Agronomy

(Under Semester System as Per ICAR Recommended)

Syllabus

Academic Session- 2022-24

Jananayak Chandrashekhar University, Ballia
Uttar Pradesh

Preamble

Agronomy is a discipline which deals with various processes such as cultivation, intercultural, management of field through various measures like weed management, soil fertility development, and proper use of water resources and so on. Agronomy has a major component of agro ecology which includes several activities that affect the environment and human population. An Agronomist remains in the centre of effort to work with issues related to environmental and ecological concerns and to increase the production of food, feed, fuels and fiber for growing population in world. Agronomists today are involved with many issues including producing food, creating healthier food, managing environmental impacts and creating energy from plants. Research activities in Agronomy focus on system analysis and simulation modeling of environmental and management impacts on agricultural production, these are key to the sustainability of agricultural production system.

Hence, it is very much essential to revise the course curriculum of Agronomy so that students even teachers may be well acquainted with the present concept of development of the discipline. This will help bringing competency in students along with confidence so as to develop himself / herself for being tackling field problems and management of land. The existing M.Sc. (Ag) courses of Agronomy have been modified taking into account of present day need by incorporating the necessary and important topics in the respective courses.

Minor changes have been made in most of the existing courses. As a part of course curriculum, M. Sc.(Ag) Agronomy was restructured to equip students to tackle emerging issues by inclusion of one new course on "Conservation agriculture". All the Ph.D courses of Agronomy was slightly revised by adding/ deleting some portion in the existing courses. The course "Fundamentals of Meteorology" is dropped from Agronomy department and interested students can take the course from department of Agri. Meteorology. The course "Agro ecology" offered by the department for Ph.D. programme is also dropped. Similarly, the Ph.D. course "Crop production and system modeling" is also deleted and the contents are merged with Agron601, i.e. "Current trends in Agronomy".

It was proposed by some members to include new courses like "Seed production technology", "Experimental technique in Agronomy" and "Management of Problem soils and water". But finally, it was decided that these courses should be offered by the core departments such as Department of Seed Technology, Department of Statistics and Department of Soil Science, respectively. There are few courses in the existing syllabus which are not offered by in many universities. Hence these courses are merged and there by reduced the number of courses to limit choices that complete knowledge of the subject can be given to the students. In all the courses, the practical aspects are strengthened.

Topics such as automated irrigation systems, value chain addition/post-harvest processing, variable rate application, precision farming, protected agriculture, soil less farming, farm mechanization of practical operations, practical applications of advanced tools for big data analysis and interpretation, artificial intelligence, drone set care included in the revised syllabus so that students can show competency at national and international level.

M.Sc. (Ag.) Agronomy

Course Code	Course Title	Credit Hours
AGR 501*	Modern Concepts in Crop Production	3+0
AGR502	Agronomy of Major Cereals and Pulses	2+0
HOR 503	Production of Cool Season Vegetable Crops	2+1
PGS504	Intellectual Property and Its Management	1+0
STAT505	Experimental Design	2+1
AGR506*	Principles and Practices of soil fertility and nutrient management	2+1
AGR 507	Agronomy of oilseed, fibre and sugar crops	2+1
HOR 508	Production of Warm Season Vegetable Crops	2+1
PGS 509	Basic concepts in laboratory techniques	0+1
MCA510	Information Technology in agriculture	1+1
AGR 511*	Principle and practices of water management	2+1
AGR 512	Agronomy of fodder and forage crops	2+1
HOR513	Growth and Development of Vegetable Crops	2+1
PGS514	Technical writing and communication skills	0+1
PGS 515	Agricultural research, research ethics and rural development programmes	0+1
AGR 516*	Principles and practices weed management	2+1
PGS 517	Library and information services	1+0
AGR 550	Seminar	1
AGR 560	Thesis research	30

*Indicate score course which Is Compulsory course for MSc. (Agri.)

1st Semester						Evaluation Marks
Code No.	**Course Title**	**Credit Hours**	**Mid Term**	**End Term**	**Practical**	**Total**
AGR 501	Modern Concepts in Crop Production	3+0	25	50	25	100
AGR 502	Agronomy of Major Cereals and Pulses	2+0	25	50	25	100
HOR 503	Production of Cool Season Vegetable Crops	2+1	25	50	25	100
PGS 504	Intellectual Property and Its Management	1+0	25	50	25	100
STAT 505	Experimental Design	2+1	25	50	25	100
Total Credits		**12**	**-**			

2nd Semester						Evaluation Marks
Code No.	**Course Title**	**Credit Hours**	**Mid Term**	**End Term**	**Practical**	**Total**
AGR 506	Principles and Practices of soil fertility and nutrient management	2+1	25	50	25	100
AGR 507	Agronomy of oilseed, fibre and sugar crops	2+1	25	50	25	100
HOR 508	Production of Warm Season Vegetable Crops	2+1	25	50	25	100
PGS 509	Basic concepts in laboratory techniques	0+1	25	50	25	100
MCA 510	Information Technology in agriculture	1+1	25	50	25	100
Total Credits		**12**	**-**			

3rd Semester						Evaluation Marks
Code No.	**Course Title**	**Credit Hours**	**Mid Term**	**End Term**	**Practical**	**Total**
AGR 511	Principle and practices of water management	2+1	25	50	25	100
AGR 512	Agronomy of fodder and forage crops	2+1	25	50	25	100
HOR 513	Growth and Development of Vegetable Crops	2+1	25	50	25	100
PGS 514	Technical writing and communication skills	0+1	25	50	25	100
PGS 515	Agricultural research, research ethics and rural development programmes	0+1	25	50	25	100
Total Credits		**11**	**-**			

4th Semester						Evaluation Marks
Code No.	**Course Title**	**Credit Hours**	**Mid Term**	**End Term**	**Practical**	**Total**
AGR 516	Principles and practices weed management	2+1	25	50	25	100
PGS 517	Library and information services	1+0	25	50	25	100
AGR 550	Seminar	1				
AGR 560	Thesis research	30				
Total Credits		**35**	**-**			
Total Semester Credit Hours		**70**				

M.Sc. (Ag.) Agronomy
First Semester

I. Course Title : Modern Concepts in Crop Production

II. Course Code: AGR 501

III. Credit Hours : 3+0

IV. Need of the course

To teach the basic concepts of soil management and crop production.

V. Theory

Unit I

Crop growth analysis in relation to environment; geo-ecological zones of India.

Unit II

Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.

Unit III

Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield.

Unit IV

Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition.

Unit V

Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture. Modern crop production concepts: soilless cultivation, Aeroponic, Hydroponic, Robotic and terrace farming. use of GIS, GPS and remote sensing in modern agriculture, precision farming and protected agriculture.

VI. Teaching methods/activities

Classroom teaching with AV aids, group discussion, assignment and class discussion

VII. Learning outcome

Basic knowledge on soil management and crop production

VIII. Suggested Reading

- Balasubramaniyan P and Palaniappan SP .2001. Principles and Practices of Agronomy. Agrobios.
- Fageria NK. 1992. Maximizing Crop Yields. Marcel Dekker.
- Havlin JL, Beaton JD, Tisdale SL and Nelson WL. 2006. Soil Fertility and Fertilizers.7

Ed. PrenticeHall.
- Paroda R.S. 2003. Sustaining our Food Security. Konark Publ.
- Reddy SR. 2000. Principles of Crop Production. Kalyani Publ.
- Sankaran S and Mudaliar TVS. 1997. Principles of Agronomy. The Bangalore Printing & Publ.
- Singh SS. 2006. Principles and Practices of Agronomy .Kalyani.
- Alvin PT and kozlowski TT (ed.). 1976. Eco physiology of Tropical Crops. Academia Pul., New York.
- Gardner PP, Pearce GR and Mitchell RL. 1985. Physiology of Crop Plants. Scientific Pub. Jodhpur.
- Lal R.1989. Conservation tillage for sustainable agriculture: Tropics versus Temperate Environments. Advances in Agronomy 42:85-197.
- Wilsie CP. 1961. Crop Adaptation and Distribution. Euresia Pub., New Delhi.

I. Course Title : Agronomy of Major Cereal sand Pulses

II. Course Code : AGR 502

III. Credit Hours : 2+0

IV. Need of the course

To impart knowledge of crop husbandry of cereals and pulse crops.

V. Theory

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of:

Unit I: Rabi cereals

.**Unit II:** Kharif cereals.

Unit III: Rabi pulses.

Unit IV: Kharif pulses

VI. Practical

- Phenological studies at different growth stages of crop
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities
- Working out growth indices (CGR, RGR, NAR, LAI, LAD, LAR, LWR, SLA, SLW etc)
- Assessment of land use and yield advantage (Rotational intensity, Cropping intensity, Diversity Index, Sustainable Yield Index Crop Equivalent Yield, Land Equivalent ration, Aggressiveness, Relative Crowding Coefficient, Competition Ratio and ATER etc)
- Estimation of protein content in pulses
- Planning and layout of field experiments
- Judging of physiological maturity in different crops
- Intercultural operations in different crops
- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in selected crops
- Visit of field experiments on cultural, fertilizer, weed control and water management aspects
- Visit to near by villages for identification of constraints in crop production

VII. Teaching methods / activities

Classroom teaching with AV aids, group discussion, assignment and class discussion

VIII. Learning outcome

Basic knowledge once real sand pulse growing in the country.

IX. Resources

- Das NR. 2007. Introduction to Crops of India. Scientific Publ.
- Hunsigi Gand Krishna KR. 1998. Science of Field Crop Production. Oxford & IBH.
- Jeswani LM and Baldev B. 1997. Advances in Pulse Production Technology. ICAR.
- Khare D and Bhale MS. 2000. Seed Technology. Scientific Publ.
- Kumar Ranjeet and Singh NP. 2003. Maize Production in India: Golden Grain in Transition. IARI, NewDelhi.
- Pal M, Deka J and Rai RK. 1996. Fundamentals of Cereal Crop Production. Tata Mc Graw Hill.
- Prasad Rajendra. 2002. Text Book of Field Crop Production. ICAR.
- Singh C, Singh P and Singh R. 2003. Modern Techniques of Raising Field Crops. Oxford & IBH.
- SinghSS.1998.CropManagement.Kalyani.
- Yadav D S. 1992. Pulse Crops. Kalyani.

- **CourseTitle :Production of Cool Season Vegetable Crops**
- **CourseCode :HOR503**
- **CreditHours :(2+1)**
- **Need ofcourse?**

Cool season vegetables are a major source of dietary fibres, minerals and vitamins.Some of these vegetables also contribute protein, fat and carbohydrate. Most of theleafyandrootvegetablesarerichinminerals,especiallyinmicro-elementssuchas copper, manganese and zinc. Vegetables differ in their temperature requirementforpropergrowthanddevelopment.Mostofthewintervegetablecropsarecultivated in cool season when the monthly mean temperature does not exceed 21°C. Even intemperate climate, these vegetables are cultivated in spring summer in hilly

trackswherethedaytimetemperatureinsummerislessthan21°C.Thestudentsofvegetablesci enceneedtohaveanunderstandingofproductiontechnologyofimportantcoolseasonvegetab lecropsandtheirmanagement.

- **Objective of Course**

  Toimpartknowledgeandskillsonadvancementinproductiontechnologyofcoolseasonveget ablecrops

  Thecourseisconstructedgivenasunder:

No.	Block	Unit
•	Productionofcoolseasonvegetable Bulbandtubercropscrops	I IIColecrops • Rootcrops • Peasand beansVLeafyvegetabl es

- **Theory**

  Introduction, commercial and nutritional importance, origin and distribution, botanyandtaxonomy,area,production,productivityandconstraints,soilrequirements,clim aticfactorsforyieldandquality,commercialvarieties/hybrids,seedrateandseed treatment, raising of nursery, sowing/ planting time and methods,hrydroponicsandaeroponics,precisionfarming,croppingsystem,nutritionalinclu dingmicronutrientsandirrigationrequirements,interculturaloperations,specialhorticultu ralpractices,weedcontrol,mulching,roleofplantgrowthregulators,physiological disorders, maturity indices, harvesting, yield, post-harvest management(grading,packagingandmarketing),pestanddiseasemanagementandproduct ioneconomicsofcrops.

  UnitI

  Bulbandtubercrops—Onion,garlicandpotato.

  Colecrops—Cabbage,cauliflower,kohlrabi,broccoli,Brusselssproutsandkale.

  UnitIII

  Rootcrops—Carrot,radish,turnipandbeetroot.

  UnitIV

  Peasandbeans—Gardenpeasandbroadbean.

  UnitV

  Leafyvegetables—Beetleaf,fenugreek,corianderandlettuce.

- **Practical**
  - Scientificraisingofnurseryandseedtreatment;
  - Sowingandtransplanting;
  - Description of commercial varieties and hybrids;
  - Demonstrationonmethodsofirrigation,fertilizersandmicronutrientsapplication;
  - Mulchingpractices,weedmanagement;
  - Useofplantgrowthsubstancesincoolseasonvegetablecrops;
  - Studyofnutritionalandphysiologicaldisorders;
  - Studiesonhydroponics,aeroponicsandothersoillessculture;
  - Identificationofimportantpestanddiseasesandtheircontrol;
  - Preparationofcroppingschemeforcommercialfarms;
  - Visittocommercialfarm,greenhouse/polyhouses;

- Visittovegetablemarket;
- Analysisofbenefittocostratio.

- **TeachingMethods/Activities**
  - Classroomlectures
  - Assignment(writtenandspeaking)
  - Studentpresentation
  - Handsontrainingofdifferentprocedures
  - Groupdiscussion

- **Learningoutcome**

  Aftersuccessfulcompletionofthiscourse,thestudentsareexpectedto:
  - Appreciatethe scope andscenario of coolseason vegetable cropsin India
  - Acquireknowledgeabouttheproductiontechnologyandpost-harvesthandlingofcoolseasonvegetablecrops
  - Calculatetheeconomicsofvegetableproductioninindia

- **SuggestedReading**

BoseTK,KabirJ,MaityTK,ParthasarathyVAandSomMG.2003.*Vegetablecrops*.Vols.I-III.Nayaudyog.

BoseTK, Som MG and Kabir J. (Eds.). 1993.*Vegetablecrops*. Naya prokash.

ChadhaKLandKallooG.(Eds.).1993-94.*Advancesinhorticulture*Vols.V-X.Malhotrapubl.house.

ChadhaKL.(Ed.).2002.*Handbookofhorticulture*.ICAR.

ChauhanDVS.(Ed.).1986.*Vegetableproductioninindia*.Ramprasadandsons.

FageriaMS,ChoudharyBRandDhakaRS.2000.*Vegetablecrops:productiontechnology*.Vol. II.Kalyanipublishers.

GopalakrishananTR.2007.*Vegetablecrops*.NewIndiapubl.agency.

HazraPandBanerjeeMKandChattopadhyayA.2012.*Varietiesofvegetablecropsinindia*,(Secondeditiion),Kalyanipublishers,Ludhiana,199p.

HazraP.2016.*VegetableScience*.2nded n,Kalyanipublishers,Ludhiana.

HazraP.2019.*Vegetableproductionandtechnology*.NewIndiapublishingagency,NewDelhi.

HazraP,ChattopadhyayA,KarmakarKandDuttaS.2011.*Moderntechnologyforvegetableproduction*,NewIndia publishingagency,NewDelhi,413p

RanaMK.2008.*OlericultureinIndia*.Kalyanipublishers,NewDelhi.

Rana MK. 2008.

Scientificcultivationofvegetables.Kalyanipublishers,NewDelhi.RanaMK.2014.*Technology forvegetableproduction*.Kalyanipublishers,NewDelhi.

RubatzkyVEandYamaguchiM.(Eds.).1997.*Worldvegetables:principles,productionandnutritivevalues*.ChapmanandHall.

SainiGS.2001.*Atextbookofoleriandfloriculture*.Amanpublishinghouse.

SalunkheDKandKadamSS.(Ed.).1998.Handbookofvegetablescienceandtechnology:production,composition,storageandprocessing.Marceldekker.

ShanmugaveluKG.1989.*Productiontechnologyofvegetablecrops*.OxfordandIBH.

SinghDK.2007.*Modernvegetablevarietiesandproductiontechnology*.Internationalbookdistributing Co.

SinghSP.(Ed.).1989.*Productiontechnologyofvegetablecrops*.Agril.comm.res.centre.Thambur

aj S and Singh N. (Eds.), 2004. *Vegetables, tuber crops and spices.*

ICAR.ThompsonHCandKellyWC.(Eds.).1978.*Vegetablecrops*.TataMcGraw-Hill.

CourseTitle **:Intellectual property and management In agriculture**

CourseCode **:PGS 504**

CreditHours **:1+0**

Objective of Course

Themainobjectiveofthiscourseistoequipstudentsandstakeholderswithknowledge of Intellectual Property Rights (IPR) related protection systems, theirsignificance and use of IPR as a tool for wealth and value creation in a knowledge-basedeconomy.

Theory

Historicalperspectivesandneedfortheintroductionof IntellectualPropertyRightregime;TRIPsandvar iousprovisionsinTRIPSAgreement;IntellectualPropertyandIntellectualPropertyRights(IPR),benef itsofsecuringIPRs;IndianLegislationsfortheprotectionofvarioustypesofIntellectualProperties;Fun damentalsofpatents,copyrights,geographicalindications,designsandlayout,tradesecretsandtraditio nalknowledge,trademarks,protectionofplantvarietiesandfarmers'rightsand biodiversity protection; Protectable subject matters, protection in biotechnology,protectionofotherbiologicalmaterials,ownershipandperiodofprotection;National

Biodiversity protection initiatives; Convention on Biological Diversity; InternationalTreatyonPlantGeneticResourcesforFoodandAgriculture;Licensingoftechnologies,Materialtransferagreements,ResearchcollaborationAgreement,LicenseAgreement.

SuggestedReadings

1. ErbischFHandMarediaK.1998.IntellectualPropertyRightsinAgriculturalBiotechnology.CABI.
2. GanguliP.2001.IntellectualPropertyRights:UnleashingKnowledgeEconomy.McGraw-Hill.
3. IntellectualPropertyRights:KeytoNewWealthGeneration.2001.NRDCandAestheticTechnologies.
4. MinistryofAgriculture,GovernmentofIndia.2004.StateofIndianFarmer.Vol. V.TechnologyGenerationandIPRIssues.AcademicFoundation.
5. RothschildMandScottN.(Ed.).2003.IntellectualPropertyRightsinAnimalBreedingandGenetics.CABI.
6. SahaR.(Ed.).2006.IntellectualPropertyRightsinNAMandOtherDevelopingCountries:ACompendiumonLawandPolicies.DayaPubl.House.

The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; TrademarksAct,1999;TheCopyrightAct,1957andamendments;LayoutDesignAct,2000;PPVandFRAct2001,andRules2003;TheBiologicalDiversityAct,2002.

I. Course Title : Experimental Designs
II. Course Code : STAT 505
III. Credit Hours : 2+1
IV. Need of the course

This course is meant for students of agricultural and animal sciences other than Agricultural Statistics. Designing an experiment is an integrated component of research in almost all sciences. The students would be exposed to concepts of Design of Experiments so as to enable them to understand the concepts involved in planning, designing their experiments and analysis of experimental data.

V. Theory

Unit I

Need for designing of experiments, characteristics of a good design. Basic principles of designs- randomization, replication and local control.

Unit II

Uniformity trials, size and shape of plots and blocks, Analysis of variance, Completely randomized design, randomized block design and Latin square design.

Unit III

Factorial experiments, (symmetrical as well as asymmetrical). orthogonality and partitioning of degrees of freedom. Concept of confounding.

Unit IV

Split plot and strip plot designs, analysis of covariance and missing plot techniques in randomized block and Latin square designs; Transformations, Balanced Incomplete Block Design, resolvable designs and their applications, Lattice design, alpha design - concepts, randomization procedure, analysis and interpretation of results. Response surfaces. Combined analysis.

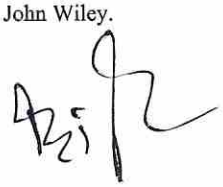
VI. Practical

- Uniformity trial data analysis, formation of plots and blocks, Fairfield Smith Law, Analysis of data obtained from CRD, RBD, LSD, Analysis of factorial experiments,
- Analysis with missing data,
- Split plot and strip plot designs.

VII. Suggested Reading

- Cochran WG and Cox GM. 1957. Experimental Designs. 2nd Ed. John Wiley.
- Dean AM and Voss D. 1999. Design and Analysis of Experiments. Springer.
- Montgomery DC. 2012. Design and Analysis of Experiments, 8th Ed. John Wiley.

• Federer WT. 1985. Experimental Designs. MacMillan.
• Fisher RA. 1953. Design and Analysis of Experiments. Oliver & Boyd.
• Nigam AK and Gupta VK. 1979. Handbook on Analysis of Agricultural Experiments. IASRI Publ.
• Pearce SC. 1983. The Agricultural Field Experiment: A Statistical Examination of Theory and Practice. John Wiley.



Second Semester

I. **CourseTitle:PrincipalandPracticesofSoilFertilityandNutrientManagement**

II. **CourseCode :AGR 506**

III. **CreditHours :2+1**

IV. **Ojectiveofthecourse**

To impart knowledge of fertilizers and manures as sources of plant nutrients andapprise about the integrated approach of plant nutrition and sustainability of soilfertility.

V. **Theory**

UnitI

Soil fertility and productivity - factors affecting; features of good soil management;problemsofsupplyandavailabilityofnutrients;relationbetweennutrientsupplyandcrop growth;organicfarming-basicconceptsanddefinitions.

UnitII

Criteriaofessentialityofnutrients;Essentialplantnutrients– theirfunctions,nutrientdeficiencysymptoms;transformationanddynamicsofmajorplantnutrients.

UnitIII

Preparation and use of farmyard manure, compost, green manures, vermicompost,biofertilizersandotherorganicconcentratestheircomposition,availability andcropresponses;recyclingoforganicwastesandresiduemanagement.Soillesscultivation.

UnitIV

Commercial fertilizers; composition, relative fertilizer value and cost; crop responsetodifferentnutrients,residualeffectsandfertilizeruseefficiency;agronomic,chemical and physiological, fertilizer mixtures and grades; methods of increasingfertilizeruseefficiency;nutrientinteractions.

UnitV

Time and methods of manures and fertilizers application; foliar application and itsconcept;relativeperformanceoforganicandinorganicnutrients;economicsoffertilizeruse;integrate dnutrientmanagement;useofvermincompostandresiduewastesincrops.

VI.Practical

- DeterminationofsoilpHandsoilEC
- DeterminationofsoilorganicC
- DeterminationofavailableN,P,KandSofsoil
- DeterminationoftotalN,P,KandSofsoil
- DeterminationoftotalN,P,K,Sinplant
- Computationofoptimumandeconomicyield

VII. Teachingmethods/activities

ClassroomteachingwithAVaids,groupdiscussion,assignmentandclassdiscussion

VIII. Learningoutcome

Basicknowledgeonsoilfertilityandmanagement

IX. SuggestedReading

- BradyNCandWeilRR.2002.TheNatureandPropertiesofSoils.13thEd.PearsonEdu.
- FageriaNK,BaligarVCandJonesCA.1991.GrowthandMineralNutritionofFieldCrops. MarcelDekker.
- HavlinJL,BeatonJD,TisdaleSLandNelsonWL.2006.SoilFertilityandFertilizers.7thEd.PrenticeHall.
- PrasadRandPowerJF.1997.SoilFertilityManagementforSustainableAgriculture.CRC Press.
- YawalkarKS,AgrawalJPandBokdeS.2000.ManuresandFertilizers.Agri-HortiPubl.

I. CourseTitle :Agronomy of Oilseed, Fibre and Sugar Crops

II. CourseCode :AGR 507

III. CreditHours :2+1

IV. Aimofthecourse

Toteachthecrophusbandryofoilseed,fiberandsugarcrops

V. Theory

Origin and history, area and production, classification, improved varieties, adaptability,climate,soil,waterandculturalrequirements,nutrition,qualitycomponent,handlingandprocessingoftheproduceformaximumproductionof:

UnitI

RabioilseedsRapeseedandmustard,LinseedandNiger

UnitII

Kharifoilseeds-Groundnut,Sesame,Castor,Sunflower,SoybeanandSafflower

UnitIII

Fibercrops-Cotton,Jute,RamieandMesta.

UnitIV

SugarcropsSugar-beetandSugarcane.

VI. Practical

- Planningandlayoutoffieldexperiments
- Cuttingofsugarcanesetts,itstreatmentandmethodsofsowing,tyingandproppingofsugarcane
- Determination of cane maturity and calculation on purity percentage, recoverypercentage and sucrose content in cane juice phenological studies at differentgrowthstagesofcrop
- Interculturaloperationsindifferentcrops

- Cottonseedtreatment
- Working out growth indices (CGR, RGR, NAR, LAI, LAD, LAR, LWR, SLA, SLWetc)
- Assessmentoflanduseandyieldadvantage(Rotationalintensity,Croppingintensity, Diversity Index, Sustainable Yield Index Crop Equivalent Yield, LandEquivalent ration, Aggressiveness, Relative Crowding Coefficient, CompetitionRatioandATERetc)
- Judgingofphysiologicalmaturityindifferentcropsandworkingoutharvestindex
- Workingoutcostofcultivationofdifferentcrops
- Estimationofcropyieldonthebasisofyieldattributes
- Formulationofcroppingschemesforvariousfarmsizesandcalculationofcroppingandrotationalintensities
- Determinationofoilcontentinoilseedsandcomputationofoilyield
- Estimationofqualityoffibreofdifferentfibrecrops
- Studyofseedproductiontechniquesinvariouscrops
- VisitoffieldExperimentsoncultural,fertilizer,weedcontrolandwatermanagementaspects
- Visittonearbyvillagesforidentificationofconstraintsincropproduction

VIII. Teachingmethods/activities

ClassroomteachingwithAVaids,groupdiscussion,assignmentandclassdiscussion

IX. Learningoutcome

Basicknowledgeonproductionofoilseed,sugarandfibrecrops.

X. SuggestedReading

- DasNR.2007.IntroductiontoCropsofIndia.ScientificPubl.
- DasPC.1997.OilseedCropsofIndia.Kalyani.
- LakshmikantamN.1983.TechnologyinSugarcaneGrowing.2ndEd.Oxford&IBH.
- PrasadRajendra.2002.TextBookofFieldCropProduction.ICAR.
- SinghC,SinghP&SinghR.2003.ModernTechniquesofRaisingFieldCrops.Oxford& IBH.
- SinghSS.1998.CropManagement.Kalyani.

- Groupdiscussion

IX.Learningoutcome

Aftersuccessfulcompletionofthiscourse,thestudentsareExpectedto:

- Acquireknowledgeaboutheprinciplesofvegetablebreeding
- Improveyield,quality,abioticandbioticresistance,otherimportanttraitsofvegetablecrops
- Understandhowthebasicprinciplesareimportanttostartbreedingofvegetablecrops

X.SuggestedReading

AllardRW.1960.Principleofplantbreeding.JohnWilleyandSons,USA.KallooG.1988.Vegetablebreeding(Vol.I,II,III).CRCPress,Fl,USA.
KoleCR.2007.Genomemappingandmolecularbreedinginplants-vegetables.Springer,USA.PeterKVandPradeepKumarT.1998.Geneticsandbreedingofvegetables.ICAR,NewDelhi,p.
488.
ProhensJandNuezF.2007.Handbookofplantbreeding-vegetables(VolIandII).Springer,USA.
SinghBD.2007.Plantbreeding-principlesandmethods(8thedn.).KalyaniPublishers,NewDelhi.
SinghRamJ.2007.Geneticresources,chromosomeengineering,andcropimprovement-vegetablecrops(Vol.3).CRCPress,Fl,USA.

- **CourseTitle :Production of Warm Season Vegetable Crops**
- **CourseCode :HOR 508**
- **CreditHours :(2+1)**
- **Need of thecourse?**

  Unlikecool-seasonvegetables,warm-seasonvegetablecropsrequire higher soiland air temperature, thus, they are always planted after the last frost date rangingfromlatespringafterthelastfrostdatetolatesummer.Daytimetemperaturemay still be warm enough but drop so much at night-time that the weather is notsuitableforwarm-seasoncropsanylonger.Ingeneralsummervegetablesrequirea little higher temperature than winter vegetables for optimum growth. In summervegetables, the edible portion is mostly botanical fruit. The students of vegetablescience need to have an understanding of production technology of important warmseasonvegetablecropsandthereaftertheirmanagement.

- **Objectofthecourse**

  To impart knowledge and skills on advancement in production technology of warmseasonvegetablecrops

  Thecourseisconstructedgivenasunder:

No.	Block	Unit
•	Productionofwarmseasonvegetable	1.Fruitvegetablescrops 2.Beans • Cucurbits • Tubercrops • Leafyvegetables

- **Theory**

  Introduction, commercial and nutritional importance, origin and distribution, botanyand taxonomy, area, production, productivity and constraints, soil requirements,climaticfactorsforyieldandquality,commercialvarieties/hybrids,seedratea nd

  seed treatment, raising of nursery including grafting technique, sowing/ plantingtimeandmethods,precisionfarming,croppingsystem,nutritionalincludingmicron utrientsandirrigationrequirements,interculturaloperations,specialhorticultural practices namely hydroponics, aeroponics, weed control, mulching,roleofplantgrowthregulators,physiologicaldisorders,maturityindices,harvestin g,yield,post-harvestmanagement(grading,packagingandmarking),pestanddiseasemanagementandec onomicsofcrops.

  UnitI

  Fruitvegetables—Tomato,brinjal,hotpepper,sweetpepperandokra.

  UnitII

  Beans—Frenchbean,Indianbean(Sem),clusterbeanandcowpea.

  UnitIII

  Cucurbits—Cucumber,melons,gourds,pumpkinandsquashes.

  UnitIV

  Tubercrops—Sweetpotato,elephantfootyam,tapioca,taroandyam.

  UnitV

Leafyvegetables—Amaranthanddrumstick.

- **Practical**
  - Scientificraisingofnurseryandseedtreatment;
  - Sowing,transplanting,vegetablegrafting;
  - Description of commercial varieties and hybrids;
  - Demonstrationonmethodsofirrigation,fertilizersandmicronutrientsapplication;
  - Mulchingpractices,weedmanagement;
  - Useofplantgrowthsubstancesinwarmseasonvegetablecrops;
  - Studyofnutritionalandphysiologicaldisorders;
  - Studiesonhydroponics,aeroponicsandothersoillessculture;
  - Identificationofimportantpestanddiseasesandtheircontrol;
  - Preparationofcroppingschemeforcommercialfarms;
  - Visittocommercialfarm,greenhouse/polyhouses;
  - Visittovegetablemarket;
  - Analysisofbenefittocostratio.
- **TeachingMethods/Activities**
  - ClassroomLectures
  - Assignment(writtenandspeaking)
  - Studentpresentation
  - Handsontrainingofdifferentprocedures
  - Groupdiscussion
- **Learningoutcome**

  Aftersuccessfulcompletionofthiscourse,thestudentsareexpectedto:
  - Appreciatethescopeandscenarioofwarmseasonvegetablecropsin India
  - Acquireknowledgeabouttheproductiontechnologyandpost-harvesthandlingofwarmseasonvegetablecrops
  - Calculatetheeconomicsofvegetableproductionin India

SuggestedReading

BoseTK,KabirJ,MaityTK,ParthasarathyVAandSomMG.2003.*Vegetablecrops*.Vols.I-III.Nayaudyog.

BoseTK, Som MG and Kabir J. (Eds.). 1993.*Vegetablecrops*. Naya prokash.

ChadhaKLandKallooG.(Eds.).1993-94.*Advancesinhorticulture*Vols.V-X.Malhotrapubl.house.

ChadhaKL.(Ed.).2002.*Handbookofhorticulture*.ICAR.

ChauhanDVS.(Ed.).1986.*VegetableproductioninIndia*.Ramprasadandsons.

FageriaMS,ChoudharyBRandDhakaRS.2000.*Vegetablecrops:productiontechnology*.Vol. II.Kalyani.

GopalakrishananTR.2007.*Vegetablecrops*.NewIndiapubl.agency.

HazraPandBanerjeeMKandChattopadhyayA.2012.*VarietiesofvegetablecropsinIndia*,(Secondediti on),Kalyanipublishers,Ludhiana,199p.

HazraP.2016.*Vegetablescience*. 2nded n,Kalyanipublishers,Ludhiana.

HazraP.2019.*Vegetableproductionandtechnology*.NewIndiapublishingagency,NewDelhi.

HazraP,ChattopadhyayA,KarmakarKandDuttaS.2011.*Moderntechnologyforvegetableproduction*,NewIndia publishingagency,NewDelhi,413p

RanaMK.2008.*OlericultureinIndia*.KalyaniPublishers,NewDelhi.

RanaMK.2008.*Scientificcultivationofvegetables*.KalyaniPublishers,NewDelhi.

RubatzkyVEandYamaguchiM.(Eds.).1997.*Worldvegetables:principles,productionandnutritiveval ues*.ChapmanandHall.

SainiGS.2001.*Atextbookofoleriandfloriculture*.Amanpublishinghouse.

SalunkheDKandKadamSS.(Ed.).1998.*Handbookofvegetablescienceandtechnology:production,co mposition,storageandprocessing*.Marceldekker.

ShanmugaveluKG.,1989.*Productiontechnologyofvegetablecrops*.OxfordandIBH.

SinghDK.2007.*Modernvegetablevarietiesandproductiontechnology*.Internationalbookdistributin gCo.
SinghSP.(Ed.).1989.*Productiontechnologyofvegetablecrops*.Agril.comm.res.centre.Thambur aj S and Singh N. (Eds.). 2004. *Vegetables, tuber crops and spices*.
ICAR.ThompsonHCandKellyWC.(Eds.).1978.*Vegetablecrops*.TataMcGraw-Hill.

- **CourseTitle :Basic concepts in laboratory techniques**
- **CourseCode :PGS 509**
- **CreditHours :0+1**

Objective

Toacquaintthestudentsaboutthebasicsofcommonlyusedtechniquesinlaboratory.

Practical

- SafetymeasureswhileinLab;
- Handlingofchemicalsubstances;
- Useofburettes,pipettes,measuringcylinders,flasks,separatoryfunnel,condensers,micropipet tesandvaccupets;
- Washing,dryingandsterilizationofglassware;
- Dryingofsolvents/chemicals;
- Weighingandpreparationofsolutionsofdifferentstrengthsandtheirdilution;
- Handlingtechniquesofsolutions;
- Preparationofdifferentagro-chemicaldosesinfieldandpotapplications;
- Preparationofsolutionsofacids;
- Neutralisationofacidandbases;
- PreparationofbuffersofdifferentstrengthsandpHvalues;
- Useandhandlingofmicroscope,laminarflow,vacuumpumps,viscometer,thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath,oilbath;
- Electricwiringandearthing;
- Preparationofmediaandmethodsofsterilization;
- Seedviabilitytesting,testingofpollenviability;
- Tissueculture ofcropplants;
- Descriptionofflowering plants in botanical terms in relation to taXonomy.

SuggestedReadings

1. FurrAK.2000.CRCHandBookofLaboratorySafety.CRCPress.
2. GabbMHandLatchemWE.1968.AHandbookofLaboratorySolutions.ChemicalPubl.Co.

I. Course Title : Information Technology in Agriculture
II. Course Code : MCA 510
III. Credit Hours :1+1
IV. Need of the course

This is a course on Introduction to Networking and Internet Applications that aims at exposing the students to understand analogy of computer, basic knowledge of MS Office. Also to understand Internet and WWW, use of IT application and different IT tools in Agriculture

V. Theory
Unit I

Introduction to Computers, Anatomy of computer, Operating Systems, definition and types, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions,

Unit II

Database, concepts and types, uses of DBMS in Agriculture, World Wide Web

(WWW): Concepts and components, Introduction to computer programming languages, concepts and standard input/output operations. e-Agriculture, concepts and applications,

Unit III

Use of ICT in Agriculture, Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computercontrolled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.,

Unit IV

Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc. for supporting Farm decisions, Preparation of contingent crop-planning using IT tools.

VI. Suggested Reading

- Vanitha G. 2011. Agro-informatics
- http://www.agrimoon.com
- http://www.agriinfo.in
- http://www.eagri.org
- http://www.agriglance.com
- http://agritech.tnau.ac.

THIRD SEMESTER

I. **CourseTitle** :**Principles and Practices of Water Management**

II. **CourseCode** :**AGR 511**

III. **CreditHours** :**2+1**

IV. **Aimofthecourse**

Toteachtheprinciplesofwatermanagementandpracticestoenhancethewaterproductivity

V. **Theory**

UnitI

Waterandits roleinplants;Irrigation:Definitionandobjectives,waterresourcesand irrigation development in of India and concerned state, major irrigation projects,eXtentofarea andcropsirrigated inIndiaand indifferentstates.

UnitII

Field water cycle, water movement in soil and plants; transpiration; soil-water-plantrelationships;waterabsorptionbyplants;plantresponse to water stress,cropplantadaptationtomoisturestresscondition.Wateravailabilityanditsrelationshipwith nutrientavailabilityandloses.

UnitIII

Soil, plant and meteorological factors determining water needs of crops, scheduling,depthandmethodsofirrigation;microirrigationsystems;deficitirrigation;fertigation;man agementofwaterincontrolledenvironmentsandpolyhouses.Irrigationefficiencyandwateruseefficien cy.

UnitIV

Water management of crop and cropping system, Quality of irrigation water andmanagementofsalinewaterforirrigation,wateruseefficiency,Cropwaterrequirement-estimation of ET and effective rainfall; Water management of themajorcropsandcroppingsystems.Automatedirrigationsystem.

UnitV

EXcessofsoilwaterandplantgrowth;watermanagementinproblemsoils,drainagerequirement of crops and methods of field drainage, their layout and spacing; rainwatermanagementanditsutilizationforcropproduction.

UnitVI

Quality of irrigation water and management of saline water for irrigation, watermanagementinproblemsoils

UnitVII

Soilmoistureconservation,waterharvesting,rainwatermanagementanditsutilizationforcroppro duction.

UnitVIII

Hydroponics,

UnitIX

Watermanagementofcropsunderclimatechangescenario.

VI. **Practical**

- DeterminationofFieldcapacitybyfieldmethod
- DeterminationofPermanentWiltingPointbysunflowerpotculturetechnique
- DeterminationofFieldcapacityandPermanentWiltingPointbyPressurePlateApparatus
- DeterminationofHygroscopicCoefficient
- Determinationofmaximumwaterholdingcapacityofsoil
- Measurementofmatricpotentialusinggaugeandmercurytypetensiometer
- Determinationofsoil-moisturecharacteristicscurves
- Determinationofsaturatedhydraulicconductivitybyconstantandfallingheadmethod
- Determinationofhydraulicconductivityofsaturatedsoilbelowthewatertablebyaugerholemethod
- Measurementofsoilwaterdiffusivity
- Estimationofunsaturatedhydraulicconductivity
- Estimationofupwardfluxofwaterusingtensiometerandfromdepthgroundwatertable
- Determinationofirrigationrequirementofcrops(calculations)
- Determinationofeffectiverainfall(calculations)
- DeterminationofETofcropsbysoilmoisturedepletionmethod16.Determinationofwaterrequirementsofcrops
- Measurementofirrigationwaterbyvolumeandvelocity-areamethod
- Measurementofirrigationwaterbymeasuringdevicesandcalculationofirrigationefficiency
- Determinationofinfiltrationratebydoubleringinfiltrometer

VII. Teachingmethods/activities

ClassroomteachingwithAVaids,groupdiscussion,assignmentandfieldvisit

VIII. Learningoutcome

Basicknowledgeonwatermanagementforoptimizationofcropyield

IX. SuggestedReading

- MajumdarDK.2014.IrrigationWaterManagement:PrinciplesandPractice.PHLLearningprivatepublishers
- MukundJoshi.2013.ATextBookofIrrigationandWaterManagementHardcover,Kalyanipublishers
- LenkaD.1999.IrrigationandDrainage.Kalyani.
- MichaelAM.1978.Irrigation:TheoryandPractice.VikasPubl.
- PaliwalKV.1972.IrrigationwithSalineWater.IARIMonograph,NewDelhi.
- PandaSC.2003.PrinciplesandPracticesofWaterManagement.Agrobios.
- PriharSSandSandhuBS.1987.IrrigationofFoodCrops-PrinciplesandPractices.ICAR.
- ReddySR.2000.PrinciplesofCropProduction.Kalyani.
- SinghPratapandMaliwalPL.2005.TechnologiesforFoodSecurityandSustainableAgriculture.AgrotechPubl.

I. CourseTitle :**Agronomy of Fodder and Forage Crops**

II. CourseCode :**AGR 512**

III. CreditHours :**2+1**

IV. Aimofthecourse

Toteachthecrophusbandryofdifferentforageandfoddercropsalongwiththeirprocessing.

V. Theory

UnitI

Adaptation, distribution, varietal improvement, agro-techniques and quality aspectsincluding anti-quality factors of important fodder crops like sorghum, maize, bajra,guar,cowpea,oats,barley,berseem,senji,lucerne,etc.

UnitII

Adaptation, distribution, varietal improvement, agro-techniques and quality aspectsincludinganti-qualityfactorsofimportantforagecrops/grasseslime,Napiergrass,Panicum,Lasiuras,Cenchrus,etc.

UnitIII

Year-roundfodderproductionandmanagement,preservationandutilizationofforageandpasturecrops.

UnitIV

Principles and methods of hay and silage making; chemical and biochemical changes,nutrientlossesandfactorsaffectingqualityofhayandsilage;useofphysicalandchemicalenrichmentsandbiologicalmethodsforimprovingnutrition;valueadditionofpoorqualityfodder.Fodderproductionthroughhydroponics.Azollacultivation.

UnitV

Economicsofforagecultivationusesandseedproductiontechniquesofimportantfoddercrops.

VI. Practical

- Practicaltrainingoffarmoperationsinraisingfoddercrops;
- Canopy measurement, yield, Leaf: Stem ratio and quality estimation, viz. crudeprotein,NDF,ADF,lignin,silica,celluloseandIVDMD,etc.ofvariousfodderandforagecrops
- Anti-qualitycomponentslikeHCNinsorghumandsuchfactorsinothercrops
- Hayandsilagemakingandeconomicsoftheirpreparation.

VII. Teachingmethods/activities

ClassroomteachingwithAVaids,groupdiscussion,assignmentandfieldvisit

VIII. Learningoutcome

Acquaintedwithvariousfodderandforagecropsandtheircommercialbasefordevelopingentrepreneurship.

IX. SuggestedReading

- ChatterjeeBN.1989.ForageCropProduction-PrinciplesandPractices.Oxford&IBH.
- DasNR.2007.IntroductiontoCropsofIndia.ScientificPubl.
- NarayananTRandDabadghaoPM.1972. ForageCropsofIndia.ICAR.
- SinghPandSrivastavaAK.1990.ForageProductionTechnology.IGFRI,Jhansi.
- SinghC,SinghPandSinghR.2003.ModernTechniquesofRaisingFieldCrops.Oxford&IBH.
- TejwaniKG.1994.AgroforestryinIndia.Oxford&IBH.

- **CourseTitle :Growth and Development of Vegetable Crops**
- **CourseCode :HOR513**
- **CreditHours :(2+1)**
- **Need of thecourse?**

  Inagriculture,thetermplantgrowthanddevelopmentisoftensubstitutedwithcropgrowth and yield since agriculture is mainly concerned with crops and their economicproducts. Growth, which is irreversible quantitative increase in size, mass, and/ orvolume of a plant or its parts, occurs with an expenditure of metabolic energy. Plantdevelopmentisanoverallterm,whichreferstovariouschangesthatoccurduringitslife cycle. In vegetable crops, development is a series of processes from the initiationof growth to death of a plant or its parts. Growth and development are sometimesused interchangeably in conversation, but in a botanical sense, they describe separateevents in the organization of the mature plant body. The students of vegetable scienceneedtohaveanunderstandingofgrowthanddevelopmentofvegetablecrops.
- **Objectiveofthecourse**

  Toteachthephysiologyofgrowthanddevelopmentofvegetablecrops

No.	Block	Unit
•	Growthanddevelopmentof 2.Physiologyofdormancyandgermination	1.Introduction and phytohormonesvegetablecrops • Abioticfactors • Fruitphysiology • Morphogenesisandtissueculture

- **Theory**

UnitI

Introductionandphytohormones—
Definitionofgrowthanddevelopment;Cellularstructuresandtheirfunctions;Physiologyofphyto-hormonesfunctioning/biosynthesisandmodeofaction;Growthanalysisanditsimportanceinvegetable production.

UnitII

Physiologyofdormancyandgermination—
Physiologyofdormancyandgerminationofvegetableseeds,tubersandbulbs;Roleofauxins,gibberellins,cyktokininsandabscissicacid;ApplicationofsyntheticPGRsincludingplantgrowthretardantsand inhibitors for various purposes in vegetable crops; Role and mode of action ofmorphactins,antitranspirants,anti-auxin,ripeningretardantandplantstimulantsinvegetablecropproduction.

UnitIII

Abioticfactors—
Impactoflight,temperature,photoperiod,carbondioxide,oxygenandothergasesongrowth,developmentofundergroundparts,floweringandsexexpressioninvegetablecrops;Apicaldominance.

UnitIV

Fruitphysiology—Physiologyoffruitset,fruitdevelopment,fruitgrowth,flowerand fruit drop; parthenocarpy in vegetable crops; phototropism, ethylene inhibitors,senescence and abscission; fruit ripening and physiological changes associated withripening.

UnitV

Morphogenesis and tissue culture—Morphogenesis and tissue culture techniques invegetablecrops;Graftingtechniquesindifferentvegetablecrops.

- **Practical**
  - Preparationofplantgrowthregulator'ssolutionsandtheirapplication;
  - Experimentsinbreakingandinductionofdormancybychemicals;
  - Induction of parthenocarpy and fruit ripening;
  - Application of plant growth substances for improving flower initiation, changingsex expression in cucurbits and checking flower and fruit drops and improvingfruitsetinsolanaceousvegetables;
  - Growthanalysistechniquesinvegetablecrops;
  - Graftingtechniquesintomato,brinjal,cucumberandsweetpepper.
- **TeachingMethods/Activities**
  - ClassroomLectures
  - Assignment(writtenandspeaking)
  - Studentpresentation
  - Handsontrainingofdifferentprocedure
  - Groupdiscussion
- **Learningoutcome**

  Aftersuccessfulcompletionofthiscourse,thestudentsareexpectedto:
  - Acquireknowledgeaboutthegrowthanddevelopmentofplantsinvegetablecrops
  - Distinguishbetweenprimaryandsecondarygrowthinplantstems
  - Understandhowhormonesaffectthegrowthanddevelopmentofvegetablecrops
- **SuggestedReading**

BleasdaleJKA.1984.*Plantphysiologyinrelationtohorticulture*(2ndEdition)MacMillan.GuptaUS.Eds.1978.*Cro pphysiology*.OxfordandIBH,NewDelhi.
KallooG.2017.*Vegetablegrafting:Principlesandpractices*.CABInternationalKrishnamoortiHN.1981.*Applicat iongrowthsubstancesandtheirusesinagriculture*.Tata McGrawHill,NewDelhi.
LeopoldACandKriedemannPE.1981.*Plantgrowthanddevelopment*,TataMcGraw-Hill,NewDelhi.
PeterKVandHazraP.(Eds).2012.*Handbookofvegetables*.StudiumPressLLC,P.O.Box722200,Houston,Texas7 7072,USA,678p.
PeterKV.(Eds).2008. *Basicsofhorticulture*.NewIndiapublicationagency,NewDelhi.RanaMK.2011.*Physio-biochemistryandBiotechnologyofVegetables*.NewIndiaPublishing Agency,PritamPura,NewDelhi.
Sainietal.(Eds.).2001.*Laboratorymanualofanalyticaltechniquesinhorticulture*.Agrobios,Jodhpur.

CourseTitle **:Technical writing and communications skills**

CourseCode. **:PGS 514**

CreditHours **:0+1**

Objective

To equip the students/ scholars with skills to write dissertations, research papers,etc. To equip the students/ scholars with skills to communicate and articulate inEnglish(verbalaswellaswriting).

Practical(TechnicalWriting)

- Various forms of scientific writings- theses, technical papers, reviews, manuals,etc.;
- Variouspartsofthesisandresearchcommunications(titlepage,authorshipcontentspage,preface,introduction,reviewofliterature,materialandmethods,experimentalresultsanddiscussion);
- Writingofabstracts,summaries,précis,citations,etc.;
- Commonly usedabbreviationsinthethesesandresearchcommunications;
- Illustrations,photographsanddrawingswithsuitablecaptions;pagination,numberingoftables andillustrations;
- Writingofnumbersanddatesinscientificwrite-ups;
- Editingandproof-reading;
- Writingofareviewarticle;
- CommunicationSkills-Grammar(Tenses,partsofspeech,clauses,punctuationmarks);
- Erroranalysis(Commonerrors),Concord,Collocation,Phoneticsymbolsandtranscription;
- Accentualpattern:Weakformsinconnectedspeech;
- Participationingroupdiscussion;
- Facinganinterview;
- Presentationofscientificpapers.

SuggestedReadings

1. BarnesandNoble.RobertC.(Ed.).2005.SpokenEnglish:FlourishYourLanguage.
2. ChicagoManualofStyle.14thEd.1996.PrenticeHallofIndia.
3. Collins'CobuildEnglishDictionary.1995.
4. Harper Collins. Gordon HMand Walter JA. 1970.TechnicalWriting.3rdEd.
5. Holt,RinehartandWinston.HornbyAS.2000.Comp.OxfordAdvancedLearner'sDictionaryofCurrentEnglish.6thEd.OxfordUniversityPress.
6. JamesHS.1994. HandbookforTechnicalWriting.NTCBusinessBooks.
7. JosephG.2000.MLAHandbookforWritersofResearchPapers.5thEd.AffiliatedEast-WestPress.
8. MohanK.2005.SpeakingEnglishEffectively.MacMillanIndia.
9. RichardWS.1969.TechnicalWriting.
10. SethiJandDhamijaPV.2004.CourseinPhoneticsandSpokenEnglish.2ndEd.PrenticeHallofIndia.
11. WrenPCandMartinH.2006.HighSchoolEnglishGrammarandComposition. S.Chand&Co.

CourseTitle programmes	**:Agricultural research, research ethics and rural development**
CourseCode	**: PGS 515**
CreditHours	**:1+0**

Objective

To enlighten the students about the organization and functioning of agriculturalresearch systems at national and international levels, research ethics, and ruraldevelopmentprogrammesandpoliciesofGovernment.

Theory

UNIT I History of agriculture in brief; Global agricultural research system: need,scope, opportunities; Role in promoting food security, reducing poverty and protectingthe environment; National Agricultural Research Systems (NARS) and RegionalAgriculturalResearchInstitutions;ConsultativeGrouponInternationalAgriculturalResearch(CGIAR):InternationalAgriculturalResearchCentres(IARC),partnershipwithNARS,roleasapartnerintheglobalagriculturalresearchsystem,strengthening capacities at national and

regional levels; International fellowshipsforscientificmobility.

UNIT II Research ethics: research integrity, research safety in laboratories, welfareof animals used in research, computer ethics, standards and problems in researchethics.

UNIT III Concept and connotations of rural development, rural development policiesandstrategies.Ruraldevelopmentprogrammes:CommunityDevelopmentProgramme,IntensiveAgriculturalDistrictProgramme,Specialgroup–AreaSpecificProgramme,IntegratedRuralDevelopmentProgramme(IRDP)PanchayatiRajInstitutions,Co-operatives,VoluntaryAgencies/Non-GovernmentalOrganisations.Criticalevaluationofruraldevelopmentpoliciesandprogrammes.Constraintsinimplementationofruralpoliciesandprogrammes.

SuggestedReadings

1. BhallaGSandSinghG.2001.IndianAgriculture-FourDecadesofDevelopment.SagePubl.
2. PuniaMS.ManualonInternationalResearchandResearchEthics.CCSHaryanaAgriculturalUniversity,Hisar.
3. RaoBSV.2007.RuralDevelopmentStrategiesandRoleofInstitutions-Issues,InnovationsandInitiatives.MittalPubl.
4. SinghK.1998.RuralDevelopment-Principles,PoliciesandManagement.SagePubl.

FOURTH SEMESTER

I. CourseTitle :PrinciplesandPracticesofOrganicFarming

II. CourseCode :AGR 516

III. CreditHours :2+1

IV. Aimofthecourse

Tostudytheprinciplesandpracticesoforganicfarmingforsustainablecropproduction.

V. Theory

UnitI

Organic farming - concept and definition, its relevance to India and global agricultureandfutureprospects;principlesoforganicagriculture;organicsandfarmingstandards;organicfarmingandsustainableagriculture;selectionandconversionof land, soil and water management - land use, conservation tillage; shelter zones,hedges,pasturemanagement,agro-forestry.

UnitII

Organic farming and water use efficiency; soil fertility, nutrient recycling, organicresidues, organic manures, composting, soil biota and decomposition of organicresidues, earthworms and vermicompost, green manures, bio-fertilizers and biogastechnology.

UnitIII

Farming systems, selection of crops andcrop rotations, multiple and relay croppingsystems,intercroppinginrelationtomaintenanceofsoilproductivity.

UnitIV

Controlofweeds,diseasesandinsectpestmanagement,biologicalagentsandpheromones,bio-pesticides.

UnitV

Socio-economicimpacts;marketingandexportpotential:inspection,certification,labelingandaccreditation procedures;organicfarmingandnationaleconomy.

VI. Practical

- Methodofmakingcompostbyaerobicmethod
- Methodofmakingcompostbyanaerobicmethod
- Methodofmakingvermicompost
- Identificationandnurseryraisingofimportantagro-forestrytressandtressforshelterbelts
- Efficientuseofbiofertilizers,techniqueoftreatinglegumeseedswithRhizobium cultures,useofAzotobacter,Azospirillum,andPSBculturesinfield
- Visittoabiogasplant
- Visittoanorganicfarm
- Qualitystandards,inspection,certificationandlabelingandaccreditationproceduresforfarmproducefromorganicfarms

VII. Teachingmethods/activities

ClassroomteachingwithAVaids,groupdiscussion,assignment.exposurevisit

VIII. Learningoutcome

Basicknowledgeonorganicfarmingforsustainableagricultureanddevelopment ofentrepreneurshiponorganicinputs.

IX. SuggestedReading

- AnanthakrishnanTN.(Ed.).1992.EmergingTrendsinBiologicalControlofPhytophagousInsects.Oxford&IBH.
- GaurAC.1982.AManualofRuralComposting,FAO/UNDPRegionalProjectDocument,FAO.
- JoshiM.2016.NewVistasofOrganicFarming.ScientificPublishers
- LampinN. 1990. Organic Farming. PressBooks, Ipswitch,UK.
- PalaniappanSPandAnanduraiK.1999.OrganicFarming–TheoryandPractice.ScientificPubl.
- RaoBVVenkata.1995.SmallFarmerFocusedIntegratedRuralDevelopment:Socio-economic EnvironmentandLegalPerspective:Publ.3,ParisaraprajnaParishtana,Bangalore.
- ReddyMV.(Ed.).1995.SoilOrganismsandLitterDecompositionintheTropics.Oxford&IBH.
- SharmaA.2002.HandBookofOrganicFarming.Agrobios.
- SinghSP.(Ed.).1994.TechnologyforProductionofNaturalEnemies.PDBC,Bangalore.
- SubbaRaoNS.2002.SoilMicrobiology.Oxford&IBH.
- TrivediRN.1993.ATextBookofEnvironmentalSciences,AnmolPubl.
- Veeresh GK,Shivashankar Kand SuiglacharMA. 1997.OrganicFarming andSustainableAgriculture.AssociationforPromotionofOrganicFarming,Bangalore.
- WHO.1990.PublicHealthImpactofPesticidesUsedinAgriculture.WHO.
- WoolmerPLandSwiftMJ.1994.TheBiologicalManagementofTropicalSoilFertility.TSBF&Wiley.

I. Course Title : Library and information services
II. Course Code : PGS 517
III. Credit Hours : (0+1)

Objective

Toequipthelibraryuserswithskillstotraceinformationfromlibrariesefficiently,toapprisethemofinformationandknowledgeresources,tocarryoutliteraturesurvey, to formulate information search strategies, and to use modern tools (Internet,OPAC,searchengines,etc.)ofinformationsearch.

Practical

Introduction to library and its services; Role of libraries in education, research andtechnologytransfer;Classificationsystemsandorganizationoflibrary;Sourcesofinformation-PrimarySources,SecondarySourcesandTertiarySources;IntricaciesofabstractingandindeXingservices(ScienceCitationIndeX,BiologicalAbstracts,ChemicalAbstracts,CABIAbstracts,etc.);Tracinginformationfromreferencesources;Literaturesurvey;Citationtechniques/Preparationofbibliography;UseofCD-ROMDatabases,OnlinePublicAccessCatalogueandothercomputerizedlibraryservices;UseofInternetincludingsearchenginesanditsresources;e-resourcesaccessmethods.

Seminar 0+1

Thesis Research 30