONTENT

1. Binomial identification of plants using Gamble.
2. Study of the families with reference to their South Indian representatives and a minimum of one member each to be dissected and sketched

   Families of Polypetalae :Magnoliaceae – Annonaceae – Nymphaeaceae – Brassicaceae – Capparidaceae – Caryophyllaceae – Meliaceae – Rutaceae – Ceasalpiniaceae – Apiaceae.

   Families of Gamopetalae : Rubiaceae – Asteraceae – Sapotaceae – Apocyanaceae – Asclepiadaceae – Convolvulaceae – Solanaceae – Acanthaceae – Verbenaceae – Lamiaceae.

   Families of Monochlamydeae : Chenopodiaceae – Piperaceae – Amaranthaceae – Loranthaceae – Euphorbiaceae. . Families of Monocotyledons : Hydrocharitaceae – Orchidaceae – Musaceae – Cannaceae – Liliaceae – Arecaceae – Poaceae – Commelinaceae – Cyperaceae .
3. Technical description of plants – temporary preparations of dissected floral parts. Exercises in key – making – preparation of indented key – dichotomous key – computational identification of plants.
4. Field trip for collection of plants
5. Preparation and submission of 30 herbarium

REFERENCE BOOK(S)

Gamble, J.S, & Fischer, C.E.C. (2011). *Flora of the Presidency of Madras,* Volume I – III. W.C.London: Adlard & Son Limited. Print.

Jeffrey, C. (1982). *An Introduction to Plant taxonomy*. New Delhi, India: Allied publishers Private Limited. Print.

Lawrence, G.H.M. (1965). *Taxonomy of Vascular plants.* New York: The Mac Milan Co. Print.

Sambamurty, A.V.S.S. (2005). *Taxonomy of Angiosperms.* New Delhi, India: I.K. International Pvt. Ltd. Print.

Simpson, M.G. (2010). *Plant Systematics.* USA: Elsevier Academic Press. Print.

PGB3521M PLANT ANATOMY AND EMBRYOLOGY

(THEORY)

LEARNING OUTCOME: **5 hrs./wk.**

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

- describe the primary, secondary and anomalous secondary growth of root and stem
- understand the structure & function of reproductive organs associated with seed development
- illustrate the various aspects of developmental embryology

COURSE CONTENT:

UNIT I: PRIMARY STRUCTURE OF PLANT PARTS **15 hrs.**

Meristem – tissues (simple, compound secretory & dermal) – primary structure of leaf – stem – root of dicot & monocot plants (review) – root – stem transition region – anatomy of petiole – nodal anatomy – floral anatomy – anatomy of fruit and seed – ecological anatomy – anatomical adaptations in hydrophytes – xerophytes – epiphytes and halophytes – Anatomy in relation to taxonomy.

UNIT II: SECONDARY STRUCTURE **15 hrs.**

Cambium – structure & function – normal secondary growth in stem & root – periderm – secondary phloem - secondary xylem – wood types (reaction wood, compression wood, and tension wood) periderm – bark annual rings – anomalous secondary growth – causes with explanation and examples – Wood anatomy in relation to phylogeny.

UNIT III: MICROTECHNIQUES **15 hrs.**

Temporary mounting – maceration – epidermal peeling – microtome – clearing – embedding – sectioning – staining.

– mounting – labeling - fixation – dehydration – stains – neutral stains – vital stains – single staining – double staining – permanent mounting for light microscope – preparation of serial sections.

UNIT IV: EMBRYOLOGY **15 hrs.**

Microsporangium – structure & development – microspores – pollen morphology and ultrastructure. Megasporangium – structure & development – Ovule types, embryo sac structure – Pollination – anthesis – Self and cross pollination (anemophily – hydrophily – entomophily – ornithophily) Artificial pollination – pollen storage – Fertilization – Sexual incompatibility – methods to overcome.

UNIT V: DEVELOPMENTAL EMBRYOLOGY **15 hrs.**

Seed – development – endosperm – types and functions – embryo development in dicot and monocot – Apomixis – definition – types – causes – significance – parthenogenesis – polyembryony – definition – classification – causes – significance.

TEXT BOOK(S):

Annie, R, Kumaresan, V. & Arumugam, N, (2015). *Cell biology, Anatomy and Microtechniques*, Nagercoil, India: Saras Publication. Print.

Bhojwani, S.S, & Bhatnagar, S.P, (2001). *The Embryology of Angiosperms,* New Delhi, India: Vikas Publishing House Pvt. Ltd. Print.

Esau, K, (1962). *Plant Anatomy,* New York, USA: John Wiley & Sons. Inc. Print.

Pandey, B.P, (2011). *Plant Anatomy,* New Delhi, India: S.Chand & Company Ltd. Print.

REFERENCE BOOK(S):

Annie Ragland, (2014). *Plant Anatomy & Microtechniques,* Nagercoil, India: Saras Publication. Print.

Eames, A. J, & Mac Daniels, L. M, (1953). *An Introduction to Plant Anatomy*, New York, USA: Mc Graw Hill Book Company Ltd. Print.

Fahn, A, (1989). *Plant Anatomy,* Oxford, UK: Pergamon Press. Print.

Maheswari, P, (2007). *An Introduction to the Embryology of Angiosperms*, New York, USA: McGrawHill Publishing House. Print.

Mauseth, J.D, (1988). *Plant Anatomy,* California, USA: The Benjamin/ Cummings Publishing Company Ltd. Print.

Pandey, S.N, & Chadha, A, (2001). *Plant Anatomy & Embryology,* New Delhi, India: Vikas Publishing house

PGB3421P LAB FOR PLANT ANATOMY AND EMBRYOLOGY

(LAB)

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

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

- understand the organization of tissues in plant parts
- relate the anatomical modifications to the habitat
- appreciate the architecture of plant tissues and the components

COURSE CONTENT: **60 hrs.**

1. Maceration – observation of plant tissues
2. Anatomy of dicot and monocot plant parts
    - Leaf – *Hibiscus* & Grass
    - Stem – *Tridax* & Grass
    - Root – Bean & Grass
3. Secondary growth
    - Normal – Dicot stem and Root
    - Anomalous – *Boerhaevia, Bougainvillea, Dracaena*
4. Preparation of permanent slides using hand section – 10
5. Preparation of permanent slides using microtome – 2
6. Microscopic observation of C.S. of anther (*Datura*)
7. Microscopic observation of pollen of various flowers
8. Effect of sucrose / boron solution concentration on pollen germination
9. Embryo mounting (*Tridax* / *Achyranthes*)
10. Microscopic observation of permanent slides of different types of ovules
11. Anatomical adaptations of hydrophytes and xerophytes

REFERENCE BOOK(S):

Bhojwani, S.S, & Bhatnagar, S.P, (2001). *The Embryology of Angiosperms,* New Delhi, India: Vikas Publishing House Pvt Ltd. Print.

Maheswari, P, (2007). *An Introduction to the Embryology of Angiosperms*, New York, USA: McGrawHill Publishing House. Print.

Pandey, B.P, (2011). *Plant Anatomy,* New Delhi, India: S. Chand & Company Ltd. Print.

PGB3522M CELL & MOLECULAR BIOLOGY

(THEORY)

LEARNING OUTCOME: **6 hrs./wk.**

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

- identify the stages of mitosis and meiosis with reference to chromosome movement
- learn the genome organization in prokaryotes and eukaryotes
- understand the mechanism of gene action and regulation in prokaryotes and eukaryotes

COURSE CONTENT:

UNIT I: CELL ENVELOPE AND NUCLEUS **18 hrs.**

Structure of cell – cell wall – primary and secondary structure – Prokaryote – Eukaryote (Plant & Animal-review) Structure of Bio-membrane models – lipid bilayer and membrane protein – properties and functions of biomembrane –— functions. nucleus – chromosome – structure and special types – DNA types – RNA structure & types. Cell cycle – mitosis – meiosis.

UNIT II: CELL ORGANELLES **18 hrs**.

Cell organelles – Living & non-living inclusions – structure and function of living inclusions – endoplasmic reticulum – golgi complex – ribosome – lysosome – dictyosome – chloroplast and mitochondria – Non-living inclusions – ergastic substances – minerals – chemical substances

UNIT III: MOLECULAR STRUCTURE OF NUCLEIC ACIDS & REPLICATION **18 hrs**.

DNA content and C – Value Paradox – DNA – RNA – DNA as a genetic material – Experimental evidences – DNA Replication in Prokaryotes & Eukaryotes – Enzymes – mechanism & regulation – Rolling circle model of replication – DNA repair – Mismatch – Base Excision – Nucleotide – excision and direct DNA repair – Plasmid – types – properties

UNIT IV: TRANSCRIPTION **18 hrs.**

Transcription in prokaryotes & eukaryotes – mechanism – enzymes – type I – II & III (RNA polymerase) – Transcription factors – Post transcriptional modifications – 5-cap formation – 3' end processing – Regulation of Gene Expression in Eukaryotes – Controlled transcription of DNA – Alternate splicing of RNA and mRNA stability – Overview of genetic recombination in bacteria – conjugation – transformation – transduction

UNIT V: TRANSLATION AND THE GENETIC CODE **18 hrs.**

One gene one collinear Principle (Beadle & Tatum) – Colinearity – coding sequence of genes and polypeptide product – Protein synthesis – Components required – activation – initiation – elongation –termination – Properties of genetic code – codon – t-RNA interactions – Wobble hypothesis – altered codon regulation – post translation regulatory mechanism – Inhibitors of protein synthesis – Regulation of gene expression in Prokaryotes – positive and negative regulation – *E.coli* – gene regulation in eukaryotes – *Lac* – A*ra* – *trp* operon

TEXT BOOK(S):

Devasena, T, (2012). *Cell Biology,* U.P, India: Oxford University Press. Print.

Powar, C.B, (2008). *Cell Biology,* Mumbai, India: Himalaya Publishing House. Print.

Rastogi, S.C, (1988). *Cell Biology,* New Delhi, India: Tata Mc Graw Hill Publishing Company Limited. Print.

Snustad, D. P, & Simmons, M.J, (2003). *Principles of Genetics,* (3rd Edition), USA: John Wiley & Sons. Print.

Verma, P.S, & Agarwal, V.K, (2012). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology,* New Delhi, India: S. Chand & Company, Ltd. Print.

REFERENCE BOOK(S):

De Robertis, E.D.P, Seez, F.A. & De Robertis, E.M.F, *(1988). Cell and Molecular Biology,* (International Edition), Philadelphia: Lea & Febiger. Print.

Freifelder, D, (1995). *Molecular Biology,* New Delhi, India: Narosa Publishing House. Print.

Karp, G, (1984). *Cell Biology,* New York, USA: Mc Graw Hill Book Company. Print.

Klug, W.S, & Cummings, M.R, (2003). *Concepts of Genetics*, New Delhi, India: Pearson education. Print.

Kornberg, A, & Baker, T.A, (1997). *DNA Replication,* (2nd Edition), USA: Jones & Barlett Publishers. Print.

Lolury, A.G,& Sie Kevitz, P, (1969). *Cell Structure and Function,* New Delhi, India: Oxford & IBH Publishing Co. Print.

Maloy, S.R, Cronan, J.E, & Freifelder, D, (1997). *Microbial Genetics,* (2nd Edition), USA: Jones & Barlett Publishers. Print.

Primrose, S.B, Twyman, R.M, & Old, R.W, (2004). *Principles of Gene Manipulation*, (6th edition), USA: Blackwell Scientific Publishers. Print.

Strickberger, M.W, (2006). *Genetics*, (3rd Edition), New Delhi, India: Prentice Hall of India Pvt. Ltd. Print.

Tamarin, R.H, (1996). *Principles of Genetics,* (5th Edition), USA: Wm.C. Brown Publishers. Print.

Watson, J.D, Gilman, M, Witkowski, J, & Zoller, M, (1992). *Recombinant DNA,* New York: WH Freeman & Co. Print

PGB3422P LAB FOR CELL & MOLECULAR BIOLOGY

(LAB)

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

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

- identify the stages of mitotic and meiotic cell division
- understand the structure and function of living and non-living cell inclusions in plants
- demonstrate the various techniques of Molecular biology

COURSE CONTENT: **60 hrs.**

1. Ergastic substances – Starch grains – cystolith – raphides – druses
2. Mitosis from onion root tip
3. Meiosis using *Tradescantia* bud
4. Microscopic observation of permanent slides of Polytene Chromosomes and Lampbrush chromosome
5. Isolation of genomic DNA from cauliflower
6. Effect of physical mutagen – UV on *E.coli*
7. Isolation of antibiotic resistant mutants by replica plating
8. Agarose gel electrophoresis
9. Conjugation
10. Transformation – Blue White screening

REFERENCE BOOK(S):

Rajan, S. & Selvi Christy, R, (2010). *Experimental Procedures in Life Sciences,* Chennai, India: Anjanaa Book House. Print.

Sambrook, J, & Russell, D.M, (2006). *The Condensed Protocols from Molecular Cloning: A Laboratory Manual,* New York: Cold Spring Harbor Laboratory Press. Print.

Verma, P.S, & Agarwal, V.K, (2012). *Cell Biology, Genetics, Molecular Biology, Evolution and Ecology,* New Delhi, India: S. Chand & Company, Ltd. Print.

PGB3521O RESEARCH METHODOLOGY & COMPUTER APPLICATIONS

(THEORY)

LEARNING OUTCOME: **5 hrs./wk.**

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

- understand the principles of a selection of a research problem
- acquire knowledge about different methods of collection of literature
- learn the methods of data collection and interpret the biological data statistically

- illustrate the applications of computers in data and sequence analysis using bioinformatics tools

COURSE CONTENT:

UNIT I: RESEARCH **15 hrs.**

Selection of a research problem – sources – attitude – evaluation – defining the problem – proposal writing – literature collection – primary – secondary and tertiary sources – bibliography – indexing and abstracting – thesis writing – components – research journals – preparation of research paper in national and international journals – plagiarism – funding agencies of research – impact factor – citation index

UNIT II: SAMPLING AND REPRESENTATION OF DATA **15 hrs.**

Sampling techniques – data collection – classification of data – tabulation of data – Analysis of data – frequency distribution – Bar diagrams – types – graphical representation of data – histogram – Frequency polygon – Ogive – Merits and demerits of each type of graph – Use of computers in graphical representation – interpretation of data

UNIT III: ANALYSIS OF BIOLOGICAL DATA **15 hrs.**

Measurement of central tendency – analysis of biological dispersion – Mean – Median – Mode – standard deviation – standard error – correlation – regression – student's t test – chi-square test – one way ANOVA – F – test.

UNIT IV: DATA ANALYSIS USING COMPUTERS **15 hrs.**

Introduction to Excel – Create Worksheet – Embed Charts – Create chart type – set layout – Perform data interpretation – Data analysis in Excel – Sort – Filter – Conditional formatting – charts – table – pivot table – what-if analysis – Solver – Analysis toolpak – Histogram – ANOVA – Descriptive statistics – F-test – t-Test-Moving average – Exponential smoothing – Correlation – Regression – List of softwares for Biostatistics – Applications and uses of biostatistics – Computation of seed testing – plant growth indices – Analysis of data on vegetation studies – Computation of crop – vegetation biomass using satellite data.

UNIT V: BIOINFORMATICS **15 hrs.**

Introduction – classification of biological databases – nucleotide – sequence – data bases – gene bank – EMBL – protein sequence databases – SWISSPROT – RASMOL – PDB – Genome databases – drug database at NCBI & sequence analysis – Basic concepts of sequence similarity – identity and homology – Sequence based database searches – BLAST – PSI BLAST – PHI BLAST – multiple sequence alignment – Clustalw – phylogenetic tree – PHYLIP – PHYLODRAW.

TEXT BOOK(S):

Claverie, J.M, & Notredame, C, (2004). *Bioinformatics –A beginners guide*, New Delhi, India: Wiley Dreamtech, Print.

Gurumani, N, (2006). *Research Methodology of Biological Sciences*, Chennai, India: MJP Publishers. Print.

Nagpal, N.P, (2000). *Computer Fundamentals, Concepts, Systems and Applications*, New Delhi, India: Wheeler Publishing. Print.

REFERENCE BOOK(S):

Alexis leon, (1999). *Fundamentals of Information Technology*, New Delhi, India: Lean Techword. Print.

Brya Prattenberger, (2001). *Linux Command*, New Delhi, India: BPB Publications. Print.

Hamacher, C, Vranesic, Z, & Zaky, S, (2002). *Computer Organization,* New Delhi, India: McGrawHill Publications. Print.

Kothari, C.R, (2004). *Research Methodology – Methods and Techniques,* (2nd Edition), New Delhi, India: New Age International Publishers. Print.

Pranab Kumar Banerjee, (2007). *Introduction to Biostatistics,* New Delhi, India: S.Chand & Company Ltd. Print.

Sander, D.H, (2004). *Computers Today,* New Delhi, India: Mc-Graw Hill Book Company. Print.

Sundar Rao, P.S.S & Richard, J, (2006). *Introduction to Biostatistics and Research Methods,* New Delhi, India: Prentice Hall of India Pvt. Ltd. Print

Tim Parker, (1999). *Linux,* New Delhi, India : BPB Publications. Print.

Excel 2010 All-in-One for Dummies' By Greg Harvey.

https://faculty.franklin.uga.edu/dhall/sites/faculty.franklin.uga.edu.dhall/files/lec1.pdf

PGB3522O MEDICINAL BOTANY AND PHYTOCHEMISTRY

(LAB CUM THEORY)

LEARNING OUTCOME: **4T: 1L hrs./ Wk.**

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

- trace the history of pharmocognosy and Indian traditional medicines and their sources
- identify and evaluate the beneficial effects of specific plants used for drug preparation
- analyze the chemical properties of the secondary metabolites

COURSE CONTENT:

UNIT I: INTRODUCTION TO PHARMOCOGENESIS AND SOURCES OF DRUGS **15 hrs.**

Definition of pharmocognosy – history of pharmocognosy – scope – importance of pharmacognosy – Indian system of Medicine in brief – Ayurvedic – Siddha – Unani – Homeopathy – Aromatherapy – Ethnobotany – Natural sources of drugs from plants – lower plants – higher plants – marine organisms – microbes – Classification of crude drugs – morphological – taxonomical – chemical – pharmocological.

UNIT II: PLANTS USED AS MEDICINE, THERAPEUTIC USES AND DRUG ADULTERATION **15 hrs.**

Geographical distribution – morphology of the useful part – chemical constituents – therapeutic uses of the following plants:

Underground plant parts – *Curcuma longa* L.(Turmeric) – *Zingiber officinale* Roscoe(Ginger) – *Alpinia officinarum* Hance (Chitharathai) – *Acorus calamus* L. (Vasambu) – *Allium cepa* L(Onion) – *Allium sativum* L.(Garlic) – *Glycyrrhiza glabra* L (Athimathuram).

Leaves – *Azadirachta indica* A. Juss (Vembu) – *Adhatoda vasica* Nees (Adathoda) – *Eucalyptus globulus* Labill (*Eucalyptus*) – *Ocimum sanctum* L. (Thulasi) – *Solanum trilobatum* Linn (Thoothuvalai)

Flower – *Cassia auriculata* Linn (Avarum) – *Hibiscus rosa-sinensis* L (Semparuthi)
Fruits & Seeds – *Carica papaya* L. (Papaya) – *Emblica officinalis* Gaertn.(Gooseberry) – *Piper nigrum* Linn. (Pepper) – *Piper longum* L (Thipili).

Drug Adulteration – Faulty collection – Imperfect preparation – incorrect storage – deliberate adulteration – substitution of exhausted drugs – confusion of common vernacular nomenclature – gross substitution by different materials.

UNIT III: PREPARATION OF CRUDE DRUGS **15 hrs.**

Methods of collection – harvesting – methods of drying – garbling – packing – storage – processing of crude drugs – Physical method of evaluation – Chemical methods – methods of preparation of decoction – maceration – infusion – juice extraction – solvent extraction – steam distillation – UV spectrophotometric analysis – Biological method – study of sensory characters – colour – taste – odour – texture – microscopical method – anatomical features – leaf constant – water pores – types of covering hairs – trichomes – observation of powdered drugs – *Lycopodium* spore method – Standardization of drugs (GMP & GAP).

UNIT IV: STRUCTURE AND PROPERTIES OF CHEMICAL CONSTITUENTS IN PLANTS 15 hrs.

Carbohydrates – its derivatives – Carbohydrates – Molisch test – Fehling's test

Fats – oils – Lipids – Properties for identification of castor oil – sesame oil – volatile oils.

Glycosides – Classification of glycerides – test for anthraquinone – Glycoside – Borntnager's test – cardiac glycosides – Keller – Kilian's test.

Tannins – Properties – classification – Ferric Chloride test – Gelatin test.

Alkaloids – properties – classification – Wagner's reagent – Dragendorff's reagent.

Flavanoids – Lead acetate solution test – Alkali test.

UNIT V: LAB 15 hrs.

6. Collection and preparation of dried leaf powder of selected medicinal plants.
7. Extraction of secondary metabolites using the dried powder with soxhlet extraction using selected solvents.
8. Qualitative analysis of the following:
    - Secondary metabolites present in the extracts
    - Carbohydrates and its derivatives: Carbohydrates – Molisch test & Fehling test
    - Fats, oils & Lipids: Identification of castor oil, sesame oil and volatile oils.
    - Glycosides: Test for anthroquinone; Glycoside – Borntnager's test; cardiac glycosides – Keller-Kilian's test.
    - Tannins – Ferric chloride test; Gelatin test.
    - Alkaloids – Wagner's reagent; Dragendorff's reagent.
    - Flavonoids – Lead acetate solution test; Alkali test.
9. UV spectrophotometric analysis of the extract
10. Lab visit – Aryavaidhya nillaiyam – Nagarjuna – INCOPS, Chennai with the help of Dr. J. Jeyavenkatesh.
11. Antimicrobial activity of solvent extraction of leaf of selected medicinal plants

TEXT BOOK(S):

Daniel, M, (2017). *Medicinal Plants – Chemistry and Properties,* New Delhi, India: Oxford & IBH Publishing Co. Pvt. Ltd. Print.

Mohammed Ali, (1994). *Text book of Pharmacognosy*, (1st Edition), New Delhi, India: CBS Publishers & Distributors. Print.

Verma, V, (2013). *Text Book of Economic Botany,* New Delhi, India: Ane Books Pvt. Ltd. Print.

REFERENCE BOOK(S):

Bhattacharjee, S.K, (2001). *Handbook of Medicinal Plants*, (3rd Edition), Jaipur, India : Pointer Publishers. Print.

Mehta, S. C, Ashutosh Kar, (2011). *Pharmaceutical Pharmacology*, New Delhi, India : New Age International Publishers. Print.

Reddy, K.J, Bahadur, B, Bhadraiah, B. & Rao, M.L.N, (2007). *Advances in Medicinal Plants,* Hyderabad, India: University Press. Print.

Rosaline, A, (2011). *Pharmacognosy,* Chennai, India: MJP Publishers. Print.

Shah, R. M. & Nayak, R. T, (2012). *Pharmacognosy,* New Delhi, India: Global Academic Publishers and Distributors. Print.

Sukh Dev, (2006). *A Selection of Prime Ayurvedic Plants Drugs Ancient,* University of Chicago: Anamaya Publishers. Print.

Yaniv, Z. & Bachrach, U, (2007). *Handbook of Medicinal Plants,* New Delhi, India: CBS Publishers & Distributors Pvt. Ltd. Print.

PGB4421M PLANT BIOTECHNOLOGY

(THEORY)

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

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

- acquire knowledge about the various techniques involved in plant transformation
- analyze the scope and applications of gene manipulation in plants
- appreciate the significance of transformed plants which produces useful products

COURSE CONTENT:

UNIT I: PLANT GENOME ORGANIZATION & GENE TRANSFER IN PLANTS **12 hrs.**

Nuclear genome – Chloroplast genome – Mitochondrial genome – *Arabidopsis* – model plant – the new techniques – Vectors for plant transformation – Bacterial –Ti plasmid – Ri plasmid – cosmids – phagemids – Viral – TMV – CAMV – Promoters for gene expression in plants – nos – Ocs – CaMV35s – 19s promoters – Tissue specific promoters – Patatin (potato) – Zein (Maize) – glutelin (Rice) – Tapetum specific promoter (*Tobacco*) – Inducible promoters – PIN – Reporter and Marker genes

UNIT II: METHODS OF GENE TRANSFER **12 hrs.**

Direct gene transfer methods – Particle bombardment – Micro injection – PEG – Electroporation – Biolistic – Gene transfer – Silicon carbide fibre – whiskers – *Agrobacterium* mediated gene transfer – regeneration of plants from protoplasm – transfer of T-DNA – binary vectors – cloning genes by transposon (*Antirrhinun*) – cloning genes by T-DNA (*Arabidopsis*).

UNIT III: PLANT TISSUE CULTURE **12 hrs.**

Plant tissue culture – History – nutrient requirements – sterilization – maintenance of culture – Types of culture – (Seed – Embryo – Callus – Organ – Nucellus – Endosperm – Micropropagation – Meristem culture – Cell culture – Organogenesis – Somatic Embryogenesis – Embryogenesis – Applications of tissue culture.

UNIT IV: AGRICULTURAL BIOTECHNOLOGY **12 hrs.**

Haploid production – Protoplast culture – somatic hybridization – cybridization – Somaclonal variation – synthetic seed technology – Engineering plants for various purposes – Resistance to herbicides – insects – viruses – fungi – bacteria – Knocking out gene activity by antisense expression – co-suppression – Golden – Rice – Bt Cotton.

UNIT V: INDUSTRIAL APPLICATIONS OF PLANT BIOTECHNOLOGY **12 hrs.**

Suspension culture – Secondary metabolites – types – application – control mechanisms – manipulation of alkaloids – (Shikimate and PHA pathway) – Industrial enzymes – amylase –

protease – lipase – phytase – production – Types of Bioreactors – immobilization techniques – Plant products with altered biochemical properties – carbohydrates – fats – oils – Synthesis of novel plant products – poly hydroxy butyrate.

TEXT BOOK(S):

Chawla, H.S, (2002). *Introduction to Plant Biotechnology*, Calcutta, India: Oxford and IBH Publishing Co. Pvt. Ltd. Print.

Ramawat, K.G, (2000). *Plant Biotechnology,* New Delhi, India: S.Chand Publishers. Print.

REFERENCE BOOK(S):

Balasubramanian, D, Bryce, C.F.A, Dharmalingam, K, Green, J, & Jeyaraman, K, (1996). *Concepts in Biotechnology,* Hyderabad, India: University Press Ltd. Print.

Dodds, J,H, and Roberts, L.W, (1995). *Experiments in Plant tissue culture*, Cambridge: Cambridge University Press. Print.

Gatehouse, A.M.R, Hilder, V.A, and Boulter, D, (1992). *Plant Genetic Manipulation for Crop Protection*, Cambridge, UK: C.A.B. international Publication. Print.

Ignacimuthu, S, (1996). *Applied Plant Biotechnology*, New Delhi, India: Tata Mc-Graw Hill Publishing Company Ltd. Print

Ignacimuthu, S, (1997). *Plant Biotechnology*, Calcutta, India: Oxford and IBH Publishing Co. Pvt. Ltd. Print.

Jogdand, S.N, (1997). *Gene Biotechnology,* Mumbai, India: Himalaya Publishing house. Print.

Kalyan kumar De, (1992). *Plant Tissue Culture,* Calcutta, India: New Central Book Agency. Print.

Kreuzer, H. & Massey, A, (2001). *Recombinant DNA and Biotechnology*, Washington, D.C.: ASM Press. Print.

Kumar, H.D, (2005). *Modern Concepts of Biotechnology,* New Delhi, India: Vikas Publishing Company ltd. Print.

Kumar, H.D, (2007). *A Text Book on Biotechnology,* (2nd ed.), New Delhi, India: East-West Press Pvt. Ltd. Print.

Kyte, L. and Kleyn, J, (1996). *Plants from Test Tubes – An Introduction to Micropropogation*, (3rd ed.), Oregon, USA: Timber Press. Print.

Razdan, M.K, (2011). *Introduction to Plant Tissue Culture,* (2nd ed.), New Delhi, India: Oxford & IBH Publishing Co. Pvt. Ltd. Print.

Slater, A. Scott, N,W. and Fowler, M. R, (2003). *Plant Biotechnology,* New York: Oxford University Press. Print.

Thieman, J.W. and Palladino A.M, (2011). Introduction to Biotechnology, (2nd ed.), Noida, India: Pearson Education in South Asia. Print.

Watson, J.D, Gilman, M, Witkowski, J, and Zoller, M, (1992). *Recombinant DNA,* New York: WH Freeman & Co. Print

PGB4421P LAB FOR PLANT BIOTECHNOLOGY

(LAB)

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

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

- know the artificial culturing of plants under lab condition
- acquire essential skills in Plant Tissue culture
- relate the applications of tissue culture in conservation of economically important plants

COURSE CONTENT: **60 hrs.**

1. Tissue culture media preparation and sterilization
2. Preparation of Explant for morphogenetic expression – shoot tip & leaf bit (*Catharanthus roseus*) seed – *Oryza sativa*
3. Embryo axes derived leaflet from *Arachis hypogea*
4. Effect of plant growth hormones on callus induction in *Arachis hypogea*
5. Measurement of callus growth – Fresh weight – Dry weight – Packed cell volume – Cell counting – cell viability.
6. Regeneration from callus and suspension cultures
7. Chemical analysis of suspension culture – TLC
8. Immobilization using Cyanobacteria
9. Somatic embryogenesis in *Arachis hypogea*
10. Synthetic seed preparation – mustard seed
11. Haploid plant production – Anther cell culture
12. Protoplast isolation – viability test
13. Micropropagation of carrot – potato

REFERENCE BOOK(S):

Pierik, R.L.M, (1997). *In vitro culture of Higher plants,* Netherland: Kluwer Academic Publishers. Print.

Rajan, S. and Selvi Christy, R, (2010). *Experimental Procedures in Life Sciences,* Chennai, India: Anjanaa Book House. Print.

Reinert, J. and Yeoman, M.M, (1983). *Plant Cell and Tissue culture, A Laboratory Manual*, New Delhi, India: Narosa Publishing house. Print.

Tejovathi, G, Vimala, Y. and Bhadauria, R, (1996). *A Practical Manual for Plant Biotechnology*, New Delhi, India: CBS Publishers and distributors. Print.

PGB4521M APPLIED BOTANY

(THEORY)

LEARNING OUTCOME: **5 hrs./wk.**

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

- know the techniques involved in plant nursery establishment and develop entrepreneurial skills
- appreciate the applications of Horticultural concepts in crop improvement
- explain principles of preservation using plant products
- identify the methods of Plant breeding

COURSE CONTENT:

UNIT I: PLANT BREEDING **15 hrs.**

Principles of Plant Breeding – Selection – types (Mass – Pure line & Clonal – Review) – Hybridization – Important conventional methods of breeding of self – cross pollinated and vegetatively propagated crops – Non-conventional methods – Polyploidy – Genetic variability – *invitro* methods for variety maintenance – mutational breeding.

UNIT II: ESTABLISHMENT AND MAINTENANCE OF PLANT NURSERY **15 hrs.**

Types – lay out – Maintenance of nursery – Plant propagation methods (Layering – Simple – air layering – Cuttage – Stem – leaf – root cuttings – Grafting – Tongue – side tongue – approach – Budding – T – inverted T – Chip budding – Separation – Division) Transplanting – irrigation – surface – spray – drip – Packing of Nursery plants – Establishment of cacti and succulents – Establishment of kitchen garden – principles – selection of crops – basic techniques involved - lay out – Terrace garden – Organic farming – organic manures (Farm Yard manure – vermicompost – panchakaavya) – botanical pesticides. Landscaping – Principles – Designs.

UNIT III: COMMERCIAL FLORICULTURE **15 hrs.**

Cut flowers – Green house – Types (Even span, lean to) – Cultivation – Conditioning of cut flowers – Packing – Flower arrangement – Principles – types – Preparation of bouquet – wreath – Dried – pressed flowers – Methods of drying – pressing – dyeing – Use of dried – pressed plant materials – Dry arrangement.

UNIT IV: FRUIT AND VEGETABLE PRESERVATION **15 hrs.**

Factors influencing the growth of microorganisms in food – Sources of contamination of fruits – Types of spoilage – Fruits – vegetables – Preservation methods – Physical methods – Temperature – drying – Chemical methods – Common salt – Sugar – Organic acids – mushroom culture – Oyster – milk mushroom.

UNIT V: VALUE ADDED PLANT BASED PRODUCTS **15 hrs.**

Bonsai – Terrarium – Hanging pot – Preparation of greeting cards – wall hanger – Pot pourri – jam – jelly – squash – sauce – Ketch up – pickle – vathal – vadam – Papad – Amla candy – Dried amla – Raisin – Masala (sambar masala – Garam masala) – Mushroom recepies (soup – omlette – pakora – biriyani – pickle) Coco peat – properties – production process – Plant fibre products – Jute – Banana.

TEXT BOOK(S):

Bahl, N, (2015). *Hand Book on Mushrooms,* (4th ed.), New Delhi, India: Oxford and IBH Publishing Co. Pvt. Ltd. Print.

Chaudhari, H. K. (1992). *Elementary Principles of Plant Breeding.* New Delhi, India: Oxford & IBH Publishing Co Pvt. Ltd. Print.

Desrosier, N.W, and Desrosier, J.N, (1987). *The Technology of Food Preservation,* (4th ed.), CBS Publishers & Distributors. Print.

Frazier, W.C. and Westhoff, D.C, (2008). *Food Microbiology,* (4th ed.), New Delhi, India: Tata McGraw Hill Publishing Company Limited. Print.

Harold Piercy, (1980). *Flower arranging,* London: Sundial Publication. Print.

Hartmann, T.H, Kester, E.D, Davies, T.F. & Geneve L.R, (2009). *Plant Propagation Principles and Practices*, (7th ed.), New Delhi, India: PHI Learning Pvt. Ltd. Print

Kumar, N, (2011). *Introduction to Horticulture*, (7th ed.), New Delhi, India: Oxford & IBH Publishing Co. Pvt. Ltd. Print.

Narayanaswami, R.V. and Rao, K.N, (1963). *Outlines of Botany,* Chennai, India: Esvee Press. Print.

Pamela, W, (1995). *Drying flowers*, London: New Burlington books, Pvt. Ltd. Print.

Pandey, B.P, (1980). *Introduction to Economic Botany,* New Delhi, India: S.Chand and Company Limited. Print.

Sambamurthy, A.V.S.S, (2005). *Taxonomy of Angiosperms*, New Delhi, India: I.K. International Pvt. Ltd. Print.

Sheen, J, (1988). *Pressing flowers*, London: Merehurst Press. Print.

Shirley, M, (1989). *Arranging flowers, London:* Merehurst Press. Print.

REFERENCE BOOK(S):

Acquaah, G, (2009). *Horticulture Principles and practices,* (4th ed.), New Delhi, India: PHI Learning Pvt. Ltd. Print

Bahl, N, (1995). *Hand Book on Mushroom*, (3rd ed.), New Delhi, India: Oxford and IBH Publishing Co. Pvt, Ltd. Print.

De, L.C, (2012). *Handbook of Gardening,* Jaipur, India: Aavishkar Publishers & Distributors. Print.

Gupta Srinivasan, C.B, (1996). *Entrepreneurial Development*, New Delhi, India: Sultan Chand & Sons. Print.

Khanka, S.S, (2004). *Entrepreneurial Development,* New Delhi, India: S. Chand & Company Ltd. Print.

Nandan, H, (2011). *Fundamentals of Entrepreneurship,* (2nd ed.), New Delhi, India: PHI Learning Pvt. Ltd. Print.

Pathak, V.N, Yadav, N. and Gaur, M, (2004). *Mushroom Production and Processing Technology,* Jodhpur, India: Agrobios. Print.

Poehlman, J. M, and Borthakur, D. (1969). *Breeding Asian Field Crops.* New Delhi, India: Oxford & IBH Publishing Co. Print.

Rekha Sarin, (1995). *The art of Flower Arrangement,* London: UBS Publishers. Print.

Sharma, J.R. (1994). *Principles and Practice of Plant Breeding*. New Delhi, India: Tata McGraw Hill Publishing Co Ltd. Print.

Sharma, R.D, (1991). *Designing and Managing of Marketing Research*, New Delhi, India: Deep and Deep Publications. Print.

Shirley Monckton, (1990). *The complete Guide to Flower Arranging,* UK: Serapeum Publishing. Print.

Shoe Maker, J.S. and Teskey, B.J.E, (1989). *Practical Horticulture,* New Delhi, India: Wiley Eastern Pvt. Ltd. Print.

Verma, V, (2013). *Text Book of Economic Botany,* New Delhi, India: Ane Books Pvt. Ltd. Print.

PGB4422P LAB FOR APPLIED BOTANY

(LAB)

LEARNING OUTCOME: **5 hrs. /wk.**

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

- identify the techniques involved in plant nursery establishment
- develop entrepreneurial skills in commercial floriculture
- explain the various methods adopted in food preservation and cookery

COURSE CONTENT: **75 hrs.**

1. Garden implements,
2. Preparation of plants in the Nursery – Propagation (Layering: Simple, tip and air layering, Cuttage: Stem, leaf and root cuttings, Grafting: Tongue, side, approach, Budding: T, inverted T and Chip budding, Separation, Division), Transplanting.
3. Emasculation – Bagging
4. Bonsai, Terrarium and Hanging pot.
5. Kitchen garden / terrace garden
6. Flower arrangement, Preparation of Bouquet, Wreath.
7. Drying, Pressing and dyeing of flowers and foliage.
8. Preparation of greeting cards, Book mark, wall hangers and Dry flower Arrangement.
9. Cultivation of Oyster mushroom and Mushroom recipies (Soup, Omelette, Pakora and Biriyani).
10. Preparation of Squash (Lemon/ Orange/ Pine apple) – Jam (Mixed fruit jam) – Pickle (Garlic/tomato/mango/ chilly/goose berry/ mixed vegatables) Tomato sauce – Ketch up – Vathal – Vadam – Sambar powder – Idly powder – Garam masala.
11. Visit to plant nursery, small scale industries and florist shop.
12. Sale of plants and items mentioned in No. 2 – 9.

REFERENCE BOOK(S):

Bahl, N, (2015). *Hand Book on Mushrooms,* (4th ed.), New Delhi, India: Oxford and IBH Publishing Co. Pvt, Ltd. Print.

Bose, U.S, (2012). *Handbook of Horticulture,* Jaipur, India: Oxford Book Company. Print.

Desrosier, N.W, and Desrosier, J.N, (1987). *The Technology of Food Preservation,* (4th ed.), New Delhi, India: CBS Publishers & Distributors. Print.

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Gupta Srinivasan, C.B, (1996). *Entrepreneurial Development,* New Delhi, India: Sultan Chand & Sons. Print.

Harold Piercy, (1980). *Flower Arranging,* London: Sundial Publication. Print.

Narayanaswami, R.V, and Rao, K.N, (1963). *Outlines of Botany,* Chennai, India: Esvee press. Print.

Pamela, W, (1995). *Drying Flowers,* London: New Burlington books Pvt. Ltd. Print.

Pandey, B.P, (1980). *Introduction to Economic Botany,* New Delhi, India: S.Chand and Company Limited. Print.

Pathak, V.N, Yadav, N, and Gaur, M, (2004). *Mushroom Production and Processing Technology,* Jodhpur, India: Agrobios. Print.

Rajan, S, and Selvi Christy, R, (2010). *Experimental Procedures in Life Sciences,* Chennai, India: Anjanaa Book House. Print.

Rekha, S, (1995). *The art of Flower Arrangement,* London: UBS Publishers. Print.

Sambamurthy, A.V.S.S, (2005). *Taxonomy of Angiosperms,* New Delhi, India: I.K. International Pvt. Ltd. Print.

Sheen, J, (1988). *Pressing Flowers,* London: Merehurst Press. Print.

Shirley, M, (1989). *Arranging flowers,* London: Merehurst Press. Print.

Shirley, M, (1990). *The Complete Guide to Flower Arranging,* UK: Serapeum Publishing. Print.

Shoe Maker, J.S, and Teskey, B.J.E, (1989). *Practical Horticulture,* New Delhi, India: Wiley Eastern Pvt. Ltd. Print.

PGB4521O BIOSAFETY AND BIOETHICS

(THEORY)

LEARNING OUTCOME: **5 hrs./wk.**

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

- identify the difference between Class I, Class II & Class III biosafety cabinets
- appreciate the importance of biosafety in science experimentation
- choose the ethical guidelines in research process

COURSE CONTENT:

UNIT I: BIOSAFETY **15 hrs.**

Introduction, Definition – biosafety guidelines in India – guidelines for research in transgenic organism – Introduction of GMO into the environment – Field triats with GM plants – Biosafety protocol (UN Cartagena Biosafety protocol CBP) mechanism of implementation of biosafety guidelines.

UNIT II: BIOSAFETY CONTAINMENT & WASTE DISPOSAL **15 hrs.**

Basic and essential biosafety equipment – containment levels – physical & biological – hazardous materials used in Biotechnology / GMO – their handling & disposal – chemical & biological waste.

UNIT III: ANIMAL ETHICS **15 hrs.**

Operation of Animal ethics committee – research procedures – use of animals in teaching – ethical issues in human animal relationships – ethical conduct & care of animals – Animal ethical committees – Guidelines for use of animals in research – Animal welfare measures; Housing and

environment – Organizations – objectives – Animal Welfare Board of India – Blue Cross Society – People for Animals (PFA) – Buddha Society for Animal Welfare (BSAW) – Cultural concerns: animal sacrifices – vegetarianism.

UNIT IV: MEDICAL ETHICS **15 hrs.**

Medical ethics: Historical aspects, Indian Medical Council – Cultural concerns

Reproductive ethics: Sex determination – Embryonic Stem cell research and Embryo donation – Stem cell biobanking - Ethics Control and Justice. Biotechnology and ethics – benefits and risks of genetic engineering, GM crops and GMO's- Human Genome Projects – Ethical Legal and Social Implications Research Program

UNIT V: INTELLECTUAL PROPERTY RIGHTS **15 hrs.**

Introduction, forms, (patents, copyright, trademark, design, geographical indication) International & Regional agreement / treaties in IPR – WTO, GATT, TRIPS, WIPO. IPR problems & its hindrance to diffusion of agricultural biotechnology. Case studies in IPR (Turmeric – Neem – Basmati Rice)

TEXT BOOK(S):

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

REFERENCE BOOK(S):

Broady, B.A. and Engelhardt, H.T, (1992). *Bioethics- Reading & Cases,* New Delhi, India: Dorling Kinderslay Press. Print.

Kreuzer, H. and Massey, A, (2005). *Biology & Biotechnology Science: Applications & Issues,* Washington DC: ASM Press. Print

Ojha, S, (2011). *Encyclopedia of Bioethics*, Tamil Nadu, India: Dominant Publishers and Distributors. Print.

Sateesh, M.K, (2008). *Bioethics & Biosafety,* New Delhi, India: I.K. International Publishing House Pvt. Ltd. Print.

Sathyanarayana, U, (2008). *Biotechnology,* Kolkata, India: Books & Allied Pvt. Ltd. Print.

WEBSITE(S):

www.icmr.nic.in

www.dbt.nic.in

PGB4522O PREPARATION FOR COMPETITIVE EXAMS IN LIFE SCIENCES

(THEORY)

LEARNING OUTCOME: **5 hrs./wk.**

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

- gain self-confidence to face interviews and overcome communication barriers
- guide students to equip themselves for competitive examinations
- assess the teaching and research aptitude of the students

COURSE CONTENT:

UNIT I: COMMUNICATION SKILLS **15 hrs.**

Basics of communications – barriers to communications – verbal communication – body language – voice culture – presentation skills – work place communication skills – group discussion – interview – handling – telephonic interview – English proficiency test – testing of oral and written communication skills in concepts in life sciences.

UNIT II: APTITUDE TESTING **15 hrs.**

Mental ability – quantitative aptitude – Verbal reasoning tests – Coding – Decoding tests – Logical

diagrams – Analytical reasoning tests – verbal intelligence tests – quantitative aptitude – data interpretation.

UNIT III: EDUCATIONAL SYSTEM, TEACHING & RESEARCH APTITUDE 15 hrs.

Teaching – Nature – objectives – characteristics – basic research – learners characteristics – factors affecting teaching – methods of teaching – teaching aids – use of technology in teaching – debating – evaluation systems.

Research – meaning – characteristics – types – steps of research – methods of research – research ethics – paper – article – workshop – seminar – conference – symposium – thesis writing – its characteristics & format.

UNIT IV: OBJECTIVE REVIEW QUESTIONS – I 15 hrs.

Cell Biology – Biochemistry – Physiology – Evolutionary Biology – Environmental Biology – Molecular Biology

UNIT V: OBJECTIVE REVIEW QUESTION – II 15 hrs.

Developmental Biology – Animal Physiology – Inheritance biology – Applied biology – Methods in Biology

NOTE: CSIR 2016 syllabus to be followed for **UNIT IV & V**

REFERENCE BOOK(S):

Agarwal, R.S, (2003). *Quantitative Aptitude,* New Delhi, India: S. Chand & Co. Print.

Fry, R, (2003). *Your First Interview,* New Delhi, India: Pearson Education. Print.

Jack, C.R, (1987). *Language and Communication,* Chennai, India: Orient Longmann Ltd. Print.

Judith, V, (2000). *Succeeding at Interviews,* Viva Books Pvt. Ltd. Print.

Mohan, K, (1998). *Developing Communication Skills,* New Delhi, India: Macmillan India Ltd. Print.

Thrope, E, (2000). *Test of Reasoning for Competitive Examinations,* (2nd ed.), New Delhi, India: Tata McGraw-Hill Publishing Company Limited. Print.

Thrope, E, (2004). *Course in Mental Ability and Quantitative Aptitude for Competitive Examinations,* New Delhi, India: Tata McGraw-Hill Publishing Company Limited. Print.

PGB0401D THE ART OF SCIENTIFIC WRITING

(Theory)

LEARNING OUTCOME

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

- write effective and concise scientific report
- acquire skills in oral communication in scientific presentation
- gain experience in the preparation of research proposals and scientific texts for publication

COURSE CONTENT

UNIT – I: GUIDELINES FOR BETTER SCIENTIFIC WRITING

What makes good writing? Words – Word choice – the basic elements of Sentences and Sentence structure – Writing in the active voice – Punctuation and Organisation strategies.

UNIT – II : BASICS OF SCIENTIFIC COMMUNICATION

Introduction – forms and purposes of Scientific communication – electronic communication in science and science education – guidelines for effective oral and poster presentation.

UNIT – III: COMMUNICATING EFFECTIVELY WITH THE MEDIA, LAY PUBLIC AND SCIENTIFIC AUDIENCE

Dissecting the news article – Summarizing a lengthy feature article (3000+words) from a popular science magazine into 500 words maximum – Writing articles for the lay public and the media – Writing a peer review of a book.

UNIT – IV: THE SCIENTIFIC MANUSCRIPT- PREPARATION FOR A JOURNAL

Steps in scientific manuscript publication process – Analysis of a variety of journal articles that present data in different ways – Preparation of a scientific paper.

UNIT – V: RESEARCH PROPOSALS FOR FUNDING AGENCIES

Funding agencies for scientific research – writing quality research proposals for grants – merit review criteria of a proposal – Significance – Approach – Innovation – Investigator and Environment – why proposals are not funded?

TEXT BOOK(S)

Donald miller MD. (2006). *Scientific style and format: The CSE Manual for authors.* New York: The Rockefeller University press. Print.

REFERENCE BOOK(S)

Day, R.A. (1995). *Scientific English: A guide for Scientists and other professionals.* Hyderabad, India: Universities press. Print.

Day, R.A. (1998). *How to write & Publish a scientific paper*. USA: Oryx press, Phoenix, A-Z. Print.

Jayatilleke, C.L.V, & Sivasegaram.S. (1979). *Technical report Writing.* New Delhi, India: Tata McGraw Hill Publishing company ltd. Print.

Mathews, J.R, Bowen, J.M, & Mathews, R.W. (2001). *Successful scientific writing – A step by step guide for biological and biomedical scientists.* UK: Cambridge publishers. Print.

PGB0402D FOOD SCIENCE & HOUSEHOLD ARTS

LEARNING OUTCOME

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

- understand the relationship of food science to food chemistry, food microbiology and food processing
- select the proper test or technique for evaluating specific characteristics
- gain knowledge and acquire basic skills in home decoration
- prepare the students as better home makers

COURSE CONTENT

UNIT – I: FOOD SCIENCE

Basic concepts – colloidal systems in food – balanced diet – modified diets – new trends in nutrition – food adulterants - toxicants naturally occurring in foods – Food infection and intoxification: Typhoid – Cholera – Botulism – Staphylococcal food poisoning – Food allergy – Evaluation of food quality.

UNIT – II: FOOD PREPARATION, HYGIENE, SANITATION & SAFETY

Methods of cooking using water – hot air and oil as the cooking medium – advantages and disadvantages of each method – personal and food hygiene – sources of contamination of food – common house hold pests (mosquitoes – bugs – flies – cockroach – silver fish & white ants) and control – home accidents and first aid – home medicines – pepper – aniseed – ginger – garlic – clove – turmeric – coriander – fenugreek

UNIT – III: HOME CLEANLINESS AND MANAGING HOUSE HOLD WASTES

Cleanliness – types of cleaning – daily – weekly – monthly – cleaning agents – disinfectants and polishes – waste disposal – biodegradable and non-biodegradable wastes – composting and vermicomposting of kitchen and garden wastes – kitchen and terrace garden – ornamental garden – establishment – suitable plants and recycling of organic wastes and water.

UNIT – IV: INTRODUCTION TO HOME MANAGEMENT

The home – its role and functions in a changing world – family types – their advantages and disadvantages – management process in a family living – planning – controlling and evaluation – Management of Resources – Types (human & nonhuman resources) Characteristics of resources – management of energy (energy requirement – work simplification), management of money (budget – planning – objectives – savings & investments) management of food.

UNIT – V: INTERIOR DECORATION&ETIQUETTES

Cleanliness and care of the home – use of colour in the home – choice of pictures – curtains – cushions – furniture – indoor gardening – flower arrangement – cut flowers – principles & styles – Art of serving – table decoration – napkins – special decoration of plates – preparing the table – western and Indian styles – Traditional knowledge

REFERENCE BOOK(S)

Moorthy, G. (1993). *Home management*, (3rd ed.). New Delhi, India: Arya Publishing House. Print.

RodaySunetra. (2007). *Food Science and Nutrition.* New Delhi, India: Oxford University Press. Print.

Soundararaj, S. (1993). *A text book of house hold arts*, (4th ed.). New Delhi, India: Orient Longman Limited. Print.

Srilakshmi, B. (2006). *Food Science*, (3rd ed.). New Delhi: New age International Publishers. Print.

Sawminathan, M. (1978). *Advanced Text Book on Food & Nutrition*, volume II. Bangalore, India: BAPPCO publishers. Print.

Varghese, M.A. (1992). *Home Management.* New Delhi, India: Wiley Eastern Limited. Print.

Frazier, W.C, & Westhoff, D.C. (2009). *Food Microbiology*, (4th ed.). New Delhi, India: Tata McGraw Hill Company. Print.