A.VEERIYA VANDAYAR MEMORIAL

SRI PUSHPAM COLLEGE (AUTONOMOUS)

POONDI-613 503, THANJAVUR (DT)

SYLLABUS

M.Sc., Botany

(From 2020 - 2021 onwards)

M.Sc. BOTANY

Programme specific outcome

On successful completion of M.Sc. botany the students will acquire knowledge about phytochemical, pharmacological and pharmacognostic aspects of higher plants. They can improve their knowledge incompleting competitive examinations for getting employment in Government and public sector undertaking institutions. The students will get idea about various scholarships and become eligible for JRF, SRF, and other relevant scholarships. The students will learn various techniques of plant breeding to enable better crop production for human welfare and economic upliftment. The students will acquire basic knowledge of biostatistics and learn its application in biological studies. The students will learn the basic principles and research methodology, thesis writing and research publications.

Programme Outcome

Students are able to access the primary literature, identify relevant works for a particular topic and evaluate the scientific content of these works. Compare and contrast the characteristics of the different groups of plants. Relate the physical features of the environment to the structure of populations, communities and ecosystems.

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M.Sc., Botany (2020 – 2021) on wards

Semester	Category	Course Code	Title of the course	Maximum Marks			Minimum Marks			Hours/Week	Credits
				C.I.A.	E.E.	Total	C.I.A.	E.E	Total		
I	Core	20P1BOC1	Plant Diversity– I (Algae, Fungi Lichen and Bryophytes)	25	75	100	10	30	50	6	4
	Core	20P1BOC2	Ecology, Environment and Conservation Biology	25	75	100	10	30	50	6	4
	Core	20P1BOC3	Cytology, Genetics and Plant Breeding	25	75	100	10	30	50	6	4
	Core	20P1BOCP1	Practical – I	40	60	100	16	24	50	6	5
	Major Elective	20P1BOEL1A / 20P1BOEL1B	Biofertilizer/ Biofuel Technology	25	75	100	10	30	50	6	4
II	Core	20P2BOC4	Plant Diversity – II (Pteridophytes, Gymnosperms and Paleobotany)	25	75	100	10	30	50	5	4
	Core	20P2BOC5	Angiosperms of Anatomy, Embryology and Microtechniques	25	75	100	10	30	50	5	4
	Core	20P2BOC6	Molecular Biology and Genetic Engineering	25	75	100	10	30	50	5	4
	Core	20P2BOC7	Herbal Science and Phytotheraphy	25	75	100	10	30	50	5	4
	Core	20P2BOCP2	Practical-II	40	60	100	16	24	50	5	3
	Major Elective	20P2BOEL2A 20P2BOEL2B	Horticulture/ Food Processing and Preservation	25	75	100	10	30	50	5	4
	Extra credit	-	MOOC(**M**assive **O**pen **O**nline **C**ourse)	-	-	-	-	-	-	-	-
III	Core	20P3BOC8	Plant Taxonomy and Economic Botany	25	75	100	10	30	50	5	4
	Core	20P3BOC9	Microbiology and Plant Pathology	25	75	100	10	30	50	5	4
	Core	20P3BOC10	Plant Biotechnology	25	75	100	10	30	50	5	4
	Core	20P3BOC11	Bionanotechnology	25	75	100	10	30	50	5	4
	Core	20P3BOCP3	Practical – III	40	60	100	16	24	50	5	3
	EDC	20P3BOEDC ----------	Medical Botany and Pharmacogonosy	25 -	75 -	100 -	10 -	30 -	50 -	4	

		20P4….CPD	Communicative skill& Personality development(N.S)							1	
	Extra credit	-	MOOC (**M**assive **O**pen **O**nline **C**ourse)	-	-	-	-	-	-	-	-
IV	Core	20P4BOC12	Research Methodology	25	75	100	10	30	50	5	4
	Core	20P4BOC13	Plant Physiology, Biochemistry and Biophysics	25	75	100	10	30	50	5	4
	Core	20P4BOCP4	Practical – IV	40	60	100	16	24	50	6	5
	Major Elective	20P4BOEL3A/ 20P4BOEL3B	Applied Phycology/ Mushroom technology	25	75	100	10	30	50	6	4
		20P4BOCK	Comprehensive Knowledge Test	-	-	100	-	-	-	4	2
		20P4BOPR	Industrial internship/Project (Along with Industrial visit)	40	60	100	16	24	50	2	4
		20P4….CPD	Communicative skill and personality development (N.S)							1	

M.Sc., Botany (2020 – 2021)

Nature of Courses	Total No. of course	Total Marks	Total Credits	Classification
Core	**17**	**1700**	**72**	
Elective	**03**	**300**	**12**	
EDC	**01**	**100**	**-**	
Project	**01**	**100**	**04**	
Comprehensive viva	**01**	**100**	**02**	
Communicative skill and personality development	**-**	**-**	**0**	
Extra credit-online course **MOOC**	-	-	**-**	**-**
Total	**23**	**2300**	**90**	

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GRADING OF COURSE PERFORMANCE (10 POINT SCALE)

Aggregate Marks	Grade	Grade point
96 and above	S+	10
91-95	S	9.5
86-90	D++	9.0
81-85	D+	9.0
76-80	D	8.0
71-75	A++	7.5
66-70	A+	7.0
61-66	A	6.5
56-60	B	6.0
50-55	C	6.5

Comprehensive Knowledge Test: Objective type question patternwith 100 compulsory questions carrying 100 marks to be answered in 3 Hours with 2 Credits. The portion isentire core courses.

Industrial Internship: Studentshave to undergo In-Plant training in Industry or Organization where any process related to Botany is going on. The period of training should be minimum 10 days.Students haveto submit the report of the training underwent with the certificate from the concerned authority of the Industry /Organanization.

Industrial visit: Students have toattach a report on the Industrial visit made with the counter signature of staff in charge for the Industrial visitwhile submitting the Project /Industrial internship report.

MOOC: Massive open online course is introduced in the second and third semester as an extra credit course from this academic year 2020-2021. Students can avail any one or more of the courses available in MOOC to equip their skill and knowledge themselves.

Field Visit / Industrial Visit / Hands on training programme having minimum 15 hours of contact time as Extra Credit course is introduced for I year PG students to gain experiential learning

Evaluation of the visit report will be held at the end of II Semester.

Components of Evaluation

Internal Marks	40
External marks	60
Total	100

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QuestionPatternforUGandPGProgrammesforstudentstobeadmittedduring 2020–2021andafterwards.

TotalMarks:75

QUESTIONPATTERN

SECTION –A

(Question1to 10)

10x2=20Marks

1. ShortAnswerQuestions.
2. TwoQuestionsfromeachunit(Allareanswerable)

SECTION –B

(Question11to15)

5x5=25Marks

1. 5Paragraphtypequestionswith"either/or"typechoice.
2. Onequestionfromeach unitoftheSyllabus.
3. Answerallthequestions.

SECTION –C

(Question16to20)

3x10=30Marks

1. 5Essaytypequestions–anythreeareanswerable.
2. Onequestionsfromeach unitoftheSyllabus.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
I	**20P1BOC1**	**Plant Diversity I (Algae,Fungi,LichensandBryophytes)**	**6**	**4**

Objectives

- Tounderstandtheclassification,rangeofthallusstructure,reproductionmethods and life cyclepatterns oflowerplants.
- Toinculcateknowledgeonthephylogenyandinterrelationshipsofvariousclassesofalgae and fungi.
- Tolearnvariousculturetechniquesforgrowingfreshwaterandmarinealgaeinlaboratorycondition.
- Toknowtheclassificationrangeofstructuralvariationsingametophytes,sporophytes,evolution,ecologyandeconomicimportanceofBryophytes.

Unit I

Algae– Classification (Fritsch,Smith andChristensen)– Thallusvariations,reproduction, life cycles, phylogeny and inter-relationships of main groups of algae –Ecology, physiology and distribution of algae – Freshwater, marine, soil and symbioticalgae-Evolutionofalgae-Fossilalgae.

UnitII

Laboratory culture methods – Isolation, kinds of culture – Culture media forfreshwater (Chu-10 medium, Pringsheim and BG 11 medium) and marine algae (GuillardF-2medium)–Cultivationmethodsofmicroandmacroalgae,pollution– Algalbloomanditseffectonalgal growth–Industrial uses ofalgae.

UnitIII

Fungi–Classification(AlexopoulosandMims,1973;Ainsworth,1974)– Systematicstudyofmycelialstructureanditsmodification-Nutritioninfungi– Reproductionoffungi–Fruitbodiesoffungi–Phylogenyandinter-relationshipofvariousgroupsoffungi-Heterothallism–Economic importanceoffungi.

UnitIV

Lichen-Definition,history,habitandhabitat-Classification-Nutritioncomponentsand theirrelationships-Types, structureandreproductionoflichens–Economicimportance - Ecology of Lichens -Common Indian lichens – Evolution of lichens – Fossillichens.

UnitV

Bryophytes-Generalcharacters–Classification(Proskaeur,1957)- Structureandreproductionofmaingroupsofbyrophytes.Structuralvariationsinthegametophytesandsporophytes –Ecology of bryophytes -Evolution of bryophytes– Economic importance ofbryophytes.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbeableto

- Acquireknowledgeon classification,structure,lifecyclepatterns,phylogenyandinterrelationships oflowerforms.
- Gainknowledgeonvariouslaboratorymethodsofmarineandfreshwaterforms.
- Getinformation onecology and economicimportanceoflowerplants.
- Become an entrepreneur in cultivation and marketing of marine seaweed *Kappaphycus*.
- Develop their skill in collection preservation and marketing of lichens for home needs.

BooksforReference

- Kumar,H.D.andSingh,H.N.,(1971).AtextbookofAlgae.EastWestPressPvt.Ltd.,New Delhi.
- Bold,H.C.andWynne,M.J.,(1978).IntroductionofAlgae-structureandreproduction,Prentice Hall,NewJersey.
- Vasisthta,B.R.,(1977).BotanyforDegreestudents-Part–I.Algae. S.Cnandandcompany Ltd.Ram Nagar,NewDelhi
- Alexopoulos,C.J.,(1973).IntroductoryMycology.WileyEasternPrivateLtd.,NewYork.
- Gangulee and Kar,CollegeBotany,Vol.II,New Central Book Agency,Calcutta.
- Parihar, N.S., (1957). An Introduction to Bryophyta. Central Book Depot,Allahabad.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
I	**20P1BOC2**	**Ecology, Environment andConservationBiology**	**6**	**4**

Objectives

- Toenablethestudentstoacquireknowledgeabouttheirenvironment.
- Toidentifytheenvironmentalproblemsandissues.
- Toteachthestudentstofindoutremedialsolutionstosolvetheenvironmentalproblem.
- Totrainthestudentstoacquireknowledgeinenvironmentalmanagement.

Unit I

Ecology–History,conceptandscope.Ecologicalclassification–Autecology–Synecology– Gene ecology– Population ecology. Origin and development of plantcommunity.Plant succession – Hydrosere and Xerosere. Environmental factors - Climatic,edaphicandbioticfactors.Ecologicaladaptations–Hydrophytes,Mesophytes,XerophytesandHalophytes.

Unit II

Ecosystem –concept, components, structure and functions. Ecological pyramids – Ecosystemenergetics–Energyflow.Biogeochemicalcycles–Carbon,Nitrogen,PhosphorousandSulfurandWater.Aquaticecosystem–Freshwater,MarineandMangroves-Terrestrialecosystem–Forest,GrasslandandDesert.Productivityindifferentecosystems.

Unit III

Environmental degradation – Pollution: Industrial, radiation and oil pollution - Wastelandformation-Abandonedminelands,ravines,deforestation,shiftingcultivation,impactofdams,lossofsoilfertility-Globalenvironmentalchanges-GlobalwarmingandClimatic Change - Greenhouse effect - Acid rain - Ozone depletion - EnvironmentalMonitoringand ImpactAssessment

Unit IV

Environmental Impact Assessment - Definition, Methods and Problems - Publicparticipation–ImpactAnalysisandEnvironmentalAudit–BioindicatorsandEnvironmentalMonitoring-Environmentaleducation–Principles.Typesofforestsandforestconservation-Utilizationofenergyresources–Non-renewableandRenewable.

Unit V

Conservation of resources: IUCN -Redlistcategories –Endemism–Biodiversity – Hotspots-Endangeredfloraandfauna–RedDataBook–Conservationstrategies: *Ex-situ*approach-tissueculture and cryopreservation,genebank,pollenbankandseedbank - *In-situ*approach-biosphere reserves,nationalparksandSanctuaries–TheEnvironmental Protection Act 1986 - Forest Conservation Act 1080 - Convention onBiologicalDiversity(CBD).

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gainknowledge on the environmentaldegradationissues in global level.
- understandtheconservationofremotesensoryanditsapplication by using satellites
- analysestheconservationaspectsofresourcesand theirenvironmentalprotection act.
- impact on the knowledge of endangered species of flora and fauna and their conservation.
- Create an employment opportunity in forest department as scientist by doing survey of flora.

BooksforReference

- Sharma,P.D.2012.EcologyandEnvironment,RastogiPublications,Meerut.
- Odum,E.G.FundamentalsofEcology.
- Ignacimuthu, S.J, (1996). Applied Plant Biotechnology. McGraw HillPublications,Co.,Ltd.,NewDelhi.
- Kudesia,V.P.andKudesia,R.,(1978).EnvironmentalHealthandTechnology.McGr awHill Publications Co.,Ltd.,NewDelhi.
- HarvinderSohalandSrivastava,A.K.,(1982).EnvironmentalandBiot echnology, BlackwellPublishers,NewDelhi.
- Kumar,H.D.,(1982).ModernConceptsofEcology–VikasPublishingHousePvt.Ltd.
- Satyanarayana.U.(2007).Biotechnology.Books&Allied(p)Ltd, Kolkata.
- Olguin,E.J.,Sanchez,G.andHernandez,E.,(2003).EnvironmentalBiot echnologyandCleanairBioprocess.TaylorandFrancis

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
I	**20P1BOC3**	**Cytology, GeneticsandPlantBreeding**	**6**	**4**

Objectives

- Toenablethestudenttounderstandtheultrastructureofcellanditscomponents.
- Toget abroadknowledgeinthefieldofgenetics.
- Tounderstandtheimportanceofplantbreedingtechniques.

UnitI

Cytology-Lightandmicroscopicstructuresofprokaryoticandeukaryoticcells–PlantCell-structureandchemistryofcellwall,cytoplasm,plasmamembrane,dictyosomes,endoplasmicreticulum,ribosomes,mitochondria,plastids,vacuolesandcellinclusions,ergastic substances.

UnitII

Detailedstudyofnucleus–Chromosome–types(includingspecialtypes),structure,organization(solenoidmodel)–Chromosomalaberrations-Changesinstructureandnumberofchromosomes-DNAasageneticmaterial-Cellcycle-celldivision,mitosisandmeiosis

UnitIII

Genetics –History and development– Mendel's laws of inheritance - BiologicalimportanceofMendelism-Simplegeneinteraction–Complementaryfactor-Supplementaryfactor – Epistasis – Duplicate factor - Multiple factorhypothesis – Populationgenetics(Hardy–Weinberglaw).

UnitIV

Multiplealleles -Linkageandcrossingover(concepts) -Chromosomemapping-Sexdetermination in plants– Sexlinkedinheritancein Drosophila–Cytoplasmicinheritance - Modern concept of gene and gene expression – cistron, recon and muton(Benzer'sexperiment).

UnitV

Plant Breeding **-** Principles of plant breeding -Introduction and domestication - Methodsofplantbreeding–Selection–Mass,pureandline,clonalselection.Hybridization – Pedigree breeding, bulk breeding and back cross breeding -Heterosisbreeding-Mutationinplant breeding-Polyploidyinplantbreeding.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- impartknowledgeinthefieldofcytologyespecially functions ofcellanditsorganelle.
- understandthebasicofMendalianconcepts andimportanceofMendelism.
- gaint the knowledge about the cell cycle in plant metabolism.
- inculcate the knowledge of an entrepreneur in the field of plant breeding.
- acquire skills about the principles and techniques of plant breeding.

BooksforReference:

- Gupta,P.K.1985.AtextbookofCytology,Genetics&evolution.RastagiPublications,Meerut
- VermaandAgarwal,1979.Cytology.S.Chand&Company,Ltd,NewDelhi.
- Sinha&Sinha,Cytogenetics,Plantbreedingandevolution,VikasPublishinghouse.
- Gardener,E.J.PrinciplesofGenetics.
- Chaudhary,IntroductiontoPlantBreeding.
- RobertH.Tamarin,2002.PrinciplesofGenetics,TataMcGraw-HillPublishingCompanyLimited,NewDelhi.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
I	**20P1BOCP1**	**Practical I – (Plant diversity – I,Environmental Biotechnology andCytology, Genetics and PlantBreeding)**	**6**	**5**

Objectives

- Tostudythevegetativeandreproductivestructuresofimportantalgae,fungi,lichens and bryophytes.
- ToknowtheequipmentsusedinMicrobiology.
- Tostudythewaterpollution, microbesinpollutedenvironment,microbesinsoil fertility,Biocontrol&vermicompost.

PlantDiversity I

Algae: Study of the vegetative and reproductive structures of the followinggenera– *Hydrodictyon,Scenedesmus,Chaetomorpha,Stigeoclonium,Fritschiella,Bulbochaete, Codium; Acetabularia, Nitella, Botrydium, Diatoms, Turbinaria, Liagora,Gelidiella, Champia,Ceramium,Lyngbya, Stigonema*and*Nostoc*.

Fungi: Studyofthevegetativeandreproductivestructureofthefollowinggenera – *Pythium,Albugo,Aspergillus,Penicillium,Taphrina,Phyllochora,Xylaria,Peziza,Puccinia,Polyporus*and*Lycoperdon.*

Lichens: Internalstructureof*Parmelia*

Bryophytes: Studyof vegetative andreproductivestructuresof thefollowinggenera:*Marchantia,Targionia,Reboulia,Pallavicinia,Porella,Anthoceros,Polytrichum.*

Ecology,Environmentandconservationbiology

Sewagewateranalysis

- Alkalinity
- FreeCO_2
- Chloride
- Dissolvedoxygen
- Calciumhardness
- Magnesium

hardness
Microbes of polluted watersMicrobesofoilcontaminatedsoil

Cytology

Studyofcellorganellesusingslidesandelectronmicrophotographs,Mitosis,Meiosis,Karyotype analysis.

Genetics

LinkageandcrossingoverGenemapping
Sexlinkedinheritance(fromphotographs)

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gainthe knowledgeon variousgenerainplantsdiversity.
- understand the knowledge on sex linked inheritance in plants.
- analysesandcategorizethecrucialroleofmicrobeinsewagewatermanagement.
- knowtheultrastructureandfunction ofcellorganelles.
- learnthevariousmethods ofplantbreeding.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/Week	No. ofCredits
I	**20P1BOEL1A**	**MajorElectiveIBiofertilizerTechnology**	**6**	**4**

Objectives

- Tounderstandtheimportantroleofbiofertilizersinagriculture.
- Toenablethevarioustypesofmicrobialinoculantsusedasbiofertilizers.
- Tolearnaboutmethodologyofisolation,characterization,identification,massmultiplicationandmethodofapplicationsofbiofertilizers.
- Togetawarenessaboutthecommercializationofbiofertilizers

Unit I

Generalaccountofmicrobesusedasbiofertilizersforcropplantandtheiradvantages - Symbiotic N_2fixers: *Rhizobium* – isolation, characterization, identificationclassification, inoculum production and field application – Nitrogen fixation – Nif genes - *Bradyrhizobium*and *Azorhizobium*– Isolation of *Frankia* -Actinorrhizal nodules –Non-leguminouscrop symbiosis.

UnitII

Freeliving–Associative–Non-symbioticN_2fixers:*Azospirillum*– Isolation,characterization, mass inoculum production and filed application. *Azotobacter*–isolation,characterization,massinoculumproductionandfieldapplication.Consortiumofbiofertilizers.

UnitIII

Freelivingnitrogenfixers–Cyanobacteria(BGA),*Azolla*– Isolation,characterization,mass multiplication–Industrial application ofbioreactors -Role of BGA and *Azolla*in ricecultivation–Cropresponse–Fieldapplication–ImmobilizationofCyanobacteria.

UnitIV

PhosphatesolubilizersPhosphateSolubilizingMicrobes(PSM)-*Bacillusmegaterium* Phosphobacteria – Isolation, characteristics, mass inoculum production andmechanismofP-solubilizationanditsfieldapplications.

UnitV

Mycrorrhizalbioinoculants–Classificationandtheirimportance–Ectomycorrhizae –Endomycorrhizae – Ectendomycorrhizae–Isolations of AM spore and assessment of AMinfection in roots – Mass inoculum production and field applications of Ectomycorrhizaeand VAM - Potash mobilizers (*Fraturiaaurantia)* – Role of bioinputs in organic farming –co- inoculation – Microbial consortium – Biofertilizers asbiocontrol agent – Response ofbiofertilizersinstress–pH and saline.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbeable to

- gaintheknowledgeabouttheimportantofbiofertilizersanditspotentialroleinagriculture.
- understandtheapplicationofcynobacteriainricefields.
- Create an entrepreneur inmassmultiplicationproduction,costanalysisandmarketingofbiofertilizzer
- awarenesabouttheMycorrhizalbioinoculantsasbioinputsinorganicfarming
- develop the skill insustainableagricultural practices especially using bioenhancer.

BooksforReference

- Subbarao,N.S.,(1982).Biofertilizersinagricultureandforestry.
- Bagyaraj, D.J. and Rangaswamy, (2005). Agricultural Microbiology–Tata McGraw Hill.,NewDelhi.
- Subbarao,N.S.,(1995).SoilMicroorganismsandPlantGrowth.SciencePublishers,Inc.,

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
I	**20P1BOEL1B**	**Major ElectiveIIBiofuelTechnology**	**6**	**4**

Objectives

- To acquire basic knowledge on Biofuels-origin, structure, occurrence-fossilfuels-advantagesand disadvantagesofBio-fuels.
- Theacquirebasicknowledgeonbiofuelsanditsimportanceandlimitations
- Todevelopthestudentswithenoughknowledgeonbiodieselproduction

Unit I

Introduction - importance of biofuels - Limitations of biofuels - Energy: Wood,SugarandStarchCrops,Hydrocarbonproducingcrops–Utilizationofbiomass.

UnitII

Substrates-Industrialandfoodprocessingwastes,domesticandmunicipalwastes.Micro-organisms–Hydrolyticandfermentativebacteria,SyntrophicH_2producingbacteria,Methanogenic bacteria, Acetogenic bacteria - Process of biogas production - Factorsaffectingbiogasyield-Precautions,advantagesand disadvantages.

UnitIII

BioethanolVsPetrol-Productionofbioethanol-sugarandstarchcrops-Cellulosicmaterials - Ethanol recovery - Biobutanol – Microorganism formulations for fermentationmedium,process,recoveryanduses-Futuredirectionsforresearchanddevelopmentforbiofuelproduce.

UnitIV

Biodieselandits properties–Petrocrops–*Millettia,Jatropha*,Castorand Groundnut - Lipidsasasourceofbiodiesel -Biodieselfromhydrocarbons -Advantagesofbiodiesel.

UnitV

Biohydrogen-scope for commercial utilization –Biohydrogenandbiocells productionfromalgaeandbacteria**-**Photosyntheticalgae**–***Invitro*photosynthetichydrogenasesystem-Advantagesofbiohydrogens-Ongoingandfutureresearchgoverninginbiohydrogenprediction.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- understandtheconceptsofbiofuelsanditsutilizationinhumanwelfare.
- gain the basic knowledge on properties of biodiesel from petrocrops.
- understand the role of photosynthetic algae in primary productivity.
- learntheoccurrenceoffosill fuels as indicators of biohydrogen.
- train to knowbiofuelproductionanditscommercialutilization.

BooksforReference

- Bulock, J.D. and Kristiansen, B., (1987). Basic Biotechnology, Academic Press, New York. PP:9337–358.
- Hobson,P.N.andWhatiey,A.D.,(1993).AnaerobicDigestion,ModernTheoryandPractice.Elsevier, London.
- Klasson,K.T.,Ackerson,M.D.,Clausen,E.C.andGaddy,J.L.,(1992).Bio-conversionsyntheticgasintoliquidorgaseousfuels.EnzymeMicrob.Technol.
- Leach,C.K.andVanDam-Mieras,MCE.,(1994).BiotechnologicalInnovations inEnergyandEnvironmentalManagementButterworth–HeinemannLtd.,Oxford.
- Meyers,R.A.,MolecularBiologyandBiotechnology.AcomprehensiveDeskReferenceVCHPublishers, Inc.NewYork.
- Singh,B.D.,(1998).Biotechnology,KalyaniPublishers,Ludhiana,Biofuel–AcademicPress.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/ Week	No. ofCredits
II	**20P2BOC4**	**Plant Diversity II (Pteridophytes,Gymnospermsand Paleobotany)**	**5**	**4**

Objectives:-

- Toknowtheclassification,salientfeaturesofgametophyteandsporophyte,morphology of the major groups, phylogeny, evolutionary status and economicimportanceofPteridophytes.
- To learn a comprehensive knowledge on the classification, distribution, generalstructure,evolutionarysignificanceandeconomicimportanceofGymnosperms.

Unit I

Pteridophytes **-** General characters – Classification (K.R. Sporne, 1975) – Lifecyclepatterns – Phylogeny of Pteridophytes – Stelar evolution – Psilophytopsida – *Rhynia*,Lycopsida–*Lepidodendron,Sigillaria*;Sphenopsida–*Sphenophylum,Calamites,Calamostachys*;Pteropsida–*Botryopteris*.

UnitII

Studyofthevegetativeandreproductivestructuresofthefollowinggenera-*Angiopteris,Ophioglossum,Botrychium,Osmunda,Gleichenia,Hymenophyllum,Salvinia*and *Azolla*–*Soral*evolutioninferns–heterosporyandseedhabit–Telomeconceptandits significance–Economicimportance ofPteridophytes.

UnitIII

Comparativestudyof thevegetativeandreproductivecharacteristicsof thefollowingordersPteridospermales(Lyginopteridaceae,Medullosaceae),Bennettiatles(Williamosoniaceae)and Pentoxylales(Pentoxylaceae).

UnitIV

Gymnosperms -Generalcharacters–Classification(K.R.Sporne,1965)–Evolutionarytrendsandphylogeneticrelationshipamongvariousgroupsof Gymnosperms – Cycadales(*Cycas*),Coniferales(*Pinus,Podocarpus*),Taxales(*Taxus*),Ginkgoales(*Ginkgo*)and Gnetales(*Gnetum,Ephedra*)– EconomicimportanceofGymnosperms.

UnitV

Paleobotany –Geologicaltimescale –Typesoffossils -MethodsofFossilization – FossildistributioninIndia.Radiocarbondating–Importanceofthestudy ofPaleobotany – Indianpaleobotanists.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gain the knowledge about classification of Pteridophytes and gymnosperm
- learn about the characteristic features of Pteridophytes and gymnosperms.
- acquire knowledge on Paleobotany and its importance in archeology.
- attain the knowledge on economic importance of Indian Pteridophytes.
- understand the methods of fossilization and radio carbon dating method to study the age of fossil plants.

BooksforReference

- Sporne,K.R.andHutchinsonCo.,(1970).TheMorphologyofPteridophytes,London.
- Rasheed,(1976).Pteridophyta,VikasPublications,NewDelhi.
- Sporne,K.R.andHutchinsonCo.,(1970).TheMorphologyofGymnosperms,London.
- Vasishta,P.C.andGhand,S.,(1996).Gymnosperms,GhandandCompanyLtd.,New Delhi.
- Arnold, C.I.A., (1947). An introduction to Paleobotany–McGraw-Hill, New York andLondon.
- Parihar, N.S., (1967). The Biology and Morphology of Pteridophytes by New CentralBook,DepotAllahabad.
- LivingCycadsbyChamberlain.
- CollegeBotanyVol.IIbyGanguleeandKar,NewCentralAgecny,Calcutta.(1959).
- GnetalesbyPearson.
- GnetalesbyMaheswariandVasil
- GymnospermsbyChamberlain.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
II	**20P2BOC5**	**Angiosperm Anatomy, Embryologyand Microtechniques**	**5**	**4**

Objectives

- Tounderstandtissues,theirclassificationandfunctions.
- Tostudymeristems,theirclassificationanddistribution.
- Tolearnthevariousaspectsofrootsandstemsofdicotsandmonocots.
- Tostudythemicrosporogenesisand megasporogenesis
- Todescribethestructureanddevelopmentofendospermandembryo
- Toimportknowledgeofmicrotechniquesinfieldofanatoms

Unit I

Anatomy-Developmentofseedplant–Apicalmeristemandtheirderivatives–Theories-Xylem –developmentofprimaryxylem–differentiation oftrachearyelements – gross structure of secondary xylem – cell types – phylogenetic specialization. Variationinwoodstructure–Coniferousanddicotyledonouswoods–Factorsinvolvedindevelopment of secondary xylem – Identification of wood. Vascular cambium - Phloem –Cell types - Differentiation of sieve elements-Primary phloem and secondary phloem –Coniferousanddicotyledonous phloem.

UnitII

Root–development–apicalmeristem–Theories–lateralroot,adventitiousroots.Stem – vascular system – shoot apex - Origin of leaves and branches – Phylogenetic andevolutionaryconsiderations–Floralvasculature-Seedlinganatomy–Root-stemtransition.

UnitIII

Embryology of Angiosperms - Structure and development of microsporangium – Microsporogenesis– Ultra structure of microspore -Structure and functions of pollen– Pollen viability test – Morphology, cytology and physiology of anther tapetum – Pollenembryosac – Megasporangium– Megasporogenesis– Types of embryosac – Endothelium -Sexualincompatibility.

UnitIV

Fertilization and its significance – Endosperm – Types -haustoria – Ruminateendosperm(contributionbyPeriyasamy)–Classificationofembryobasedondevelopmentin dicots – Embryo development in monocots – Suspensor – Apomixis – Polyembryony –Structureand developmentofseed coat.

UnitV

Microtechnique –Micrometry–CameraLucida-Maceration–Killingandfixation-Dehydration– Clearing,infiltration,embedding,blockmaking–Sectioning– Microtomesandits types-stainsand staining-Smearand squashtechniques.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gainknowledgeon development of seed plants and its apical meristem.
- learn on phylogenetic and evolutionary consideration of xylem and phloem.
- impartknowledge on sexual imcompatibility and methods to overcome it.
- analyse the double fertilization and trible fusion and its significance in angiosperms.
- Develop an entrepreneur by learning of preparation of permanent slides and marketing in schools and colleges.

BooksforReference

- Cutter, E.G., (1965). Plant Anatomy- Experiment and Interpretation. Part ICellsand tissues,EdwardArnoldLondon.
- Cutter, E.G., (1971). Plant Anatomy -Experiment and Interpretation. Part IIOrgans,Edward.ArnoldLondon.
- BhojawaniandBhatnagar,(1990).EmbryologyofAngiosperms,VikasPublishingHouse(P)Ltd.,NewDelhi.
- Swamy, B.G.L. and Krishnamoorthy, M.V., (1980). From Flower to Fruit, TataMcGrawHillPublishingCo.,NewDelhi.
- Wardlaw,C.W.,(1976).EmbryogenesisinPlants,MetherandCo.London.
- Raghavan,V.,(1976).ExperimentalEmbryogenesisinVascularPlantsAcademicPress,London.
- Prasad,M.K.andKrishnaPrasad,M.,(1975).OutlinesofMicrotechnique,EmkyPublications,Delhi.
- Johri,B.M.(1984).EmbryologyofAngiospermsSpringer –verlag,New,Delhi.
- Eames,A.J.MacDaniels,L.H.(1972).TataMcGraw-HillPublishingcompanyLtd,New,Delhi.
- AnnieRagland,(2010).PlantAnatomyandMicrotechnique.Saraspublications,Nagercoil.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/Week	No. ofCredits
II	**20P2BOC6**	**Molecular Biology andGeneticEngineering**	**5**	**4**

Objectives

- Toenablethestudents tounderstandthestructureandfunctionofnucleicacids
- To studyaboutthemechanismofDNAreplication
- Toinculcateknowledgeonthemolecularmechanismofproteinsynthesisandgeneexpression
- TounderstandtheapplicationofRecombinantDNATechnologyingeneticengineering

Unit I

Structure and chemistry of nucleic acids.DNA structure – double helix – Types ofDNA Super coiling function of DNA & RNA- types of RNA– mRNA, rRNA and tRNA..Sub-unit structure ofribosomesinprokaryotes andeukaryotes.

UnitII

Eukaryotic genome organization - Structure of chromatin, coding and non-codingsequences-DNA–Semiconservativereplication–EnzymesinvolvedinDNAreplication–helicases,topoisomerases,DNApolymerases,DNAligases,nucleasesandmethylases.DNAdamageand repairing.

UnitIII

Transcription – Mechanism of transcription in prokaryotes and eukaryotes - RNAsplicing, RNA editing and Ribozymes –Polyadenylation. Translation in prokaryotes andeukaryotes–Geneticcode–PropertiesandWobblehypothesis–Posttranslationmodifications-proteinsynthesis

UnitIV

Regulation of gene expression - Induction and repression – Operon concept fortranscriptionalregulation-*lac*operonand*trp*operon–Eukaryoticgeneregulation(BrittenandDavidsonmodel)-DNAmethylation – Lyticcascadeandlysogenicrepression

UnitV

ToolsandtechniquesofRecombinantDNAtechnology-Vectors–Plasmidsand their types – Cosmids, Bacteriophage vectors –Principle and applications of PCR and RT-PCR – Molecular markers – RFLP, RAPD and ISSR - Construction and screening ofGenomiclibraries and cDNAlibraries.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- indentifythestructureandchemistryof nucleicacids as genetic material.
- demonstrateanexperimentallearningandcriticalthinkingofstructureofeukaryoticgenome.
- understandthemechanismoftranscriptioninprokaryotesandeukaryotesonmolecularbasis.
- acquirefundamentalknowledgeonregulationofgeneexpression.
- create an entrepreneur in understandingthetoolsandtechniquesinvolvedinrDNAtechnology.

BooksforReference

- Friefelder,D.,(1987).MolecularBiology,2nd Ed.,JonesandBarlett Publishers,Boston.
- Grierson,D.S.andCovey,S.N.,(1988).MolecularBiology2nd Ed.,Blackie,ChapmanandHall,NewYork, USA.
- MalchenskyandFrifelder,(2003).MolecularBiology.NarosaPublishingHouse,NewDelhi.
- Gupta,P.K.,(2002).CellandMolecularBiologyRastogiPublications,SivajiRoad,Meerut.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/Week	No. ofCredits
II	**20P2BOC7**	**HerbalScienceandPhytotherapy**	**5**	**4**

Objectives:

- Toenablethestudentstoidentifyindigenousmedicinalplantsanditsprinciplecompounds
- To learn the uses of medicinal plants as natural medicines alternative to theexistingallopathicmedicine.
- Toimpartthestudentstoobtainknowledgeonbotanyandphytochemistryofmedicinalplants.
- Tomakethestudentstoknow nowtocurecommonhumanalimentsusingmedicinalplants.

UnitI

Introduction to medical botany – History and scope – Classification-Geographicalsource–Ethnobotany–TraditionalandFolkloremedicine–Indigenousmedicine-Ecological habitats of medicinal plants. Indian Systems of Medicine: Ayurveda, Siddha,Unani,HomeopathyandNaturopathy.

UnitII

Therapeuticalandpharmaceuticalusesofthefollowingmedicinalplants:Rhizome (*Zingiber officinale, Curcuma longa*), Root (*Glycyrrhiza glabra, Asparagusracemosus*),Leaves(*Solanumtrilobatum,Ecliptaprostrata*),Flower(*Hibiscusrosa-sinensis,Rosadomescena*),Fruit(*Caricapapaya,Phyllanthusemblica*),Seed(*Strychnosnux-vomica, Piper nigrum*), whole plant (*Andrographis paniculata, Justiciaadhatoda*)

UnitIII

Cultivation, collection and processing of herbal drugs – Macroscopic characters(Physical and Oraganoleptic) – Microscopic characters- Fixed oils - Cultivation andutilization of selected medicinal plants – *Acorus calamus, Aloe vera*, *Murryakoenigii,Withaniasomnifera*Herbalfarms-RoleofAYUSHandNMPBincultivationandmarketingofmedicinalplants.

UnitIV

Pharmacognosy–Definitionandscope -Drugadulterationanddetection - Drugevaluation - Chemical, physical and biological methods - Phytochemical investigation - Standardizationandqualitycontrolofherbaldrugs.Drugscontainingglycosides(*Cassiaangustifolia*), tannins (*Terminalia chebula*), lipids (*Arachishypogea*oil) resins(*Cannabissativus*)andalkaloids(*Catheranthusroseus*).IPR,patenting,accessandbenefitsharing.

UnitV

Preparation of herbal powders,shampoo,oil,infusions and tinctures-HerbalFoods-Salad,Sprouts-HerbalDrinks–Tea,Soup-Herbalmedicinesforhumanailments-heart,lung,kidney,liver,skin,hair,stomach,diabetes,infertility,cold,cough,jointpain–Immuneboosters–KabasuraKudineer,NilavembuKudineer

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gainknowledgeonIndiasystems of medicine.
- getaclearcutideasontherapeuticallyandpharmaceuticalusesofmedicinalplants.
- acquireskillsoncultivationofmedicinalandprocessing andpreparation of herbaldrugs.
- identify the adulterationofdrugsand its detection.
- impartknowledgeaboutIPRandpatentregulationanditsimportance.
- generate an entrepreneur inthevariousmethodsofherbalpreparation and its marketing.

BooksforReference:

- umar,N.C.(1993).AnIntroductiontoMedicalBotanyandPhamrmacogonosy,
- Balu, S, Pandiyan,P. and Murugan, R. (2005). Herbal Technology,Dept. ofBotany&Microbiology,A.V.V.M SriPushpamCollege,Poondi.
- Nadkarni,1981IndianMeteriaMedia,
- Gamble,J.S.Flora(1973).oftheMadrasPresidency,
- Jani,S.K.,(1980)IndianMedicinalplants,.
- MichaclHeinrich,JoanneBarne,SimonGibbonsandElizabath,M.Williamson.(2012). Fundamentals of Pharmacognosy and PhytotherapyElseviar Ltd ISBN:978-0-7020-3388-9
- Kirtikar,K.R.Basu,B.D.(1991).nIndianMedicinalplantsVol.ItoV.Dehradun.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/Week	No. ofCredits
II	**20P2BOEL2A**	**Major Elective IHorticulture**	**5**	**4**

Objectives

- Toprovidetheinformationrelatedtothemainprincipleandimportanceofhorticulture
- Toenhancethehorticultureproduction,improvenutritionalsecurityandincomesupporttofarm households
- Learntheprincipleandmethodsofpropagationdesigningaformal&informalgardening
- Tocreateopportunitiesforemploymentgenerationforskilledandunskilledpersonespecially anemployedyouth.

Unit I

Horticulture-Importanceandscope–Divisionsofhorticulture– Climate,soilandnutritional needs – Water irrigation – Plant propagation methods – cutting, layering,grafting,budding,stock-scionrelationship-Greenhouseandshadehouse– HorticultureinstitutesinIndia.

Unit II

Fruitcrops-Growthregulators– Inductionofflowering,flowerthinning,fruitsetting,fruitdevelopment– Cultivationofimportantfruitcrops–Mango,LimeandGuava – Vegetablecrops-classificationofvegetables,cultivationofimportantvegetablecrops – Tomato,BrinjalandGarden bean*(Dolichoslablab).*

Unit III

Principles and methods of designing a flower garden (out-door) –Hedges – Sedges – Fences –Trees - Climbers -Rockeries– Arches Terrace garden -Lawn makingand maintenance –Arboriculture -Water garden – cultivation of water plants, commonwaterplants.

Unit IV

Indoorgardening– factors,light,humidity,watering,designing-Bonsaiplants – watering,pruning,dwarfing -Roofgardening-Flowerarrangementanddecoration– Wetdecoration–drydecoration-Cultivationofcommercialflowercrops– Rose,Jasmine(Jasmineconcrete),Chrysanthemum.

UnitV

Preservation and Storage of fruits and vegetables- Nursery – Micropropagation – Hardening and transplantation– Germplasm maintenanceof sweet potatoandcassava.Marketingofhorticultural cropproducts.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- becomea trainedpersonin learning variousmethodsofpropagation of horticultural crops.
- learnthecultivationmethodsof someimportancefruitsandvegetablecrops
- developtheskillofpreparation of manuresandmanuring.
- evolve an entrepreneur in the field of floriculture and obtain the knowledgeonwet and dry decorationofflowersincludingmarketing.
- Inculcate the knowledge on preservation and storageoffruitsandvegetablesincludinggermplasm maintenance.

BookforReference:

- TextBookof Horticulture–K.ManibushanRao(1991).McMillan.
- IntroductiontoHorticulture–N.Kumar(1986).RajalakshmiPublishers.
- AGuide on Horticulture–J.S.Sundararaj, S.Muthusamy, Dr.K.G.Shanmugavelu,R.Balakrishnan.
- Horticulture:PrinciplesandPractices(1999).4th EditionbyGeorgeAcquaah.
- Bose,U.S.,(2012).HandBookofHorticultureOxfordBookCompanyNewDelhi-110002.
- Hertmann,H.T., Keiter,D.E, Davies,F.T., Geneeve, R.2., (1997). Plant Propagation – Priciples andpractices. Prentice–HallofdIndiaPvt. Ltd.NewDelhi.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
II	**20P2BOEL2B**	**MajorElective-IIFoodProcessingTechnology**	**5**	**4**

Objectives

- Toawareaboutthefoodadulterationdetectionontechnique.
- To provide knowledge on principles and types of food preservation.

UnitI

Vegetableanditsvalueaddedproducts:Canningofvegetable,pickles,chutneys,etc., Baked Products flour preparation baking formulation, processing. Milk and milkproducts -butter, lassi,condensed milks-cheese,andmilkpowder.

UnitII

Processing–Methods–opencookers,continuousnon-agitatingcookers,continuous agitating cookers. Fruits and fruit products – Canning of fruits, Extractionequipments – continuous screw expeller press, filtration equipment – deaerator, flashpasteurizer, uses ofthinning agents,clarification.

UnitIII

Food additives: Definition – preservatives – anti-oxidants – colouring agents,emulsifier, establishers and thickness, antifoaming agents, nutrient supplements, non-nutritive sweetness; functions of additives. Food adulteration – adulterants and simpledetectiontechniques–foodgrades–standards,lawsand regulations.

UnitIV

Foods preservation principles and methods. Types of preservation – Temporarypreservation – asepsis, low temperature, antiseptics, pasteurization, exclusion of air,electromagnetic radiation – Permanent preservation. Sterilization processing by heat,effectofacidification,antiseptics, drying,fermentation, exclusionofair.

UnitV

ChemicalmethodsofPreservation:Preservationbysalting,Preservationbysugar syrup for canning, jam, Role of pectin in Jam preparation. Jelly – constituents of jelly,fruitjelly,preparationofjellyPreservationbyChemicals:benzoicacid,parafin,sulphites, diethylpyrocarbonates(DEPC),HydrogenPeroxidecarregenanCO_2,Carragenan-Preservation by antibiotics and irradiation. Preservation by cold storage,Preservationbysugars.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- understandthevariousprocessesinvolvedin value added products of vegetables,pastryandmilk.
- acquaint knowledge on foodadditivesandfoodpreservatives.
- gainbasicknowledgeaboutprinciplesandmethodsofpreservation.
- become an entrepreneur in developing food additive industry and food preservation processing unit.
- engender their skill by knowing the preparation techniques of jam and jelly.

BooksforReference:-

- ManorajanKailaandSangita,(2008).FoodPreservationandprocessing,Department of Food Science and nutrition, College of Home Science. HimachalPradesh,Agri University,Palampur(H.P.)176062.
- Giridharilal,Siddappa,G.S.andToandon,G.L.(2009).PreservationofFruitsandVegetables –CFTRI,Mysore.
- S.Ranganna – Hand book of analysis and quality control for fruit, vegetablesproducts –CFTRI,Mysore.
- Vijayaramesh,K.(1967).FoodMicrobiology,MJPPublisher.
- George,J.Banwat(2004)BasicFoodMicrobiology,SecondEdition,CBEPublishersandDistributers,NewDelhi.
- William.C.FrazierandDennis.C.Westhoff(2008),FoodMicrobiology,FourthEdition
- TataMcGraw–HillpublishingCompanyLimited.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No.of Credits
II	**20P2BOCP2**	**Practical - II(Plant Diversity II, PlantAnatomy, Embryology, Microtechnique,MolecularBiology&GeneticEngineeringandherbalScienceandPhytotherapy)**	**5**	**5**

Objectives

- ToattainknowledgeonthevegetativeandreproductivestructuresofPteridophytesand Gymnosperms.
- ToUnderstandthestructureofmeristems, xylem,phloem, cambiumandNodalanatomyandstomata
- Tostudythedifferentmethodsemployedinmolecularbiologyandgeneticengineering

Pteridophytes

Study of vegetative and reproductive structure of the following genera: *Rhynia,Lepidodendron,Calamites,Adiantum,Ophioglossum,Botrychium,Osmunda,Gleichenia,Salvinia*and*Azolla*.

Gymnosperms

Studyofthevegetativeandreproductivestructuresofthefollowinggenera: *Lyginopteris,Heterangium,Medullosa,Pinus,Podocarpus,Araucaria,Cupressus*&*Gnetum.*

MolecularBiologyandGeneticEngineering

IsolationandQuantificationofGenomicDNA(PaddyandCoconutendosperm)ConstructionofStandard graphsforDNAandRNA
Semi-conservativereplication(Chat)
Lacoperonandtryptophan operonmodel-Demonstration
Lyticcascadeandlysogenicrepression Demonstration
RAPD,RFLP,ISSR–DemonstrationPolymeraseChainReaction–Demonstration
cDNAsynthesisDemonstration

Anatomy

Studyofdifferenttypesofapicalmeristems(ShootandRoot)–Studyofdifferenttypesofxylemelementsby macerationmethods,measurement(Micrometry).

Wood

T.S, R.L.SandT.L.Sof *Pinus*woodT.S,R.L.SandT.L.SofDicot wood

VascularCambium

CambialzoneinT.S.andL.S, storiedandnon-storiedcambium.

Phloem

Study of structure and distribution of sieve elements in Pinus, *Cucurbita* and*Tinospora*stems.Nodalstructures–Unilacunar–TrilacunarandMultilacunar.Stomataltypes –Frequencyand stomatalindex.

Embryology

Studyofdifferenttypesofanther –EmbryoandEndospermmounting.

Microtechnique

Preparationofpermanentandsemi-permanentslides(30slidesshouldbesumbitted).

HerbalScience&Phototherapy

PreparationofherbalPowderfrom Sembaruthi,ChooranamAlhimathra,Andrographis(leaf)Preparationofherbaloil Aswagandha(root) NeelibringhaammlathailumKarisalithailum,Amla,Coconutoil,Neeli Preparation of cough syrup: *Adathoda, Oldenlandia, Vitex, Glycyrrhiza*, *Piper* + jaggeryPreparation of Natural shampoo: *Ecliptaprostrate, Hibiscusrosa-sinensis,Lippianodiflora*PreparationofherbalTea:*Ecliptaprostrata, Piper,Cuminum*Preparation ofingjimarapa ,Preparation of PepperChocolate, Preparation ofherbalSoup,Preparationofherbalsalad, PreparationofherbalChutney , PreparationofpainoilPreparationofimmunobooster:KabasuraKudineer,Nilavembu Kudineer

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- learnon thevariousgenerainplantsdiversity i.e., PteridophytesandGymnosperms.
- gainbasicknowledgeaboutmolecularbiologyandgeneticengineering
- studytheinternalstructureofvarioustotissuesystemby taking system andalsolearnthemethodsofstaining.
- develop an entrepreneur skillon permanent slide preparation and marketing.
- attainknowledgeonthepreparationmethodsofherbalproductsthroughPhytotherapy

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/ Week	No. ofCredits
III	**20P3BOC8**	**Plant Systematics andEconomicBotany**	**5**	**4**

Objectives:

- Toenablethestudents to getafair knowledgeof plantsystematicofangiosperms.
- Knowthemoderntrendsintaxonomyofangiosperms.
- Todevelopskillinidentifyingtheangiospermsuptospecieslevel.
- Tounderstandthevitalroleeconomicbotany.

Unit I

AbriefstudyonmorphologyofAngiosperms(root,stem,leaf,inflorescence,flowerand fruit) - Systems of Classification: Artificial Systems - Linnaeus; Natural Systems – BenthamandHooker;PhylogeneticSystems-Hutchinson,TakhtajanandAPGIV.

UnitII

BotanicalNomenclature-ICN(MelbourneCode)–TypesandTypification–Principlesof priority and their limitations – Effective and valid publications - Author citations – Retention, Choice and rejection of names – name changes in plants – Problems innomenclature.Herbariumanditspotentialroleinteachingandresearch–Keys–Types-Preparation of dichotomous key, Flora – Monographs and revisions – Major Botanicalgardens.

UnitIII

Chemotaxonomy–Micromolecules(primaryandsecondarymetabolites)andmacromolecules(proteins,nucleicacids,polysaccharides)-NumericalTaxonomy–Biosystematics – Anatomy, Embryology, Palynology, Ecology, Cytology and Serology inrelationtoTaxonomy(each3examples)–MolecularTaxonomy-Cladistics-DNAbarcoding(Principleandapplications).

UnitIV

Vegetative,floralcharacteristics,phylogeneticrelationshipandeconomicimportance of following families: Menispermaceae, Rhamnaceae, Vitaceae, Sapindaceae,Anacardiaceae,Combretaceae,Myrtaceae,Lythraceae,Onagraceae,Aizoaceae, Sapotaceae, Boraginaceae, Convolvulaceae, Pedaliaceae,Nyctaginaceae, Loranthaceae,Aristolochiaceae,Liliaceae,Amaryllidaceae,Commelinaceae,Typhaceae,Cyperaceae.

UnitV

EconomicBotany–Fibretypesandfibreyieldingplants;Timber-Principalwoods of India, Medicinal plants -drugs obtained from roots, underground stems, barks, stems,woods, leaves, flowers and fruits, all parts of plants – Spices and condiments - Spicesobtainedfromroots,undergroundstems,barks,flowerbudsandflowers,fruits,seedsand leaves–Fattyoils: Dryingandsemidryingoils,non-dryingoils,vegetablesfats–EssentialOils:types,oilyielding plants.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbeable to

- gainknowledgeaboutvarious systems of classificationofangiosperms.
- learntheprinciplesofpriorityand their limitations.
- expandtheknowledgeoneconomically importancecashcrops.
- learn the diagnostic features of some important families of dicot and monocot plants.
- attainbasicknowledgeonchemotaxonomyandnumericaltaxonomy.

BooksforReference

- GanguleeDasandKar,CollegeBotany,Vol.II,NewCentralBookDepot,Calcutta.(1992)
- George,H.M.Lawrence(1967)Ed.TaxonomyofVascularplants,Oxford&IBHPublishingCo.Pvt.Ltd.,NewDelhi.
- Shrivastav.L.K.,Nene.M.C.andJoshi.G.V.,(1971)ElementsofBotany,ThiirdEd.KityabMahal,Allahabad.
- Pandy.H.P.(2009)Planttaxonomy(Prinicipleofpractice),SilverEconomicBotany,Silver Line Publications,Faridabad.
- Das.P.C.(2009)EconomicBotanyA.I.T.B.S.Publishers,India.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
III	**20P3BOC9**	**Microbiology and PlantPathology**	**5**	**4**

Objectives

- Tounderstandclassificationofmicrobes,structureandreproduction.
- TogainsomebasicknowledgeinsoilandIndustrialMicrobiology
- TogainknowledgeonmycosesAnd,actionofAntibiotics
- Toknow thebasisofplantpathology,cropdiseaseandtheircontrol

Unit I

General microbiology - Classification of microorganisms (Bacteria – Bergey'sManual 9thEd.)Fungi, Viruses, microalgae and protozoa. Bacteriology - morphology,structure, nutrition, reproduction and growth (growth curve and physical conditionsrequired for growth). Virology -morphology of viruses (size, shape and structure) –replication of viruses – transmission of viruses – isolation and purification of viruses –Generalaccountofmycoplasma.

UnitII

SoilMicrobiology-Commonsoilmicroflora– influenceofenvironmentalfactors – moisture,light,wind,pH,temperatureandorganicmatter.Plantsurfacemicrobiology - Definitions and explanations of the following: Rhizosphere, Rhizoplane, Phyllosphere,Phylloplane and Spermosphere.

UnitIII

Plant Pathology - History and scope – present status – Koch's postulates - Primary andSecondarysourcesofinoculums-Symptomsofplantdiseases–classification of plant diseases Dissemination of plant pathogens – Disease resistance -PlantProtection.

UnitIV

Plant microbe-interaction –Phyto-immunology - Diseases caused by bacteria(blight of paddy, black arm of cotton) - fungi (blast of paddy, red rot of sugarcane,tikkadiseaseofgroundnut)- Diseasescausedbyvirus(bunchytopofbananaandTMV)

- Diseases caused by mycoplasma (*Citrus* stubborn, corn stunt) - Control of plantdiseases–cultural,physical,chemicalandbiologicalmethods– IntegratedPestManagement –Principle andapplications.

UnitV

MedicalMicrobiology:Systemicmycoses-Dermatophytes–Therapeuticdrugs fortreatmentofdermatitisdiseases.Emergingviralinfectionsinhuman– Coronaviruses.Antibiotics-Structureandmodeofaction ofPenicillinandStreptomycin.

Course Outcomes:
Aftercompletionofthiscourse,studentswouldbe ableto

- understandthecommonsoilmicrofloraandplantsurfacemicrobiology.
- gainknowledgeaboutmicrobial system of classification.
- understandthedisseminationofplantspathogenandplantprotection.
- learnabouttheplantmicrobialintegration.
- realizetheemergingviralinfectioninmanespecially coranoand covid 19.

BooksforReference

- Schlegel,H.S.,(1986).GeneralMicrobiology6thEd.(TranslatedbyM.Kugut)Cambridge UniversityPress,London.
- Walker,J.C.,(1953).PlantPathology.ChandPublicationsPrivatelimited.
- P.D.Sharma.,(2007)Microbiologyandplantpathology2ndEd.Rastogipublications,Meerut.,India.
- Johnston,A.and Booth,C.,(1983).PlantPathologists"Pocketbook" 2ndEd.CommonWealthMycologicalInstitute London.
- G.Rangaswami, A.MahadevanDiseasesofCropPlantsinIndia.PrenticeHallofIndia. 110001.
- Mehrotra,R.S.,(1980).PlantPathology,TataMCGrawHillPublishingCompanyLimited,NewDelhi.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
III	**20P3BOC10**	**PlantBiotechnology**	**5**	**4**

Objectives

- Toknowtheprinciplesandapplicationsinvariousfieldsofbiotechnology.
- Toenablethestudenttounderstandthedifferenttechnologies involvedintissueculture.
- To impart potential application in commercial and industrial field ofagriculture
- Theknowledgeoftissueculture inthecommercialandindustrialfield ofagriculturalbased plantbiotechnology

Unit I

History and scope of plant tissue culture –Laboratory safety rules - Culturetechnique – Tissue culture media – White, MS and B5 media –Formulation and mediapreparation,sterilization-Explantpreparationandinoculation-Callusinduction– Organogenesis-Meristemculture.

UnitII

Somatic embryogenesis - Artificial seeds - Anther culture- Ovule culture– Hairyroot culture. Haploids in crop improvement - Protoplast isolation and fusion - SomatichybridizationCellandsuspensionculture–Productionofsecondarymetabolites.

UnitIII

Transformation – Gene transfer techniques– Gene construction - Control ofexpressionPromotors-Tissuespecificregulatorysequences(enhancer/silencer– RUBISCO,chlorophyllaandbbindingprotein,heatshockprotein,alcoholdehydrogenase(ADH)-Markergenes–GUS,Luciferase andNopalin(nos).

UnitIV

Agrobacterium mediated gene transfer – Ti plasmids- Characteristic features - Disarming, reconstruction of Ti plasmid -Co-integrative and binary vector - Molecularbiologyofinfection-Co-cultivation-IntegrationofT-DNAintohostgenome – Virusesasvectors - CaMV,SV40 - Direct gene transfer – Electroporation – Microinjection - Biolisticmissiles -Ca^{++}ionunderhighpH.

UnitV

Plantbiotechnologyin agricultureandindustry-Transgenicplantsforvirusresistance - Herbicide tolerance - Molecular pharming –Genetically modified organisms(GMOs)andfoods-AntisenseRNAtechnology–Delayedripening oftomato.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- atttainknowledgeonthescopeandhistoryofplanttissueculture.
- studyabouttheagrobacteriummediatedgenetransfer.
- learnabouttheroleoftsomaticembryogenesisinthefieldofplant biotechnology.
- understand the role of biotechnology in transgenic plants.
- develop the skill on genetically modified organism (GMOs) and foods.

BooksforReference

- BhojwaneSSandRazdanMK.1996.PlantTissueCulture:Theoryandpractice,Elsevi erScience.
- GuptaPK,2017.Biotechnology –7thEditionRastogiPublications,Meerut.
- SinghBD,1988.Biotechnology–KalyaniPublishers,Ludhiana.
- RamawatandChand,2010.PlantSecondarymetabolite.ChandPublications,NewDelhi
- SatgiyanarayanaU,2007.BoitechnologyBookand Allied(P)Ltd.Kolkata
- Ignacimuthus,2015.Reprint)NarosePublishingHoure,PvtLtd,NewDelhi
- GuptaPK,2015.ElementsofBoitechnology.Raotogipublications,New Delhi
- RitaSingh,2004.PlantBiotechnology.Globalvisionpublishinghouse,NewDelhi

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
III	**20P3BOC11**	**Bionanotechnology**	**5**	**4**

Objectives:

- Totaughtthebiologicalsystemsthatoperateinnanolevelalongwithinstrumentation.
- To understand the importance of future global with perspective of this technologyinthenextwavesof industries
- Tounderstandthisfieldforthestudentstoexplore thenaturallyoccurringnanotechnologyandharnessandmodifythesenonomechines
- Tounderstandofthistechnologyinexemplifiedinmolecularmedicineanddiversitysyste

UnitI IntroductoryNanotechnology

Definition - History of Nanoscience, Nanotechnology and nanobiotechnology – Need, challenges and present status of nanotechnology -Nanoscience in India andabroad–Socialandethicalissuesinnanotechnology.Nanomaterials– Types,classification and properties – Quantum dots – Significance of surface volume ratio–Preparationofnanomaterials–Top-downandBottom-up approaches.

UnitIIBasicconceptsinNanotechnologyandNanobiotechnology

Nanostuctures-Nanopores-nanowires-Nanotubes-Nanochannels-Nanorobots - Nanoshells– Nano-transistors. Carbon nanotubes and fullerenes - types,propertiesandapplications.Synthesisofnanoparticles-Microbialandgreensynthesis– Nanolithography - Nanobiosensors - Antibodies as biosensors – Engineered nanoporestodetect DNAsequencesDetectionofglucoselevelby biosensors.

UnitIIIAppliedNanotechnology

Nanotechnology applications in medicine – cancer therapy – implants; Nano-computingtechnology;Nanomaterialbasedsunscreensandcosmetics;Nanotechnologyin fuel cells, displays, batteries – Nanomaterials as catalyists. Nanotechnology in waterpurification, reducing environmental pollution, agriculture, food industries and militarybattle suits.

UnitIVMedicalNanotechnology

Nanotechnologyanditsapplicationsingenetherapy– stemcelltechnology.DNAProfiling - Blotting techniques – Southern – Northern – Western and Eastern blotting -Protein based nanotechnology – Microarray –types and applications - Computer aideddrug design - Targeted drug delivery and its advantages – Nanotechnology in tissueengineering

UnitVInstrumentsinNanotechnology

AtomicForceMicroscope(AFM)–ScanningTunnelingMicroscope(STM)-ScanningElectron Microscope (SEM) –Confocal microscope –Dynamic light scattering(DLS) X-Ray Diffractiometer (XRD) – UV-Vis-Spectrophotometer - FT-IR - Zeta potentialanalyserNanoparticleassistedPCR(NanoPCR)–NanomaterialbasedELISA(NanoElLISA),LCMS.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- impartknowledgeabout the nanoscienceandnanometerials.
- inferthebasicconceptsinnanotechnologyand nanobiotechnology.
- analysetheroleofnanotechnologyinmedicine and gene theraphy.
- knowtheapplicationofnanotechnologyincosmetology.
- learnthe skill on workingmechanismofinstrumentsinnanotechnology.

BooksforReference:

- GoodsellDS(2004).Boinanotechnologylessonsfromnature.JohnWiley&Sons,Inc.,Hoboken,New Jersey.ISBN0-471-41719-X.
- Papazoglou,ES,ParthasarathyA(2007).BioNanotechnology.Morgan&Claypoolpublishers,London,UK.ISBN:1598291386
- Shanmugam S (2019). Nanotechnology. MJP Publishers,Chennai, India.ISBN10:8180940640
- Pradeep T (20017). NANO: The Essentials – Understanding Nanoscience andNanotechnology.McGrowHillEducation(India)Pvt.Ltd,NewDelhi.ISBN:0-07-061788-0
- RavichandranK,Swaminathan,K,SakthivelB,RajdhasC(2018).Introductionto the characterization of nanomaterials and thin films. Research IndiaPublication,New Delhi.ISBN:978-93-81521-84-7
- Ramsden JR (2009). Applied Nanotechnology. Elsevier Inc., Burlington, MA01803,USA.ISBN: 978-0-8155-2023-8

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
III	**20P3BOCP3**	**PracticalIII– (PlantSystematics&EconomicBotany,Microbiology& PlantPathologyandPlantBiotechnology)**	**5**	**5**

Objectives

- ❖ Toidentifytheplantsofdifferencefamiliesthroughdichotomouskeypreparationinthetheory syllabus.
- ❖ Toacquireknowledgeoneconomicallyimportantplantsanditsproducts
- ❖ Toknowaboutthevarioustechniquesinvolvedinmicrobiologyandbiotechnology
- ❖ Togainknowledgeonthediseasesofcropplants andnanotechnology

PlantSystematicsandEconomicBotany

- Identificationandbinomialoftheplantsbelongingtothefamiliesmentionedinthetheorysyllabus.
- Preparationofdichotomouskeys(indented)
- Problemsinnomenclature
- Identificationofeconomicallyimportantplantsandplantproductsmentionedintheory syllabus.
- Gainknowledgeaboutdiversityofplantsthroughmandatorybotanicaltourand submissionof
- herbarium(30sheets)andtour report.

Biotechnology(Demonstration/Charts/Photographs)

- MediaPreparation
- Callusinduction
- ProtoplastIsolation
- Meristemculture
- Industrial FermentationModelMini– BiogasModel
- CulturingofBiofertilizers
- Bio-insecticides
- Antibiotics
- SCP–Spirulina

Microbiology

Equipments in microbiology – Hot air oven, Autoclave, Inoculation needle, filters,LAF

- Isolationofmicrobesfrom soil

- Gramstainingofbacteria
- Presumptivetest
- Effectofdifferentantibioticsofbacterialgrowth
- EffectofpHonBacterialgrowth/fungalgrowth
- MicrobialanalysisofmilkbyMethylenebluereductiontest
- IsolationofRhizobiumfromrootnodules/stemnodules
- IsolationofVAMsporesfromsoil
- AssessmentofVAMinroots.

PlantPathology

- Study of herbarium of Fresh specimens of Blight of Paddy, Black Arm of Cotton,TMV,BunchyTopofBanana,LittleLeafofBrinjal,WhiteRust,TarSpot,Rustand Smutonwheat,BrownSpot ofRice,TikkaDiseaseofGroundnut.
- BaitingTechnique–usingsunflowerseeds
- Demonstration of cell wall degrading enzyme activity by Rhizopus / Fusarium onPotatotuber discs.

Nanotechnology

- Preparationofnanopowder/nanomaterials
- Plantmediatedsynthesisofsilvernanoparticlesandanalysisby UV-Visiblespectrophotometer
- Antibacterialactivityofgreen-synthesizednanoparticles
- Microbial mediatedsynthesisof nanoparticles andanalysisby UV-Visiblespectrophotometer
- Antibacterialactivityofmicrobiallysynthesizednanoparticles
- Spotters– Nanotubes,Nanotransisters,Nanowires,STM,ConfocalMicroscope,XRD.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe able to

- understandthebasicknowledgeofplanttaxonomyandeconomicallyimportanceplants .
- exploretheknowledgeaboutplantbiotechnology.
- acquaintthemselveswithknowledgeoncellwall degrading enzyme activities.
- exhibit nanotechnology and its potential role in recent era.
- identifytherolepathogens and diseases causing mechanisminplants.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
IV	**20P4BOC12**	**ResearchMethodology**	**5**	**4**

Objectives

- Tomakethestudentstolearnthe physiologicaltechniques.
- Totrainthestudentstounderstandthemainprinciplesandapplystatisticinbiological studies
- Toenablethestudentstounderstandcomputerhardware,softwareandvariousprogramminglanguages andscientificapplicationofpackages
- Tolearnthestudentstounderstandtheproblemselectionandprojectdesign
- Tolayastrongfoundationforthestudentstounderstandthebasicsofresearchandreportpreparation.

UnitI

Principleandapplicationofphasecontrastfluorescence,scanningand transmissionelectronmicroscopy-Principle,instrumentsandapplications:Centrifuge –Ultra centrifuge – GM counter, scintillation counter, Chromatography: HPLC - GC-MS.UV-Vis-Spectrophotometer–flame photometer–Atomicabsorptionspectrophotometer – Electrophoresis–SDSPAGE.

UnitII

Scope of biostatistics – Graphical and diagrammatic representation of data– Measures of Central tendency: Mean, Median, Mode – Standard deviation – Standarderror – Test of significances - one-way ANOVA – Simple correlation and regression.Statisticalsoftwares:MANIVAand SPSS.

UnitIII

Basic knowledge of computers and Bioinformatics – Organization of a computer(CPU,inputdevices,outputdevicesandMemory)– InternetBasic(InternetBrowsing) – websites, webpages andweb links. Websites addresses – Information in the web – Internetfiletypes–savinginternettext.E-mailandattachingfiles– searchingthenet.DataBases:Nucleicacidsequences(EMBL,GenBank,DDBJ)andProteinsequenceDatabases(PIR,MIPS,SWISS-PROT,TREMBL,andPDB),Data science.

UnitIV

Research design – Choosing the problem for research – Review of literature – Primary, Secondary and Tertiary sources. Bibliography - indexing and abstracting – Reportingtheresultsofresearchinconference–Oralpresentation–PosterPresentation – Planningandpreparingathesis–Proofcorrection.

UnitV

Journal: Standard of research journals –paid and refereed journals – impactfactor, citationindex,H-index.Sciencecitationindex-Choiceofjournalsforpublication.Informationretrieval:accesstoarchivesanddatabases,searchengines:Google,Pubmed,NCBI,–Online data base library–Plagiarism.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- learntheprinciplesandapplicationofbio instruments.
- gainsome knowledgeonvariousscopes and importanceofbiostatistics.
- studythebasicinformationoncomputersand its role in bioinformatics.
- understandthevariousaspectsresearchandresearchdesign.
- attainknowledgeonstandardofresearchjournalsandplagiarism.

BooksforReference

- Jayaraman,J.,(1972).TechniquesinBiology,Higginbotham's,Pvt.Ltd.,Madras.
- Jayaraman,J.,(1985).LaboratoryManualinBiochemistry,WileyEasternLtd.,New Delhi.
- Connor&PeterWoodford,(1979).WritingScientificPaperinEnglishPitman,Medi calPub.Co.,Ltd.,England.
- Balagurusamy,E.,(1985).ProgramminginBASIC,2nd Ed.,TataMcGrawHillPub.Co .,NewDelhi.
- Dheenadayalu, R., (1987). Computer Science, Vol-I Tata McGraw Hill Pub. Co.,Ltd.,NewDelhi.
- Khan, I.A., and Khanum, A., (1994). Fundamentals of Biostatistics, Vikas Pub.,Hyderabad.
- Kothari, C.R., (1991). Research Methodology – Methods and Techniques, WileyEasternLtd.,NewDelhi.
- SreeRamulu,V.S.,(1988).ThesisWriting,Oxford&IBHPub.,NewDelhi.
- Zar,J.H.,(1984).BiostatisticsAnalysis,PrenticeHallInternational,EnglandCliffs ,NewJerseym.
- Attwood Teresa, K., Parry, Smith and David, J., (2001). Introduction toBioinformatics-cellandmolecularBiologyinActionseries,PearsonEducation(Asia)NewDelhi.
- Rastogi,S.,Mendinatta,N.andRastogi,P.,(2003).Bioinformaticsconceptsskillsa ndapplicationsCBS.Publishers,NewDelhi.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
IV	**20P4BOC13**	**Plant Physiology,Biochemistryand Biophysics**	**5**	**4**

Objectives

- Tounderstandtheroleofenzymesinvariousmetabolicactivitiesofplants.
- Tolearntheenergyrelationshipsinvariousmetabolicactivities.
- Totrainthestudentstogetknowledgeinmolecularphysiology

UnitI

Metabolic Pathways: Photochemical phase–Photosystem Iand IIandtheircomponents Emerson effect – Electron transport in PS I and PS II. Photolysis of water,Photphosphorylation. Carbon fixation: C3, C4 and CAM pathways, Kranz anatomy and itstypes,Photorespirationanditssignificance.Carbohydrates–Monosaccharidesandpolysaccharides.

UnitII

Respiration:Glycolysis,TCAcycle,Electrotransportsystemandterminaloxidation – Anaerobic respiration. Lipid Metabolism. β-oxidation. Fat of acetyl – COAGlyoxylatecycleanditssignificance.Fatsynthesis(Synthesisoffattyacids,synthesisofglycerol),Condensationoffattyacidsandglycerol.Phospholipids,Nitrogenmetabolism:Biological nitrogen fixation, Nitrate reduction, Reductive and oxidative amination – Transamination- synthesis of amino acids, role of amides. Proteins – structure andproperties.

UnitIII

Growth physiology and Photomorphogenesis: Auxin-bioassay, chemical nature,biosynthesisandmodeofaction,physiologicaleffects–Gibberellins–Chemicalnature,Mode of action and physiological effect – ABA and Ethylene, A general account ofmorphactins,vitaminsandpolyamines.Photomorphogenesis:Regulatingaspects.Phytochrome: Structure and function, phytochrome controlled photoregulation andflowerinduction:Photoperiodism andvernalization.

Unit IV

Biomolecules(inbrief)–Nucleicacids,Carbohydrates,Proteins,Lipids.Enzymes:Classification and Nomenclature – Isolation and purification – Properties – Mechanismofenzymeaction–MichaelisMentonconstantandKmvalue.Apoenzymes,co-enzymesand Isoenzymes. Activation and induction, Inhibition and repression. Factors affectingenzyme action.

UnitV

Biophysics: Thermodynamics – Laws of Thermodynamics - Redox reaction – Energy coupling reactions – Energy rich compounds – ATP, $NADPH_2$, $FADH_2$, ATP cycle.Biological energy transducers, Energy states of electron spin – ground and excitedstates, Fluorescence, Phosphorescence, Absorption and action spectrum, Mitochondrialandchloroplast Bioenergetics–Transport acrossthemembrane.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- understandthe role of photorespiration and its significance.
- inculcate the knowledge on various metabolic pathways in photosynthesis.
- makethestudentstounderstandthe growth physiology and photomorphogenesis.
- the role of various loss of thermodynamics in biophysics.
- study the mechanism of enzyme action and factors affecting it.

BooksforReference

- Lehninger,(1982).PrinciplesofBiochemistry–C.B.S.Pubanddistributors,NewDelhi.
- Bidwell,R.G.S.,(1979).2nd Ed.,PlantPhysiology,McmillanPub.Co.,Inc.NewYork.
- Devlin, R.M. and Witham, F.H., (1982). 4th Ed., Plant Physiology C.B.S. Pub. anddistributorsNewDelhi,32.
- Noggle, R. and Fritz, G.J., (1989). 2nd Introduction of Plant Physiology. Prentice HallofIndianPub.,Ltd.,NewDelhi.
- Salisbury,F.B.andRoss,(1974).PlantPhysiology–Prenticehall,IndiaLtd.,
- Jain,V.K.(2015).FundamentalsofPlantsphysiology,S.ChandandCompanyLtd.
- Verma.V.(2011).TextBookPvt.Ltd.NewDelhi.
- Satyanarayana.U.andChakrapani.U.(2010).EssentialsofBiochemistory,Booksandal lied(p)Ltd.Kolkata.
- Narayanan.P,(2008).EssentialsofBiophysicsNewAgeInternationalPublishers,New, Delhi.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
IV	**20P4BOEL3A**	**Major Elective IIIAppliedPhycology**	**6**	**4**

Objectives

- Tounderstandtheappliedaspectsofalgaeandtheirmass cultivation
- ToLearnaboutroleofalgaeinenvironmental
- Toawarestudents aboutpositiveandnativeroleofalgaeinagricultureandfisheries

Unit I

Historicalperspectivesandapplicationsofalgaeinhumanneeds–Algaeasasourceoffood,feedandbiofertilizers–Singlecellprotein–cultivationandapplications-Industrialusesof algae.

UnitII

Masscultivationofcommerciallyvaluablemarinemacroalgae(Mariculture-*Gracilaria*)–theextractionandproductionofagar-agar,carrageenan,alginatesandotherminerals. Isolation methods of algal strains. Media for the culture of micro algae (ASN_3,BG11)and macroalgae(Guillard,F/2).

UnitIII

Role of algae in environmental health: Sewage treatment, Industrial effluents andsoilreclamation.Aquatic pollution;causesandconsequence; algaeas indicatorsinassessingwaterquality-Saprobianindex.

UnitIV

Eutrophication – Types and its impacts algal blooms - toxic algae - control ofnuisance algae –Source of algal cultures -Algal culture collection of the world – Role ofalgaeingenetic modification.

UnitV

Positive and negative role of algae in agriculture and fisheries – algae in open andclosed system, various types of symbiotic algae – Algae in medicine, Parasitic algae – Phycopathology,fossil algae.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- determinetheperspectives and applications of algae.
- attainthemselvestolearn the masscultivationofcommercially availablemarinemacroalage.
- implementtheknowledgeontheroleofalgae in environment health and asindicators.
- develop an entrepreneur skill on the
- cultivation of kappaphycus.
- Trinethestudentstogetsomeawarenessaboutsomefossilalgae.

BooksforReference

- Bold&Wynne,M.J.,(1978).IntroductionofAlgae.
- Carr&Whitton,B.A.,(1981).TheBiologyofCyanobacteria,BlackWell,Oxford.
- Chapman,V.J.,(1962).TheAlgae,MacmillanCompanyLtd.,St.MartinPress,NewYork.
- Venkataraman,G.S.,(1969).TheCultivationofAlgae,I.C.A.R.NewDelhi.
- Chapman,V.J.andChapman,D.J.,(1980).Seaweedsandtheiruses,ChapmanandHall,London.
- Kumar,H.D.,(1990).IntroductoryPhycology,AffiliatedEast,WestPressPvt.Ltd.,NewDelhi.
- Loban,C.S.andWynne,M.J.,(2007).Biologyof seaweeds.Roud,F.F.,EcologyofAlgae.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
IV	**20P4BOEL3B**	**Major ElectiveIIMushroomTechnology**	**6**	**4**

Objectives

- Toknowthevarioustypes ofediblemushroomandtheirnutritionalvalue.
- Tounderstandthemethods ofcultivationofmushrooms.
- Toknowthetypesoffoodpreparedfrommushroom andtheirimportanceinhumanhealth.
- TolearnthemarketingofmushroomsinIndiaandabroad

Unit I

Introduction,history,scopeandimportanceofediblemushroomcultivation–Typesof edible mushroom available in India-*Calocybe indica, Volvariellavolvacea, Pleurotuscitrinopileatusand Agaricusbisporus.*

UnitII

Pureculture–preparationofmedium(PDAandOatmealAgarmedium)–sterilization preparation of test slants for store mother culture – culturing of *Pleurotus*mycelium on Petriplates, preparation of mother spawn in saline bottle and polypropylenebagand theirmultiplication.

UnitIII

Cultivation Technology - Infra structure: substrates (locally available), Polythenebag for bed, vessels, Inoculation hood, inoculation loop, low cost stove, sieves, culturerack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag forspawn,Mushroombedpreparation– Paddystraw,sugarcanethrash,maizestraw,bananaleaves.Factorsaffectingthemushroombed preparation-lowcosttechnology,compostingtechnology inMushroomproduction.

UnitIV

Storageandnutrition:Short-termstorages(Refrigeration– upto24hrs)Longtermstorage (canning, pickles, papads), drying, storage in salt solutions, Nutritive Value – proteinsaminoacids,mineralelements,carbohydrates,Crudefibercontentandvitamins.

UnitV

FoodPreparation-Typesoffoodspreparedfrommushroom;soup,cutlet,omelette, samosa, pickles, curry, mushroom-65 and Briyani- Research Centres – National level andRegionallevel-Cost benefit ratio-MarketinginIndiaandabroad,Exportvalue.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gettingawarenessaboutediblemushroomandtheirnutritionalvalue.
- obtainbasicknowledgeforthemethodsofcultivationofmushrooms.
- understandthe food receipes prepared from mushroom and their importantace.
- inculcate the knowledge on the difference between edible mushroom and toadstool.
- produce an entrepreneur in cultivation andmarketingofmushroomsinIndiaandabroad.

BooksforReference:

- Marimuthu,T.,Krishnamoorthy,A.S.,Sivaprakasam,K.andJayarajan,R.,(1991).
- *OysterMushrooms*,DepartmentofPlantPathology,TamilNaduAgriculturalUniversity,Coimbatore.
- Swaminathan,M.,(1990).FoodandNutrition,Bappco,TheBangalorePrintingandPublishingCo.Ltd.,No.88,MysoreRoad,Bangalore560018.
- Tewari,PankajKapoor,S.C.,(1988).MushroomCultivation,MittalPublicationsDelhi.
- NitaBahl(1984–1988). HandBookofMushrooms, IIEd., Vol. I&Vol.II.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching /Week	No. ofCredits
IV	**20P4BOCP4**	**PracticalIV– ResearchMethodologyandPlantPhysiology**	**6**	**5**

Objectives

- Toknowthevariousaspectspertainingtoresearch
- Toidentifythe instruments,theirpartsandapplications
- Topreparebuffers,standardgraphsetc.
- Toestimatevariousphysiologicalparametersinplants
- Toknow abouttheenzymesandtheirroleinplantphysiology

ResearchMethodology

1. PreparationofIndexcards.
2. Preparationofbibliography
3. Proofcorrection
4. Exercisesinthecalculationofcitationindex
5. DeterminationofimpactfactorofAuthor,ArticleandJournal.
6. Preparationofstandardgraphfor sugars
7. Preparationofstandardgraphforaminoacids
8. Preparationofstandardgraphforproteins
9. Identificationofinstruments/theirpartsandtheirapplications
10. PreparationofcomputergraphsanddiagramusingMSexcelandpowerpoint
11. Biostatisticsproblems.

PlantPhysiologyPractical

1. PreparationofBuffers.
2. StudyofHillreactionwithisolatedchloroplasts
3. Separationofaminoacidsby paperchromatography
4. Separationofpigmentsbypaper chromatography
5. Separationofpigmentsbythinlayerchromatography
6. Estimationofsolublesugars
7. Estimationofprotein
8. Estimationofaminoacids
9. Estimationofstarch
10. Determinationofsaponificationvalueoffattyacids
11. Estimationofxanthophyllsandcarotenefromthegivenmaterial
12. Findout theabsorptionspectrumofchlorophyllfromthegivenmaterial
13. Assayofnitratereductaseactivity
14. AssayofGSactivity
15. AssayofCatalaseactivity

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- understandthebasicknowledgeonvariousaspectsofresearchmethodology
- study about the research journals and usage of software to check the plagiarism
- analysis the application of chromatography in pigment and aminoacid separation.
- input the intellegence to prepare the graphs using the MS excel and power point.
- gainknowledgeonthepracticalapplicationsofplantsphysiology

Semester	CourseCode	TitleoftheCourse	Hours of Teaching /Week	No. ofCredits
I	**20P1BOCOP1**	**CoreOptional-Evolutionand Behaviour**	**6**	**4**

Objectives:

- Toknowtheemergenceofevolutionarythoughts
- Tolearntheoriginofcellsand unicellularevolution.
- Toknowthepalaeontologyandevolutionaryhistory.
- Tolearnaboutmolecularevolutionandpopulationgenetics

UnitI

Emergence of evolutionary thoughts: Lamarck; Darwin–concepts of variation,adaptation,struggle,fitnessandnaturalselection;Mendelism;spontaneityofmutations;theevolutionary synthesis.

UnitII

Originofcellsandunicellularevolution:Originofbasicbiologicalmolecules;abioticsynthesisoforganicmonomersandpolymers;conceptofOparinandHaldane;experimentofMiller(1953);thefirstcell;evolutionofprokaryotes;originofeukaryoticcells;evolutionofunicellulareukaryotes;anaerobicmetabolism,photosynthesisandaerobicmetabolism.**UnitIII**

Paleontologyandevolutionaryhistory:Theevolutionarytimescale;eras,periodsand epoch; major events in the evolutionary time scale; origins of unicellular andmulticellularorganisms;majorgroupsofplantsandanimals;stagesinprimateevolutionincludingHomo.

UnitIV

Molecular Evolution: Concepts of neutral evolution, molecular divergence andmolecular clocks; molecular tools in phylogeny, classification and identification; proteinand nucleotide sequence analysis; origin of new genes and proteins; gene duplicationanddivergence.

UnitV

The Mechanisms: Population genetics – populations, gene pool, gene frequency;Hardy-Weinberg law; concepts and rate of change in gene frequencythrough naturalselection, migration and random genetic drift; adaptive radiation and modifications;isolating mechanisms; speciation; allopatricity and sympatricity; convergent evolution;sexualselection;co-evolution.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gainbasicknowledgeonoriginof life and emergence of evolutionary thoughts.
- learn about paleobotany and evolutionary history.
- study about the molecular tools and its potential role in physiology.
- understand the concepts of paleonbotony and its evolutionary history.
- studyaboutconceptsofmolecularevolution,attainknowledgeaboutpopulationgenetics.

BooksforReference:-

- EdwardM.Barrows(2001).TheAnimalBehaviourDeskReference:A DictionaryofAnimalBehaviour, EcologyandEvolution (SecondEdition). CRCPressLLC.
- Anderson, Judith. 1989. A methodological critique of the evidence for genetic similaritydetection. BehavioralandBrainSciences,12:3p.518
- hilippeRushton,J.P.,(1995).*Race,Evolution,andBehavior:ALifeHistoryPerspective*3rdEd., Transaction Books, later The Charles Darwin Research Institute London School ofEconomicsUniversityofOxford.
- Weizmann, Fredric (November 2001). Race, Evolution, and Behaviour: A Life HistoryPerspective(Review).*CanadianPsychology.*
- Kondalkar, V.G., (2007). Organizational Behaviour. New Age International (P) Limited,Publishers.4835/24,AnsariRoad,Daryaganj,NewDelhi–110002Visitusatwww.newagepublishers.com

Semester	CourseCode	TitleoftheCourse	Hours of Teaching /Week	No. of Credits
II	**20P2BOCOP2**	**CoreOptional-CellCommunicationandCell Signaling**	**5**	**4**

Objectives

- Toknow thehostparasiteinteractions.
- Tolearnthecellsignalingand pathways
- Toenablethestudentstounderstandtheinteractionofcancercellswithnormalcells
- Toknowtheinnateandadaptiveimmunesystem

Unit I

Hostparasiteinteraction:Recognitionandentryprocessesofdifferentpathogenslikebacteria,virusesintoanimalandplanthostcells,alterationofhostcellbehaviorbypathogens,virus-inducedcelltransformation,pathogeninduceddiseasesinanimalsandplants,cell-cell fusioninbothnormal and abnormal cells.

UnitII

Cell signaling: Hormones and their receptors, cell surface receptor, signalingthrough G-protein coupled receptors, signal transduction pathways, second messengers,regulation of signaling pathways, bacterial and plant two-component signaling systems,bacterialchemotaxis and quorum sensing.

UnitIII

Cellular communication: Regulation of hematopoiesis, general principles of cellcommunication, cell adhesion and roles of different adhesion molecules, gap junctions,extracellularmatrix,integrins,neurotransmissionanditsregulation.

UnitIV

Cancer:Geneticrearrangementsinprogenitorcells,oncogenes,tumorsuppressorgenes,cancerandthecellcycle,virus-inducedcancer,metastasis,interaction of cancer cells with normal cells, apoptosis, therapeutic interventions ofuncontrolledcell growth.

UnitV

Innate andadaptive immune system: Cellsandmoleculesinvolvedin innateandadaptiveimmunity,antigens,antigenicityandimmunogenicity.BandTcellepitopes,structureandfunctionofantibodymolecules,generationofantibodydiversity,monoclonalantibodies, antibody engineering, antigen-antibody interactions, MHC molecules, antigenprocessing and presentation, activation and differentiation of B and T cells, B and T cellreceptors,humoral andcell mediated immuneresponses.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- understandcellsignaling through G-Protein coupled receptors
- gainknowledgeoncellularcommunication and neuro transmission and its regulation.
- Learn apoptosis, theorpaeutic intervention of uncontrol cell growth .
- understand the interaction of cancer cells with normal cells and its therapeutic intervention.
- knowaboutinnateandadaptiveimmunesystem

BooksforReference

- B.Alberts,A.Johnson,J.Lewis,M.Raff,K.Roberts,P.Walter.(2002).MolecularBiologyoftheCell,4theditionNewYork:Garland Science.
- A.Mitra (2009). Lecture Notes on Mobile Communication. A Curriculum Development CellProjectUnderQIP,IITGuwahati.DepartmentofElectronicsandCommunicationEngineering. Indian InstituteofTechnologyGuwahati.Guwahati,781039,India.
- Hausman,GeoffreyM.Cooper,RobertE.(2000).SignalingMoleculesandTheirReceptors.InNCBI bookshelf. Thecell:amolecularapproach(2ndEd.).Washington.

Semester	CourseCode	TitleoftheCourse	Hours ofTeaching/Week	No. ofCredits
III	**20P3BOCOP3**	**Core Optional-WoodTechnology**	**5**	**5**

Objectives

- Tounderstandthesignificanceofwood.
- Tolearnthechemicalcomposition,structureandpropertiesofwood
- Toidentifythedefects ofwoodduetofungiandinsectsattack
- Toknowthedurabilityofwoodandmethodsofwoodpreservation

Unit I

Microscopicstructureofwood:Vessels,Tyloses,Tracheids,Fibres,Woodparenchyma, Wood rays, Grain and Texture. Organisation of the cell wall - Microfibril -Orientation, cellwallpit-structure.Identificationandclassificationofwood.

UnitII

Chemicalcompositionofwood,structureandpropertiesofCellulose-Hemicellulose - Wood polysaccharides and Lignin. Distribution of chemical constituentsinwood.Physicalpropertiesofwood-Colour-Lustre-Fluorescence-OdourandWeight.

UnitIII

Mechanical properties of wood - Bending properties - Composition - Hardness - Shear.PropertiesofDicotandMonocotwood.Growthringsinwood-Annualrings,earlywoodand late wood, soft wood and hard wood, pycnoxylic and manoxylic wood.Dendrochronology.

UnitIV

Defects of wood - Knots - Reaction wood - Compression and tension wood - Cross- grain - variation in log form - shake - pitch pocket - Drying crack and Logginginjury.Defectsinseasoningandmachiningofwood,Defectsduetoweathering-Defectsofwood due tofungi andinsects.

UnitV

Natural durability of wood - Wood preservation - Non-pressure processes - Pressure process - Chemical processing of wood - Commercial wood species andidentification, Synthetic woods, Marine plywood, Fuel wood, pulp and paper makingwoods,matchstickwood.Economicimportance ofpulpandwood.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- gainknowledgeaboutthemicroscopicstructureofwood
- learnbasicinformationon themechanicalpropertiesofwood.
- observe the economic importance of various types of wood and its preservation.
- start timber depo by gaining the knowledge as an entrepreneur in relation to timbers value of commercially important wood.
- identifydefectsanddurabilityof commercially important woods

BooksforReference

- Brown *etal*.(1981).TextbookofWoodTechnology.TataMcGraw-Hill,NewDelhi.
- Brown,H.P.(1985).ManualofIndianWoodTechnology.InternationalBooksandPeriodicalsSupplyService,NewDelhi.
- Chowdhury,K.A.andGhose,S.S., (1958).IndianWoods.PublicationDivision,GovernmentofIndia, NewDelhi.
- Franz,F.P.,KollmannandWilfredA.Cote,Jr.(1968).PrinciplesofWoodScienceandTechnology.Vol. I:SolidWood.Springer-Verlag,NewYork.
- Franz,F.P.Kollmann(1988).WoodScienceandTechnology.Vol.IandII.SpringerVerlag,NewYork.
- PearsonandBrown(1984).CommercialTimbersof India.GovernmentofIndiaPublication,NewDelhi.
- Tieuran,H.D.(1951).WoodTechnology.PituranPublishingCo.,NewYork.
- Vaux,H.J.(1949).Textbookof WoodTechnology.Vol.I.McGraw Hill,New York.
- Vaux,H.J.(1952).TextbookofWoodTechnology.Vol.II.McGrawHill,NewYork

Semester	CourseCode	TitleoftheCourse	Hours of Teaching /Week	No. of Credits
IV	**20P4BOCOP4**	**Core Optional - MolecularTaxonomyand Phylogeny**	**5**	**5**

Objectives

- Toobtainsomebasic knowledgeaboutthemicrobialtaxonomy
- Tolearnthebiochemicalandmoleculartaxonomy
- Tounderstandthemolecular phylogenyofmicrobes

Unit I

MicrobialTaxonomy-Introductiontomicrobialtaxonomy–morphologicaltaxonomy, biochemical taxonomy, and molecular taxonomy.Numerical taxonomy – basicconceptsoftaxonomy.Positiveandnegativeaspectsofeachtaxonomicalmethod.Morphological phylogeny.

UnitII

Biochemical & molecular taxonomy - Chemotaxonomy - fatty acid, protein fingerprinting,Isozymetyping,pigments&polyamines.Biochemicalphylogeny.Moleculartaxonomy––G+Ccontent,DNA–DNAhybridization,Plasmidprofiles,RFLP,RAPD,STRR&LTRR,REP –PCR,rRNAbased DNAfingerprinting methods.

UnitIII

16SrRNAbasedfingerprinting-TypesofrRNA-23srRNA, 16SrRNA&5SrRNA.Importance of 16SrRNA in microbial identification and taxonomy. Methods of 16S rRNA /rDNA fingerprinting - Isolation of rRNA, RT- PCR, Isolation of DNA, amplification of 16SrDNA using PCR, Cloning, transformation, Blue-white screening, Plasmid isolation, Dotblot/Southern blot hybridization using specific probes Sequencing of 16S rDNA usingchain-terminationmethod.

UnitIV

Sequenceanalysis-SubmissionofrDNAsequencesinGenBank–Bankkit&Sequinguidelines.NCBI,EMBL&DDBJ–retrievingsequences.RNAstructureprediction,Restriction enzyme patterns. Ribosomal Database Project - Designing primers & probes.Sequence comparison, alignment and data base searching – ClastalW, FASTA & BLAST.DNAbarcoding.

UnitV

Molecular phylogeny - Introduction to Molecular phylogeny – tree terminology,softwareprogramsformakingphylogenetictrees–MEGA,Phylib,RAPDistance.Cladogram,additivetreesandultrametrictrees,rooted, unrootedtreesandtreeshapes.

Course Outcomes:

Aftercompletionofthiscourse,studentswouldbe ableto

- learnthe basicconceptsof morphology phylogeny.
- acquirefundamentalknowledgeinbiochemicalandmoleculartaxonomy
- understandtheconceptsof16SrRNAbasedfingerprinting.
- inculcate the knowledge oh sequence analysis and molecular physiology.
- realize the role of software programmes for making phylogenetic tree.

BooksforReference:

- Roderic,D.M.Page,EdwardC.Holmes,(1998).MolecularEvolution:APhylogeneticApproach. Blackwellpublishing, USA.
- Primrose, S.B., (1998). Principles of Genome Analysis: A Guide to Mapping andSequencingDNAfromDifferentOrganisms.
- Adolph,W.,(1996).MicrobialGenomeMethodsbyKenneth)GenomeMappingandSequencingbyIanDunham (Hardcover-Sep1,2003).
- BrendanWren(Editor),NickDorrell(2002)FunctionalMicrobialGenomics(Volume33)(MethodsinMicrobiology),AcademicPress,UK.
- SandyB.PrimroseRichardM.Twyman(2005)PrinciplesofGenomeAnalysisandGenomics, BlackwellPublishing, USA.

COMMUNICATION SKILL AND PERSONALITY DEVELOPMENT

SEMESTER	SUBJECT CODE	TITLE	HOURS OF TEACHING/ WEEK	NOOF CREDITS
IV	20P4-CPD	Communication Skill and Personality Development	1	

COURSE OBJECTIVES:

- To cultivate positive personality traits for successful life.
- To groom Winning Attitude among the learners.
- To assist the learners to identify their own potential and realize their aspirations.
- To enable a holistic development.
- To facilitate optimum means of improving personal performance.

UNIT 1

1. Personality- Definition.
2. Determinants of Personality.
3. Perceptual Process.
4. Personality Traits.
5. Developing Effective Habits.
6. Self Esteem (Freud and Erikson).
7. Self Appraisal and Self Development.
8. Dos and Don'ts to develop positive self esteem.
9. Interpersonal Relationship.
10. Difference between Aggressive, Submissive and Assertive behaviour.
11. Mind Mapping, Competency Mapping, 360 degree assessment.
12. Presentation Skills – Opening, ending, Handling nerves, Handling audience, Power Storytelling, Visual aids, Question and answer session

UNIT 2

1. Projecting Positive Body Language.
2. Conflict Management.
3. Change Management.
4. Stress Management.
5. Time Management.
6. Goal Setting.
7. Assertiveness and Negotiating Skill.
8. Problem Solving Skill.
9. Decision Making Skills.
10. Leadership Qualities of a Successful Leader.
11. Attitudes – Positive Attitudes.
12. Public Speaking – Engaging, Connecting, and Influencing the audiences.
13. Employability Skill – Group Discussion, Interview Questions, Psychometric analysis.

COURSE OUTCOMES:

After completion of the course, Students will be able to:

- Gain self confidence and broaden perception of life.
- Maximize their potential and steer that into their career choice.
- Enhance one's self image&self esteem.
- Find a means to achieve excellence and derive fulfilment.

References:

Hurlock.E.B (2006) : Personality Development, 28th Reprint. New Delhi: Tata McCraw Hill.

Stephen.P.Robbins and Timothy. A.Judge (2014) : Organisation Behaviour.16thEdition.Prentice Hall.

Andrews, Sudhir. How to Succeed at Interviews. 21st (rep) New Delhi.Tata McGrew Hill 1988.

Lucas, Stephen. Art of Publication. New Delhi. Tata McGrew Hill. 2001.

Kumar, Pravesh. All about Self Motivation. New Delhi. Goodwill Publication House. 2005.

EXTRA DISCIPLINARY COURSES

Sl. No.	Subject Code	Title of the Paper	Department
1.	20P3HYEDC	**INDIAN ADMINISTRATION**	History
2.	20P3ECEDC	**ISSUES IN INDIAN ECONOMY**	Economics
3.	20P3TAEDC	***தமிழ்மொழி வரலாறு***	Tamil
4.	20P3ENEDC	**SHAKESPEARE STUDIES**	English
5.	20P3CMEDC	**ENTREPRENEURIAL DEVELOPMENT**	Commerce
6.	20P3MAEDC	**APPLICABLE MATHEMATICAL TECHNIQUES**	Mathematics
7.	20P3PHEDC	**FUNDAMENTALS OF NANOTECHNOLOGY**	Physics
8.	20P3CHEDC	**CHEMISTRY IN EVERY DAY LIFE**	Chemistry
9.	20P3BOEDC	**MEDICAL BOTANY AND PHARMACOGNOSY**	Botany
10.	20P3MBEDC	**MUSHROOM TECHNOLOGY**	Microbiology
11.	20P3ZOEDC	**CLINICAL LAB TECHNOLOGY**	Zoology
12.	20P3BTEDC	**RECENT TRENDS IN BIOTECHNOLOGY**	Biotechnology
13.	20P3CSEDC 20P3ITEDC	**E-LEARNING TECHNOLOGIES**	Computer Science
14.	20P3LSEDC	**DOCUMENTATION CENTERS IN INDIA**	Library and Information Science

Semester	Course Code	Title of the Course	Hours of Teaching /Week	No. of Credits
III	**20P3HYEDC**	**Extra Disciplinary Courses – Indian Administration**	**5**	**--**

Objectives:

1. To know the evolution of Indian Administration.
2. To prepare the students for the competitive examination.
3. To give up-to-date knowledge on Indian administration.
4. To trace economic planning of India, through which the students may get practical knowledge on budget, etc.
5. To expose the state administration and the latest issues like Lok Ayukt and LokPal through which the students may get awareness about the latest issues.

Unit I ***Hrs 15***

The evolution of Indian administration: Structure and Functions–Mauryan and Mughal legacy; British Indian system: Company's experiments–Warren Hastings, Lord Cornwallis, Lord Hastings and Lord Dalhousie; Administrative consolidation since 1861 – Famine policy - Financial, Police and judicial administration.

Unit II ***Hrs 15***

Indian Administration since 1950: Parliamentary Democracy–Federation–Structure of Central Administration–Central Secretariat–Cabinet Secretariat, Ministries–Department of Boards.

Unit III ***Hrs 15***

Machinery for planning: Plan formulation at the National level – National Development Council – Planning Commission – Public undertaking – Controls of Public expenditure.

Unit IV ***Hrs 15***

State Administration–Executives–Secretariat–Chief Secretary–Directorates–District and Local Administration–District Rural Development Agency–Special development programmes.

Unit V ***Hrs 15***

Center-State relations – Public services – Police and Judicial administration – Lok Ayukt – Lok Pal – issues on Indian administration – Integrity in administration – Administrative reforms.

General References:

1. Altekar, A.S., State and Government in Ancient India, 1958.
2. Bhambri, C.H., Public Administration in India.
3. Vidya Bhushan, Indian Administration, Delhi, 2000.
4. Vishnoo Bhagawan & Vidhya Bhushan., Indian Administration, New Delhi, 1996.

Course Outcome: The students have clearly understood about the evolution of Indian Administration, State and Central administration, police and judicial administration, Centre State relations, etc.

Semester	Subject code	Title of paper	Hours of Teaching / Week	No. of Credit
III	**20P3ECEDC**	**Extra Disciplinary Courses – Issues in Indian Economy**	**4**	**-**

Objective:

- This Elective paper is offered to the Non-Economics Students to make them familiar with the recent trends in Indian Economy. The syllabus is framed accordingly with the Civil Service Examination.

Course Outcomes

- To understand the status of Indian economy before the reforms
- To assess the rationale of introducing reforms in India
- To familiarize with the package of LPG
- to get insight on the recent trends in EXIM policy

Unit I **Hrs 15**

Economic development and growth – determinants of growth and development – Market Economy – Indian Economy – a shift form mixed economy to Market economy – Reform measures introduced in India – First and second generation reforms – (Brief out line)

Unit-II **Hrs 15**

Economic reforms in India – background, rational – implementation – Trade policy – Industrial policy – exchange rate and capital market reforms

Unit-III **Hrs 15**

Dis-investment of public enterprises – rational – changing profile of PSUs comparison of public and private sector

Unit-IV **Hrs 15**

Privatization – Meaning and scope – Globalization – impact on India – foreign capital – Types FDI and FII, Policies and pattern.

Unit-V **Hrs 15**

Foreign Trade – Exim Policies – Recent exim policy – BOP- Trends in BOP – Economic reforms and BOP.

References:

Uma kapila – Indian Economy (Issues in Development and Planning and Sectoral aspects) Fifth Edition, 2006-07, Academic Foundation, New Delhi

Datt Ruddar &

Sundharam K.P.M. - Indian Economy (2007)

Misrapuri - Indian Economy

Semester	Subject Code	Title of the Paper	Hours of Teaching/Week	No. of Credits
III	**20P3TAEDC**	**கூடுதல் சிறப்புப் பாடம்: தமிழ்மொழி வரலாறு**	**4**	**-**

கூறு: 1 இந்திய மொழிக் குடும்பங்கள் நேரம்: 12

இந்தோ ஆரிய மொழிகள் - ஆஸ்டிக் மொழிகள் - சீன திபெத்திய மொழிகள் - திராவிட மொழிக் குடும்பம் - டாக்டர் கால்டுவெல், திராவிட மொழிகளின் சிறப்பியல்புகள் - தென் திராவிட மொழிகள் - தென் திராவிட மொழிகளில் தமிழ் - நடுத்திராவிட மொழிகள் - வட திராவிட மொழிகள்.

கூறு: 2 தமிழ் நேரம்: 12

தமிழ் என்பதன் வடிவம் பற்றியும் பொருள் பற்றியும் பல்வேறு செய்திகள் - பெயரெச்சங்கள் - வினையெச்சம் - சங்க இலக்கியத்தில் வினையெச்சங்கள் - தொல்காப்பிய உரைகாரர்களும் வினையெச்சங்களும்.

கூறு: 3 நேரம்: 12

தமிழ் எழுத்தின் தோற்றமும் வளர்ச்சியும் - ஆய்வெழுத்து இராசியெழுத்து, நாள், எழுத்து - ஓவியம், பானை ஓடுகள், இலங்கை முத்திரை முதலானவற்றில் காணப்படும் உருவ எழுத்துகள் - வட்டெழுத்து, பண்டைத் தமிழ் எழுத்து. தமிழ்மொழி வரலாறு: தமிழின் தொல் வரலாறு, தமிழ்மொழி வரலாறு - பழந்தமிழ்க் காலம், இடைத்தமிழ்.

கூறு: 4 நேரம்: 12

தொல்காப்பியமும் ஒலியியலும் - தொல்காப்பியமும் சொல்லியலும் - தமிழ் ஒலிகளின் பிறப்பு விளக்கம் - புணர்ச்சி வகை. தமிழ் உருபனியலும் தொடரியலும் - தலைமை இலக்கணக் கூறுகள் - தொடரமைப்பு இலக்கணம். பெயர்த்தொடர் அமைப்புகள்: மொழியின் பெருமை - எழுத்தும் பேச்சும் - கிளை மொழிகள் தோற்றம் - இலக்கியக் கிளைமொழி- வட்டாரக்கிளை மொழிகள்.

கூறு: 5 நேரம்:12

தமிழ் வளர்ச்சி - தமிழ் ஆட்சிமொழி வரலாறு - தமிழ் கல்விமொழி வரலாறு - கலைச் சொல்லாக்கம் - அறிவியல் தமிழ் வளர்ச்சி-உலகத் தமிழ் மாநாடுகள்- உலக அரங்கில் தமிழ் - தமிழ் அமைப்புகள்- உலகத் தமிழாராய்ச்சி நிறுவனம் - தமிழ்ப்பல்கலைக் கழகம்-செம்மொழி ஆய்வுமையம் - அயல் மாநிலங்களில் தமிழ்.

பார்வை நூல்கள்:

1. *தமிழ் வரலாறு - தேவநேயன். ஞா.*
2. *தமிழ் மொழி வரலாறு - பரிதிமாற்கலைஞர்*
3. *பழந்தமிழ் - இலக்குவனார் . சி*
4. *தமிழ் வரலாறு - குணா*
5. *தமிழ் மொழி வரலாறு - தமிழ் வளர்ச்சி இயக்ககம்*
6. *ஆட்சித் தமிழ் - புதுவை மொழியியல் பண்பாட்டுக் கழக வெளியீடு*
7. *இந்திய ஆட்சிப்பணி வழிகாட்டி - முனைவர் ெர. குமரன்.*
8. *உலகத்தமிழ் மாநாடுகள் - சாலை இளந்திரையன்*
9. *தாய்மொழியில் படிக்க வைப்போம் - NCBH வெளியீடு.*
10. *தமிழ் ஆட்சி மொழி வரலாறு - தமிழ்ப்பல்கலைக்கழகம்.*
11. *தமிழ் ஆட்சிமொழி வரலாறு - தெ.பொ.மீ.*
12. *தமிழ் மொழி வரலாறு - சக்திவேல்*

Semester	Course Code	Title of the Course	Hours of Teaching / Week	No. of Credits
III	**20P3ENEDC**	**Extra Disciplinary Course - Shakespeare Studies**	**4**	

Objective

- To initiate the non English majoring students to study Shakespeare's plays, and his sonnets.

Outcome

- Gaining appreciative and analytical understanding of Shakespeare's dramas and sonnets.
- Achieving potentiality to situate and relate Shakespeare's wisdom in various current disciplines and media cultures.
- Obtaining a profound perspectives on handling racism, class divisions, gender roles, crime, love, war, death betrayal, hope, loyalty etc., derived from the works

Unit – I

Shakespeare's Sonnets 1, 18, 29, 33, 35, 65 and 130

Unit – II

The Merchant of Venice

Unit – III

Henry IV, Part I

Unit – IV

Othello

Unit – V

Antony and Cleopatra

References:

- Bates, Jonathan. *The Genius of Shakespeare.* London: Picador, 1997.
- Leishman, J.B. *The Theme and Variation in Shakespeare's sonnets.* London: Routledge, 2005.

Semester	Subject Code	Title of the paper	Hours of Teaching/ Week	No. of Credits
III	**20P3CMEDC**	**Entrepreneurial Development**	**4**	**-**

Objective:

- To make the students to become a successful entrepreneur and to know the process involved in entrepreneurship.

Course Outcome:

- Learn the incentives and subsidies provided to budding entrepreneurs and Become familiar with institutions offering various forms of assistances.

Unit - I

Entrepreneurship - Nature and Characteristics of an Entrepreneur - Difference between Entrepreneur and Manager - Qualities, Types, and Functions of an Entrepreneur - Role of Entrepreneur in Economic Development.

Unit - II

Business Ideas - Sources of Idea - Idea Processing and Selection - Start up Process - Project Identification and Selection - Project Formulation - Project Appraisal.

Unit - III

Factory Design and Layout - Importance - Factors affecting Factory Design - Factory Layout - Objectives - Types - Consideration in Designing Layout - Design Requirements.

Unit - IV

Institutions Assisting to Entrepreneurs - NSIC - SIDCO - SSIB - DIC – TIIC – KVIC – TCO – ITCOT - Commercial Banks and New Entrepreneurial Development Agency.

Unit - V

Entrepreneurship Development Programmes - Need - Objectives - Institutional efforts in Developing Entrepreneurship – Evaluation of EDPs – Problems in the conduct of EDPs – Suggestions to make EDPs effective – Planning EDPs - Role of SISI, SIPCOT and SIDBI – Recent Development in Small Enterprises in India – Government rules and regulations – Rural Entrepreneurship – Need for Rural Entrepreneurship Problems – SHGs and Rural Development – MUDRA Banking /MSME Loans.

Text book:

1. C.B.Gupta., N.P.Srinivasan, (2018), Entrepreneurial Development, Sultan Chand & Sons, New Delhi.

Reference Books

1. Khanka S.S., (2019) Entrepreneurial Development, S.Chand & Co, New Delhi.
2. Saravanavel, P. (2016), Entrepreneurial Development, Principles, Policies and Programmes, Ess Pee Kay Publishing House, Tanjore.
3. Renu Arora, Sood S.K., (2018)Fundamentals of Entrepreneurship and Small Business, Kalyani Publications, Ludhiana.
4. Jayashree Suresh, (2019)Entrepreneurial Development, Margham Publications, Chennai.

Semester	Subject Code	Title of the Paper	House of Teaching / Week	No.of Credits
III	**20P3MAEDC**	**Extra Disciplinary Course- Applicable Mathematical Techniques**	**4**	**-**

Objectives:

- To discuss various methods of Interpolation

Out comes: After studying this course the student will be able to

- Student will demonstrate the ability to solve financial math problem.

Unit I **12 Hrs**

Interpolation with unequal intervals: Newton's divided difference formula - Lagrange's interpolation formula and inverse interpolation. (Only simple Problems)

Unit II **12 Hrs**

Assignment problems

Unit III **12 Hrs**

Replacement problems (Only simple Problems)

Unit IV **12 Hrs**

Decision Analysis

Unit- V **12 Hrs**

Game Theory

Text Book:

1. *For unit I,* ***Numerical Methods*** *– P. Kandasamy, K. Thilagavathy, K. Gunavathy, S.Chand*
2. *For units II to V,* ***Operation Research 12th Edition 2004:****KanthiSwarap, P.K. Gupta and Manmohan, Sultan Chanda and sons, New Delhi.*

   Unit I : Chapter - 8 (Sec: 8.5, 8.7)

   Unit II : Chapter - 11 (Sec: 11.1 to 11.4)

   Unit III : Chapter - 18 (Sec: 18.1 to18.3)

   Unit IV : Chapter - 16 (Sec: 16.1 to 16.5)

   Unit V : Chapter - 17 (Sec: 17.1 to 17.6)

General Reference:

1. *S.S. Sastry Introductory Methods of Numerical Analysis Prentice Hall of India 2000.*
2. *H.A. Taha Operation Research Prentice Hall of India 1995.*

Semester	Subject Code	Title of the paper	Hours of Teaching / Week	No. of Credits
III	**20P3PHEDC**	**Extra Disciplinary Course- Fundamentals of Nanotechnology**	**4**	**-**

Unit – I Introduction to Nanotechnology

Nanotechnology – Definitions - History of nanotechnology – Nanomaterials: classification – zero, one and two dimensional nanomaterials – Classification based on the composition of materials (metal, semiconductor, ceramic, polymeric and carbon-based nanomaterials) - Properties of nanomaterials – Surface area to volume ratio (S.A/V) – Quantum dots - Challenges in nanotechnology.

Unit – II Preparation Methods

Top-down and Bottom-up approaches – Top down methods: Ball milling - Electron beam lithography – Advantages – Limitations. Bottom-up methods: Vacuum evaporation - Sputter deposition process - Laser ablation

– Advantages – Limitations.

Unit – III Fullerenes

Fullerenes – Types of fullerenes – Bucky ball/Buckminster fullerene - Carbon nano tubes (CNTs) - Single walled CNTs – Multi walled CNTs – Differences – mechanical and electrical properties of CNTs - preparation of CNTs – Plasma discharge method – Applications.

Unit – IV Characterization Techniques

Construction, working principle, merits and demerits of X-ray diffractometer - Scanning Electron Microscope (SEM) – Atomic Force Microscope (AFM) - UV-Vis–NIR double beam spectro photometer – Energy dispersive X-ray analysis (EDAX) .

Unit – V Applications

Nanoelectronics – Nanophotonics – Nanomaterials in energy conversion and storage – Nanomaterials as antibacterial agents – Nanomaterials as photocatalysts – Nanomaterial in industrial applications – Bio-medical applications : Targeted drug delivery – Nanomaterial based radiation therapy – Photodynamic therapy (PDT) – Bio imaging.

Books for Study

1. K. Ravichandran, K. Swaminathan, P.K. Praseetha, P. Kavitha, Introduction to Nanotechnology, JAZYM publications.
2. M.Ratner.et al., Nanotechnology; A Gentle intro Practices – hall ISBN 0-13-101400-5, 2003.
3. Nanotechnology; Basic Science and Emergining Technologies, CRC Press

Books for Reference

1. Charles P.Poole Jr and Frank J.Owens. "Introduction to Nanotechnology" Wiley, 2003.
2. A. S. Edelstien and R.C. Cornmarata, Nanomaterials; synthesis, Properties and Applications, 2ed, Iop (U.K), 1996.

Semester	Subject code	Title of the paper	Hours of Teaching/ Week	No. of Credits
III	**20P3CHEDC**	**Extra Disciplinary Course - Chemistry in Every Day Life**	**4**	

OBJECTIVES

Students learn about the scientific and chemical principles underlying in everyday life.

- Students learn about the cleaning agents and water chemistry,
- Students understand about the food chemistry,
- Students shall learn about the cosmetic and their effect in health aspects
- Students shall know about the green chemistry and their significance for clean environments
- Students learn about the nano technology and their importance.

Unit-I

Cleaning agents - manufacture and uses of soaps, detergents, baking powder, shampoo, washing powder and bleaching powder **Water –** uses of water Characteristics' of water, soft water and hard water - removal of hardness – ion exchange method. Reverse osmosis method, Water pollution, causes and prevention.

Unit-II

Food – importance – spoilages – causes, preservation – additives – colouring and flavouring agents, beverages. Soft drinks aerated water – manufacturing – mineral water. Fruits, vegetables, dairy product – storage, preservation. Minerals in food and anti oxidants. Preparation of fruit Jam and pickle.

Unit-III

Cosmetics – Face powder – constituents, uses – side – effects. Nail polish, hair dye – composition and side effects. Tooth powder – lotions. Preparation of phenyl, liquid blue and incense sticks.

Unit-IV

Basic concepts of Green chemistry and its significance in day to day life. Polymers – Classification – Types of polymerization – plastics – classification – types of plastics – PVC, Teflon, PET, Bakelite – Rubber – Natural and synthetic – Bunas rubber, Butyl Rubber. Vulcanization of rubber, neoprene rubber, Plastic pollution and prevention.

Unit-V

Basic concepts of Nano Technology and its importance in day to day life.

Dyes – importance of food colours – PFA (Prevention of Food Adulteration Act) Natural dyes – Synthetic Classification importances – Uses of the following Synthetic dyes - Direct dyes, acid dye, Basic dye, mordant dye, Reactive dye, Disperse dye, Fastness – Light and Washing. Application of dyes in food, paper, plastic and lather.

COURSE OUTCOME:

- Students should able to learn about the cleaning agents and water chemistry,
- Students should able to understand about the food chemistry,
- Students should able to learn about the cosmetic
- Students shoud able to know about the green chemistry
- Students should able to learn about the nano technology

References:

1. Norrish Shreave. R. and Joseph A. Brink Jr Chemical Process Industries, McGraw Hill, Industrial Book Company London 1978.
2. Brain A.C.S. Reinhold, Production and properties of Industrial chemicals 11th Ed, John Wiley & Sons, New York.
3. Burgh, A. Fermentation Industries, Inter science, 4th Ed, 1983, A *Inter science*, New York.
4. Ramani,V. Alex, Food Chemistry(2009),MJP publishers.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	**20P3BOEDC**	**Extra Disciplinary Course – Medicinal Botany and Pharmacognosy**	**4**	**-**

Objectives

- To enable the students to identify local medicinal plants.
- To enable the students to prepare herbal medicines for curing human ailments.
- To impart knowledge to students on Botany and Phyto chemistry of medicinal plants.

Unit I

Medicinal Botany: Definition, Introduction, History, – Classification – Common medicinal plants cultivation, storage, collection and habitats of medicinal plants (*Catharanthus, Coleus*, *Aloe*) – Importance of medicinal plants.

Unit II

Indian systems of medicine – AYUSH - Siddha, Ayurveda, Homeopathy and Unani – Indigenous medicinal plants – Useful parts –Chemical constituents – medicinal uses – medicinal plant drugs.

Unit III

Herbal medicines for human ailments – Heart, kidney, liver, eye, skin, hair, stomach problems, diabetics, blood pressure, headache, cough, cold, fever, digestive problems, joint pains and wounds.

Unit IV

Pharmacognosy – History, Introduction, commercial drugs, crude drugs – classification of drugs – Chemistry of drug and drug evaluation of natural products.

Unit V

Drug adulteration and detection – Substitution – Detection of Adulterations - Elementary knowledge on alkaloids and flavonoids – Preparation of herbal oil, herbal tooth powder, herbal soup, herbal immune boosters.

Books for Reference

- Kumar, N.C., (1993). An introduction to Medical Botany and Pharmacognosy.
- Shah, S.C. and Quadry (1990). A text book of Pharmacognosy.
- Nadkarni, (1981). Indian MateriaMedica.
- Jain, S.K., (1980). Indian Medicinal Plants.
- Balu, S., Murugan, R. and Pandiyan, P., (2005). Herbal Technology.

Outcome

After completion of this course, students would be able to

- Understand the various Indian system of medicine
- Learn about the vital role of herbal medicines for human ailments
- Outline and classify the crud drugs
- Trained about drugs adulteration and direction

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	**20P3MBEDC**	**Extra Disciplinary Course – Mushroom Technology**	**4**	**-**

Objectives

- To know the various types of edible mushroom and their nutritional value.
- To understand the methods of cultivation of mushrooms.
- To know the types of food prepared from mushroom and their importance in human health.
- Marketing of mushrooms in India and abroad.
- Mushroom cultivation unit visit- mandatory –Neighbouring District –one day.

Unit I

Introduction – history – scope of edible mushroom cultivation – Types of edible mushrooms available in India – *Calocybeindica, Volvariellavolvacea, Pleurotuscitrinopileatus*, and *Agaricusbisporus.*

Unit II

Pure culture – preparation of medium (PDA and Oatmeal agar medium) sterilization – preparation of test tube slants to store mother culture – culturing of *Pleurotus*mycelium on petriplates, preparation of mother spawn in saline bottle and polypropylene bag and their multiplication.

Unit III

Cultivation Technology: Infra structure – Mushroom bed preparation – paddy straw, sugarcane thrash, maize straw, banana leaves. Factors affecting the mushroom bed preparation – Low cost technology. Composting technology in Mushroom production.

Unit IV

Storage and nutrition: Short-term storage (Refrigeration – upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions. Nutritive value – proteins – amino acids, mineral elements – Carbohydrates, Crude fibre content – Vitamins.

Unit V

Food Preparation – Types of food prepared from mushroom; Soup, Cutlet, Omlette, Samosa, Pickles, Curry – Research Centres – National level and Regional level – Cost benefit ratio – Marketing in India and abroad, Export value.

Books for Reference:-

- Marimuthu, T., Krishnamoorthy, A.S., Sivaprakasam, K. and Jayaranjan, R., (1991). Oyster Mushrooms, Department of Plant Pathology, Tamil Nadu Agricultural University, Coimbatore.
- Swaminathan, M., (1960). Food and Nutrition. Bappco, The Bangalore Printing and Publishing Co. Ltd., No.88, Mysore Road, Bangalore 560 018.
- Tewari, Pankaj Kapoor, S.C., (1988). Mushroom Cultivation, Mittal Publications, Delhi.
- Nita Bahi (1984-1988). Handbook of Mushrooms, II Ed, Vol. I & II.
- Paul Stamets, J.S and Chilton J.s (2004). Mushroom cultivation. A practical guide to graining mushroom at home Agarikon Press.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	**20P3ZOEDC**	**Extra Disciplinary Course – Clinical Lab Technology**	**4**	**-**

Objectives:

1. To study the various sterilization techniques.
2. To know the disposal of waste.
3. To identify the blood group and urine sugar.
4. To identify the bacteria and fungus.
5. To know the various diagnostic equipment.

Unit I **12 Hrs**

Scope for study of Clinical Technology. Sterilization – Methods of Sterilization – Dry heat method – Wet heat method – Chemical method of sterilization – Disposal of hospital wastes and infected material - Disinfection laboratory glassware and equipments.

Unit II **12 Hrs**

Composition of blood–ABO blood typing–Rh blood typing–Blood cells counting – Total erythrocyte count, total WBC count and differential count – Sugar level in Blood – Hypoglycemia, Hyperglycemia conditions. Composition of urine – Physical characters of urine–Method of urine analysis for sugars.

Unit III **12 Hrs**

Analysis of Semen, Sputum and stool, Identification of blood parasites, Bacterial culture in NA medium, Fungal culture in PDA medium, Histological study of cells – Histological procedure for the preparation of tissue slides.

Unit IV **12 Hrs**

Diagnostic equipment and apparatus – ECG, EEG, Colorimeter, pH meter, PCR, laminar airflow inoculation chamber, Binocular microscope and Incubator.

Unit V **12 Hrs**

Immuno techniques – ELISA, HLA typing, VDRL Test.

Viral , bacterial and fungal diseases, First aid- definition and types and applications

Reference:

1. Medical Laboratory Technology (1994) (4th edition), By Ramik Sood, Jaypee Brother Medical Publishers (P) Ltd., New Delhi 110 002.
2. Medical Laboratory Technology, K.M. Samuel.
3. Clinical Pharmacology (1987), by Dr. Lawrance and P.N. Bennett (Sixth Edition), ELBS, English Language Book Society, Churchil Livingstone, England.
4. District Laboratory Practice in Tropical countries, part I, By Mouica Cheesbrough, Cambridge Las Priced Edition, Cambridge University Press, Cambridge, U.K.
5. Basic Clinical Paraitology (1993), W.Harold Brown and A.Franklin Neva (5th edition), Prntice Hall Internation Edition.
6. Biological Chemistry – Leringer.

7. Human Physiology by Pearse.
8. The Biology of Animal Paraistes (1984), Cheng, T.Toppan C9 Ltd., Japan.
9. Medical Laboratory Technology: A procedure manual for routine diagnostic tests Volume – I-II By Kanai, L.Mukherjee, Tata McGraw – Hill Publishers, New Delhi.
10. Basic Clinical Paraitology 5th Edn, Harrold, W.Harold Brown and A. Franklin Neva-prentice Hall Internation Editions, U.S.A.

Web Links:

https://www.sunydutchess.edu/academics/catalog/current/courses/medical_laboratory_tech/index.pdf(Dutchess Community College, New York).
https://www.sunydutchess.edu/academics/catalog/current/programs/medicalandalliedhealth/mlt.pdf(Dutchess Community College, New York).
https://makautwb.ac.in/syllabus/BSc%20(Medical%20Lab%20Technology)28.02.2018.pdf

Course Outcome

- Pare the way for basic idea of various aseptic technique.
- Understanding the significance of waste disposal.
- Knowledge on Blood grouping and Blood sugar & urine sugar level.
- Gaining knowledge on culture of Bacteria, fungi and expertise on histological slide preparation.
- Operation technique of Diagnostic apparatus.
- Understanding for various immune techniques.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	**20P3BTEDC**	**Extra Disciplinary Course – Trends in Biotechnology**	**4**	**-**

Objectives:

1. To study the concept and scope of Biotechnology.
2. To Understand r-DNA Technology.
3. To aware the programmes of cell culture, preparations of hormones and vaccines, transgenic animals and human genome project.
4. To study the Bioprocess technology and their applications.
5. To study the Environment Biotechnology and aware the biodiversity and their conservation.

Unit I **Hrs12**

Biotechnology – Introduction and Scope of Biotechnology – Gene Cloning, Cell –free protein production – Production of Health care Products, Medical and Forensic application (RFLP, RAPD, DNA finger printing). Applications of PCR and LCR in disease diagnosis.

Unit II **Hrs12**

Nuclear transplantation, Transgenic Animals Development and uses – mice, goat, fish and sheep. Tendered meat production. Transgenic Plant: Insect resistance, fungus resistance, virus resistance, drought, cold resistance, saline resistance, Transgenic plant with vitamin A, Gene Production of therapeutic antibodies and edible vaccine.

Unit III **Hrs12**

Bioprocess technology – Scope – Fermentor –Bioprocess products: Organic acids – Citric acid, Lactic acid, acetic acid. Antibiotics – Wide and Narrow specxtrum antibiotics. Aminoacids – Glutamic acid, Lysine, Isoleucine, Aspartic acid and Proline. Production of SCP. Enzyme Production – Amylase, Pectinase and Cellulase. Dairy products and Biofuel production.

Unit IV **Hrs12**

Biofertilizers – N_2 fixing microbes (Azolla, Azatobacter, Azospirillum) for use in Agriculture – A. tumifasciens for crop improvement – Biopesticides. Biopolymer and its Application – Biosensor and its application – Bioleaching- Biomining – Biotechnology in oil recovery – Bioremediation of Xenobiotics – superbug – its application. Biodegradation.

Unit V **Hrs12**

Regulations of Biosafety: possible dangers of GEO, Biohazards of rDNA technology. National and International biosafety guidelines, Primary and secondary containments and implementation. Web based information of biosafety on GMO.

Reference:

1. Dubey, R.C. – A Text Book of Biotechnology, S. Chand & Co., Ltd, New Delhi, 1996.
2. Gupta, P.K. – Elements of Biotechnology, Rastogi and Co., Meerut, 1994.
3. Kumar, H.F. A text book on Biotechnology, Affiliated East & West Press Pvt., Ltd, N-Delhi.
4. D.Balasubramanian *et. al.,* - Concepts in Biotechnology.
5. Singh, R.S. – Introductory Biotechnology, Central book deport, Allahabad.
6. Primrose, R. – Molecular Biotechnolgoy, ASM Press.
7. Lick, E.R. and Pastenak – J.J. Molecular Biotechnology.
8. Ignachimuthu – Plant biotechnology, Oxford IBH Publishers, New Delhi.
9. Ranga – Fishery Biotechnology.
10. Primrose, R. – Molecular Biotechnology, ASM Press.
11. Purohit – A Text Book of Biotechnology, Agrobions, Jodhpur.

Semester	Subject code	Title of the course	Hours of Teaching/ Week	No. of Credits
III	**20P3CSEDC/ 20P3ITEDC**	**Extra Disciplinary Course- E-Learning Technologies**	**4**	**-**

Objective

- To learn the various E-learning approaches and components.
- To understand the types of design models of E-Learning.
- To explore the models for E-learning courseware development.
- To learn about E-learning authoring tools.
- To know about evaluation and management of E-learning solutions.

UNIT I INTRODUCTION

Need for E-Learning – Approaches of E-Learning – Components of E-Learning – Synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-Learning Content – Basics of Design Thinking.

UNIT II DESIGNING E-LEARNING COURSE CONTENT

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

UNIT III CREATING INTERACTIVE CONTENT

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests – Adding Additional Resources– Courseware Development Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool

UNIT IV LEARNING PLATFORMS

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

UNIT V COURSE DELIVERY AND EVALUATION

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

REFERENCES:

1. Clark, R. C. and Mayer, R. E, "eLearning and the Science of Instruction", Third Edition, John Wiley, 2016.
2. Means, B., Toyama, Y., and Murphy, R, "Evaluation of Evidence – Based Practices in Online Learning: A Meta – Analysis and Review of Online Learning Studies", Centre for Learning Technologies, 2010.
3. Crews, T. B., Sheth, S. N., and Horne, T. M, "Understanding the Learning Personalities of Successful Online Students", Educause Review, 2014.
4. Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Riley Media, 2011.
5. Madhuri Dubey, "Effective E – learning Design, Development and Delivery", University Press, 2011.

Course Outcomes:

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

- Distinguish the phases of activities in the models of E-learning.
- Identify appropriate instructional methods and delivery strategies.
- Choose appropriate E-learning authoring tools, Create interactive E-Learning courseware, Evaluate the E-learning courseware, Manage the E-learning courseware.

Semester	Subject Code	Title of the Paper	Hours of Teaching / Week	No. of Credits
III	**20P3LSEDC**	**Extra Disciplinary course Documentation Centers in India**	**4**	**-**

Objectives:

- To promote and support adoption of standards in library operations.
- To coordinate with other regional, national & international network for exchange of information and documents

Unit I

Components of information systems-Libraries, Documentation centers, Information centers.

Unit II

Data banks, Information analysis centers, Referral centers, Clearing Houses, Reprographic and translation centers-Their function and services.

Unit III

National Information systems: DESIDOC, NASSDOC, SENDOC, NISCAIR and INFLIBNET.

Unit IV

Information Aggregators, Databases Proquest, EBscohost, J-gate, POPLINE, Shodhganga, NDL,.

Unit V

Information products and series – Newsletters, House Bulletins in – house Journals, state of art reports, digest and Technical Digest.

Outcome:

The students shall be able to:

- Know the standards in library operations.
- Understand the regional, national & international network for exchange of information and documents

Reference:

1. Date, C.J. An Introduction to Database System, ed.7, Delhi: Pearson Education (Singapore), 2002
2. Desai, Bipin C. An Introduction to Database System, New Delhi, Galgetia, 2001
3. Karts Henry F, DBS Computer, New Delhi, McGraw Hill, 2000.
4. Raghu Ramakrishnan, DBMSS, New Delhi, McGraw Hill, 2000.
5. Gangadharaiah G, Management of Information Products and Services in University Libraries, Common Wealth, New Delhi, 2012.