

Deendayal Upadhyaya Kaushal Kendra (DDUKK)

Course Curriculum

B.Voc.

(Agricultural Operation and Management)



**Mahatma Gandhi Chitrakoot Gramodaya
Vishwavidyalaya, Chitrakoot, Satna (M.P.)**

(Accredited Grade 'A' by NAAC)

Title of the Programme: Bachelors of Vocation in Agricultural Operation and Management
Leading to degree **B. Voc. (Agricultural Operation and Management)**

1. Introduction:

The University Grants Commission (UGC) has launched a scheme on skills development based higher education as part of college/University education leading to Bachelor of Vocation (B.Voc.) degree with multiple entry and exits such as Certificate/Diploma/Advanced Diploma under the NSQF (National Skill Qualifications Framework). The B.Voc. programme is focused on Universities and colleges providing undergraduate studies which would also incorporate specific job roles along with broad based general education. This would enable the graduates completing B.Voc. to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge. B.Voc. (Agricultural Operation and Management) course is being run by the University under National Skills Qualification Programme of University Grants Commission, New Delhi. Agricultural Operation and Management is the practice of agriculture that enhances the efficiency of agricultural operation and improves the management skill.

2. Aim

The programme aims to build individual capacities and train persons with adequate employability skills. The programme structure attempts to blend appropriate technical knowledge and skills, personal and professional skills and substantive 'hands-on' and field / site experience required in the trade. Keeping in view the demands of the market and to provide flexible options for students the programme is designed in modular manner and allows entry and exit options at various levels. The learners will have flexibility to develop themselves according to their strengths and career interests. The curriculum has been designed to include general education and skill development components, having extensive practical and on job trainings along with regular industrial visits so that they can be easily absorbed in Industry or become Entrepreneurs. University has MoU with several leading Industries of the area and they are the industrial partners for this programme. They are supporting in training and placement programmes of students.

3. Eligibility, Duration and Level of Awards

This programme provides options of multiple entry and exit points as per the following table. Lateral entry is offered to external candidates as well as present/ ex students of this University subject to fulfilling the eligibility criteria.

Award	Duration	Eligibility /Lateral entry at different levels
Certificate	6 months	10+2 or passed Level 3 in relevant discipline as prescribed by Agriculture Sector Skill Council of India (ASCI). Candidates who are below 10+2 at the time of admission have to pass 10+2 before advancement to the next level.
Diploma	1 year	Certificate holder or passed level 4 examination of the ASCI
Advanced Diploma	2 years	Diploma holder or passed level 5 examination of the ASCI
B.Voc. Degree	3 years	Advanced Diploma holder or passed level 6 examination of the respective ASCI

3.1. Entry to First Year - Any student who has passed Level 3 of the SSC in the relevant discipline or +2 Examination (any stream) under 10+2+3 system education of a recognized university/Board/Council or any other examination recognized by MGCGV as equivalent thereto shall be eligible to offer the B.Voc. Programme.

4. Admission:

Depending on the number of applications at the time of admission, merit based decision that provides equal opportunity to all will be taken by the admissions committee, duly approved by the competent authority of the University. Admission will be done in odd semesters - direct as well as lateral entry in the month of June- July for which the process of applying begins normally in the month of April of the concerned year. Those, who after passing certificate course or clearing one semester have left the programme, will be given admission to 2nd semester and for that provision of admission in January will be made.

4.1. Reservation: Reservation rules of the government of M.P. is followed.

4.2. Lateral entry: Lateral entry may be offered in the 2nd, 3rd and 5th semesters respectively to external candidates as well as those candidates who have opted for multi exit facility and want to avail of the multi entry facility. The candidates must have undertaken courses deemed to be equivalent to the 1st and 2nd year programme and are able to qualify the skill proficiency test organized by the University.

4. Programme Structure:

The course titled as B.Voc. (Agricultural Operation and Management) is proposed with a modular structure that gives entry and exit option after every year, with an additional option in the 1st year after 6 months, providing employable skill at the end of each module. The four modules have been described under section 3.

4.1. Components: Each semester is divided into two main components-Skill Component and General Component which have a weightage of 60% and 40% respectively. Thus each semester will have 18 credits under Skill Component and 12 credits under General component. 1 credit means 1 hour per week for theory classes and 2 hours per week for practical classes and outreach activities like industrial visit/ training/ market and field survey work as well as self study. Self study courses should not be more than 20% of the total courses in any semester.

Table 1: Division of General and Skill Components Semester wise

S.N.	Semester	Hours	Credits
Semester 1 to VI per semester			
1.	General Component		
	Compulsory	90-135	06
	Elective	90-135	06
	SubTotal	180-270	12
2.	Skill Component*		
	Compulsory*	270-300	12
	Elective*	150-180	06
	Sub Total	320-480	18

	Total for any semester	500-750	30
	Grand Total of all 6 semesters	3100-4500	180
NB	1.1hr Theory classes and 2 hr practical classes/outreach activities including skill training in industry or industrial visit/ self study for an average 15 weeks account for 1 credit i.e. Minimum 15 and 30 hours per credit is needed for theory and practical classes respectively.		
	2. The above table describes the overall distribution of General Component and Skill Component in a broad sense.		
	3. No. of credits for electives in the 3 rd year will be comparatively more and this includes the project work. Electives under the skill component will essentially consist of the job role prescribed by the ASCI.		
	4. All students are expected to undergo on job training / project work for 4-8 weeks every semester that may continue partly during summer / winter breaks. Students have to undertake project work in an industry of repute for 12 weeks in their final semester.		

5.2. Credit Transfer: There is a provision of credit transfer in this programme as per the MGCGV rules. Students who have done some Vocational or General courses prior to joining the University will get equivalent transfer of credits for the courses that are similar in nature and content of the courses of B.Voc. programme.

5.3. Curriculum: Curriculum of the B.Voc. (Agricultural Operation and Management) is as follows

B. Voc. (Agricultural Operation and Management) Semester-wise Distribution of Courses					
Semester	Component	Course code	Name of Papers	Credits	Remarks
Semester I	Skill Component	BVAMS 101	Agriculture Heritage/ *Introductory Agriculture	1(1+0)	*Subject to the B. Voc. (Ag. Op. & Mgn.) Batch 2015-16 only.
		BVAMS 102	Fundamental of Agronomy/ *Principles of Agronomy and Agricultural Meteorology	2(1+1)	
		BVAMS 103	Fundamental of Soil Science / *Introduction of Soil Science	3(2+1)	
		BVAMS 104	Crop Production Technology- I (<i>Kharif Crops</i>) /*Field Crop I (<i>Kharif</i>)	2(1+1) * 3(2+1)	
		BVAMS 105	Basics of Agricultural Operation and Practices	2(1+1) * 3(2+1)	@ Subject to the B. Voc. (Ag. Op. & Mgn.) Batch 2016-17 and onward.
		BVAMS 106	Fundamental of Horticulture@	@ 2(1+1)	
		BVAMS 107	Work Integrated Learning I (ASCI Qualification Pack: NSQF Level-4/ Maize Cultivator/Pulse Cultivator: NSQF Level-4)	6(2+4)	

			SUB TOTAL	18(7+11)/ *18(8+10)	
	General Component	BVAMG 101	Communication Hindi	2(1+1)	# Subject to be chosen from General Stream
		BVAMG 102	Fundamentals of Computers	4(2+2)	
			Optional Subjects/ #Paper-I of the General Subject chosen by the student.	6(4+2)	
			SUB TOTAL	12(8+4)	
Semester II	Skill Component	BVAMS 108	Crop Production Technology- II (<i>Rabi Crops</i>)*Field Crops II (<i>Rabi</i>)	2(1+1) *4(2+2)	*For Batch 2015-16 only. #For Batch 2016-17 only.
		BVAMS 109	Fundamental of Agricultural Extension Education #Manures, Fertilizers and Soil fertility / * Soil fertility and Nutrient Management	3(2+1)	
		BVAMS 110	Management Production Technology of Cash Crops/ *Cultivation Practices of Cash Crops	2(1+1)	
	General Component	BVAMS 111	Rainfed Agriculture and Watershed Management/ *Water management including micro-irrigation	3(2+1)	@For Batch 2016-17 and onward.
		BVAMS 112	Fundamentals of Agricultural Economics@	@ 2(2+0)	
		BVAMS 113	Work Integrated Learning II (ASCI Qualification Pack: NSQF Level-4/ Watershed Supervisor: NSQF Level-4)	6(2+4)	
			SUB TOTAL	18(8+10)/ *18(7+11)	
		BVAMS 103	Communication English	2(1+1) *4(2+2)	*For Batch 2015-16 only.
		BVAMS 104	Statistical Methods Analysis	2(1+1)	
		BVAMS 105	Values and Social Responsibilities I (VSR I)	2(1+1)	
			Optional Subjects/ Paper-II of the General Subject chosen by the student.	6(4+2)	
			SUB TOTAL	12(7+5)/ *12(7+5)	
Semester III	Skill Component	BVAMS 201	Production Technology of Fruit and Plantation Crops	2(1+1)	*Subject to the B. Voc. (Ag. Op. & Mgn.) Batch 2015-16 only
		BVAMS 202	Production Technology of Vegetable and Spices crops	2(1+1)	
		BVAMS 203	Renewal Energy and Green Technology * Farm Machinery and Power	2(1+1)	

		BVAMS 204	Fundamental of Plant Breeding	2(1+1)	
		BVAMS 205	Pest of crops and stored Grain and their management	2(1+1)	
		BVAMS 206	Agricultural Finance and Co-operation	2(1+1)	
		BVAMS 207	Work Integrated Learning III (ASCI Qualification Pack: NSQF Level-5/ Watershed Engineer: NSQF Level-5)	6(02+04)	
			SUB TOTAL	18(6+12)	
	General Component	BVAMG 201	Computer Programming & Web desegining	3(1+2)	
		BVAMG202	Environmental Studies and Disaster Management	3(2+1)	
			Optional Subjects/ Paper-III of of the General Subject chosen by the student.	6(4+2)	
			SUB TOTAL	12(7+5)	
Semester IV	Skill Component	BVAMS 208	Production Technology of Medicinal and Aromatic crops	2(1+1)	
		BVAMS 209	Production Technology of Ornamental Crops, MAP and Land Scaping	2(1+1)	
		BVAMS 210	Principle of Seed Technology	3(2+1)	
		BVAMS 211	Manures, Fertilizers and Soil fertility #Fundamental of Agricultural Extension Education	3(2+1)	
		BVAMS 212	Farm Machinery and Power *Renewal Energy and Green Technology	2(1+1)	
		BVAMS 213	Work Integrated Learning IV (ASCI Qualification Pack: NSQF Level-5/ Watershed Engineer: NSQF Level-5)	6(02+4)	
			SUB TOTAL	18(7+11)	
	General Component	BVAMG 203	Financial Accounting Practices	4(2+2)	#For Batch 2016-17 only. *For Batch 2015-16 only.
		BVAMG 204	Values and Social Responsibilities II (VSR II)	2(1+1)	
			Optional Subjects/ Paper IV of of the General Subject chosen by the student.	6(4+2)	
			SUB TOTAL	12(7+5)	
Semester V	Skill Component	BVAMS 301	Elective Course \$ • Protected Cultivation and Secondary Agriculture / • Soil and Water Analysis	5(3+2)	\$One Elective course to be chosen
		BVAMS 302	Post Harvest Management & Value Addition of fruit and vegetable crops	3(1+2)	
		BVAMS 303	Agricultural Marketing, Trade and Prices	2(1+1)	
		BVAMS 304	Integrated Pest Management	2(1+1)	

		BVAMS 305	Work Integrated Learning V (ASCI Qualification Pack: NSQF Level-6/ Watershed Manager: NSQF Level-6)	6(02+4)	
			SUB TOTAL	18(6+12)	
	General Component	BVAMG301	Reasoning and Analytical ability	2(1+1)	
		BVAMG302	Entrepreneurship Development	4(2+2)	
		Optional Subjects/ Paper- V of of the General Subject chosen by the student.	6(4+2)		
		SUB TOTAL	12(7+5)		
Semester VI	Skill Component	BVAMS306	Elective Course \$ • Livestock and Poultry Management/ • Development of Tissue Culture Plants	5(3+2)	\$ One Elective course to be chosen
		BVAMS 307	Organic Production of Crops	1(0+1)	
		BVAMS 308	Seed Production and Processing	2(1+1)	
		BVAMS 309	Agro Processing Practices	2(1+1)	
		BVAMS 310	Work Integrated Learning VI (ASCI Qualification Pack: NSQF Level-6/ bWatershed Manager: NSQF Level-6)	6(02+4)	
			SUB TOTAL	18(5+13)	
	General Component	BVAMG303	Management Information System	4(2+2)	
		BVAMG304	Corporate Social Responsibility (CSR)	2(1+1)	
			Optional Subjects/ Paper-VI of the General Subject chosen by the student.	6(4+2)	
			SUB TOTAL	12(7+5)	
*General Component	*Any one subject From Science/ Arts / Commerce Streams depending upon the subjects in Intermediate. Two papers are required to be completed in each year. The syllabi of the General component will be, as discussed above, as per the unified syllabus of the Department of Higher Education, Govt. of M.P. Students wanting to switch from Vocational to General B.A./ B.Sc./ B. Com after completing Diploma/ Adv. Diploma have to clear the papers of the left over subjects. Moreover, Students have to essentially clear rest of credits of B. Sc. (Ag) in next 02 Semesters, if they want to switch over from B.Voc. (Ag. Op. & Mgn.) to B. Sc. (Ag) subject to the availability of vacant seats.				
Work Integrated Learning	Work Integrated Learning of even semesters will essentially be carried out in some industry in a project mode and reports have to be submitted for evaluation thereof. Work Integrated Learning of odd semesters may be completed in the faculty itself, in addition to industrial visits, by directing the students to undertake the production and marketing of the products combined together with market and consumer survey.				

Weight age and Evaluation Criteria

Theory/ Practical	CFA	ESE	Evaluation Criteria
Theory	40%	60%	CFA : Attendance 25%, Class performance & Assignment 25% , Test and Viva 50% ESE : Test 60%
Practical	60%	40%	CFA & ESE : Practical and record 50% , Test 25%, Viva 25%

Detailed Syllabus

AGS 101 Agriculture Heritage

Credit hours: 1(1+0)

Theory

Introduction of Indian agricultural heritage, status of farmers in society; advice by sages to kings on their duties towards farmers, soil management in ancient, medieval & pre-modern India and its relevance in modern day sustainable agriculture, heritage of crop & water management, plant growth and development & plant protection through vrikshayurveda and traditional knowledge. Heritage of medicinal plants and their relevance today, seed health in ancient & medieval history and its relevance to present day agriculture, description of Indian civilization and agriculture by travelers from China, Europe and United States, our journey in agriculture, green revolution and its impact and concerns, vision for the future.

***AGS 101 Introductory Agriculture**

1(1+0)

Art, Science and business of crop production, Basic elements of crop production; Factors affecting crop production;

History of Agricultural Development; Ancient Indian Agriculture in Civilization Era, Chronological Agricultural Technology development in India. Indian Agriculture;

Balance sheet, liabilities; Assets and Contrasting trends (DATA), Agricultural growth, contrasting food chains, Diversity in Physigraphy,

Soil groups, marine, livestock and water; Liabilities: Soil factors, weather factors, Economic ecology, dry and irrigation agriculture, Farming Systems approach, value addition, requirements in new technology;

Women in Agriculture: multifaceted roles and tasks, work stress factors, Nutritional and rural life standards, role in house hold design making, drudgery reduction for farm women, women friendly agricultural technology; Empowerment of women; Group dynamics for farm women, rural women; The nucleus of Agricultural Extension and Training.

AGS 102 Fundamentals of Agronomy

Credit hours: 2(1+1)

Theory

Agronomy and its scope, seeds and sowing, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency. Water and crop water requirement, water use efficiency, irrigation- scheduling criteria, quality of irrigation water, water logging.

Weeds- importance, classification, crop weed competition, concepts of weed management- methods, herbicides- classification. Growth and development of crops, factors affecting growth and development. Crop rotation and its principles, harvesting and threshing of crops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, Effect of sowing depth on germination and seedling vigour, Identification of weeds in crops, Study of yield contributing characters and yield estimation, Seed

germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate.

***AGS 102 Principles of Agronomy and Agricultural Meteorology 2(1+1)**

Meaning and scope of Agronomy: National and International Agricultural Research Institutes in India. Agro-climatic zones of India and Rajasthan.

Tillage, crops stand establishment, Planting geometry and its effect on growth and yield cropping systems, Harvesting.

Agricultural meteorology: Weather and climate, micro-climate, weather elements, Earth's atmosphere, Composition and structure,

Solar radiation, Nature, properties, depletion, solar constant and energy balance, Atmospheric, temperature, factors affecting, horizontal and vertical distribution, variations and global warming, Air Pressure variations; Wind: factors affecting, cyclones and anticyclones and general circulation,

Atmospheric humidity, vapour pressure and saturation, Process of formation of dew, fog, mist, snow, rain and hail; Formation and classification of clouds, Introduction to monsoon, Basics of weather forecasting.

Practical

Study of Tillage; Practice of Ploughing; Participation in Ongoing Field operation; Study of inter-cultivation and practices; Different methods of Sowing; Study of Manures, Fertilizers and Green Manures crops /seeds; Methods of Fertilizer Application.; Site Selection for Agro met observatory; Measurement of Temperature; Measurement of Rainfall; Measurement of Evaporation; Measurement of humidity; Measurement of atmospheric pressure.

AGS 103 Fundamentals of Soil Science

Credit hours: 3(2+1)

Theory

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement and availability; soil air, composition, gaseous exchange, problem and plant growth; source, amount and flow of heat in soil; soil temperature and plant growth; Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge ion exchange, cation exchange capacity, base saturation; soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.

AGS 103 Introduction of Soil Science*3(2+1)**

Soil: Origin of the earth, Earth's crust; Composition: Rocks and minerals Weathering, Soil formation factors and processes

Components of soils: Soil profile, Soil physical properties, Soil texture, Textural classes, Particle size analysis, Soil structure -Classification, Soil aggregates, significance, Soil consistency, Soil crusting, Bulk density and particle density of soils & porosity, their significance and manipulation, Soil compaction,

Soil Colour. Elementary knowledge of soil classification and soils of India; Soil water, Retention and potentials, Soil moisture constants, Movement of soil water, Infiltration, percolation, permeability,

Drainage, Methods of determination of soil moisture, Irrigation: definition and objectives, water resources and irrigation development in India; Soil plant water relationships;

Methods of soil moisture estimation, evapotranspiration and crop water requirement; effective rainfall, scheduling of irrigation; Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency.

Practical:

Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water through flumes and weirs; Calculation of irrigation water requirement (Problems).

AGS 104 Crop Production Technology-I (*Kharif* Crops) Credit hours: 2(1+1)**Theory**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and finger millet, Pulses-pigeonpea, mungbean and urdbean; Oilseeds- groundnut, and soybean; Forage crops-sorghum, cowpea, cluster bean and Napier.

Practical

Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea and mungbean. Maize and groundnut, effect of seed size on germination and seedling vigour of *kharif* season crops, effect of sowing depth on germination of *kharif* crops, identification of weeds in *kharif* season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of *kharif* season crops, study of crop varieties and important agronomic experiments at experimental farm. study of forage experiments, morphological description of *kharif* season crops, visit to research centres of related crops.

AGS 104 Field Crops-I (*Kharif*)*3(2+1)**

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of *kharif* crops:

Cereals – rice, maize, sorghum, pearl millet and minor millets;

Pulses : pigeonpea, mungbean and urdbean;

Oilseeds: groundnut, sesame and soybean;

Forage crops: sorghum, maize, cowpea, cluster bean and napier.

Practical

Seed bed preparation and sowing of rice, maize, pigeonpea and greengram; Calculations on seed rate; Top dressing of nitrogen in rice/maize and study of fertilizer experiments on maize and pigeonpea; Identification of weeds in rice, maize and grain legumes, application of herbicide and study of weed control experiments; Morphological characteristics of rice, maize and pulses; Yield contributing characters of rice/maize and pulses; Yield and quality analysis of cereals and pulses; Crop distribution in the state and the region; Important agronomic experiments of *kharif* crops and visit to research stations related to *kharif* crops.

AGS-105 Basics of agricultural operations and practices

2(1+1)

Theory:

Tillage, Tillage, Type of Tillage, Modern Concept of Tillage, Advantage and Disadvantage of Tillage, Tillage Equipment, Method of Sowing and its advantage and disadvantages, Sowing Equipment and Management, Method of Fertilizer Application and its Advantages and disadvantages, Weed and its management, Equipment used for weed control, Irrigation and its methods and equipments used for irrigation; Harvesting and plant protection equipments and its management.

Practical-

Tillage Equipment, Method of Sowing; Study of Sowing Equipment, Method of Fertilizer Application and its equipment; Weed Control equipment, Method of irrigation, Study of irrigation equipments; Plant protection equipments.

AGS 106 Fundamentals of Horticulture

Credit hours: 2(1+1)

Theory

Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarp; kitchen gardening; garden types and parts; lawn making; medicinal and aromatic plants; species and condiments; use of plant bio-regulators in horticulture. Irrigation & fertilizers application-method and quantity.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation. Layout and planting of orchard plants. Training and pruning of fruit trees. Transplanting and care of vegetable seedlings. Making of herbaceous and shrubby borders. Preparation of potting mixture, potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

AGS 107 Work integrated learning

6(0+6)

(Qualification Pack-Maize Cultivator/Pulse Cultivator: NSQF Level-4)

AGG 101

COMMUNICATION HINDI

2(1 + 1)

सैद्धान्तिक

इकाई 1

व्याकरण में कारक का महत्व, वाक्य संयोजन, वाक्यों की सामान्य अ गुणियां,

इकाई 2

मुहावरे व कहावतें, प्रत्यय व उपसर्ग का प्रयोग, समानार्थक व भिन्नार्थक भाब्द, कई भाब्दों के बदले एक भाब्द

इकाई 3

संप्रेषण— अर्थ व महत्व, प्रभावी संप्रेषण के आव यक तत्व, संप्रेषण के तरीके—बोलकर, लिखकर, चित्र व अन्य माध्यम, पत्र लेखन— पत्रों के विभिन्न प्रकार, औपचारिक व अनौपचारिक पत्र, कार्यालयीन व व्यापारिक पत्र

इकाई 4

सारां ि लेखन, निबन्ध लेखन

इकाई 5

विि िष्ट अवसरों के लिए लेखन— नारा लेखन, कविता, नाटक, संवाद लेखन, चित्रों की व्याख्या

व्यावहारिक

1. संवाद अदायगी
2. भाषण
3. बॉयोडाटा लेखन
4. साक्षात्कार
5. सो िल मीडिया व सूचना प्रौद्योगिकी का प्रयोग
6. समूह चर्चा
7. चित्र देखकर कहानी लिखना
8. विि िष्ट अवसरों के लिए नारा लेखन
9. अपने उत्पाद की बिक्री बढ़ाने के लिए प्रभावी विज्ञापन बनाना
10. सेमिनार प्रस्तुति

AGG 102

FUNDAMENTALS OF COMPUTER

4(2 + 2)

UNIT-I

Introduction: Characteristics of Computers, Evolution of computers, Capabilities and limitations of computers, Generations of computers, Types of computers (micro, mini, main frame, supercomputers), Block diagram of computer, Basic components of a computer system-Input unit, output unit, Arithmetic logic Unit, Control unit, Central Processing Unit, Instruction set, processor speed, type of processors, Flowchart & algorithms and their applications

UNIT-II

Memory- main memory organization, main memory capacity, Types of RAM & ROM, cache memory, Secondary Storage Devices: Magnetic Tape, Magnetic Disks-Hard Disk, Floppy Disks, Optical Disks: CD, VCD, CD-R, CD-RW, DVD, Blue ray etc. Solid State Storage: Flash Memory: Different types of Pen drives & SD cards, USB Drives, PCs specifications and technological revolutions

UNIT-III

Input devices: different types of Keyboards, Pointing Devices- different types of mouse, Touch Screens, Joystick, Electronic pen, Trackball, Scanning Devices-Optical Scanners, OCR, OMR, Bar Code Readers, MICR, Digitizer, Electronic card reader, Image Capturing Devices-Digital Cameras. Output devices: Monitors, CRT/LCD/TFT, Printers, Dot matrix, Inkjet, Laser, Plotters, Drum, Flatbed, Screen image projector, ATMs

UNIT-IV

Computer Software - Software's its Need, Different types of software - System software, Application software, System software-operating system, utility program, Introduction to operation system for PCs-DOS, windows, Linux, file allocation table (FAT & FAT32), files & directory structure and its naming rules.

UNIT-V

Programming languages - Machine, Assembly & high level Languages, 4GL, Merits and demerits of different computer languages, assemblers, compilers and interpreter, Application software and its types, Word-processing, Spreadsheet, Presentation graphics, Uses and examples and Area of application of each of them, Computer security, File security, Virus working, feature, types of viruses, virus detection, prevention and cure.

Semester II

AGS 108 Crop Production Technology-II (*Rabi* crops) Credit hours: 2(1+1)

Theory

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rape seed, mustard and sunflower; sugar crops- sugarcane; other crops- potato, Forage crops- berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

*AGS 108 Field Crops- II (*Rabi*)

4(2+2)

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *rabi* crops;

Cereals: wheat, barley;

Pulses: chickpea, lentil, peas, french bean;

Oilseeds: rapeseed and mustard, sunflower, safflower and linseed;

Forage crops: berseem, lucerne and oat.

Practical:

Seed bed preparation and sowing of wheat and sunflower; Calculation on seed rate; Top dressing of nitrogen in wheat and study of fertilizer experiments on wheat and mustard; Identification of weeds in wheat and grain legumes, application of herbicide and study of weed control experiments; Morphological characteristics of wheat, chickpea and mustard; Yield contributing characters of wheat; Crop distribution in the state and the region; Important agronomic experiments of *rabi* crops and visit to research stations related to *rabi* crops.

AGS 109 Fundamentals of Agricultural Extension Education Credit hours: 3(2+1)

Theory

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme

Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Physiology of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies; communication: meaning and definition; models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television

AGS 109 Manures, Fertilizers and Soil Fertility ManagementCredit Hours: 3(2+1)

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Integrated nutrient management. Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of available N in soils. Estimation of available P in soils. Estimation of available K. Estimation of available S in soils. Estimation of available Ca and Mg in soils. Estimation of available Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

***AGS 109 Soil fertility and Nutrient Management 3 (2+1)**

Soil as a source of plant nutrients. Essential and beneficial elements, criteria of essentiality, forms of nutrients in soil, mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Measures to overcome deficiencies and toxicities. Problem soils – acid, salt affected and calcareous soils, characteristics, nutrient

availabilities. Reclamation – mechanical, chemical and biological methods. Fertilizer and insecticides and their effect on soil water and air. Irrigations water – Quality of irrigation water and its appraisal. Indian standards for water quality. Use of saline water for agriculture. Soil fertility – Different approaches for soil fertility evaluation. Methods, Soil testing – Chemical methods, critical levels of different nutrients in soil. Plant analysis – DRIS methods, critical levels in plants. Rapid tissue tests. Indicator plants. Biological method of soil fertility evaluation. Soil test based fertilizer recommendations to crops. Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers. Source, method and scheduling of nutrients for different soils and crops grown under rainfed and irrigated conditions.

Practical

Principles of analytical Instruments and their calibration and applications, Colorimetry and flame photometry. Estimation of available N, P, K, S, and Zn in oils, Ph, EC, soluble cations and anions in soil water extracts. Lime requirement and gypsum requirement of problem soils. Estimation of N, P and K in plants.

AGS-110 Cultivation practices of Cash crops/Production Technology of Cash Crops2(1+1)

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of Sugarcane and Sugar beet; Cotton, Jute and Sunhemp; Potato and Tobacco.

Practical

Seed bed preparation and sowing of sugarcane, Potato and Tobacco; Calculations on seed rate; Top dressing of nitrogen in Sugarcane and study of fertilizer experiments on Sugarcane, potato and Tobacco; Identification of weeds in Sugarcane, potato and Tobacco, application of herbicide and study of weed control experiments; Morphological characteristics of Sugarcane, potato and Tobacco; Yield contributing characters of Sugarcane, potato and Tobacco; Yield and quality analysis of sugarcane.

AGS 111 Rainfed Agriculture and Watershed Management

Credit hours: 2(1+1)

Theory

Rainfed agriculture: Introduction, types, History of rainfed agriculture & watershed in India; Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas; Drought: types, effect of water deficit on physio- morphological characteristics of the plants, Mechanism of crop adaptation under moisture deficit condition; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different dry land areas in the country and demarcation of dry land area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices viz; mulching, plant density, depth of sowing, thinning and leaf removal for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

***AGS 111 Water Management Including Micro Irrigation**

3 (2+1)

Irrigation: definition and objectives, water resources and irrigation development in India; Soil plant water relationships; Methods of soil moisture estimation ,evapotranspiration and crop water requirement; effective rainfall, scheduling of irrigation; Methods of irrigation: surface, sprinkler and drip irrigation; Irrigation efficiency and water use efficiency, conjunctive use of water, irrigation water quality and its management. Water management of different crops (rice, wheat, maize, groundnut, sugarcane, mango, banana and tomato); Agricultural drainage.

Practical-Determination of bulk density by field method; Determination of soil moisture content by gravimetric method, tensiometer, electrical resistance block and neutron moisture meter; Determination of field capacity by field method; Determination of permanent wilting point; Measurement of irrigation water through flumes and weirs; Calculation of irrigation water requirement (Problems).

AGS 112 Fundamentals of Agricultural Economics Credit hours: 2 (2+0)

Theory

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. *Demand*: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship. *Laws of returns*: Law of variable proportions and law of returns to scale. *Cost*: Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit. *National income*: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax*: meaning, direct and indirect taxes, agricultural taxation, VAT. *Economic systems*: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

AGS 113 Work integrated learning 6(0+6)

(Qualification Pack-Watershed Supervisor: NSQF Level-5)

AGG 103 COMMUNICATION ENGLISH 2 (1+1)

THEORY

UNIT – I

Spotting the errors pertaining to Nouns, Pronouns, Adjective and Adverbs, Concord (Grammatical Concord, National Concord) and the Principal of Proximity between Subject and Verb, Precis writing

UNIT II

Changing the Voice: From Active to Passive and vice-versa, Lexis: Idioms and phrases: Words Often Confused, One-word Substitutes, Formation of Words (Suffixes, Prefixes and Derivatives).

UNIT – III

Communication - its meaning and its importance, one way and two way communication, Essentials of good Communication, Methods of communication - oral, written and non verbal, Different forms of letter writing – Formal and Informal letters, Official Letters, Business Letters

UNIT – IV

Introduction to principal components of spoken English- Transcription, Word-Accent, Intonation, Weak Forms in English, Developing Reading and Writing Skills through tasks/ activities as Developing Outlines,

UNIT –V

Key Expressions, Situation, Slogan Writing and Theme Building Exercises, Dialogue Writing, Interpreting Pictures/Cartoons

PRACTICALS

1. How to locate reading material in the library
2. How to look up words in a dictionary
3. How to look up information from an encyclopedia
4. Acquaintance with 44 sounds of pronunciation
5. Developing, Listening, Speaking and communicating Skills through Various activities such as
 - Introducing self and others
 - Role play Activities
 - Practicing Short Dialogues
 - Debates
 - Speeches
 - Paper reading
 - Listening to News Bulletins
 - Viewing and Reviewing of TV Programmes
 - Mock Interview
 - Resume writing
 - Seminar presentation on a given topic/theme
6. Using IT and Social media – Profile generation, Blog Writing

AGG 104 Statistical Method

2(1+1)

Theory

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof). Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations. Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification. Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness &

Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2×2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

AGG 105 Values and Social Responsibilities I

2(1+1)

As VSR booklet published by the University

Semester III

AGS 201 Production Technology for Fruit and Plantation Crops

Credit hours: 2(1+1)

Theory

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks; Production technologies for the cultivation of major fruits-mango, banana, citrus, grape, guava, litchi, papaya, apple, pear, peach and; minor fruits- pineapple, pomegranate, jackfruit, strawberry, nut crops; plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops including Micro-propagation. Description and identification of fruit. Preparation of plant bio regulators and their uses, Pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchard.

AGS 202 Production Technology for Vegetable and Spices

Credit hours: 2(1+1)

Theory

Importance of vegetables & spices in human nutrition and national economy, brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders, disease and pest control and seed production of important vegetable and spices.

Practical

Identification of vegetables & spices crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizers applications. Raising of nursery of vegetables & spices. Vegetables & spices seed extraction. Harvesting & preparation for market. Economics of vegetables and spices cultivation.

AGS 203 Renewable Energy and Green Technology Credit hours: 2(1+1)

Theory

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of

solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

***AGS 203 Farm Machinery and Power**

Credit hours: 2(1+1)

Theory

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practical

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

AGS 204 Fundamentals of Plant Breeding

Credit hours: 2(1+1)

Theory

Concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, Centre of origin/diversity, component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses.

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment, analysis of

Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.

AGS 205 Pests of Crops and Stored Grains and their Management

Credit hours: 2(1+1)

Theory

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, narcotics, spices and condiments. Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godown.

AGS 206 Agricultural Finance and Co-Operation

Credit hours: 2(1+1)

Theory

Agricultural Finance- meaning, scope and significance. Agricultural credit: definition, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India.. Preparation and analysis of financial statements – Balance Sheet and Income Statement.

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture. Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practical

Determination of most profitable level of capital use. Optimum allocation of limited amount of capital among different enterprise. Analysis of progress and performance of cooperatives using published data. Analysis of progress and performance of commercial banks and RRBs using published data. Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. Estimation of credit requirement of farm business – A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal – A case study. Techno-economic parameters

for preparation of projects. Preparation of Bankable projects for various agricultural products and its value added products. Seminar on selected topics.

AGS 207Work integrated learning

6(0+6)

A student has to choose any course approved by ASCI(Agriculture Skill Council of India) for level 6. Some of the suggested courses are (Qualification Pack-Watershed Engineer: NSQF Level-6)

AGG 201COMPUTER Programming and Web Designing

3(1+2)

UNIT-I

Working with Word document, Formatting Text, Creating Headers & Footers, Tables & Graphics, Mail Merge, Templates, Wizards & Printing Techniques, Printing Techniques, Viewing the Document before Printing, Introduction to spreadsheets, Introduction to excel, File management in excel, Formatting, Adding Formulate & Functions, Large Databases, Additional Facilities to Format Data, Charts & Maps, Work with Multiple Worksheets, Printing in Excel, Importing & Exporting of Data, Industrial application of MS-Word & PPT

UNIT-II

Applications of Power Point, Add Text and other Objects to Slides, Templates and Master Slides, Giving Animation effects, Links and Action buttons, Tuning up of Presentation, Introduction to MS-Access, Understanding Databases, Creating Databases, Creating Tables, Adding, Editing and Viewing Data, Sorting, Query, Creating Forms, Creating Reports, Industrial application of MS-Excel & MS-Access

UNIT-III

Internet & E-mail Services

Introduction to Internet : Website, Web pages, HTML, HTTP, Information Super Highway, Types of Network, Basic Uses of the Internet, Internet Administration, Client/Server Overview, Protocol used in different Generation, Concept of Network and IP address World Wide Web, Domain Name System, Domain & Address, Web Browsers, URLs, Protecting PCs from Internet Viruses, E-governance services & Industrial application of Internet

UNIT-IV

Introduction to Front Page Express: Entering the page's Title, Adding Color to Web Page, Formatting Text, Adding Graphics, Browsing Web Page, Exiting Front Page Express, Saving Page to a Web Server, Uploading File to an FTP Server, Link of Different Pages, Linking to Web Sites, Adding Sound to Web Pages, Creation of Moving Web Pages

Fundamentals of Web Elements

UNIT-V

Introduction, Elements of an HTML Document, Structural elements of HTML documents, Formatting HTML Documents, Managing images in HTML, tables in HTML documents, Hypertext and Link in HTML Documents, Special effects in HTML documents, managing forms.

PRACTICALS

Study of computer component; Booting of computer and its shutdown; practice of some fundamental of DOS commands; TIME, DATE, DIR, COPY, FORMAT, VOL, LABEL, PATH; Practicing, WINDOWS Operating system, use

of mouse, title bar, minimum, maximum and close button, scroll bar, Menus and tool bar; WINDOWS Explorer, creating folders, COPY and PASTE function; MSWORD: Creating a document, saving and editing;MSWORD,use of option from toolbar, format, insert and tools(spelling and grammar), Alignment of text; MSWORD, Creating a table, Merging of cell, columns and row width; MSEXCEL: Creating a spreadsheet, Alignment of row, columns and cell using format toolbar; MSEXCEL: Entering expressions through the formula tool bar and use of inbuilt functions, SUM, AVERAGE, STDEV; MSEXCEL: Data analysis using inbuilt tool packs, correlation and regression; MSEXCEL: Creating graph and saving with and without data; MSACCESS: Creating database, structuring with different types of fields; MS power point; preparation of slides on power point; transforming the data of WORD,EXCEL and access to other format; internet browsing a web page and creating of E- Mail ID.

AGG 202 Environmental Studies and Disaster Management Credit hours: 3(2+1)

Theory

Multidisciplinary nature of environmental studies Definition, scope and importance.

Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. • Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

DISASTER MANAGEMENT

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site-Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

Semester IV

AGS-208 Production Technology of Medicinal and Aromatic Crops

2(1+1)

Theory:

Importance and cultivation technology of **Spices** – ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek; **Aromatic crops** – mentha, lemon grass, citronella, palma rosa, vetiver, geranium, dawana; **Medicinal plants** – diascoria, rauwolfia, opium, ocimum, perwinkle, aloe, guggul, belladonna, nuxvomica, *Solanum khasiamum*, aonla, senna, plantago, stevia, coleus and Acorus.

Practical

Botanical description and identification of aromatic plants; Identification of varieties in spices; Identification of medicinal plants; Propagation techniques in aromatic and spice crops; Study of identification of aromatic plants; Distillation procedures for aromatic crops; Propagation and planting methods in turmeric; Propagation and planting techniques in ginger; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger, turmeric and black pepper); Training methods in betelvine; Products – byproducts of spices; Procedures for oleoresin extraction; Visit to local Aromatic & medicinal plant nurseries and seed spices field.

AGS 209 Production Technology for Ornamental Crops, MAPs and Landscaping

Credit hours: 2(1+1)

Theory

Importance and scope of ornamental crops and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers. Production technology of important cut flowers like rose, gerbera, carnation, liliun and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions. Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like

asparagus, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs produce.

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

AGS 210 Principles of Seed Technology

3(2+1)

Introduction to Seed Production, Importance of Seed Production, Seed policy, Seed demand forecasting and planning for certified, foundation and breeder seed production, Deterioration of crop varieties, Factors affecting deterioration and their control; Maintenance of genetic purity during seed production, Seed quality; Definition, Characters of good quality seed, Different classes of seed, Production of nucleus & breeder's seed, Maintenance and multiplication of pre-release and newly released varieties in self and cross-pollinated crops; Seed Production, Foundation and certified seed production in maize (varieties, hybrids, synthetics and composites); Foundation and certified seed production of rice (varieties & hybrids); Foundation and certified seed production of sorghum and bajra (varieties, hybrids, synthetics and composites); Foundation and certified seed production of cotton and sunflower (varieties and hybrids); Foundation and certified seed production of tomato and brinjal (varieties and hybrids); Foundation and certified seed production of chillies and bhendi (varieties and hybrids); Foundation and certified seed production of onion, bottle gourd and ridge gourd (varieties and hybrids); Seed certification, phases of certification, procedure for seed certification, field inspection and field counts etc.; Seed Act and Seed Act enforcement, Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories; Duties and powers of seed inspectors, offences and penalties; Seed control order: Seed Control Order 1983, Seed Act 2000 and other issues related to seed quality regulation. Intellectual Property Rights, Patenting, WTO, Plant Breeders Rights, Varietal Identification through Grow-Out Test and Electrophoresis Seed Drying: Forced air seed drying, principle, properties of air and their effect on seed drying- air and heated. Seed processing: air screen machine and its working principle. Establishing a seed testing laboratory. Seed testing procedures for quality assessment, Seed treatment, Importance of seed treatment, types of seed treatment, equipment used for seed treatment (Slurry and Mist-O-matic treater). Seed packing and seed storage, stages of seed storage, factors affecting seed longevity during storage and conditions required for good storage, General principles of seed storage, Constructional features for good seed warehouse, measures for pest and disease control, temperature control. Seed marketing, marketing structure, marketing organization, sales generation activities, promotional media, pricing policy; Factors affecting seed marketing.

Practical

Seed sampling principles and procedures; Physical Purity analysis of Field and Horticultural crops; Germination analysis of Field and Horticultural crops; Moisture tests of Field and Horticultural crops; Viability test of Field and Horticultural crops; Seed health test of Field and Horticultural crops; Vigour tests of Field and Horticultural crops; Seed dormancy and breaking methods; Grow out tests and electrophoresis for varietal identification; Visit to Seed production plots of Maize, Sunflower, Bajra, Rice, Sorghum, Cotton, Chillies and Vegetables. (Add or delete crops of the region); Visit to Seed processing plants; Visit to Seed testing laboratories; Visit to Grow out testing farms; Visit to Hybrid Seed Production farms; Varietal identification in seed production plots; Planting ratios, isolation distance, roguing etc.

AGS 211 Manures, Fertilizers and Soil Fertility Management

Credit Hours: 3(2+1)

Theory

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Integrated nutrient management. Chemical fertilizers: classification, composition and

properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of available N in soils. Estimation of available P in soils. Estimation of available K. Estimation of available S in soils. Estimation of available Ca and Mg in soils. Estimation of available Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

#AGS 211 Fundamentals of Agricultural Extension Education Credit hours: 3(2+1)

Theory

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND, NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Physiology of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions. Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies; communication: meaning and definition; models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

AGS 212 Farm Machinery and Power**Credit hours: 2(1+1)****Theory**

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations, Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practical

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

AGS 212 Renewable Energy and Green Technology Credit hours: 2(1+1)*Theory**

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bio energy resource, introduction of solar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

AGS 213 Work Integrated Learning**6(0+6)**

(Qualification Pack-Watershed Engineer: NSQF Level-6)

AGG203 Financial Accounting Practices**4(2+2)****AGG 204 Values and Social Responsibilities II****2(1+1)**

Semester V

Elective

- **AGS 301 Protected Cultivation and Secondary Agriculture Credit hours: 5(3+2)**

Theory

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes. Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

- **AGS-301 Soil and Water Analysis** **5(3+2)**

Theory

Principles of analytical Instruments and their calibration and applications, Colorimetry and flame photometry, Atomic Absorption Spectrophotometer. Study of water quality parameters. Rapid tissue test for nutrient status in plants.

Practical

Estimation of available N, P, K, S, and Zn in soils, pH, EC, soluble cations and anions in soil water extracts. Lime requirement and gypsum requirement of problem soils. Estimation of N, P and K in plants. Rapid tissue test for identification of nutrient deficiency. Estimation of water quality- BOD and COD.

AGS-302 Post Harvest Management and value addition of fruit and vegetable crops 3(1+2)

Theory:

Importance of post harvest technology in horticultural crops. Maturity indices, harvesting and post harvest handling of fruits and vegetables. Maturity and ripening process. Factors affecting ripening of fruits, and vegetables. Pre harvest factors affecting quality on post harvest shelf life of fruits and vegetables. Factors responsible for deterioration of harvested fruits and vegetables. Chemicals used for hastening and delaying ripening of fruits and vegetables. Methods of storage – precooling, prestorage treatments, low temperature storage, controlled atmospheric storage, hypobaric storage, irradiation and low cost storage structures. Various methods of packing, packaging materials and transport. Packing technology for export. Fabrication of types of containers, cushioning material, vacuum packing, poly shrink packing, specific packing for export of mango, banana, grapes kinnow, sweet orange, and mandarin etc.

Practical

Practice in judging the maturity of various fruits and vegetables. Conservation of zero energy cool chambers for on farm storage. 3& 4. Determination of physiological loss in weight (PLW), total soluble solids (TSS), total sugars, acidity and ascorbic acid content in fruits and vegetables. Packing methods and types of packing and importance of ventilation. Pre cooling packing methods for export or international trade. Methods of prolonging storage life. Effect of ethylene on ripening of banana, sapota, mango, sapota.

AGS 303 Agricultural Marketing, Trade and Prices Credit hours: 2(1+1)

Theory

Agricultural Marketing: Concepts and definitions of market, market structure, classification and characteristics of agricultural markets; demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities, pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions:– buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark);

Market functionaries and marketing channels: meaning and definition of marketing channel; number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India;

Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy;

Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels

for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

AGS 304 Integrated Pest Management Credit hours: 2(1+1)

Theory

Categories of insect pests and diseases, IPM: concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Safety issues in pesticide uses. Important IPM programmes.

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma*, *Pseudomonas*, *Trichogramma*, NPV etc. Identification and nature of damage of important insect pests and diseases and their management. Crop (agro-ecosystem) dynamics of a selected insect pest and diseases. Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pest and diseases . Awareness campaign at farmers fields.

AGS 305 Work integrated learning 6(0+6)

(Qualification Pack-Watershed Manager: NSQF Level-7)

AGG301 Reasoning and Analytical ability

2(1+1)

AGG 302 Entrepreneurship Development

Credit hours: 4(2+2)

Theory

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; Assessment of entrepreneurship skills, SWOT Analysis & achievement motivation, Entrepreneurial behavior, Government policy and programs and institutions for entrepreneurship development, Entrepreneurial Development Process; Business Leadership Skills; Communication skills for entrepreneurship development, Developing organizational skill , Developing Managerial skills, Problem solving skill, Achievement motivation; time management; Supply chain management and Total quality management, Project Planning Formulation and report preparation; Opportunities for entrepreneurship and rural entrepreneurship.

Practical

Assessing entrepreneurial potential, problem solving ability, managerial skills and achievement motivation, exercise in creativity, time audit, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

Semester VI

Elective

- **AGS 306 Livestock & Poultry Management Credit hours: 5(3+2)**

Theory

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding of poultry. Management of growers and layers.

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

- **AGS 306 Development of Tissue Culture Plants** **5(3+2)**

AGS-307 Practices of Organic Farming **1(0+1)**

Practical

Introduction, concept, relevance in present context of organic farming; Organic production requirements Raising of vegetable crops organically through nutrient, diseases and pest management– use of biocontrol agents, biopesticides, pheromones, trap crops, bird perches;; vermin composting; vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, post harvest management and Certification process.

AGS-308 Seed Production and Processing**2(1+1)**

Principles and objectives of seed production, method of seed production cereals crop: Rice, wheat, maize, sorghum. Oil seed crops: Rapeseed, mustard, soybean, groundnut, sunflower. Pulses: Pigeonpea and chickpea. Grading, processing and packaging of seeds.

Practical:

Determination of seed moisture contents, testing seeds for viability, germination test, seed health test, Seed purity test, seed treatment, seed certification and their standard for variety and hybrid at seed and field levels.

AGS-309 Agro Processing Practices**2(1+1)**

Importance and scope of fruit and vegetable preservation in India. Principles of preservation by heat, low temperature, chemicals and fermentation. Unit layout – selection of site and precautions for hygienic conditions of the unit. Preservation through canning, bottling, freezing, dehydration, drying, ultraviolet and ionizing radiations. Preparation of jams, jellies, marmalades, candies, crystallized and glazed fruits, preserves, chutneys, pickles, ketchup, sauce, puree, syrups, juices, squashes and cordials Spoilage of canned products, biochemical, enzymatic and microbial spoilage. Preservatives, Colours permitted and prohibited in India.

Practical-

Identification of equipment and machinery used in preservation of fruits and vegetables. Preservation by drying and dehydration. Preparation of jam, jelly and marmalades. Preparation of squash, cordials and syrups. Preparation of chutneys, pickles, sauces and ketchup. Visit to local processing units. Visit to local market yards and cold storage units. Visit to local market and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

AGS 310 Work integrated learning**8(0+8)**

(Qualification Pack-Watershed Manager: NSQF Level-7)

The student will be carried out a project and their reported have submitted for evolution for thereof .

AGG303 Management Information System**4(2+2)**

Unit-I Introduction to Information Systems - definition - features - steps in implementation of MIS - need for information, information system for decision making- MIS as competitive advantages – MIS structures.

Unit- II MIS - Strategic information system - MIS support for planning - organising – controlling - MIS for specific functions - personnel, finance, marketing, inventory, production. Data Base Management System

Models - hierarchical -network - relational - modular.

Unit- II System Life Cycle Information Flow, Entity Relationship Modeling, Data Modeling, Detailed Process Analysis, Data Flow Diagrams

Unit – IV Decision Making with MISSystem Concepts for MIS, Data Information and Communication, Problem Solving and Decision Making

Unit – V The Future Trends in MISThe Emerging IT Trends, Electronic Data Interchange, Objected Oriented Approach Networking (Information System Highway), Extended Enterprise Systems, Managing International Information Systems

Practical: Lab Sessions on specific topics of the syllabus.

AGG 304 Corporate social responsibility (CSR)

Credit hour 2(1+1)

OPTIONAL SUBJECTS

Semester I

1.1 Principle of Genetics

3(2+1)

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Mendel's laws of inheritance and exceptions to the laws; Types of gene action, Multiple alleles, Pleiotropism, Penetrance and expressivity; Quantitative traits, Qualitative traits and differences between them; Multiple factor hypothesis;

Cytoplasmic inheritance, its characteristic features and difference between chromosomal and cytoplasmic inheritance; Mutation and its characteristic features; Methods of inducing mutations and C I B technique.

Gene expression and differential gene activation; Lac operon and Fine structure of Gene; Ultra structure of cell and cell organelles and their functions; Study of chromosome structure, morphology, number and types, Karyotype and Idiogram; Mitosis and meiosis, their significance and differences between them;

DNA and its structure, function, types, modes of replication and repair. RNA and its structure, function and types; Transcription, Translation, Genetic code and outline of protein synthesis; Crossing over and factors affecting it; Mechanism of crossing over and Cytological proof of crossing over;

Linkage, Types of linkage and estimation of linkage; Numerical chromosomal aberrations (Polyploidy) and evolution of different crop species like Cotton, Wheat, Tobacco, Triticale and Brassicas; Structural chromosomal aberrations.

Practical: Microscopy (Light microscopes and electron microscopes; Preparation and use of fixatives and stains for light microscopy; Preparation of micro slides and identification of various stages of mitosis; Preparation of micro slides and identification of various stages of mitosis; Preparation of micro slides and identification of various stages of meiosis; Preparation of micro slides and identification of various stages of meiosis; Monohybrid ratio and its modifications; Dihybrid ratio and its modifications; Trihybrid ratio; Chi-square analysis and Interaction of factors; Epistatic factors, Supplementary factors and Duplicate factors; Complementary factors, Additive factors and Inhibitory factors; Linkage – Two point test cross; Linkage – Three point test cross; Induction of polyploidy using colchicines; Induction of chromosomal aberrations using chemicals.

1.2 Fundamentals of Soil, Water and Conservation Engineering 3(2+1)

THEORY: Surveying: survey equipment, chain survey, cross staff survey, plotting procedure, calculations of area of regular and irregular fields.

Levelling – levelling equipment, terminology, methods of calculation of reduced levels, types of levelling, contouring.

Irrigation, classification of projects, flow irrigation and lift irrigation. Water source, Waterlifting devices – pumps (shallow and deep well), capacity, power calculations.

Irrigation water measurement – weirs, flumes and orifices and methods of water measurement and instruments. Water conveyance systems, open channel and underground pipeline.

Irrigation methods – drip and sprinkle irrigation systems. Soil and water conservation – soil erosion, types and engineering control measures.

Practical: Acquaintance with chain survey equipment; Ranging and measurement of offsets; Chain triangulation; Cross staff survey; Plotting of chain triangulation; Plotting of cross staff survey; Levelling equipment – dumpy level, levelling staff, temporary adjustments and staff reading; Differential leveling; Profile leveling; Contour survey – grid method; Plotting of contours; Study of centrifugal pumping system and irrigation water measuring devices; Study of different components of sprinkler irrigation systems; Study of different components of drip and sprinkle irrigation systems; Uniformity of water application in drip and sprinkler systems; Study of soil and water conservation measures.

1.3 Plant Pathogens and Principles of Plant Pathology

4(3+1)

Introduction, Important plant pathogenic organisms, different groups, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, virioids, algae, protozoa and phanerogamic parasites with examples of diseases caused by them. Prokaryotes: classification of prokaryotes according to Bergey's Manual of Systematic Bacteriology.

General Characters of fungi, Definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction in fungi (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions and sub-divisions.

Introduction: Definition and objectives of Plant Pathology. History of Plant Pathology. Terms and concepts in Plant Pathology. Survival and Dispersal of Plant Pathogens. Phenomenon of infection – pre-penetration, penetration and post penetration. Pathogenesis – Role of enzymes, toxins, growth regulators and polysaccharides. Defense mechanism in plants – Structural and Bio-chemical (pre and post infection).

Plant disease epidemiology. Plant Disease Forecasting – Remote sensing – General principles of plant diseases management – Importance, general Principles – Avoidance, exclusion, protection – Plant Quarantine and Inspection – Quarantine Rules and Regulations. Cultural methods – Rouging, eradication of alternate and collateral hosts, crop rotation, manure and fertilizer management, mixed cropping, sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage. Role and mechanisms of biological control and PGPR. Physical Methods – Heat and Chemical methods –

Methods of application of fungicides. Host plant resistance – Application of biotechnology in plant disease management – Development of disease resistant transgenic plants through gene cloning. Integrated plant disease management (IDM) – Concept, advantages and importance.

Practical: Acquaintance to plant pathology laboratory and equipments; Preparation of culture media for fungi and bacteria; Isolation techniques, preservation of disease samples; Study of *Pythium*, *Phytophthora* and *Albugo*; Study of *Sclerospora*, *Peronosclerospora*, *Pseudoperonospora*, *Peronospora*, *Plasmopara* and *Bremia*; Study of genera *Mucor* and *Rhizopus*. Study of *Oidium*, *Oidiopsis*, *Ovulariopsis*, *Erysiphe*, *Phyllactinia*, *Uncinula* and *Podosphaera*; Study of *Puccinia*

(different stages), Uromyces, Hemileia; Study of Sphacelotheca, Ustilago and Tolyposporium; Study of Agaricus, Pleurotus and Ganoderma; Study of Septoria, Colletotrichum, Pestalotiopsis and Pyricularia; Study of Aspergillus, Penicillium, Trichoderma, and Fusarium; Study of Helminthosporium, Drechslera, Alternaria, Stemphyllium, Cercospora, Phaeoisariopsis, Rhizoctonia and Sclerotium; Demonstration of Koch's postulates; Study of different groups of fungicides and antibiotics; Preparation of fungicides – Bordeaux mixture, Bordeaux paste, Chestnut compound; Methods of application of fungicides – seed, soil and foliar; Bio-assay of fungicides – poisoned food technique, inhibition zone technique and slide germination technique; Bio-control of plant pathogens – dual culture technique, seed treatment. Visit to quarantine station and remote sensing laboratory.

SECOND SEMESTER

2.1. Introductory _Nematology

2(1+1)

Introduction: History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes. Nematode general morphology and biology. Classification of nematodes up to family level with emphasis on groups containing economically important genera. Classification of nematodes by habitat. Identification of economically important plant nematodes up to generic level with the help of keys and description. Symptoms caused by nematodes with examples. Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Different methods of nematode management. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarisation, hot water treatment) Biological methods, Chemical methods (fumigants, non fumigants). Resistant varieties. IDM.

Practical: Methods of survey – sampling methods, collection of soil and plant samples; Extraction of nematodes from soil and plant tissues following combined Cobb's decanting –sieving and Baermann funnel technique, counting and estimation of plant parasitic nematodes; Preparation of temporary and permanent mounts; Method of preparation of perineal patterns for identification of species of Meloidogyne; Study and identification of most important plant parasitic nematodes with special reference to their characteristics and symptomatology – Meloidogyne, Pratylenchus; Heterodera, Ditylenchus, Globodera, Tylenchulus, Xiphinema, Radopholus, Rotylenchulus, and Helicotylenchus. Experimental techniques used in pathogenicity studies with root knot nematode.

2.2. Statistics

2(1+1)

Introduction: Definition of Statistics and its use and limitations; Frequency Distribution and Frequency Curves; Measures of Central Tendency: Characteristics of Ideal Average, Arithmetic Mean; Median, Mode, Merits and Demerits of Arithmetic Mean; Measures of Dispersion: Standard Deviation, Variance and Coefficient of Variation; Probability: Definition and concept of probability; Normal Distribution and its properties; Introduction to Sampling: Random Sampling; the concept of Standard Error; Tests of Significance- Types of Errors, Null Hypothesis, Level of Significance and Degrees of Freedom, Steps involved in testing of hypothesis; Large Sample Test- SND test for Means, Single Sample and Two Samples (all types); Small Sample Test for Means, Student's t-test for Single Sample, Two Samples and Paired t test. F test; Chi-Square Test in 2x2 Contingency Table, Yates' Correction for continuity; Correlation: Types of Correlation and identification through Scatter Diagram, Computation of Correlation Coefficient 'r' and its testing. Linear Regression:

of Y on X and X on Y. Inter-relation between 'r' and the regression coefficients, fitting of regression equations. Experimental Designs: Basic Designs, Completely Randomized Design (CRD), Layout and analysis with equal and unequal number of observations, Randomized Block Design (RBD), Layout and analysis, Latin Square Design (LSD), Layout and analysis.

Practical: Construction of Frequency Distribution Tables and Frequency Curves; Computation of Arithmetic Mean for Un-Grouped and Grouped data; Computation of Median for Un-Grouped and Grouped data; Computation of Mode for Un-Grouped and Grouped data; Computation of Standard Deviation, Variance and Coefficient of Variation for Un-Grouped and Grouped data; SND test for Means, Single Sample; SND test for Means, Two Samples; Student's t-test for Single Sample; Student's t-test for Two Samples; Paired t-test and F test; Chi-Square Test in 2x2 Contingency Table, Yates' Correction for continuity; Computation of Correlation Coefficient 'r' and its testing; Fitting of regression equations- Y on X and X on Y; Analysis of Completely Randomized Design (CRD); Analysis of Randomized Block Design (RBD); Analysis of Latin Square Design (LSD).

2.3. Principles of Agricultural Economics

2(2+0)

Economics: Meaning, Definition, Subject matter, Divisions of Economics, Importance of Economics; Agricultural Economics: Meaning, Definition; Basic Concepts: Goods, Service, Utility, Value, Price, Wealth, Welfare. Wants: Meaning, Characteristics, Classifications of Wants, Importance. Theory of consumption: Law of Diminishing Marginal utility, Meaning, Definition, Assumption, Limitations, Importance. Consumer's surplus: Meaning, Definition, Importance. Demand: Meaning, Definition, Kinds of Demand, Demand schedule, Demand Curve, Law of Demand, Extension and Contraction Vs Increase and Decrease in Demand. Elasticity of Demand: Types of Elasticity of Demand, Degrees of price elasticity of Demand, Methods of Measuring Elasticity, Factors influencing elasticity of Demand, Importance of Elasticity of Demand. Welfare Economics: Meaning, Pareto's optimality. National Income: Concepts, Measurement. Public Finance: Meaning, Principles. Public Resource: Meaning, Services Tax, Meaning, Classification of Taxes: Canons of Taxation, Public expenditure: Meaning, Principles. Inflation: Meaning, Definition, Kinds of inflation

2.4. Dimensions of Agricultural Extension

2(1+1)

Education – Meaning, Definition, Types – Formal, Informal and Non-formal education and their Characteristics. Extension Education and Agricultural Extension – Meaning, Definition, Concepts, Objectives and Principles. Rural development – Meaning, Definition, Concepts, Objectives, Importance and Problems in rural development. Developmental programmes of pre-independence era – Sriniketan, Marthandam, Gurgaon experiment and Gandhian constructive programme. Development programmes of Post independence era, Firka

Development, Etawah – Pilot project and Nilokheri Experiment. Community Development Programme – Meaning, Definition, Concepts, Philosophy, Principles, Objectives, Differences between Community Development and Extension Education, National Extension service. Panchayati Raj system – Meaning of Democratic – Decentralization and Panchayat Raj, Three tiers of Panchayat Raj system, Powers, Functions and Organizational setup. Agricultural Development Programmes with reference to year of start, objectives & salient features –

Intensive Agricultural District Programme (IADP), High Yielding Varieties Programme (HYVP), Institution Village Linkage Programme (IVLP), Watershed Development Programme (WDP), National Agricultural Technology Project

(NATP), ATMA, ATIC. Social Justice and Poverty alleviation programmes – Integrated Tribal Development Agency (ITDA), Integrated Rural Development Programme (IRDP), Swarna Jayanthi Gram Swarojgar Yojana (SGSY), Prime Minister Employment Yojana (CMEY). New trends in extension, privatization. Women Development programmes – Development of Women and Children in Rural Areas (DWCRA), Rashtriya Mahila Kosh (RMK), Integrated Child Development Scheme (ICDS) and Mahila Samridhi Yojana (MSY). Reorganized extension system (T&V System) – Salient features, Fort night Meetings, Monthly workshops, Linkages, Merits and Demerits, Emergence of Broad Based Extension (BBE).

Practical: Visits to a village and kisan mandal to study the ongoing development programmes. Visits to Panchayat Raj Institutions to study the functioning of Gram Panchayat (GP) & Zilla Praja Parishad (ZPP). Visit and study the District Rural Development Agency (DRDA). Participation in monthly workshops of Training and Visit (T & V) System. Visit to

Watershed Development Project area. Visit to a village to study the Self Help Groups (SHGs) of DWCRA. Visit to a voluntary organization to study the developmental activities. Organizing PRA techniques in a village to identify the agricultural problems. Visit to villages.

2.5. Agricultural Microbiology

3(2+1)

History of Microbiology: Spontaneous generation theory, Role of microbes in

fermentation, Germ theory of disease, Protection against infections, Applied areas of Microbiology Metabolism in bacteria: ATP generation, chemoautotrophy, photo autotrophy, respiration, fermentation. Bacteriophages: structure and properties of Bacterial viruses – Lytic and Lysogenic cycles: viroids, prions. Bacterial genetics; Gene expression; Genetic recombination: transformation, conjugation and transduction, genetic engineering, Plasmids, episomes, genetically modified Organisms. Soil Microbiology: Microbial groups in soil, microbial transformations of carbon, nitrogen, phosphorus and sulphur, Biological nitrogen fixation. Microflora of Rhizosphere and Phyllospheremicroflora, microbes in composting. Microbiology of Water. Microbiology of food: microbial spoilage and principles of food preservation. Beneficial microorganisms in Agriculture: Biofertilizer (Bacterial Cyanobacterial and Fungal), microbial insecticides, Microbial agents for control of Plant diseases, Biodegradation, Biogas production, Biodegradable plastics, Plant – Microbe interactions.

Practical: General instructions, Familiarization with instruments, materials, glassware etc. in a microbiology laboratory: Practice of Aseptic methods: I - Evaluation of aseptic technique with Nutrient broth tubes. II- Evaluation of aseptic technique with a Nutrient agar plate. Methods of Sterilization and Preparation of media I- Preparation of nutrient broth, nutrient agar plates, nutrient agar slant and nutrient agar stab; II- Sterilization of glassware by Dry heating; III - Sterilization of nutrient broth by Filtration. Plating methods for Isolation and Purification of bacteria I - Isolation of bacteria by Streak plate method. II - Isolation of aerobic spore forming bacteria by Enrichment using Streak plate method. III - Checking of purity of a bacterial culture by Streak plating method. Identification of bacteria by staining methods and Biochemical tests: I– Morphological examination of bacteria by Simple and Differential staining. II – Different biochemical tests for identification of bacterial culture; Enumeration of bacteria: I - Enumeration of bacteria by Stain slide method. II- Enumeration of bacteria by Most probable number method. III - Enumeration of bacteria by Pour plate method and Spread plate method.

THIRD SEMESTER

3.1.Principles of Plant Breeding

3(2+1)

Classification of plants, Botanical description, Floral biology, Emasculation and Pollination techniques in cereals, millets, pulses, oil seeds, fibers, plantation crops etc. Aims and objectives of Plant Breeding; Modes of reproduction, Sexual, Asexual, Apomixis and their classification; Significance in plant breeding; Modes of pollination, genetic consequences, differences between self and cross pollinated crops; Methods of breeding – introduction and acclimatization. Selection, Mass selection Johansson's pure line theory, genetic basis, pure line selection; Hybridization, Aims and objectives, types of hybridization; Methods of handling of segregating generations, pedigree method, bulk method, back cross method and various modified methods; Incompatibility and male sterility and their utilization in crop improvement; Heterosis, inbreeding depression, various theories of Heterosis, exploitation of hybrid vigour development of inbred lines, single cross and double cross hybrids; Population improvement programmes, recurrent selection, synthetics and composites; Methods of breeding for vegetatively propagated crops; Clonal selection; Mutation breeding; Ploidy breeding; Wide hybridization, significance in crop improvement.

Practical: Botanical description and floral biology; Study of megasporogenesis and microsporogenesis; Fertilization and life cycle of an angiospermic plant; Plant Breeder's kit; Hybridization techniques and precautions to be taken; Floral morphology, selfing, emasculation and crossing techniques; Study of male sterility and incompatibility in fieldplots; Rice and Sorghum; Maize and Wheat; Bajra and ragi; Sugarcane and coconut; Groundnut, Castor, Safflower and Sesamum; Redgram, Bengalgram and Greengram; Soybean and blackgram; Chillies, Brinjal and Tomato; Bhendi, Onion, Bottle gourd and Ridge gourd; Cotton and Mesta; Jute and Sunhemp

3.2. Insect Morphology and Systematics

3(2+1)

History of Entomology in India. Factors for insects abundance. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and moulting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts and legs. Wing venation, modifications and wing coupling apparatus. Structure male and female genitalia. Sensory organs. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system in insects. Types of reproduction in insects. Systematics: Taxonomy importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders. Orthoptera, Acrididae. Dictyoptera, Mantidae, Odonata, Isoptera, Termitidae, Thysanoptera, Thripidae, Hemiptera, Pentatomidae, Coreidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Aleurodidae, Pseudococcidae, Neuroptera, Chrysopidae Lepidoptera, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae,

Coleoptera, Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae, Hymenoptera, Tenthredinidae, Apidae, Trichogrammatidae, Ichneumonidae, Braconidae, Diptera, Cecidomyiidae, Trypetidae, Tachinidae, Agromyziidae.

Practical: Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importances

3.3. Agricultural Finance and Co-Operation

2(1+1)

Agricultural finance: nature and scope. Time value of money, Compounding and Discounting. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4R's 5C's and 7 P's of credit, repayment plans.

History of financing agriculture in India. Commercial banks, nationalization of commercial banks. Lead bank scheme, regional rural banks, scale of finance. Higher financing agencies, RBI, NABARD, AFC, Asian Development Bank, World Bank,

Insurance and Credit Guarantee Corporation of India. Assessment of crop losses, determination of compensation. Crop insurance, advantages and limitations in application, estimation of crop yields.

Agricultural cooperation: philosophy and principles. History of Indian cooperative Movement, pre-independence and post independence periods, cooperation in different plan periods, cooperative credit structure: PACS, FSCS.

Reorganisation of cooperative credit structure in Andhra Pradesh and single window system. Successful cooperative systems in Gujarat, Maharashtra. Punjab etc.

Practical: Factors governing use of Capital and identification of credit needs; Time value of money, Compounding and discounting; Tools of financial management, Balance sheet, Income statement and cash flow analysis; Estimations of credit needs and determining unit costs; Preparations and analysis of loan proposals; Types of repayment loans; Study of financial institutions: PACS, DCCB, Apex Banks, RRBs, CBs, NABARD.

3.4. Crop Physiology

3(2 +1)

Introduction, Importance in Agriculture. Seed Physiology, Seed structures, Morphological, physiological and biochemical changes during seed development, Physiological maturity –Morphological and physiological changes associated with physiological maturity in crop, Harvestable maturity, Seed viability and vigour, Factors affecting seed viability and vigour. Methods of testing seed viability and vigour,

Germination, Utilization of seed reserves during seed germination, Morphological, physiological and biochemical changes during seed germination, Factors affecting seed germination. Growth and Development, Definition, Determinate and Indeterminate growth, Monocarpic and Polycarpic species with examples. Measurement of growth, Growth analysis

Growth characteristics, Definitions and mathematical formulae. Crop Water Relations, Physiological importance of water to plants, Water potential and its components, measurement of water status in plants.

Transpiration, significance, Transpiration in relation to crop productivity, Water Use Efficiency, WUE in C3, C4 and CAM plants, Factors affecting WUE. Photosynthesis, Energy synthesis, Significance of C3, C4 and CAM pathway, Relationship of Photosynthesis and crop productivity, Translocation of assimilates, Phloem loading, apoplastic and symplastic transport of assimilates, Source and sink concept, Photorespiration, Factors affecting

Photosynthesis and productivity, Methods of measuring photosynthesis, Photosynthetic efficiency, Dry matter partitioning, Harvest index of crops. Respiration and its significance, Brief account of Growth respiration and maintenance respiration, Alternate respiration – Salt respiration – wound respiration – measurement of respiration. Nutriophysiology – Definition

– Mengel's classification of plant nutrients – Physiology of nutrient uptake – Functions of plant nutrients – Deficiency and toxicity symptoms of plant nutrients – Foliar nutrition – Hydroponics. Introduction of Photoperiodism and Vernalisation in relation to crop productivity – Photoperiodism Plant Growth Regulators – Occurrence – Biosynthesis – Mode of action of Auxins, Gibberellins, Cytokinins, ABA, Ethylene. Novel plant growth regulators,

Commercial application of plant growth regulators in agriculture. Senescence and abscission – Definition – Classification – Theories of mechanism and control of senescence – Physiological and biochemical changes and their significance. Post Harvest Physiology –Seed dormancy – Definition – types of seed dormancy – Advantages and disadvantages of seed dormancy – Causes and remedial measures for breaking seed dormancy, Optimum conditions of seed storage – Factors influencing seed storage (ISTA standards). Fruit ripening

– Metamorphic changes – Climateric and non-climateric fruits – Hormonal regulation of fruit ripening (with ethrel, CCC, Polaris, paclobuterozole).

Practical: Preparation of solutions; Growth analysis: Calculation of growth parameters; Methods of measuring water status in roots, stems and leaves; Measurement of water potential by Chardakov's method; Measurement of absorption spectrum of chloroplastic pigments and fluorescence; Measurement of leaf area by various methods; Stomatal frequency and index – Respirometer – Measurement of respirometer; Leaf anatomy of C3 and C4 plants; Transpiration of measurement; Imbibition of seed; Optimum conditions for seed germination; Breaking seed dormancy; (a) Chemical method (b) Mechanical method; Yield analysis; Seed viability and vigour tests; Effect of ethylene on regulation of stomata

FOURTH SEMESTER

4.1. Manures, Fertilizers and Agro-Chemicals

3(2+1)

Introduction – Raw materials – Manures – Bulky and concentrated – FYM, Composts –Different methods, Mechanical compost plants, Vermicomposting, Green manures, Oil cakes, Sewage and sludge – Biogas plant slurry, Plant and animal refuges. Fertilizers –classifications, Manufacturing processes and properties of major nitrogenous (ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate) phosphatic (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate), potassic and complex fertilizers their fate and reactions in the soil, Secondary and micronutrients fertilizers, Amendments. Fertilizer Control Order, Fertilizer storage; Biofertilizers and their advantage, Organic chemistry as prelude to agro chemicals, Diverse types of agrochemicals, Botanical insecticides (Neem), Pyrethrum, Synthetic pyrethroids. Synthetic organic insecticides, Major classes, Properties and uses of some important insecticides under each class. Herbicides – Major classes – Properties and uses of 2, 4-D, atrazine, glyphosate, butachlor benthiocarb; Fungicides – Major classes – Properties and uses of carbendazim, carboxin, captan, tridemorph and copper oxychloride –Insecticides Act, Plant growth regulators.

Practical: Total nitrogen and phosphorus in manures / composts – Ammoniacal and nitrate nitrogen – Water soluble P₂O₅, potassium, calcium, sulphur and zinc contents of fertilizers COD in organic wastes – Adulteration in fertilizer. Argentimetric and iodometric titrations –their use in the analysis of lindane metasystox, endosulfan, malathion, copper and sulphur fungicides – Compatibility of fertilizers with pesticides.

4.2. Insect Ecology and Integrated Pest Management Including 3 (2+1)

Beneficial Insects

Beneficial Insects Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors–temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance. Concepts of

Balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro-ecosystem. Pest surveillance and pest forecasting. Categories of pests. IPM; Introduction, importance, concepts principles and tools of IPM-Host plant resistance, Cultural, Mechanical, Physical, Legislative, Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses) methods of control. Chemical control – importance, hazards and limitations. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Study of important insecticides. Botanical insecticides – neem based products, Cyclodiens, Organophosphates, Carbamates, Synthetic pyrethroids, Novel insecticides, Pheromones, Nicotinyl insecticides, Chitin synthesis

inhibitors, Phenyl pyrazoles, Avermectins, Macrocyclic lactones, Oxadiazimes, Thiourea derivatives, pyridine azomethines, pyrroles, etc. Nematicides, Rodenticides, Acaricides and fumigants. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control. Practices, scope and limitations of IPM. Insecticides Act 1968 – Important provisions. Application techniques of spray fluids. Phytotoxicity of

insecticides. Symptoms of poisoning, first aid and antidotes. Beneficial insects: parasites and predators used in pest control and their mass multiplication techniques. Important groups of microorganisms, bacteria, viruses and fungi used in pest control and their mass multiplication techniques. Important species of pollinators, weed killers and scavengers, their importance. Non insect pests – mites, nematology, rodents and birds. Vermiculture

Practical: Visit to meteorological observatory / automatic weather reporting station; Study of terrestrial and pond ecosystems of insects; Studies on behaviour of insects and orientation (repellency, stimulation, deterancy); Study of distribution patterns of insects, sampling techniques for the estimation of insect population and damage; Pest surveillance through light traps, pheromone traps and field incidence; Practicable IPM practices, Mechanical and physical methods; Practicable IPM practices, Cultural and biological methods; Chemical control, Insecticides and their formulations; Calculation of doses/concentrations of insecticides; Compatibility of pesticides and Phytotoxicity of insecticides; IPM case studies;

Identification of common phytophagous mites and their morphological characters; Identification of common plant parasitic nematodes and their morphological characters; Identification of rodents and bird pests and their damage; Identification of earthworms in vermiculture – visit to vermiculture unit; Other beneficial insects – Pollinators, weed killers and scavengers

4.3. Agricultural Marketing, Trade and Prices

2 (1+1)

Agricultural Marketing: Concepts and Definition, Scope and subject matter, Market and Marketing: Meaning, Definitions, Components of a market, Classification. Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer's surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition,

Channels for different products. Market integration, Meaning, Definition, Types of Market Integration. Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm commodities, Ways of reducing marketing costs. Theories of International Trade: Domestic

Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, Domestic support, Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions. Quality Control, Agricultural Products, AGMARK. Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

Practical: Identification of marketing channels; Study of Rythu Bazars, Regulated markets; Study of unregulated markets; Study of livestock markets; Price spread analysis; Visit to market institutions, NAFED; Study of SWC, CWC and STC; Analysis of information of daily prices; Marketed and marketable surplus of different commodities.

4.4. Diseases of Field Crops and Their Management 3 (2+1)

Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of rice, sorghum, bajra, maize, wheat, sugarcane, turmeric, tobacco, groundnut, sesamum, sunflower, cotton, redgram, bengalgram, blackgram, greengram, tea, soybean.

Practical: Study of symptoms, etiology, host-parasite relationship and specific control measures of the following crop diseases. Presentation of disease samples survey and collection of Diseases of rice, sorghum; Diseases of wheat, bajra & maize; Diseases of sugarcane, turmeric & tobacco; Diseases of groundnut, castor & sunflower; Diseases of sesamum & cotton; Diseases of redgram, greengram, blackgram, bengalgram & beans; Field visits at appropriate time during the semester

Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester.

1.5. Breeding of Field / Horticulture Crops

3(2+1)

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg Law; Study in respect of origin, distribution of species, wild relatives and forms, Cereals, (rice,

wheat, maize, millets, sorghum, bajra,ragi); Pulses (redgram,greengram, blackgram, soybean); Oilseeds (Groundnut, sesame,sunflower, safflower, castor, mustard) etc. Fibers (Cotton, kenaf, roselle, jute) etc. Vegetables(Tomato, bhindi, chilli, cucumbers); Flowers crops (Chrysanthemum, rose, galardia, gerbera& marigold); Fruit crops (aonla, guava, mango, custard apple, banana, papaya); Major breeding procedures for development of hybrids / varieties of various crops; Plant Genetic Resources their conservation and utilization in crop improvement; Ideotype concept in crop improvement; Breeding for resistance to biotic and abiotic stresses variability in pathogens

and pests; Mechanisms of resistance in plant to pathogens and pest; Genetic basis of adaptability to unfavourable environments; Definition of biometrics, assessment of variability i.e., additive, dominance and epistasis and their differentiation; Genotype x Environment interaction and influence on yield/performance, IPR and its related issues.

Practical: Emasculation and Hybridization techniques; Handling of segregating generations,pedigree methods; Handling of segregating generations, bulk methods; Handling of segregating generations, back cross methods; Field lay out of experiments; Field trials, maintenance of records and registers; Estimation of Heterosis and inbreeding depression; Estimation of Heritability, GCA and SCA; Estimation of variability parameters; Parentage of released varieties/hybrids; Problems on Hardy, Weinberg Law; Study of quality characters; Sources of donors for different characters; Visit to seed production and certification plots; Visit to AICRP trials and programmes; Visit to grow out test plots; Visit to various research stations; Visit to other institutions

1.6. Livestock Production and Management

3(2+1)

Place of livestock in the national economy, different livestock development programmes of Govt. of India. Important exotic and Indian breeds of cattle, buffalo, sheep, goat and swine. Measures and factors affecting fertility in livestock, reproductive behaviour like oestrus, parturition, farrowing etc. Milk secretion, milking of animals and factors affecting milk yield and composition. Selection and breeding of livestock for higher milk and meat production. Feeding and management of calves, growing heifers and milch animals and other classes and types of animals, housing principles, space requirements for different species of livestock. Disease control measures, sanitation and care, breeding, feeding and production records. Breed characteristics of poultry, their methods of rearing, breeding, feeding and management, incubation, hatching and brooding, vaccination and prevention of diseases, preservation and marketing of eggs, its economics and keeping quality. Cost of production of milk, economical units of cattle, buffalo, sheep, goat and swine.

Practical: Identification, handling and restraining of animals; Judging and culling; Feeding and ration formulation; Hatching, housing and management of poultry; Visit to livestock farms and Economics of livestock production.

FIFTH SEMESTER

5.1. Principles of Plant Biotechnology

3(2+1)

Concepts of Plant Biotechnology: History of Plant Tissue Culture and Plant Genetic Engineering; Scope and importance in Crop Improvement: Totipotency and Morphogenesis, Nutritional requirements of in-vitro cultures; Techniques of In-vitro cultures, Micro propagation, Anther culture, Pollen culture, Ovule culture, Embryo culture, Test tube fertilization, Endosperm culture, Factors affecting above in-vitro culture; Applications and Achievements; Somaclonal variation, Types, Reasons: Somatic embryogenesis and synthetic seed production technology; Protoplast isolation, Culture, Manipulation and Fusion; Products

of somatic hybrids and cybrids, Applications in crop improvement. Genetic engineering; Restriction enzymes; Vectors for gene transfer – Gene cloning – Direct and indirect method of gene transfer – Transgenic plants and their applications. Blotting techniques – DNA finger printing – DNA based markers – RFLP, AFLP, RAPD, SSR and DNA Probes – Mapping QTL – Future prospects. MAS, and its application in crop improvement.

Practical: Requirements for Plant Tissue Culture Laboratory; Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm culture; Hardening / Acclimatization of regenerated plants; Somatic embryogenesis and synthetic seed production; Isolation of protoplast; Demonstration of Culturing of protoplast; Demonstration of Isolation of DNA; Demonstration of Gene transfer techniques, direct methods; Demonstration of Gene transfer techniques, indirect methods; Demonstration of Confirmation of Genetic transformation; Demonstration of gel-electrophoresis techniques.

5.2. Crop Pests and Stored Grain Pests and Their Management

3(2+1)

Stored grain pests: Coleopteran and Lepidopteran pests, their biology and damage, preventive and curative methods. Distribution, biology, nature and symptoms of damage, and management strategies of insect and non insect pests of rice, sorghum, maize, ragi (*Eleusine coracana*), wheat, sugarcane, cotton, mesta, sunhemp, pulses, groundnut, castor, gingerly, safflower, sunflower, mustard, brinjal, bhendi, tomato, cruciferous and cucurbitaceous vegetables, potato, sweet potato, colacasia, moringa, amaranthus, chillies, mango, citrus,

grapevine, cashew, banana, pomegranate, guava, sapota, ber, apple, coconut, tobacco, coffee, tea, turmeric, betelvine, onion, coriander, garlic, curry leaf, pepper, ginger and ornamental plants.

Practical: Identification of pests, their damage symptoms and management of rice, sorghum, maize, wheat, sugarcane, cotton, pulses, Solanaceous and Malvaceous vegetables, cruciferous and cucurbitaceous vegetables, chilli, mango, carbon, citrus and sapota

5.4. Fundamentals of Rural Sociology and Educational Psychology 2 (2+0)

Extension Education and Agricultural Extension – Meaning, Definition, Scope and Importance. Sociology and Rural Sociology, Meaning, Definition, Scope, Importance of Rural Sociology in Agricultural Extension and Interrelationship between Rural Sociology & Agricultural Extension. Indian Rural Society, Important characteristics, Differences and Relationship between Rural and Urban societies. Social Groups – Meaning, Definition, Classification, Factors considered in formation and organization of groups, Motivation in group formation and Role of Social groups in Agricultural Extension. Social Stratification – Meaning, Definition, Functions, Basis for stratification, Forms of Social stratification – Characteristics and – Differences between Class & Caste System. Cultural concepts – Culture, Customs, Folkways, Mores, Taboos, Rituals and Traditions – Meaning, Definition and their Role in Agricultural Extension. Social Values and Attitudes – Meaning, Definition,

Types and Role of Social Values and Attitudes in Agricultural Extension. Social Institutions – Meaning, Definition, Major institutions in Rural society, Functions and their Role in Agricultural Extension. Social Organizations – Meaning, Definition, Types of organizations and Role of Social organizations in Agricultural Extension. Social Control – Meaning, Definition, Need of social control and Means of Social control. Social change – Meaning,

Definition, Nature of Social change, Dimensions of social change and factors of social change. Leadership – Meaning, Definition, Classification, Roles of a leader, Different methods of Selection of Professional and Lay leaders. Training of Leaders – Meaning, Definition, Methods of training, Advantages and Limitations in use of local leaders in Agricultural Extension. Psychology and Educational Psychology – Meaning, Definition, Scope and Importance of Educational Psychology in Agricultural Extension. Intelligence – Meaning, Definition, Types, Factors affecting intelligence and Importance of intelligence in Agricultural Extension. Personality – Meaning, Definition, Types, Factors influencing the Personality and Role of personality in Agricultural Extension. Teaching – Learning process – Meaning and Definition of Teaching, Learning, Learning experience and Learning situation, Elements of learning situation and its characteristics. Principles of learning and their

implication for teaching.

5.5. Diseases of Horticultural Crops and Their Management 3(2+1)

Economic Importance, symptoms, cause, disease cycle and integrated management of diseases of: citrus, mango, banana, grapevine, pomegranate, papaya, guava, sapota, apple, chilli, brinjal, bhendi, potato, crucifers, cucurbits, tomato, beans, onion, coconut, oil palm, betelvine, mulberry, coffee, tea, rose, chrysanthemum and jasmine.

Practical: Diseases of beans, citrus, guava, & sapota; Diseases of papaya, banana, pomegranate & ber; Diseases of mango, grapes & apple; Diseases of chilli, brinjal & bhendi; Diseases of potato, tomato & crucifers; Diseases of cucurbits, onion & betelvine; Diseases of oil palm, coconut, tea, coffee & mulberry; Diseases of rose, chrysanthemum and jasmine. Field visits at appropriate time during the semester.

Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester

SIXTH SEMESTER

6.1. Production Economics and Farm Management

2 (1+1)

Production Economics: Meaning, Definition, Nature and Scope of Agricultural Production Economics. Basic concepts and terms. Concepts of Production. Production Functions: Meaning, Definition, Types. Laws of returns: Increasing, Constant and decreasing. Factor Product Relationship. Determination of optimum input and output. Factor relationship. Product relationship. Types of enterprise relationships. Returns to scale: Meaning, Definition, Importance. Farm Management. Economic principles applied to the Organizations of farm

business. Types and systems of farming. Farm planning and budgeting. Risk and uncertainty. Farm budgeting. Linear programming: Assumptions, Advantages and Limitations of Linear programming.

Practical: Computation of cost concepts; Methods of computation of depreciation; Analysis of Net worth statement; Farm inventory analysis; Preparation of farm plans and budgets; Types of farm records and accounts; Preparation of profit and loss account; Break, Even analysis; Economics analysis of different crop and livestock enterprises; Application of Farm Management Principles.

6.2. Biochemistry

3(2+1)

Biochemistry – Introduction and importance. Plant cell, cell wall and its role in live stock, food and paper industries. Bio-molecules – Structure, properties & applications: Amino acids, peptides and proteins –Plant proteins and their quality. Enzymes –Factors affecting the activity, classification, Immobilisation and other industrial applications. Lipids –Acyl lipids,

Their industrial application in soaps, detergents, paints, Varnishes, lubricants, adhesives, plastics, nylon, Bio-diesel, Biodegradable plastics etc. Carbohydrates; Nucleotides and Nucleic acids. Metabolic energy and its generation – Metabolism – Basic concepts, Glycolysis, Citric acid Cycle, Pentose phosphate pathway, oxidative phosphorylation, Fatty acid oxidation. General reactions of amino acid degradation. Biosynthesis – carbohydrates,

Lipids, Proteins and Nucleic acids. Metabolic regulation. Secondary metabolites, Terpenoids, Alkaloids, Phenolics and their applications in food and pharmaceutical industries.

Practical: Amino acid models (atomic); Paper electrophoresis for the separation of plant pigments; Protein denaturation – heat, pH, precipitation of proteins with heavy metals, Protein estimation by Lowry method; Enzyme kinetics, competitive

inhibition, enzyme immobilization; Extraction of nucleic acids, column chromatography of RNA hydrolysate; Characterization of lipids by T.L.C.; Extraction of oil from oil seeds; Estimation of fatty acids by G.L.C.; Models of sugars, sucrose & starch; Quantitative determination of sugars;

Paper chromatography for the separation of sugars; Determination of phenols.

6.3. Renewable Energy

2 (1+1)

Energy sources, Introduction, Classification, Energy from Biomass, Types of biogas plants, constructional details, Biogas production and its utilization, Agricultural wastes, Principles of combustion, pyrolysis and gasification, Types of gasifiers, Producer gas and its utilization. Briquettes, Types of Briquetting machines, uses of Briquettes, Shredders. Solar energy, Solar

flat plate and focussing plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, solar grain dryers, Solar Refrigeration system, Solar ponds, Solar photo voltaic systems, solar lantern, Solar street lights, solar fencing, Solar pumping systems. Wind energy, Types of wind mills, Constructional details & application of wind mills. Liquid Bio fuels, Bio diesel and Ethanol from agricultural produce, its production & uses.

Practical: Constructional details of KVIC & Janatha type biogas plants; Constructional details of Deen Bandu type biogas plants; Field visit to biogas plants; Constructional details of different types of gasifiers; Testing of gasifiers; Briquette preparation from biomass; To study and find the efficiency of solar cooker; To study and find the performance of a solar

still; To study and find the performance of a solar dryers; Study and working of solar photovoltaic pumping system; Study and performance evaluation of domestic solar water heater; Study and performance evaluation of solar lantern; Study and performance evaluation of solar street light; To study the performance of different types of wind mills; Field visit to wind mills; To study the processing of Bio-diesel production from Jatropha.