PSGR KRISHNAMMAL COLLEGE FOR WOMEN

College with Potential for Excellence

(An Autonomous Institution, Affiliated to Bharathiar University)
(Reaccredited with 'A' Grade by NAAC, An ISO 9001:2008 Certified Institution)
Peelamedu, Coimbatore-641004

DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM

BACHELOR OF BOTANY (B.Sc Botany)

2015 - 2018

DEPARTMENT OF BOTANY

CHOICE BASED CREDIT SYSTEM SYLLABUS & SCHEME OF EXAMINATION

2015 - 2018

Sem	Part	Subject Code	Title of the Paper	Instruction Hrs/week/	Total Hrs		Duration of exam hrs	Maximum Marks			Credit
					Contact Hrs	Tutorial Hrs		CA	ESE	Total	
I	I	TAM1401/ HIN1401/ FRE1401	Language T/H/F Paper I	6	86	4	3	25	75	100	3
	II	ENG1501/ ENG15F1	English – Language through literature level – I / Language through literature Functional level - I	6	86	4	3	25	75	100	3
	III	PL14C01	Core Paper –I Plant Diversity	6	86	4	3	25	75	100	5
		PL14CP1	Core Practical – I	3	-	-	-	-	-	-	-
		CE13A01	Allied I- Paper I –Chemistry or	4	56	4	3	20	55	75	4
		PS12A01	Allied I- Paper – I Physics or								
		TH12A01	Mathematical Statistics - I	7	101	4	3	25	75	100	5
		CE13AP1/ PS08AP1	Allied I - Practical- Chemistry / Physics	3	-	-	-	-	-	-	--

	IV	NME14B1/	Basic Tamil I/	2	27	3	3	50	50	100	2
		NME14A1/	Advanced Tamil I/					25	75		
		NME12WS/	Women Studies/								
		NME12GS/	Gandhian studies/								
		NME12AS	Ambedhkar Studies								
II	I	TAM1402/ HIN1402/ FRE1402	Language T/H/F Paper II	6	86	4	3	25	75	100	3
	II	ENG1502/ ENG15F2	English - Language through literature level – II / Language through literature Functional level - II	6	86	4	3	25	75	100	3
II	III	PL14C02	Core Paper II – Plant diversity II	5	71	4	3	25	75	100	5
		PL14CP1	Core Practical I (Core Paper I & II)	3	-	-	3	40	60	100	5
		CE13A02/ PS09A02/	Allied Chemistry Paper-II/ Allied Physics Paper –II/	5	71	4	3	20	55	75	4##
		TH11A05	Mathematical Statistics II	8	116	4	3	25	75	100	5##

		CE13AP1 PS08AP1	Allied Chemistry Practical/ Allied Physics Practical	3	-	-	3	20	30	50	2##
	IV	NME14B2/	Basic Tamil II/	2	26	4	3	50	50	100	2
		NME14A2/	Advanced Tamil II/					25	75		
		OPS1408	Open course – Nutrition and Dietetics								
		NM12GAW	FC-I General Awareness	Self-study	-	-	Online	20	80	Grade	Grade
III	I	TAM1403/ HIN1403/ FRE1403	Language T/H/F – Paper III	6	86	4	3	25	75	100	3
	II	ENG1503 ENG15F3	English - Language through literature level – III / Language through literature Functional level - III	5	71	4	3	25	75	100	3
	III	PL14C03	Core Paper-III-Plant Anatomy Wood Technology and Embryology	5	71	4	3	25	75	100	4
		PL14CP2	Core Practical - II	2	-	-	--	--	--	--	--
		AS11A01 PS12A03	Allied- II-Paper I-Zoology /Physics	5	71	4	3	20	55	75	4##
		TH12A09	Allied-II-Paper-I-Maths	7	71	4	3	25	75	100	5##
		AS13AP1	Allied II-Practical I Zoology/ Physics	2	-	-	-	-	-	-	-
		NM10EVS	FC-II-Environmental Studies	Self-study	-	-	-	100	-	100	-

		NM14VHR	FCIII-Value Education and Human Rights	2	24	6	3	100	-	100	2
	IV	SB11MD01/ SB11BC01 / SB11BA01 / SB11AC01	Skill Based Subject – 2D animation/ Basics of Computer Application/ Business automation / Application with C	1	--	--	--	--	--	---	--
		SB11MDP1/ SB11DP1/ SB11BAP1 / SB11ACP1	Skill Based Subject – Practical-1 2D animation/ Basics of web desgining/ Business automation / Application with C	2	-	-	--	--	--	--	--
IV	I	TAM1404/ HIN1404/ FRE1404	Language T/H/F Paper IV	5	71	4	3	25	75	100	3
	II	ENG1504 ENG15F4	English - Language through literature level – IV / Language through literature Functional level - IV	6	86	4	3	25	75	100	3
	III	PL14C04	Core Paper IV Cell Biology, Genetics, Plant breeding and Biostatistics	5	71	4	3	25	75	100	5

		PL14CP2	Core Practical II (Core Paper III & IV)	2	-	-	3	40	60	100	5
		AS11A02/ PS12A04	Allied-II-Paper-II- Zoology/ Physics	5	71	4	3	20	55	75	4##
		TH12A14	Allied II-Paper II-Maths	7	101	4	3	25	75	100	5##
		AS13AP1 PS08AP1	Allied II – Practical – Zoology/ Physics	2	-	-	3	20	30	50	2#
	IV	SB11MD01/ SB11WD01/ SB11BA01/ SB11AC01	Skill Based Subject – 2D animation/ Web designing / Business automation/ Application with C	1	-	-	3	25	75	100	4
		SB11MDP1/ SB11WDP1/ SB11BAP1/ SB11ACP1	Skill Based Subject – Practical-1 2D animation/ Basics of Web desiging/ Business automation / Application with C	2	-	-	3	40	60	100	2
		NM10EVS	Environmental Studies	2	26	4	3	-	100	100	2
		INST1	Internship/Field training	Two weeks	-	-	-	-	-	100	2
	V	--------	NSS / NCC / YRC/Sports/ Games	-	-	-	-	-	-	100	1
V	III	PL14C05	Core Paper V – Taxonomy and Economic Botany	4	56	4	3	25	75	100	4

		PL14C06	Core Paper VI- Plant Biotechnology	4	56	4	3	25	75	100	4
		PL14E01	AOS I Basics of Bioinformatics or	5	71	4	3	25	75	100	4
		PL12E02	AOS II Biofertilisers- Paper I or								
		PL13E03	AOS- III Biotechniques								
		PL12AC1	**Advanced Learners Course- Food Microbiology **or** **Advanced Learners Course- Food and Nutrition	-	-	-	3	-	-	*100	*5
		PL12AC2									
		PL13EP1/ PL08EP2/ PL08EP3	AOS I/II/III Practical	2	-	-	3	40	60	100	3
		PL13CP3	Core Practical III [Core Paper V (3 hrs), VI (3 hrs)]	6	-	-	-	-	-	-	-
		PL15PROJ	Project &Viva voce	4	-	-	Viva	20	80	100	5
		SB11MD02/ SB11WD02/ SB11BA02/ SB11AC02	Skill Based Subject – 2D animation/ Basics of web designing / Business automation/ Application with C	1	-	-	-	-	-	-	-

		SB11MDP 2/ SB11WDP 2/ SB11BAP2 / SB11ACP2	Skill Based Subject – Practical II 2D animation/ Basics of web designing / Business automation/ Application with C	2	-	-	-	-	-	-	-
		NM12IS1	Level-1 Information Security	2	26	4	-	**100** ***	-	100	-
		PL15CE	Comprehensive Test	--	--	--	--	--	--	Grade	Grade
VI	III	PL14C07	Core Paper VII – Plant Physiology and Bio-chemistry	7	101	4	3	25	75	100	5
		PL15C08	Core Paper VIII – Pharmacognosy and Medicinal Botany	7	101	4	3	25	75	100	5
		PL15E04	AOS IV Dietetics, Food Processing and Preservation	6	86	4	3	25	75	100	4
		PL12E05	AOS V Biofertilisers-Paper II (or)								
		PL15E06	AOS VI Environmental Biotechnology								
		PL13CP3	Core Practical III [Core Paper V (3 hrs), VI (2hrs)]	--	-	-	3	40	60	100	5

		PL15CP4	Core Practical IV (Core Paper VII,VIII, AOS IV/V/VI)	7(3+2+2)	--	--	3	40	60	100	5
		PL12AC3 PL12AC4	**Advanced Learners' Course Industrial Biotechnology **or** **Advanced Learners' Course – Mushroom Technology	-	-	-	3	-	-	*100	*5
	IV	SB112D02/ SB11BC02 / SB11BA02 / SB11AC02	Skill Based Subject – 2D animation/ Basics of web designing / Business automation/ Application with C	1	-	-	3	25	75	100	4
		SB112DP2 / SB11BCP2 / SB11AP2/ SB11ACP2	Skill Based Subject – Practical II 2D animation/ Basics of web designing / Business automation/ Application with C	2	-	-	3	40	60	100	2
Total										**3900**	**140**

*** - Not considered for grand total and CGPA** **** - Self study**
##- Allied I- Physics/ Chemistry Paper –I & II and Practical – 10 credit or Mathematical statistics Paper – I & II without practical - 10 credit
##- Allied II- Zoology / Physics Paper –I & II and Practical – 10 credit or Maths Paper –I & II without practical - 10 credit

*****Evaluation pattern for Level-1 Information Security**

*****- Test 2X40 = 80marks**
Quiz =10marks
Assignment =10marks
Total =100marks

INTERNSHIP TRAINING

Students undergo training in groups in the software companies for 15 days in the IV semester vacation.

Internship training is evaluated on 5th semester [July 1st week].

Students has to produce attendance certificate and Report after the training

Internship Evaluation

Work Diary + Attendance = 25
Report = 50 (40 Pages)
Viva Voce = 25

100

PROJECT AND VIVA-VOCE

Group Project & viva voce

Each group will be comprising of 5 members and will be allotted to a staff coordinator. A specific problem will be assigned to the students or they will be asked to choose a problem/ area of interest. The topic/ area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work can be carried at the college or any other organization approved by the staff coordinator and the HOD. Viva-voce/ presentation will be conducted by a panel of internal examiners including the HOD and the staff coordinator guiding the project. A PowerPoint / OHP presentation by the group before the audience will be evaluated on the basis of student's response to questions.

Project evaluation is for 100 marks.

Internal (20marks) : I Review : 5 Marks
II Review : 10Marks
III Review : 5Marks
External (80 marks)
Evaluation of project : 60
Vivavoce : 20

An internal mark is based on the review conducted to the students

Final dissertation is submitted by the students for their viva-voce.

QUESTION PAPER PATTERN(CIA)

Section A 5x2 =10 marks (5 out of 8)
Section B 4x5 =20 marks (4 out of 6)
Section C 2x10 =20 marks (2 out of 3)

QUESTION PAPER PATTERN(ESE)

Section A 5 x 2 = 10 Marks (Open choice – 5 out of 8)
Section B 5 x 5 = 25 Marks (Internal choice)
Section C 5 x 8 = 40 Marks (Open choice-5 out of 7)

ALLIED

Subject options are introduced in I, II, III and IV semesters.

FOUNDATION COURSES

Semester I – Women Studies/ Ambedkar studies/Gandhian studies : 100 marks (CA I-25 + CA II -25 + MODEL - 25 + PROJECT-25)

Semester II - General Awareness (ONLINE SELF STUDY) : Grade

Semester II - Open Course : 25marks(CIA)+75 marks (ESE)

Semester III – Value Education : 100 marks (CA I-25 + CA II -25 + MODEL - 25 + PROJECT-25) 6

Semester IV – Environmental Studies : 100 marks (CA I-25 + CA II -25 + MODEL - 25 + PROJECT-25)

Semester V- Information Security : 100 marks (CA I - 40 + CA II - 40 + Quiz-10+ assignment-10)

SKILL ORIENTED COURSE

• Distribution of theory papers and practical papers in III, IV & V Semester with 3 Hrs per week practicals
• Maximum marks allotted for theory paper 75(ESE) + 25(CA)
• Total marks 400 with 12 credits

ADVANCE LEARNER COURSE:

• Student above 75% of marks and without any arrears is eligible for advanced level course at V and VI semester with subject options, so that the students can choose the subject of their interest.

COMPREHENSIVE EXAM

• Final year students undertake this online exam for 100 marks for 1 Hour

CREDITS

• Student receives 140 credits with 3800 marks

QUESTION PAPER PATTERN FOR INFORMATION SECURITY

Section A (5X2 = 10 Marks) (5 out of 8)
Section B (6X5 = 30 Marks) (6 out of 8)
Total = 40 Marks
Marks secured will be converted into grades

COMMUNITY ORIENTED SERVICE

UG Students should complete 30 Hrs Community Oriented Service during holidays before the end of fourth semester and can be taken up in any of the following fields: Literacy, Public Health, Hygiene, Crisis Management(Training the Public) Traffic Regulation, Green Projects etc., in villages, Schools, Orphanges,Hospitals, Old Age Homes, Prisons and SHG Groups 7

ADDITIONAL COURSES

• Add on course @ Certificate level = Job oriented course

TOTAL MARKS AND CREDITS

The course consist of

• Core = 15 papers
• Elective = 1
• Practical = 3 papers
• Project = 1
• Allied = 4 papers
• Total marks = 3800
• Total credits = 140

Plant Diversity-I

(Bacteria, Virus, Algae, Fungi, Lichens and Pathology)

Semester – I **Total Marks : 100**

Code :PL14C01 **CIA : 25**

Hours : 90 **ESE : 75**

Credit : 5

Objectives

To study the characteristics of Bacteria, Virus, Algae, Fungi and Lichens.

To study the various plant diseases and the control measures.

Unit-I Bacteria and Virus **17hrs**

*History and scope of microbiology, characterization and classification of microorganisms. –Whittaker's five kingdom concept – Bergey's manual of systematic bacteriology -Morphology, growth, nutrition and reproduction of bacteria. Viruses – structure, classification and reproduction. A general account on Mycoplasmas.

Unit-II Algae **17hrs**

General characteristics of algae, Classification (Fritsch, 1935), General characteristics of the various classes. Thallus organization, prokaryotic and eukaryotic algae (cyanophyceaen cell and chlorophycean cell), pigment, reserve food, flagella characteristics and life cycle patterns. Study on the Structure, reproduction and Life cycle of *Chlamydomonas, diatoms, Dictyota*, *Polysiphonia* and *Anabaena.**Economic importance of Algae.

Unit-III Fungi and Lichens **17hrs**

General characteristics of Fungi; classification according (Alexopolus and Mims, 1972); General characteristics of the various divisions; Economic importance of Fungi. Detailed study of morphology and reproduction of *Allomyces, Plasmodiophora, Albugo, Peziza, Puccinia* and *Fusarium*.

Lichens

General characteristics, classification (Alexopolus and Mims, 1979), reproduction and economic importance of Lichens. Detailed study of *Usnea*.

Unit-IV Plant Pathology **17hrs**

Classification of diseases – general symptoms. Penetration and disease development. Morphological and biochemical defense mechanisms in plants. A detailed study of the following plant diseases – Mosaic disease of tobacco, Citrus canker, Late blight of potato, Red rot of sugarcane, Tikka disease of groundnut (causal organisms, symptoms, disease cycle and control measures).

Unit-V Microbial techniques **18hrs**

Methods of sterilization, Culture media- PDA and Nutrient Agar/Broth media, Pure culture techniques, Staining of bacteria-Gram staining. Microbial growth and Growth curve. Conventional Bioreactor, Typical Fermentation process-Liquid Vs Solid State Fermentation.

*self study

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Pandey, B.P.	College Botany Vol II	S Chand & Company, New Delhi	2003
2	Purohit, S.S.	Microbiology- Fundamentals & Applications.		2008
3	Sharma, P.D	Microbiology	Rastogi Publications, Meerut.	2010
4	Vasishta BR & Sinha AK	Botany for degree students Fungi	S Chand and Company Ltd., New Delhi	2003
5	Vashishta, B.R., Sinha, A.E and Singh, V.P.	Algae	S Chand and Company Ltd., New Delhi	2013

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Alexopoulos, CJ	Introduction to Mycology	John Wiley & Sons, New York	1952
2	Gangulee, HC. & Kar, AK	College Botany, Vol-II	Books & Allied Pvt. Ltd.Calcutta.	1989
3	Mehrotra, RS & Aneja, KR	An introduction to Mycology, 2nd Ed.	New Age International Publishers, New Delhi	1999

Contact hrs - 86
Tutorial hrs – 4

Core Paper- II Plant Diversity- II

Semester – II **Total Marks : 100**
Code : PL14C02 **CIA : 25**
Hours : 75 **ESE : 75**
Credit : 5

Objective:
To know about plant diversity, classification, structure reproduction and life cycles of various groups of plants.

Unit I - Bryophytes **14hrs**

Classification of Bryophytes (Reimers-1954), Distribution, structure, reproduction and life cycle of Marchantiales- *Marchantia*, Jungermanniales- *Porella*, Anthocerotales-*Anthoceros* and Bryopsida -*Sphagnum*. *Economic importance.

Unit II - Pteridophytes **14hrs**
Classification (Sporne, 1975). General characteristics of major Divisions-Psilophytopsida, Psilotopsida, Lycopsida Sphenopsida, Pteropsida,. A detailed study of the following genera – *Psilotum, Lycopodium*.*Sellaginella.*

Unit III – Pteridophytes **14hrs**
A detailed study of the following genera – *Equisetum*, *Adiantum* and *Marsilea* (developmental details not required). Stelar evolution, homospory, heterospory and seed habit. Economic importance.

Unit IV- Gymnosperms **14hrs**
General characteristics, distribution, classification (Coulter & Chamberlain, 1935). Salient features of Pteridospermales, Bennettitales, Cycadales, Cordaitales, Coniferales and Gnetales. A detailed study of the following genera: *Cycas* and *Gnetum.*

Unit V- Palaeobotany **15hrs**
Fossils, fossilization process, different types of fossils (compression, impression, petrifaction, coal balls). Geological time table. Radiocarbon dating, A detailed study of external and internal morphology and reproduction in *Rhynia*, *Lepidodendron*, *Calamites*, *Williamsonia* and *Cordaites*.
*Self study

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Pandey, B.P.	College Botany Vol II	S Chand & Company, New Delhi	2003
2	Vasishta PC, Sinha AK & Anilkumar.	Botany for degree students	S Chand And Company Ltd., New Delhi.	2005
3	Vasishta.B.R , Sinha,& Adarsh	Botany for Degree students -Bryophyta	S Chand And Company	2012

	Kumar		Ltd., New Delhi	
4	Shukla and Mishra	Essentials to Palaeobotany	Vikas Publishing House Sahibabad.	1982

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Arnold. A.	An Introduction to Palaeobotany	Mc Graw Hill Book Company,London	1947
2	Sporne, KR	The Morphology of Gymnosperms	Hutchinson & Co., London.	1967
3	Sporne, KR	The Morphology of Pteridophytes,	Hutchinson & Co., London	1975
4	Steward.N.Wilson& Rothwell,W.Gar	Paleobotany and evolution of Plants	Cambridge University Press	2005

Contact hrs - 71
Tutorial hrs – 4

Core Practical – I

Semester II **Total Marks :100**
Code : PL14CP1 **CIA :40**
Hours : 90 **ESE :60**
Credit :5

Core Paper –I Plant Diversity – I (45 hrs)

Algae -*Chlamydomonas, diatoms, Dictyota, Polysiphonia* and *Anabaena.*
Fungi - *Allomyces, Plasmodiophora, Albugo, Peziza, Puccinia* and *Fusarium.*

Lichens -*Usnea*
Plant pathology- Mosaic disease of tobacco, Citrus canker, Late blight of potato, Red rot of sugarcane, Tikka disease of groundnut.

Preparation of culture media
Nutrient broth and Nutrient Agar medium
Potato – Dextrose Agar Medium
Preparation of slants
Plating techniques- Soil dilution - Enumeration of bacteria and fungi.
Microscopic observation of fungi – Lactophenol cotton blue staining,
Fermentation using yeast
Microscopic observation of bacteria – Gram staining

Core Paper –II Plant Diversity – II (45 hrs)

Study of the following types
Bryophyta - *Marchantia, Porella,Anthoceros* and *Sphagnum.*
Pteridophyta - *Psilotum, Lycopodium,Sellaginella, Equisetum, Adiantum* and *Marsilea*
Gymnosperms - *Cycas* and *Gnetum*
Palaeobotany -*Rhynia, Lepidodendron, Calamites, Williamsonia* and *Cordaites*

Open Course - Nutrition and Dietetics

Sub Code: OPS1408 **Total Marks: 100**
Hours: 30 **Credit:2**
Objective:

To study about the nutritional importance of various food substances, diet planning, processing and preservation of food materials and adulteration.

Unit I **5hrs**

Menu Planning, Balanced diet, five food groups and their major nutrients, Principles of planning a diet.

Unit II **6hrs**

Nutritional importance of Minerals and Vitamins –general account, and deficiency diseases.

Unit III **6hrs**

Dietary requirements of Infants– Nutritional and food requirements, Dietary requirements of Children- Nutritional and food requirements- protein energy malnutrition, symptoms of different types of PEM, Nutritional requirement in PEM.

Unit IV **6hrs**

Dietary requirements of Expected women-Nutritional and food requirements; Dietary requirements of Lactating women – Nutritional and Food requirements

Unit V **6hrs**

Dietary requirements of old ages – Nutritional related problems of old age, degenerated diseases. Diet in obesity – types, treatment, Principles of dietetic management.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Srilakshmi, R.	Nutrition Science. Revised 2nd edition.	New Age International Limited Publishers, New Delhi	2006
2	Swaminathan, M.S.	Advanced text book on Food and Nutrition. 2nd edition	Bangalore Printing and Publishing Company, Bangalore.	2002
3	Sheel Sharma.	Human nutrition and meal planning. Ist edition.	Jnananda Prakashan, P&D, New Delhi.	2000
4	Sri lakshmi, R.	Food Science. 1st edition.	New Age International Limited Publishers, New Delhi.	1997

Reference Books

S.No	Authors	Title of the book	Publishers	Year of

				publication
1	Arti Bhatia	Nutrition and Dietetics. 1st edition.	Anmol Publications Pvt. Ltd., New Delhi.	2000
2	Francis Siernand and Eleanar Whitney.	Nutrition: concepts and controversies. 8th edition.	Thompson Learning, Wadsworth, U.S.A.	2000
3	Gitanjali Chatterjee.	Hand book of food and nutrition. 1st edition.	Rajat Publications, New Delhi.	1999

Contact hrs -29
Tutorial hrs – 1

Paper – III Plant Anatomy, Wood Technology and Embryology

Semester III **Total Marks :100**

Code : PL14C03 **CIA: 25**

Hours: 75 **ESE:75**

Credit:4

Objective:

To know the anatomical structure of angiospermic plants, to identify woods of commercial importance, methods of preserving and seasoning of woods.

Unit I **14hrs**

Plant Anatomy: Meristems – shoot and root apex, theories - apical cell theory, histogen, tunica and corpus,. Simple tissues- parenchyma, collenchyma and sclerenchyma.

Unit II **14hrs**

Complex tissues – primary xylem, primary phloem, secondary xylem and secondary phloem. Anatomical structure of dicot leaf and monocot leaf, Types of stomata. *Primary structure of dicot stem and monocot stem and dicot root and monocot root.

Unit III **14hrs**

Secondary thickening in dicot stem and root. Annual rings and Dendrochronology. Anomalous secondary thickening in the stems of *Nyctanthus, Boerhaavia,* and the root of *Betavulgaris*. Anomalous secondary thickening in monocot stem – *Dracaena.*

Unit IV **14hrs**

Wood Technology: Physical, chemical and mechanical properties of wood. Defects in woods. Seasoning of woods, methods of preservation of wood and uses of wood.

Unit V **15hrs**

Embryology: Microsporogenesis and development of male gametophyte; Megasporogenesis and development of female gametophyte. Structure of 8 nucleate monosporic embryosac (*Polygonum*),Bisporic (*Peperomia*),tetrasporic (*Allium*). Types of endosperm. Development of monocot(*Luzulla*) and dicot (*Capsella*) embryo.

*Self study

Text Book:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Eames A J.	An Introduction to Plant Anatomy.	Tata Mc Graw Hill Publishers. New Delhi	1983
2	John.E.Dale.	The growth of leaves.	Oxford & IBH publishing Co, NewDelhi.	1982
3	Katherine Esau	Anatomy of seed plants	John Wiley and Sons. U.S.A.	2011
4	Pandey.B.P.	Plant Anatomy. Sixth	S.Chand and	2001

		Revised edition.	company	
5	Singh, Pande,&Jain.	Anatomy of seed plants. 1st edn(Reprint).	Rastogi publ. New Delhi.	1998

Reference Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Chandurkar P J.	Plant Anatomy, Fifth edn	Oxford and IBH Publishing Co. New Delhi.	1980
2	D.F.Cutter, C.E.J Bottla, D.W.Stevenson,	Plant Anatomy .An applied Approach	Blackwell Publishing. Australia	2011
3	Foster.A.S.	Practical Plant Anatomy	East west Ed.D Van Nostrand	2000
4	Susheela.M.Das.	The Latest Portfolio of Theory & Practice in Plant Anatomy	Dominant Publishers and Distributors, New Delhi.	2003

Contact hrs - 71
Tutorial hrs - 4

Paper – IV Cell Biology, Genetics, Plant breeding and Biostatistics

Semester IV **Total Marks :100**
Code : PL14C04 **CIA: 25**
Hours: 75 **ESE: 75**
Credit : 5

Objective:
Fundamental knowledge in cell biology and genetics is needed for the study of the application oriented field namely plant breeding. The basic procedure for the analysis of experimental data collected is essential for scientific studies.

Unit I- Cell Biology **14hrs**
Cell wall – structure and function, plasma membrane-structure-Fluid mosaic model – function. Structural organization and functions of Chloroplast, Mitochondria, Endoplasmic Reticulum, Ribosomes Chromosome – structure, types - lamp brush and polytene chromosome. Mitosis and meiosis.

Unit II- Genetics **14hrs**
*Mendelism- Monohybrid and Dihybrid Cross; Test Cross and Back Cross; Incomplete Dominance; Gene Interaction (Complementary, Supplementary, Duplicate and Inhibitory. Linkage and crossing over:

Unit III- Genetics **14hrs**
Cytoplasmic Inheritance (plastid inheritance in *mirabilis jalapa*); Polygenic Inheritance (skin colour in man). Multiple Alleles (ABO Blood Group in Man); Sex Determination XX-XO,XX –XY methods. Sex determination in plants. Sex Linked Diseases in Man – Colour Blindness, and Haemophilia**.**

Fine structure of gene - Cistron, Recon and Muton.Regulation of gene action- The operon model. Tautomerization. Chromosomal mutation- Numerical changes in chromosome-Euploidyand Aneuploidy; stuchtural changes in chromosome – deletion, duplication, inversion and translocation.

Unit IV- Plant Breeding **14hrs**
*Objectives, Plant Introduction, Selection Methods, Hybridization Techniques, Heterosis or hybrid vigour. Mutation breeding in crop improvement, Breeding work on some important crops –Wheat, Paddy, Cotton and Sugarcane.

Unit V- Biostatistics **15hrs**
Sample and sampling, Collection and representation of data-Tabulation of data, Graphical representation-Histogram, Line Diagram,Bar Diagram, and Pie chart. Measures of Central Tendency- Mean, Median and Mode; Measures of Dispersion – Range, Standard Deviation and Standard error. Chi-square test.

self study

Text books

S.No	Authors	Title of the book	Publishers	Year of

				publication
1	Gupta, S. P.	Statistical Methods	Sultan Chan and Co, New Delhi	1995
2	Gupta P.K.	Cell and Molecular Biology, I edn	Rastogi publications. Tata Mc Graw Hill, New Delhi.	1988
3	Shukla,R.S.and Chandel,P.S.	Cytogenetics, evolution, Biostatistics and Plant Breeding	S. Chand & Co, New Delhi	2009
4	Verma, P.S. & Agarwal,V.K.	Cytology, Genetics and plant breeding	S.Chand & Co, New Delhi.	2010

Reference Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Benjamin.A Pierce	Genetics- A conceptual Aapproach,3rd edn	Freeman & Company.	2008
2	Chahal, G.S. and S.S. Gosal.	Plant breeding	Narosa Publishers, New Delhi	2002
3	Gardener, E. J., M.J. Simmons and D. P. Snustad.	Principles of Genetics. Iedn.	John Wiley & Sons, New Delhi.	1991
4	Sharma, J.R.	Plant breeding.	Mc.Graw Hill Publications, New Delhi	1994
5	Khan I and Atiya Khanum.	Fundamentals of Biostatistics.	Ukaaz Publishers. Hyderabad.	1994
6	Sundar Rao and Richard, J.	An introduction to Biostatistics.	Prentice hall of India, New Delhi.	1997

Contact hrs - 71

Tutorial hrs - 4

Core Practical II (Core paper III & IV)

Semester: IV **Total Marks :100**
Code : PL14CP2 **CIA:40**
Hours: 60 **ESE:60**
Credit : 5

Paper III - Anatomy, Embryology and Wood technology (30hrs)

Sectioning and Identification:
Primary structure of Leaf, stem and root of dicot and monocot. Secondary thickening in dicot stem - *Polyalthia* and root–*Vigna*. Anomalous secondary thickening in the stems - *Nyctanthus, Boerhaavia*; root - *Betavulgaris*. Secondary thickening in the monocot stem *Dracaena*

Spotters: Through - Book diagram/Permanent slides/Photographs
Meristems – shoot and root apex, Xylem – tracheids and vessels, Phloem. Annual rings, Wood preservatives, Defects in wood.

Embryology: T.S of anther, Types of ovules,Types of embryosac- uninucleate, bi-nucleate and mature embryosac; Types of endosperms – nuclear, cellular and helobial. Embryo mounting (*Tridax),*

Paper IV - Cell Biology, Genetics, Plant breeding and Biostatistics (30hrs)

Cell Biology: Study of plant cell organelles- Chloroplast, Mitochondria, Endoplasmic reticulum and Ribosomes. Mitosis – Onion root tip.

Genetics and Plant breeding: Simple problems in genetics. Hybridization techniques - Emasculation, bagging, tagging.

Field visit to any one Plant breeding research Institutes-Sugarcane breeding institute/ central institute for cotton research, Coimbatore. IARI –wellington/ Tamilnadu Agricultural University,Coimbatore.

Simple problem in Biostatistics -1. Mean, Median, Mode, Standard Deviation & Standard errors .
2. Chi-square test

Paper–V Taxonomy and Economic Botany

Semester: V **Total Marks :100**
Code : PL14C05 **CIA:25**
Hours: 60 **ESE:75**
Credit : 4

Objective:
To acquire the fundamental knowledge, basic concepts and principles of plant systematic and economically important plants.

Unit I **11hrs**

Morphology of *root, stem - types and modifications; leaf - types, phyllotaxy and modifications; inflorescence – types; flower – calyx, corolla, androecium, gynoecium, placentation; fruit – types.

Unit II **11 hrs**

Taxonomy: Aims and Scope of taxonomy. Systems of classification: Artificial – Linnaeus; Natural – Bentham and Hooker; Phylogenetic – Engler and Prantl. Herbarium techniques and uses. Botanical Nomenclature – ICN – priority, typification, effective and valid publication and author citation.

Unit III **11 hrs**

A detailed study of the following families including economic importance – Annonaceae, Nymphaeceae, Capparidaceae, Malvaceae, Rutaceae, Anacardiaceae, Myrtaceae, Cucurbitaceae.

Unit IV **11 hrs**

Rubiaceae, Sapotaceae, Apocynaceae, *Solanaceae, *Asteraceae Verbenaceae, Lamiaceae Amarantaceae, Euphorbiaceae, Liliaceae, Orchidaceae and Poaceae.

Unit V **12hrs**

Economic Botany – The importance and uses of plant products – fibres: *Gossypium sp*. and *Corchorus olitorius* (cotton and jute); food plants – *Oryza sativa* and *Solanum tuberosum* (rice and potato); tannins and dyes –*Terminalia chebula* and *Indigofera tinctoria*; resins and gums- *Ferulaas afoetida* and *Acacia arabica* (gum Arabic); spices and condiments – *Eletaria cardomam* and *Eugenia caryophyllata* (Cardamom and Clove).

***Self study**

Text Books

S.No	Authors	Title of the Books	Publication	Year of Publication
1	Henry, A. N. and M. Chandrabose	An aid to the International Code of Botanical nomenclature	Today and Tomorrow's Printers and Publisher, New Delhi	1980
2	Pandey, B.P.	Text book of Economic Botany.	S.Chand & Company, New Delhi.	1999

3	Sambamurthy, A.V.V.S. and N.S. Subramanyam	A Text book of Economic Botany	Wiley Eastern Limited, New Delhi	1989
4	Sharma O.P.	Plant Taxonomy	Mc Graw Hill, New Delhi.	1993
5	Simpson,M.G.	Plant Systematics, 2nd edn,	Academic Press.ewyork.	2011

Reference Books

S.No	Authors	Title of the Books	Publication	Year of Publication
1	Davis, P.H. and Heywood, V.M.	Principles of Angiosperm Taxonomy	Oliver Boyd London.	1973
2	Rao. K.N	Angiosperms.	S. Viswanathan Pvt Ltd.Chennai	1984
3	Hutchinson, J.	The families of flowering plants, 3rd edn,	Cambridge, England.	1973
4	Stace, C.A	Plant Taxonomy and Biosystematics. 3rd edition	Edward Arnold,London	1989

Contact hrs -56
Tutorial hrs - 4

Paper VI - Plant Biotechnology

Subject code: PL14C06 **Total Marks:100**

Total Hours: 60 **CIA: 25**

ESE:75

Credit:4

Objective:

To know the techniques of tissue culture, genetic engineering and its application in plant breeding and crop improvement programme.

Unit I Tissue culture **11hrs**

Introduction, Preparation of tissue culture medium (Murashige and Skoog), Macronutrients, Micronutrients, Growth Hormones. Culture techniques – Selection of explants; preparation, sterilization and inoculation of explants, callus initiation and maintenance. Callus culture. Cell culture techniques - single cell culture, organogenesis.

Unit II **11 hrs**

Anther and pollen culture, embryogenesis and micro propagation methods. Protoplast culture - Isolation, fusion and somatic hybridization. Somaclonal variation and its application. Synthetic seed technology.

Unit III **11 hrs**

rDNA technology: Introduction & Enzymes involved - Exonucleases, Endonucleases-restriction endonucleases (type I, II & III), methyl transferases. Si nucleases, DNA ligases, alkaline phosphatase, reverse transcriptase, Taq DNA polymerase, terminal nucleotidyl transferase. Use of linkers and adaptors.

Unit IV **11hrs**

Gene cloning vectors: a general account on plasmid, lambda phage, cosmids and phasmids. Plasmids: Gene cloning vectors for bacteria - definition, classification of plasmids, isolation and purification of plasmids, plasmids as cloning vectors, characteristics of ideal plasmid vectors, natural and based plasmid vectors pBR322, shuttle vector.

Unit V **12hrs**

Nanobiotechnology: Introduction to Nanotechnology – Diversity in nano systems*, Fullerence and bucky balls – synthesis and purification of fullerence and their properties. Nanoshells – introduction, types of nanoshells, oxide nanoshells, metal nanoshells, silver nanoshell, nanoshells from liposomes and their properties.Gold nanoshells for blood immunoassay and cancer detection and therapy. Application of nano in biology – biological imaging using nanocrystals, immunogold labeling, targeted drug delivery using nanoparticles.

***Self study**

Text Books

S. No	Authors	Title of the Books	Publication	Year of Publication
1	Kumaresan, V	Biotechnology	Saras Publication, Nagercoil, TamilNadu	2001

2	Kalyan Kumar, De	An Introduction to Plant Tissue Culture	New Central Book Agency. Pvt.Ltd. Howrah.	2004
3	Pradeep, T,	Nano: The Essentials.	Tata McGraw Hill Education Private Limited	2010
4	Rastogi, SC.	Biotechnology Principals & Applications	Narosa Publishing House,New Delhi.	2009
5	Satyanarayana.U.	Biotechnology, 1st edn	Books and Allied Pvt. Ltd, Kolkata	2005

Reference books

S.No	Authors	Title of the Books	Publication	Year of Publication
1	Ashwani Kumar & SudhirK. Sopory,	Recent Advances in plant biotech & its Applications	I.K. International Publishing house, New Delhi.	2008
2	Buchanan, Gruissem and Jones.	Biochemistry and Molecular Biology of Plants, 3rd edn.	I. K. International Pvt. Ltd. New Delhi.	2004
3	Glick and Pasternak	Molecular Biotechnology, 1st edn.	ASM Press. Washington	1998
4	Thieman J.William & Palladino. A Michael	Introduction to Biotechnology.	Dorling Kindersly, PVT.Ltd. Delhi	2009

Contact hrs -56
Tutorial hrs -4

AOS - I Basics of Bioinformatics

SEMESTER - V

Code: PL14E01 **Total marks :100**

Hours: 75 hrs **CIA :25**

ESE :75

Credit :4

Objective:

To learn the basic concepts and tools in Bioinformatics.

Unit I **14hrs**

Bioinformatics:- *History, Time line of development. Scope, importance, Challenges and opportunities. DNA sequencing method: -Maxam and Gilbert method, Sanger's Method. Protein sequencing method: - Mass spectrometry, X-ray diffraction, NMR.

Unit II **14hrs**

Biological Databases: - Sequence database – nucleic acids database, protein database. Structure database PDB, MMDB, specialized database, literature database; file formats of GenBank, SwissProt, PDB, data retrieval using *Entrez*.

Unit III **14hrs**

Genomics:- central dogma, history of genomics. Structural genomics : – Sequencing of whole genomes – short gun sequencing, BAC to BAC sequencing, Annotation of the genome- ORF prediction,, Functional Genomics: - outline of Transcriptomics, proteomics and metabolomics. Comparative genomics:- gene prediction methods- content based, site based and comparative method. Web based prediction - GRAIL, Glimmer, Genscan, GeneMark.

Unit IV **14hrs**

Protein - Primary and secondary structure. Protein prediction - secondary structure, tertiary structure, Modular nature of proteins, 3D - visualization of protein structure - RASMOL and JMOL.

Unit V **15hrs**

Sequence analysis: Pair wise alignment types and methods- dot matrix, dynamic programming tools –FASTA and BLAST, Amino acid substitution matrices – PAM and BLOSUM..Homology modeling.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Alam Khan.I	Elementary Bioinformatics. 1st edn	Pharma Book Syndicate, Adithya Art Printers, Hyderabad	2005
2	Arthur.M.Lesk	Introduction to Bioinformatics, 1st edn..	Oxford University Press, USA	2003
3	Mani.K and Vijayaraj.N	Bioinformatics A Practical Approach. 1st edn.	Aparnaa Publication. Tamil Nadu, India	2004
4	Mani, K and	Bioinformatics for	Kalaikathir achchagam,	2002

	Vijayaraj.N.	Beginners. 1st edn	Tamil Nadu, India	
5	Vinay Sharma. Ashok Munjal, Asheesh Shankar	A text book of Bioinformatics. 1st edn..	Rastogi Publications,Meerut,	2008

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Mehrotra.P, Kumund Sarin, Swapna.K. Srivastava.	The New hand Book of Bioinformatics, 1st edn.	Vikas Publishing House Pvt. Ltd. Noida, Uttar Pradesh. India	2005
2	Dunn.S. R., M. J.	Proteomics from Protein sequence to function 3rd edn	Viva Books Pvt.Ltd. New Delhi	2002.
3	Rastogi,R.C. Mendiratta,N. Rastogi,P	Bioinformatics-Methods and applications Genomics, proteomics and Drug discovery, 3rdedn.	PHI learning private ltd, New Delhi.	2010
4	List of e-books - **http://www.freebookcentre.net/Biology/BioInformatics- Books.html**			

***-self study**

Contact hrs - 71

Tutorial hrs - 4

AOS – II Biofertilizers

SEMESTER - V

Code: PL12E02 **Total Marks :100**

Hours: 75 hrs **CIA :25**

ESE :75

Credit :4

Unit-I **14 hrs**

Definition, Classification of fertilizers (synthetic fertilizers & natural fertilizers), Organic Fertilizers, Bio-fertilizers, Microbial inoculants in Agriculture - contributions of microorganisms to soil fertility. Advantages of Biofertilisers over synthetic fertilizers.

Unit-II **14hrs**

Soil as a medium for growth of plants- soil microorganisms- Distribution of microorganisms in soil. Factors influencing the abundance of microbes in soil. Rhizosphere concept.

Unit-III **14 hrs**

Different groups of biofertilizers - bacterial, fungal and algal biofertilizers Phosphorus Biofertilisers - Rock phosphate solubilisation – *Bacillus megaterium, Bacillus circulans* and *Pseudomonas*.

Unit- IV **14hrs**

Phosphorus mobilization – mycorrhiza - types – endo, ectomycorrhiza and orchidaceous mycorrhiza.

Unit- V **15hrs**

Microbial solubilisation of silicates and zinc. Plant growth promoting rhizobacteria. Seaweeds.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Satyanarayana, U.	Biotechnology. 1st edn,	Books and Allied Publishers. Ltd. Kolkatta.	2005
2	Dubey, R.C.,	A Text book of Biotechnology, 4th edn	S. Chand & Co, New Delhi	2004
3	Kumaraesan , V	Biotechnology,1st edn	Saras Publication	2001

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Nutman, P.S.	Symbiotic nitrogen fixation in plants	Cambridge Univ. Press, London, P.584.	1976
2	Subba Rao, N.S	Advances in Agricultural Microbiology	Oxford and IBH Publn.Co., New Delhi..	1982

3	Subba Rao, N.S	Biofertilizers in Agriculture and Forestry	Oxford and IBH Publ. Co., New Delhi P.242	1993

Contact hrs - 71
Tutorial hrs - 4

AOS III - Biotechniques

Semester- V **Total Marks:100**
Code: PL13E03. **CIA:25**
Hours: 75 **ESE:75**
Credit:4

Objective:

To know about the various techniques used in the study of biological organisms.

Unit I - Microscope **14hrs**

*Principles and Applications of light microscope - compound and phase contrast, fluorescence microscope, electron microscope – SEM, TEM. Camera lucida.

Unit II - Microtomy **15 hrs**

Collection, Temporary, Semi – Permanent, Permanent slide preparation, Fixation, dehydration, clearing, embedding, serial sectioning, staining and mounting.

Unit III - Chromatography **14hrs**

Principles and applications of chromatography – paper, thin layer and gas chromatography, high performance liquid chromatography (HPLC) ion exchange and affinity chromatography.

Unit IV - Instrumentation **14hrs**

Principles and uses of spectrophotometer, colorimeter, pH meter, oxygen electrode. Principles, types and application of centrifuge.

Unit V - Molecular Techniques **15 hrs**

Polymerase chain reaction (PCR). RFLP, Principles and applications of electrophoresis - agarose gel. Blotting - Southern, Northern, and Western blotting, DNA fingerprinting

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Prasad & Prasad	Microtechnique,	Emkey Publishing	1985
2	Rana. S.V.S.	Biotechniques, Theory and practice	Rastogi Publications, Meerut	2004
3	Sadhasivam and Manickam	Biochemical methods	Wiley Easteren Ltd, TNAU, Coimbatore	1991

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Donald A. Johansen	Plant Microtechnique	McGraw-Hill publications in the botanical sciences, London	2009
2	Grimstone .A.V	Electron Mmicroscope in Biology.	The Edward Arnold (publishers) Ltd. Cambridge.	1983

3	John.E.SASS.	Botanical Microtechnique	Oxford and IBH publishing Co, Delhi	1964
4	Khasim, S.M.,	Botanical Microtechniques	Principles and Practice, Capital Publishing Company	2002
	Patki. L.R.	An Introduction to Microtechniques	S. Chand & Company, New Delhi.	1983

Contact hrs - 71
Tutorial hrs – 4

****Advanced Learners` Course - Self study**
Food Microbiology

Semester – V **Total Marks: 100**
Code: PL12AC1 **Credit : 5**

Objectives:

To understand the interaction between micro-organisms and food and knowledge of the factors that favors or inhibits the growth of microbes.

UNIT I

Food and microorganisms- Food as a substrate, important microbes, contamination of food, principles underlying spoilage.

UNIT II

Food preservation – Principles – Methods: - Asepsis – high and low temperature – Drying – radiation, canning – controlled atmosphere. Food additives, Chemical preservatives.

UNIT III

Contamination, preservation and spoilage of foods: spoilage of meat – meat products; spoilage of milk and milk products, Spoilage of fruits and vegetables, canned foods.

UNIT IV

Food in relation to disease: food borne illness, food poisoning, toxins and intoxicants. Primary sources of food poisoning - bacteria and moulds. Prevention of food borne diseases.

UNIT V

Microbiology in relation to food sanitation; enforcement and control agencies. Microbiological criteria for foods.

****Self study**

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Adams M.R and M.O. Moss	Food Microbiology, 2nd edition,.	New age International (P) Ltd. Publ., New Delhi	1996
2	Benwart G.J.,	Basic Food Microbiology, 1st edition	CBS Publishers & Distributors, New Delhi.	1987

Reference Books:

S.No	Authors	Title of the book	Publishers	Year of publication

1	Frazier C., D.C. Westhoff	Food Microbiology, 4th edition,	Tata McGraw Hill, New Delhi.	2000
2	Steinkraur K.H.,	Indigenous Food Fermentation, 1st edition	Academic Press, New York**.**	1988

****Not considered for grant total and CGPA**

****Advanced learners' course - Self study**
Food and Nutrition

Semester V **ESE :100**
Code:PL12AC2 **Credit:5**

Objective:
To enable students understand the vital link between nutrition and health, Gain knowledge on functions, metabolism and effects of deficiency of nutrients

Unit I
Introduction to nutrition and dietetics. Different food groups. Recommended dietary with that of FAO/WHO standards.

Unit II
Nutritional importance of carbohydrates, proteins and fats – properties, classification, functions and deficiency diseases – diabetes mellitus, quashiorkor, and atherosclerosis.

Unit III
Nutritional importance of vitamins and minerals – general account and deficiency diseases.

Unit IV
Water and electrolyte balance. Milk and milk products – general account. Milk adulteration.

Unit V
Food poisoning and adulteration. Food additives – general account. Food allergy , types of reaction, food as allergens, symptoms and treatment.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Mudambi, R. Sumathy and Rajagopal, M.V	Fundamentals of food and nutrition. IV edn	New age International Ltd. Publishers, New Delhi.	2005
2	Sheel Sharma	Human nutrition and Meal planning, 1st edn	Jnananda Prakashan, P&D, New Delhi.	2000
3	Srilakshmi, B	Nutrition Science. Revised 2nd edn	New age International Ltd. Publishers, New Delhi.	2006

Reference books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Arti Bhatia,	Nutrition and Dietetics	Anmol Publications, Pvt.Ltd., New Dehi.	2000

2	Sizer, Francis Sienkiewicz and Whitney Eleanar whitney	Nutrition – Concepts and Controversies. VIII edn.	Wadsworth, Australia.	2000.
3	Srilakshmi, B.	Food Science. 1st edn	New age International Ltd. Publishers, New Delhi.	1997
4	Swaminathan, M	Advanced textbook on Food and Nutrition	Bangalore Printing and Publishing Company, Bangalore	2002

****Not considered for grant total and CGPA**

Core Practical III (includes paper V and VI)

Code:PL13CP3 **Total Marks:100**
Hours:75 **CIA:40**
ESE:60
Credits:5

Paper V -Taxonomy (45hrs)

Study of forms belonging to the families mentioned in the syllabus and submission of herbarium of 10 locally available plants representing biological spectrum.

Economic Botany -Spotters:
Tobacco, Betel, *Terminalia*, *Indigofera*, Cotton, Jute, Cardamom.

Paper IV- Plant Biotechnology (30hrs)

Demonstration:

Preparation of MS medium, Sterilization of explants (such as nodes, inter nodes, shoot apex and anthers), inoculation and culture maintenance, preparation of synthetic seeds.
Plasmid DNA isolation, Agarose gel electrophoresis.

Spotters:

Transgenic plants -Photographs/Charts/Book diagram, Genegun, Microinjection, Blue white screening,electroporation, *Agrobacterium* gene transfer, Bucky balls, Carbon nanotubes.

Elective Practical (Paper AOS- I/AOS- II / AOS III)

CIA:40 **Hours : 30**
ESE :60 **Credits:3**
Total marks:100

AOS- I – I Bioinformatics

Subject code: PL13EP1 **30hrs**

1. Visit to public biological data bases-NCBI, SWISS-PROT, PDB and Gen Bank.
2. Prediction of physical parameters and secondary structure of proteins.
3. Visualization of protein molecules using RASMOL
4. Sequence similarity search using BLAST
5. Prediction of genes.

OR

AOS-II – Biofertilizers Paper I

Subject code: PL08EP2 **30hrs**

Isolation of rhizobium from legume root nodules; purification and characterization of rhizobium.
Testing theefficiency- leonard jar technique and plant infection test.
Rhizobium strain identification by immunological methods.
Isolationof Azospirillum from roots rhizosphere.
Identification and characterization of Azospirillum.
Isolation and identification of azatobacter and acetobacter
Isolation of Phosphobacterium from soils.
Quantitative determination of Phosphate solubilization by phosphobacteria

OR

AOS III - Biotechniques

Subject code: PL08EP3 **30hrs**

Preparation of semi-permanent and permanent slides – hand sectionsand microtome sections.
Studyof absorption spectrum of chlorophyll pigments by colorimeter and spectrophotometer.
Analysis of pH of soil solution using pH meter.

Demonstration

Centrifugation.
Agarose gel electrophoresis
Blotting techniques (Western, Southern and Northern).

Goals and Objectives of Internship

Code: INST1
Duration: 2weeks / 15days **Credit: 2**
Total Marks: 100

Goals

- To gain experience in design, implementation, and evaluation of worksite health promotion programs.
- To observe interpersonal and organizational dynamics.
- To provide awareness of the variety of worksite health promotion approaches (and job opportunities).

Objectives

- Students will develop skills in the application of theory to practical work situations.
- Observe a corporate fitness center operation.
- Internships will increase a student's sense of responsibility.
- Assist in program or product development.

Evaluation

Training: Relevance of the topic to the academic / society	- 10 marks
Objectives	- 10 marks
Experimental design	- 30 marks
Expression of results and training skill acquired	- 30 marks
Total	**- 80 marks**
Presentation	- 10 marks
Discussion	- 10 marks
Total	**- 20 marks**
Grand Total	**- 100 marks**

Project with Viva Voce

Semester V **Total Marks:100**

Code: PL15PROJ

Hours: 90 **CIA :20**

ESE:80

Credit:5

Objective:

To make the students to understand the importance of experimental analysis, scientific approach in solving problems related to the environment and society and to educate and train the students to write scientific papers

Group Project & viva voce

Each group will be comprising of 5 members and will be allotted to a staff coordinator. A specific problem will be assigned to the students or they will be asked to choose a problem/ area of interest. The topic/ area of work will be finalized at the end of IV semester, allowing scope for the students to gather relevant literature during the vacation. The research work can be carried at the college or any other organization approved by the staff coordinator and the HOD. Viva-voce/ presentation will be conducted by a panel of internal examiners including the HOD and the staff coordinator guiding the project. A PowerPoint / OHP presentation by the group before the audience will be evaluated on the basis of student's response to questions.

Area of work

Cytology, Plant Biology, Plant Biotechnology, Microbiology, Tissue culture and Medicinal Botany & Environmental Sciences etc.

Methodology

Each project should contain the following details:
Brief introduction on the topic
Review of literature
Materials and Methods
Experimental Results and Discussion – evidences in the form of figures, tables and photographs can be enclosed
Summary
Bibliography
The above content should not exceed 50 pages.

Evaluation

Project: Relevance of the topic to the academic / society	- 10 marks
Objectives	- 10 marks
Experimental design	- 30 marks
Expression of results and discussion	- 30 marks
Total	**- 80 marks**

Viva voce:	Presentation	- 10 marks
	Discussion	- 10 marks
	Total	**- 20 marks**
	Grand Total	**- 100 marks**

Title - Information Security (Level I)*

Semester: V **Lecture Hours: 26**

Code: NM13IS1
Total marks: 100

Objective

This course aims on introducing the theory and practice of designing and building secure computer systems that protect information and resist attacks. It covers all aspects of cyber security including network security, computer security and information security.

UNIT I **(5 hrs)**

Information security: History of IS-What is security?-characteristic of IS-components of I system –security system life cycle model.

UNIT II **(6hrs)**

Cryptography: Concepts and techniques-Plain text and cipher text- Encryption principles-Cryptanalysis. Authentication methods-passwords-keys versus passwords-Attacking Systems via passwords-Password verification.

UNIT III **(5hrs)**

Fire walls: Viruses and worms- Digital rights management-What is firewalls- Types of Fire wall-Design Principles of Firewall.

UNIT IV **(5hrs)**

Hacking: Hacker hierarchy-password cracking-Phishing- Network Hacking- Wireless hacking.

UNIT V **(5hrs)**

Case studies: DNS,IP SEC- Social media

Applicable to

*** B. Sc Plant Biology & Plant Biotechnology**

Text books:

S.no	Author	Title of book	Publisher	Year of publication
1	Dr.Michael E. Whitman, Herbert J. Mattord	Principles and Practices of Information Security	Course Technology Cengage Learning	4th edition, 2012
2	Atul Kahato	Cryptography and Network Security	McGraw Hill Education	3rd Edition 2012
3	William Stallings	Network Security Essential Applications and standard	Prentice Hall	2nd Edition 2009

4	Devan N. Shah	Information Security Principles and Practice	Wiley India	2009

Hours allotted – 2hrs / week

There will be only internal evaluation for these papers. Two internal tests in two units each (Unit 1 & 2 for the CA I and Unit 3 & 4 for the CA II) . The duration of the test will be 2 hours for a maximum of 40 marks. There will be no credits awarded. Marks secured will be converted into grades.

Evaluation (Internal)

Tests	2x40 = 80 marks.
Quiz	10 marks
Assignment	10 marks
Total	**100marks**

Question paper pattern

Section A

Answer in two sentences 2x5= 10 marks (5 out of 8)

Section B

Answers in one page 5x6= 30 marks (6 out of 8)

Total **40 marks**

Paper VII – Plant Physiology and Biochemistry

Semester VI
Code :PL14C07 **Total Marks:100**
Hours:105 **CIA:25**
ESE:75
Credit:5

Objective:
To obtain knowledge on plant – water relationships, various cycles of metabolism, structure and functions of Biomolecules.

Unit I Plant Physiology **20 hrs**

Water relations – Diffusion and Osmosis, significance of Osmosis in plants. Plasmolysis and its applications. Determination of osmotic pressure and DPD by plasmolytic method. Absorption of water- Active and Passive absorption; Factors affecting absorption of water. Transpiration –kinds of transpiration, Mechanism of stomata movement, Factors affecting transpiration. Ascent of sap-path os ascent of sap. Transpiration pull and cohesion of water theory. Mineral Nutrition - role of Macronutrients –(N, S, P, Ca, K, Mg, Fe) and Micronutrients – (Mn, Cu, Zn, B, Mo) on plants.

Unit II **20hrs**

Photosynthesis: Pigment system, Light and Dark reactions, C4 and CAM pathways. Respiration -Aerobic and Anaerobic, Glycolysis, Krebs cycle-electron transport system. Nitrogen metabolism – Biological nitrogen fixation, Transamination and reductive amination.

Unit III **20hrs**

Plant growth and movements: Growth Regulators –Chemical nature, Physiological effect and biosynthesis Auxins, Gibberellins, Kinetins, Ethylene and ABA. Plant movements – Types of movements. Physiology of flowering – Photoperiodism. Circadian rhythms in plants.

Unit IV Biochemistry **20hrs**

Structure of an atom- Plum pudding model, Rutherford model and Bohr model. Chemical bonds-Covalent bond and Hydrogen bonds. Intermolecular force - Vander Waals Interaction. Properties of Acids, Bases, Solutions, colloids, pH and buffer systems*.

Unit V **21hrs**

Classification and functions of carbohydrates, proteins and lipids. Enymes - Major groups, classification, structure, properties, mode of action and factors affecting enzyme activity.
* Self study

Text Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Jain. J.L	Biochemistry.	S. Chand & Company. New Delhi	2005

2	Jain. V.K.	Fundamentals of Plant Physiology.	Chand & Company. New Delhi	2014
3	Powar. C.B.	Cell Biology	Himalaya Publishing House. Kolkata	1983
4	Rastogi, S.C.	Biochemistry	Third edition, Tata McGraw Hill Education Private Limited, New Delhi.	2011

Reference Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Bernard. S. Meyer & Donald B. Anderson	Plant Physiology.	East West Press Private limited, New Delhi.	1963
2	Devlin. M	Plant Physiology.	Van Nastrand Reinhold Company New York	1969
3	Salisbury & Ross	Plant Physiology.	Prentice Hall of India. New Delhi	1969
4	Verma	Text Book of Plant Physiology	EM Kay Publ. Delhi.	

Contact hrs - 101
Tutorial hrs - 4

AOS IV - Pharmacognosy and Medicinal Botany

SEMESTER - VI
Code: PL15C08 **Total Marks:100**
Hours : 105 **CIA:25**
ESE:75
Credits:4

Objective: To study the value of herbal medicine and identification of their adulterants.

Unit I **20 hrs**

History and importance. General account of Indian Systems of medicine-Siddha, Unani and Ayurveda. Various systems of classification of natural drugs.

Unit II **20 hrs**

Study of crude drugs. *Identification based on morphological and anatomical characters. Collection, preparation and marketing of plant drugs. Factors affecting the yield of plant drugs.

Unit III **20 hrs**

Pharmacological grouping of plant drugs. Therapeutical and pharmaceutical applications of secondary metabolites like – alkaloids,steroids, tannins and terpenoids .

Unit IV **20 hrs**

Origin, distribution and uses of herbal drugs - bark (*Cinchona officinalis)*,leaves (*Adathoda vasica)*,rhizome (*Alpinia galanga)*, and flower (*Eugenia caryophyllata*). Effect of herbal drugs on Central Nervous system- *Datura metal,Withania somnifera* and *Papaversomniferum.* Cardiovascular system – *Digitalis purpurea*.

Unit V **21 hrs**

Study of drug adulteration and detection. A brief account of biological testing of crude drugs and phytochemical investigation.
***Self study**

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Kokate C.K., Purohit., A.P and Gokhale S. B,	Pharmacognosy. 12thedn	Nirali Publications Mumbai.	1999
2	Saharan, Moond, Chouhan and Gupta	Principles of Pharmacognosy.	Agrobios, Jodhpur India	2008
3	Wallis T. E	Text book of Pharmacogonsy, 5th Edn	CBS Publishers. Shahdhara, Delhi.	1985

ReferenceBooks

S.No	Authors	Title of the book	Publishers	Year of publication
1	Edwin Jarald,E. and Sheeja Edwin Jarald	Text book of Pharmacognosy and Phytochemistry	CBS Publishers & Distributors, India	2009
2	Irfan Ali Kham, Atiya Khanum	Medicinal and Aromatic Plants of India, 1st Edn.	Vkaaz Publications. Hyderabad	2005
3	Satoskar R.S. and Bhandarkar S.D,	Pharmacology & Pharma Therapeutics, Volume I &II.	Prakashan Bombay	1993
4	Tyler, V.E., Bracky, L.R. Bracky & Robert, J.E.,	Pharmacognosy 9th Edn.	Lar &Fabiger. Philadelphia.	1985
5	Warrier, P.K, Nambiar,V.P.K and Ramakutty,(eds)	Indian Medicinal Plants. (1-5)	Published by Orient Longman Ltd, Chennai	1994

Contact hrs - 101
Tutorial hrs - 4

AOS- IV Dietetics, Food Processing and Preservation

SEMESTER - VI
Code : PL15E04 **Total Marks :100**
Hours : 90 **CIA:25**
ESE:75
Credits:4

Objective
To enable students gain knowledge about principles of diet therapy and different therapeutic diets, food processing and food preservation.

Unit I
14hrs

Introduction – Nutritive importance of proteins, carbohydrates, fats, vitamins and minerals. Food sources – Plant and animal food. Fermented vegetables. Milk Products. Ready to eat Indian multi-purpose food.

Unit II **14 hrs**

Nutritional requirements and food security. RDA. Diet counseling. Menu planning. Nutritional and food requirements of infants, expected mothers, lactating women and old ages. Diet therapy and therapeutic diets. Diet in obesity, cardiovascular disease and diabetes.

Unit III **14 hrs**

Food processing: processing and methods of cooking of legumes, milk, vegetables, fruits, fish, meat, poultry and eggs. Food additives- mono-sodium glutamate, aspartame for flavor, enzymes for texture modification; Food coloring agents.

Unit IV **14 hrs**

Food preservation: Physical, chemical and biological methods - drying, cooling, deep freeze, heating, curing, jellying, chemical additives, salting, pickling, smoking, canning, and irradiation. Food spoilage and food adulterants. Food sanitation- safe methods of handling food.

Unit V **15 hrs**

Packing of preserved foods: concepts, definition, significance, classification, Primary packaging materials, methods of packaging - vacuum packaging, MAP, CAP & bio-degradable packages. Quality control; food standards: AGMARK, FSSAI, PFA. Good laboratory practice (GLP) Good Manufacturing Practice. Nutrition information on labels, GM foods.

Text Books

S.No.	Author name	Year of publication	Title of the book	Publishers name
1.	Jay, J.M.	1996	Modern Food Microbiology	CBS Publishers & Distributors, New Delhi
2.	Rastogi, S.C.	1998	Biochemistry	Tata Mc Graw Hill, New Delhi

3.	Sivasankar, B.	2002	Food processing and preservation	Prentice Hall of India, New Delhi
4.	Srilakshmi, B.	2006	Nutrition and Dietetics	New age International Ltd. Publishers, New Delhi
5.	Subbulakshmi, B and Udipi, A.S.	2006	Food processing and preservation	New Age International Ltd. Publishers, New Delhi

Reference Books

S.No.	Author name	Year of publication	Title of the book	Publishers name
1.	Towers. J	1992	Food theory and Applications	Mc Milan Publishing Co., UK
2.	Banwari GJ	1998	Basic food Microbiology	CBS Publishers and distributors, New Delhi.
3.	Winton, A. and Winton, K.B.	2006	Milk and milk products	Agrobios, Jodhpur
4.	Joshi. A	2007	Nutrition and Dietetics. 2nd edn	Agrobios, Jodhpur
5.	Casida, L.E.	2007	Industrial Microbiology	New Age International publishers, New Delhi

Contact hrs-86
Tutorial hrs- 4

AOS - V - Biofertilisers

SEMESTER - VI
Code : PL12E05 **Total Marks :100**
Hours : 90 **CIA:25**
ESE:75
Credits:4

Unit- I **17 hrs**

The organisms that fixes atmospheric nitrogen- free - living, aerobic, symbiotic bacteria. *Rhizobium* classification - cross inoculation groups - characteristics – Infection - root nodule formation - leghaemoglobin - factors affecting nodulation. Nitrogen fixation. - Nitrogen assimilation. Associative symbiosis -– Biochemistry of Nitrogen fixation - nitrogenase - mechanism of nitrogenase - hydrogenase - Assay of nitrogen fixation

Unit- II **17 hrs**

Distribution - occurrence - Morphological variation – characteristics of bacterial biofertilizers: *Azotobacter, Azospirillum, Acetobacter* and Frankia. Algal Biofertilizers: distribution - occurrence - Morphological variation – characteristics of *Anabaena* and *Nostoc*.

Unit- III **17 hrs**

Azolla - Importance *Azolla* - *Anabaena* symbiosis - growth behaviour – sporulation. Principles of Mass production - growth characteristics - Fermentation - Principles and techniques - inoculum preparation.

Unit- IV **17 hrs**

Carrier materials - Types and quality characteristics of an ideal carrier. preparation of inoculant packets - Shelf life - quality control of Biofertilizers. Field performance of biofertilizers - method of application.

Unit-V **18 hrs**

Large-scale production of bacterial biofertilizers. Mass production of *Azolla*, Blue green algae, AM fungi and Ectomycorrhiza. Problems and prospects of biofertilizers. Storage Shelf life - Quality control of biofertilizers - BSI standards of biofertilizers - Economics of biofertilizers.

Text Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Satyanarayana, U.	Biotechnology, 1st edn	Books and Allied Publishers. Ltd. Kolkatta.	2005
2	Dubey, R.C	A Text book of	S. Chand & Co.,4th	2004

		Biotechnology	edn, New Delhi.	
3	Kumaraesan , V.	Biotechnology, First edn	Saras Publication	2001

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Subba Rao, N.S.	Advances in Agricultural Microbiology	Oxford and IBH Publn.Co., New Delhi.P.704.	1982
2	Subba Rao, N.S.	Biofertilizers in Agriculture and Forestry.	Oxford and IBH Publ. Co., New Delhi.	1993

Contact hrs -86
Tutorial hrs -4

AOS VI – Environmental Biotechnology
(DBT- Star College)

Semester VI
Code:PL15E06 **Total Marks:100**
Hours:90 **CIA:25**
ESE:75
Credit:5

Unit 1- Biodiversity **17 hrs**

Definition; Geographical causes for diversity; Types of diversity; Genetic diversity; Species diversity and Ecosystem diversity; Quantifying biodiversity;Conservation of biodiversity;Methods of biodiversity conservation; Gene banks; Cryopreservation; Assessing, analyzing and documenting biodiversity; Introduction to biodiversity database: Endangered plants, Endemism and Red data books; Global biodiversity information system.

Unit II-GIS and Environmental Monitoring **17 hrs**

Concept of Remote sensing; Concept of GIS; Types of Geographical Data; Data Structure; Vector and Raster data: their Advantages and Disadvantages; Input, verification, storage and output of geographical data; Importance of Geographical Information System in environmental studies.

Unit III - Effluent treatment systems **17 hrs**

Sewage and waste water treatments systems; Primary, secondary and tertiary treatments. Biological treatments - aerobic versus anaerobic treatments; Environmental pollution control-Bioremediation, Bioaugmentation and Biostimulation; Biofilms in treatment of waste water; Aerobic Biofilms; Bioreactors for Sewage and waste water treatments systems; Primary, secondary and tertiary treatments.

Unit IV- Removal of specific pollutants **17 hrs**

Physicochemical characteristics and treatment strategies for effluent generated by Distillary and Fermentation industry, Fertilizers and Pesticide manufacturing industries, Dyes and textile industries,Paper and pulp industries, Food and dairy industries. Use of microbial systems and Phytoremediation.

Unit V-IPR & Biosafety **18 hrs**

Introduction to Intellectual Property

Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications.

Biosafety

Introduction to Biological Safety Cabinets; Primary Containment forBiohazards; Biosafety Levels; Recommended Biosafety Levels for Infectious Agents and Infected Animals; Biosafety guidelines - Government of India; Definition of GMOs & LMOs;

Text Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Acharya,N.K	Text book on Intellectual Property Rights	Jain Book Depot, New Delhi	2012
2	Kumar.S	Basics of Remote Sensing and GIS	Laxmi Publications, Chennai.	2005
3	Yadav, P.R.& Rajiv Tyagi	Environmental Biotechnology	Discovery Publishing House,New Delhi	2006
4	Sateesh.M.K	Bioethics and Biosafety.	IK International Publishing House Pvt Ltd, New Delhi.	2008
5	Indusekhar Thakur	Environmental Biotechnology, Basic concepts and application	IK International Publishing House Pvt Ltd, New Delhi	2006

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Marcos Von Sperling	Basic principles of Waste Water Treatment	IWA Publishing, Newyork	2007
2	John R .Jenson	Remote Sensing of the Environment An Earth Resource , Perspective: 2nd edn,	Dorling Kindersly Pvt Ltd , New Delhi	2009
3	Purohit S.S & Ranjan .R	Ecology,Environment and Pollution (First Edition)	Agrobios, India,Jodhpur	2003

Contact hrs-86
Tutorial hrs- 4

Core Practical – IV (includes Paper VII, VIII and AOS IV/V/VI)

Code: PL15CP4 **Total Marks:100**
Hours :120 **CIA:40**
ESE:60
Credits:5

Physiology and Biochemistry (45 hrs)

Individual Experiments:

Determination of Osmotic pressure of cell sap of the given specimen-Rheo leaf.
Separation of leaf pigments by Paper chromatography and TLC.
Measurement of rate of photosynthesis under varying CO_2 concentration.
Effect of light intensity on O_2 evolution during photosynthesis.

Demonstrations experiments:

Rate of Respiration in flower buds/germinated seeds using simple respiroscope.
Effect of light intensity on transpiration.
Determining the rate of transpiration using transpiration pull apparatus.
Determination of water absorption and transpiration ratio.
Estimation of proteins and carbohydrates.

&

Pharmacognosy and Medicinal Botany (30 hrs)

I. Morphology and uses of *Alpinia galanga, Datura metal, Withania somnifera, Papver somniferum, Digitalis purpurea, Eugenia caryophyllata, Cinchona officinalis, Cassia senna.*

II. Anatomical studies of leaf of *Cassia senna*, and leaf and stem of*Datura metal*and flower bud of *Eugenia caryophyllata.*

III. Quantitative analysis of Alkaloids and Terpenoids

or

AOS – IV Dietetics, Food Processing and Preservation (45 hrs)

1. Preparation of sample menu based on Recommended Dietary Allowance
2. Preparation of Indian multipurpose food
3. Preparation of low calorie diet
4. Preparation of pickles and jams using any vegetables and fruits, which are cheaper.
5. Isolation and identification of storage mycoflora from food stuffs/vegetables/fruits.
6. Nutritional analysis of various food-any one of each of the following:
    i. Vegetables
    ii. Fruits
    iii. Cereals
    iv. Pulses
    v. Oil seeds
    vi. Processed food
    vii. Ready to eat foods

7. Detection of adulterants in food.

AOS – V Biofertilisers – II (30 hrs)

Mass multiplication of bacterial biofertilizers - Fermentor
Carrier material - preparation of inoculant packets
Quality control - assessment of shelf life and storage methods
Methods of application of bacterial biofertilizers - Seed, soil etc.
Isolation, enumeration and identification of Blue green algae
Blue green algae - large scale production and method of application.
Azolla - large scale production and inoculation methods.
Different genera of AM and Mass multiplication - application methods

or

AOS VI-Environmental Biotechnology (30 hrs)

a. Environmental Parameters

1. Estimation of halides in water samples by potentiometer.
2. Estimation of CO^{2+} and Ni^{2+} by colorimeter/spectrophotometer.
3. Estimation of sulphates by turbidometer.
4. Detection of heavy metals- Zinc, Cobalt, Cadmium, Lead, Ferrous in anyone of the polluted sample.
5. Sampling techniques: wastewater analysis for physico-chemical characteristics such as pH, conductivity, Total dissolved solids (TDS), Dissolved oxygen (DO), Biological oxygen demand (BOD), Chemical oxygen demand (COD), CO_2, alkalinity, nutrients, chlorides,hardness, set ability of solids.

b.Bioremediation

- Microbial degradation of textile dyes/pesticides/hydrocarbons and oils
- Assay of enzymes involved in biotransformation.
- Phytoremediation of metal contaminated soil samples using Tomato/Brassica plants and estimation of metal removal in soil and metal accumulation in plants using Atomis Absorption Spectrum (AAS).
- Pollutant removal using microorganisms from industrial effluent.
- Effect of Heavy metals on microbial growth and microbial leaching of metals
- Effect of Pesticides on soil microorganism

****Advanced Learners` Course - Self study**
Industrial Biotechnology

Semester – VI **Total Marks: 100**
Code: PL12AC3 **Credit : 5**

Unit –I
Introduction to Industrial Biotechnology - Objectives and Scope: Characteristics and comparison of bioprocessing with chemical processing.

Unit-II
Biotechnology in health care: Gene therapy. Microbial production of human growth hormone. An outline of recombinant vaccines.

Unit III
Industrial microbial production: Production of industrial enzymes: amylase, aminoacid: L-lysine, antibiotics: streptomycin, Organic acid: Vinegar and lactic acid.

Unit-IV
Waste water treatment for dairies, dye industries, distilleries, tanneries and sugar industries. Water recycling. Bioremediation

Unit- V
Biotechnology and society: Patenting biotechnology inventions. Environmental risks of genetically engineered organisms.

Text Books

S.No	Authors	Year of publication	Title of the book	Publishers
1	Satyanarayana, U.	2005.	Biotechnology, 1st Edition	Books and Allied Publishers, Ltd. Kolkatta.
2	Dubey, R.C.	2006.	A Textbook of Biotechnology	S.Chand & Co. Ltd, New Delhi.

Reference Books

S.No	Authors	Year of publication	Title of the book	Publishers
1	Michael L.Shuler and Fikret Kargi.	1992	Bioprocess Engineering Basic concepts,	Prentice Hall, United States.
2	Presscott and Dunn.	1983	Industrial Microbiology, 4th edition,	AVI publishing Co. USA.

****Not considered for grant total and CGPA**

****Advanced Learners` Course - Self study**
Mushroom Technology

Semester – VI **Total Marks: 100**
Code: PL12AC4 **Credit : 5**

Unit –I
Morphology and classification of common edible mushrooms. Non edible mushrooms. Key to differentiate Edible from non edible mushroom; Distinctive features and symptoms of mushroom poisoning.

Unit-II
Distinguishing characteristics, germination and life cycle of commonly cultivated mushrooms **–** Indian Oyster mushroom (*Pleurotus* sp.), button mushroom (*Agaricus* sp.), and paddy straw mushroom (*Volvariella* sp.) and medicinal mushrooms (*Ganoderma* sp.).

Unit III
Mushroom Cultivation– Conditions for tropical and temperate countries, isolation, substrates used, spawn production, growth media, maintenance and harvesting of mushrooms.

Unit-IV
Medicinal properties and nutritional value of mushrooms, storage and composting of waste using mushrooms. Recipes of mushrooms: Mushroom pulav, mushroom gravy and Mushroom cutlet.

Unit- V
Diseases of mushrooms- Insect pest, nematodes, mites, viruses, fungal competitors and other important diseases. Post harvest technology – Freezing, drying and canning.

Text Books

S.No	Authors	Year of publication	Title of the book	Publishers
1	Satyanarayana, U.	2005.	Biotechnology, 1st Edition,	Books and Allied Publishers, Ltd. Kolkatta.
2	Dubey, R.C.	2006.	A Textbook of Biotechnology	S.Chand & Co. Ltd, New Delhi.
3	Reeti Singh and U.C. Singh.	2011.	Modern Mushroom Cultivation,	Agrobios (India).

Reference Books

S.No	Authors	Year of publication	Title of the book	Publishers
1	Tripathi, D.P	2005	Mushroom Cultivation,	Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
2	Pathak Yadav Gour.	2010.	Mushroom Production and Processing Technology	Published by Agrobios (India).

****Not considered for grant total and CGPA**

Allied Paper – I Fundamentals of Plant Biology

Code:PL13A01 **Total Marks:75**
Hours:75 **CIA:20**
ESE:55
Credit:4

Objective:
To gain knowledge of the plant diversity and internal structure and metabolism of the plant.

Unit I **14 hrs**
Outline classification of Algae (Fritsch) - A study of distribution, range of structure, reproduction and life cycle of *Volvox.**Economic importance of algae
Classification of Fungi (Alexopoulos and Mims) –A study of distribution, range of structure, reproduction and life cycle of *Saccharomyces.* *Economic importance of Fungi.
Plant Pathology - Symptoms and control measures of *Colletotrichum*.

Unit II **14hrs**
Outline Classification of Bryophyte (Reimer)- Structure, Reproduction and Life cycle of *Riccia*, Classification of Pteridophytes (Reimer) - Structure, Reproduction and Life cycle of *Lycopodium,* Classification of Gymnosperms (Sporne) - Structure, Reproduction and Life cycle of *Cycas.*

Unit III **14hrs**
A brief account of meristems**.*** Primary and Secondary structure of dicot stem and root; primary structure of monocot stem and root. Microsporogenesis and development of male gametophyte, megasporogenesis and development of female gametophyte, structure of monosporic 8 – nucleate embryo sac (*Polygonum*). Types of endosperm, development of dicot and monocot embryos.

Unit IV **14 hrs**
Outline Classification – Bentham and Hooker. Study of the following families with their Economic importance – Annonaceae, Rutaceae, Rubiaceae, Lamiaceae, Amarantaceae and Poaceae.

Unit V **15hrs**
Plant Physiology- osmosis and diffusion. Passive and Active absorption of water, Photosynthesis - *Photosynthetic apparatus, light and dark reaction. Growth regulator - Auxin, Cytokinin.

*Self study
Text Books:

S.No	Authors	Title of the book	Publishers	Year of publication
1	Srivastava, H.N	Algae and Fungi	Pradeep Publications, Delhi	2004
2	Srivastava, H.N	Plant Pathology	Pradeep Publications, Delhi	2004
3	Srivastava, H.N	Pteridophytes	Pradeep Publications, Delhi	2004

4	Pandey, P.B	Plant Anatomy	S. Chand & Co, New Delhi	2001
5	Singh .V and Jain	Taxonomyof Angiosperms	Rastogi Publications, New Delhi	1981
6	Pandey, B.P	College Botany Vol.II	S. Chand & Co, New Delhi	1989

Reference Books

S.No	Authors	Title of the book	Publishers	Year of publication
1	Sharma O.P	Plant Taxonomy	Tata Mc Graw Hill Comp, New Delhi	2009
2	Pandey, B. P.	Taxonomy of Angiosperms	S. Chand & Co, New Delhi	1992
3	Fritsch, F.E	The structure and Reproduction of Algae – Vol II	Cambridge University, England	1965
4	Smith, G.M	Cryptogamic Botany Vol I and II	Tata Mc Graw Hill Comp, New Delhi	1955
5	Esau. K	Anatomy of Seed plant	Wiley Eastern Pvt.Ltd. Newyork	1953

Contact hrs - 71
Tutorial hrs - 4

Allied Practicals

Code : PL13AP1 **Total Marks:50**
Hours: 60 **CIA:20**
ESE:30
Credit:2

Specimens

Plant Pathology- Red rot of Sugarcane- *Colletotrichum*
Bryophytes - Habit of *Riccia*
Pteridophytes - Habit of *Lycopodium cernum, L. clavatum, L. phlegmaria*
Gymnosperms - Habit of *Cycas*, Male cone , Female cone
Taxonomy - Study of plants belonging to the families (Annonaceae, Rutaceae, Rubiaceae, Lamiaceae, Amaranthaceae, and Poaceae) and their economic importance

Slides

Algae - *Volvox*- Daughter colonies, Oogonia and Antheridia.
Fungi - *Saccharomyces*-Single cell structure
Bryophytes - *Riccia*- Reproductive Structures-Antheridium, Archegonium and Sporangium
Pteridophytes - *Lycopodium*- L.S. of Cone
Gymnosperms - *Cycas*- T.S. of Corolloid root
Anatomy - Simple Tissues (Parenchyma, Sclerenchyma and Collenchyma), Complex Tissues (Xylem and Phloem)
Embryology - T.S. of Mature anther, 8- nucleated Embryosac, Mature Embryo

Sectioning

Bryophytes - *Riccia*- T.S. of Thallus
Pteridophytes - *Lycopodium*- T.S.of Stem
Gymnosperms - *Cycas* - T.S. of Leaflet, T.S. of Rachis
Anatomy - Primary structure of Dicot stems and root
- Primary structures of Monocot stems and root

Demonstration Experiments

Physiology - Determination of osmotic pressure by Plasmolytic method.
Separation of leaf pigment by Paper chromatography.
Microbiology- Preparation of Nutrient Agar Medium and Potato Dextrose Agar Medium

Spotters / Specimens
Pharmacognosy -*Ginger, Cinchona, Adhatoda, Rauwolfia* and *Myristica*
Biotechnology - Bt cotton, Ti Plasmid, Organogenesis and Callus induction.

Semester : III & IV

Title : Multimedia and DTP Software-Level I

Sub code : SB11MD01

Credits : 4 **Lecture Hours: 43**

Objective:

To provide a conceptual understanding of the basics of Adobe Pagemaker and indepth coverage of drawing and editing tools.

UNIT I (9Hrs)

About the Work Area-Using the toolbox- Creating and opening publications- Creating a publication from scratch-Opening an existing publication - Opening publications created in previous PageMaker versions-About templates - Opening templates.

Working with pages: Adding and deleting pages-Viewing pages- Applying masters to new pages as you create them-Naming and saving a publication.

Working with Palettes- Adding text and graphics to templates-Building your own template.

UNIT II (9 Hrs)

Specifying a save option preference: -Saving publication with a new or in a different location-Saving linked and associated files with publication-Saving a file to open in an earlier version of PageMaker-closing a publication-Setting up pages-Changing document setup options.

About Master Pages: -Creating master pages-Applying master pages-Applying Grids.

Text Formatting and word processing: selecting text or text objects-Importing text-Editing text-Threading text blocks-Threading text frames.

UNIT III (9 Hrs)

Balancing columns-controlling page and column breaks-Adding jump lines.Setting text preferences: -About formatting text-Formatting characters-Formatting paragraphs-Setting indents and tabs-Adding rules above or below paragraphs-Using paragraph styles-Understanding how text is composed-Tracking type-Setting word and letter spacing-Customizing hyphenation for specific words- Customizing hyphenation for paragraphs-Leading: Adjusting the space between lines of text.

UNIT IV (8 Hrs)

Manipulating an object using the control palette- Grouping and ungrouping objects-Locking objects- Masking objects-Aligning and distributing objects-Rotating, skewing, and reflecting objects.Drawing and editing lines and shapes-Using frames-Changing the stacking order of objects-Deleting an object-Manipulating an object using the control palette.Cropping a Graphic-Wrapping text around graphics- Attaching a graphic to text.

UNIT V (8Hrs)

Using image control on a bitmap-Using Photoshop effects- Compressing and decompressing a TIFF image- Viewing images on-screen at different resolutions-Keylining-Viewing clip-art images-Using layers.

About hypertext links-About Adobe PDF-Preparing a PageMaker publication for Adobe PDF-Exporting a document to Adobe PDF-Changing distiller options in PageMaker-Preparing a PageMaker publication for HTML.

TEXT BOOK: Course materials will be provided

REFERENCE BOOKS:

S.no	Author	Title of book	publisher	Year of publication
1	Halsall,fred	Multimedia Communications	Prentice Hall	2003
2	Koegel Buford, John F	Multimedia Systems	Pearson Education	2003

NOTE:

*During Semester III UNIT –I, Unit –II, Unit – III, Unit –IV till Aligning and Distributing Objects

**During Semester IV in Unit –IV from Drawing and Editing Lines and Unit V

Semester : III & IV
Title : Multimedia and DTP Software-Practical I
Sub code : SB11MDP1
Credits : 2 Practical Hours : 45

1. Create a business card using pagemaker.
2. Create a certificates using pagemaker.
3. Create greeting card for some festivals using pagemaker.
4. Type some text and give the drop cap effect
5. Create a slam book using pagemaker.
6. Create a simple logo using pagemaker.
7. Import a picture and give the mask effect for the picture.
8. Create an object and give reflect and rotate effect.
9. Create a news paper for three page and insert images.
10. Draw two or more objects in a same place and bring forward, backward using the arrange options

*During Semester III Program 1 to program 4

**During Semester IV Program 5 to program 10

Semester : V & VI
Title : Multimedia and DTP Software-Level II
Sub code : SB11MD02
Credits : 4 Lecture Hours : 43
Objective :

To provide a thorough discussion of the fundamentals of Adobe Photoshop and provide knowledge of how to design webpage.

UNIT I **(9 Hrs)**

Introduction-Tools Descriptions-Rectangular Marquee Tool (M)-Move Tool (V)-Polygon Lasso Tool (L)-Magic Wand Tool (W)-Crop Tool (C)-Slice Tool (K)-Healing Brush Tool (J)-Brush Tool (B)-Clone Stamp Tool (S).

UNIT II **(9Hrs)**

History Brush Tool (H)-Eraser Tool (E)-Gradient Tool (G)-Blur Tool (R)-Dodge Tool (O)-Path Selection Tool (A)-Horizontal Type Tool (T)-Pen Tool (P)-Rectangle Tool (U)-Notes Tool (N)-Eyedropper Tool (I)-Hand Tool (T)-Zoom Tool (Z).

UNIT III **(9 Hrs)**

Working with Layers: Active Layer-Color Modes: RGB-Indexed Color. Hue/Saturation: Hue Saturation shifts entire ranges of color within the image-Color modes.

UNIT IV **(8 Hrs)**

Color Channels: Introduction-Image Types-Image Sizes and Pixels-Blending modes-Using filters-Previewing filters-To apply a filter-To add a drop shadow to text-To convert a color photo to black-and-white-Converting images to Bitmap mode.

UNIT V **(8 Hrs)**

Designing web pages: Page design- Slices-Rollovers- Animations- Preparation in Adobe Go Live-Automating the workflow. Slicing web pages: Introduction-Slice types- To create a slice with the Slice tool-Bitmap images and vector graphics.

TEXT BOOK: Course materials will be provided

REFERENCE BOOK:

S.no	Author	Title of book	Publisher	Year of publication
1	A.Rajaram	Computer Graphics with Multimedia	Narosa Publication Edition	2006
2	Fred Halsall	Multimedia Communication Application Networks	Protocols and Standards, Addison Wesley	2001
3	Jeffery Jefcoat	Multimedia Systems and Application	TMH	2003

NOTE:

*During Semester V UNIT –I, Unit –II, Unit – III, Unit –IV till Image Sizes and Pixels

**During Semester VI in Unit –IV from Blending modes and Unit V

Semester : V & VI
Title : Multimedia and DTP Software-Practical II
Sub code : SB11MDP2
Credits : 2 **Practical Hours: 45**

1. Import an image and then cut a particular part and move into another screen using rectangular marquee tool, move tool, polygon lasso tool and magic wand tool.
2. Import a damaged picture and modified into a perfect picture using clone stamp tool and healing brush tool.
3. Import two or more pictures and split those pictures and make it a new picture.
4. Import a face and remove the unwanted scratches and make it a clarity using blur tool, dodge tool, hand tool and zoom tool.
5. Import natural pictures and insert your own quotes using horizontal type tool.
6. Modify a picture using some tools and prepare notes about your changes using notes tool.
7. Merge two or more pictures using the layer options.
8. Convert a black and white picture into a color picture using color modes and hue/saturation options.
9. Convert a color photo into a black and white one.
10. Display a picture in paint and glass effects using filter options.
11. Create an image with multiple layers and give blending options.
12. Display a picture in texture and spherize effects using filter options.
13. Create a web page using slice tool and give link to it.

*During Semester V Program 1 to program 5
**During Semester VI Program 6 to program 13

Semester : V & VI
Title : Applications with C- Practical II
Sub code : SB11ACP2
Credits : 2 **Practical Hours: 45**

1. Write a program to display lines of different style.
2. Write a program to draw a Circle using Bresenham's algorithm.
3. Write a program to display text using special functions.
4. Write a program to display a circle and ellipse drawn in different colors.
5. Write a program to draw a face changed to a smiling face.
6. Write a program to display different fill styles.
7. Write a program for drawing polygon, spectagon and octagon
8. Write a program to display concentric circles.
9. Write a program to display a circle and animate on the screen.
10. Write a program that can be used in tandem to move a ball on the screen.

*During Semester V Program 1 to program 4
**During Semester VI Program 5 to program 10

Semester : V & VI
Title :Basics of Web Design-Practical II
Sub.Code :SB11WDP2
Credits :2 **Practical Hours: 45**

PHOTO SHOP

1. Create an image & place it in an attractive frame using Layers.
2. Create a Morphing effect for Lion to Tiger & vice Versa.
3. Design a sky & lightning image using special effects (Rendering & Lens Flair)
4. Make an animated Clock using Visual Effects & Design a Web page to describe about the history of the clocks.
5. Design a web page using HTML & special effect tools Photoshop. Narrate the loss of Deforestation.
6. Design an E-Tutorial for one of your subject.

*During Semester V Program 1 to program 2
**During Semester VI Program 3 to program 6

Semester : V of UG programme / III of PG programme
Title : Information Security (Level I)*
Code: NM13IS1
Credits:2 **Lecture Hours: 26**

Objective

This course aims on introducing the theory and practice of designing and building secure computer systems that protect information and resist attacks. It covers all aspects of cyber security including network security, computer security and information security.

UNIT I (5 HRS)

Information security: History of IS-What is security?-characteristic of IS-components of I system –security system life cycle model.

UNIT II (6 HRS)

Cryptography: Concepts and techniques-Plain text and cipher text- Encryption principles-Cryptanalysis. Authentication methods-passwords-keys versus passwords-Attacking Systems via passwords-Password verification

UNIT III (5 HRS)

Fire walls: Viruses and worms- Digital rights management-What is firewalls- Types of Fire wall-Design Principles of Firewall

UNIT IV (5 HRS)

Hacking: Hacker hierarchy-password cracking-Phishing- Network Hacking- Wireless hacking.

UNIT V (5 HRS)

Case studies: DNS,IP SEC- Social media

Applicable to

*** BA(all Branches), B. Sc Advanced Zoology & Biotechnology, B. Sc Plant Biology & Plant Biotechnology, B. Sc Chemistry, B. Com Aided & SF , BBA Aided & SF**
MA & M. Sc all branches except Mathematics & Physics

TEXT BOOK:

S.no	Author	Title of book	Publisher	Year of

				publication
1	Dr.Michael E. Whitman, Herbert J. Mattord	Principles and Practices of Information Security	Course Technology Cengage Learning	4th edition, 2012
2	Atul Kahato	Cryptography and Network Security	McGraw Hill Education	3rd Edition 2012
3	William Stallings	Network Security Essential Applications and standard	Prentice Hall	2nd Edition 2009
4	Devan N. Shah	Information Security Principles and Practice	Wiley India	2009

Course material will be supplied