

TAMIL NADU AGRICULTURAL UNIVERSITY

DIPLOMA IN AGRICULTURE

I Semester

S. No.	Course No.	Course Title	Credit Hrs.
1.	AGR D11	Principles of Agronomy and Agricultural Meteorology	1+2
2.	AGR D12	Irrigation and Weed Management	1+1
3.	SAC D11	Basics of Soil Science	1+1
4.	HOR D11	Propagation Methods in Horticultural Crops	0+1
5.	AGM D11	Basic and Applied microbiology	1+1
6.	ENG D11	Farm Machinery and Post harvest Processing	2+1
7.	COM D11	Introduction to Computer and its Applications	0+1
8.	LAN D11	English Language for Effective Communication	0+1
9.	PED D11	Physical Education	0+1
		Total	6+10=16

Note: PED D11 course registered during I semester and the evaluation done at II semester.

AGR D11	Principles of Agronomy and Agricultural Meteorology	(1+2)
---------	---	-------

Objectives

- ❖ Basic principles and concepts of agronomy are explained to the students in detail since it is a basic subject which assumes significance in agriculture.
- ❖ To form basis for further learning of other agronomy courses in subsequent semesters.
- ❖ To expose students to the importance and scope of meteorology in agriculture.

Theory syllabus

Agriculture - Definition - Scope of agriculture in India and Tamil Nadu - Branches of Agriculture - Agronomy - Agronomic Classification of Crops - Major crops of India and Tamil Nadu -Factors affecting Crop Production - Moisture, Aeration, Light, Temperature and Soil Nutrients - Principles and practices of agricultural operations - Tillage - Intercultural Operations, Implements and tools in Agriculture - Cropping Systems - Principles - Merits and demerits -Seeds and Sowing - Seed treatment -Optimum plant population - Crop geometry - Nursery – Transplanting - After cultivation - weed management - irrigation management – Manures and fertilizers - Methods of application - Harvesting - Post harvest techniques - Meteorology - Agricultural Meteorology - Atmosphere - Weather parameters and their role in crop production - Rainfall - Agro Climatic Zones of Tamil Nadu

Lecture schedule

Lecture No.	Contents to be dealt
1.	Agriculture - Definition - Scope of agriculture in India and Tamil Nadu - Branches of Agriculture - Agronomy - Scope of Agronomy - Art and Science of Crop Production
2.	Agronomic Classification of Crops - Major crops of India and Tamil Nadu - Rice, wheat, maize, sorghum, cumbu, chick pea, redgram, green gram, black gram, groundnut, sunflower, gingelly, cotton, sugarcane
3.	Factors affecting Crop Production – Climate and weather factors – climate classification and its suitability for different field crops
4.	Factors affecting Crop Production – Soil factors – major soils and suitability for different field crops – crop and soil
5.	Principles and practices of agricultural operations - Tillage – Definition, types, objectives - Tillage – types
6.	On season tillage - Preparatory tillage - Primary and Secondary tillage - Inter tillage / inter cultivation - Off season tillage- Special types of tillage – modern concepts of tillage - Implements and tools in Agriculture
7.	Seeds - Sowing – methods - Seed treatment – objectives and methods - Nursery - Transplanting

8.	Irrigation –definition –Crop water requirement – irrigation scheduling
9.	Mid semester examination
10.	Optimum plant population - Crop geometry - types and factors affecting them - Gap filling and thinning
11.	Manures - Organic Manures, Green Manures, Fertilizers - Methods of application - Basal, Split and Foliar Application
12.	After cultivation- Weeding and Hoeing, Earthing up, other inter cultural operations. Weeds – definition - weed management –irrigation – definition – methods
13.	Harvesting – time and methods of harvesting, Threshing, Drying, Storage and Post harvest techniques
14.	Meteorology - Agricultural Meteorology – Definition, importance and scope of agricultural meteorology for crop production
15.	Atmosphere - Components and its importance - Weather parameters – Precipitation, temperature, atmospheric humidity, solar radiation, wind velocity, atmospheric gases - Role in crop production
16.	Rainfall – Monsoon - Spatial and Temporal variability in Tamil Nadu across seasons.
17.	Agro Climatic Zones of Tamil Nadu - North eastern zone, North western zone, Western zone, Cauvery delta zone, Southern zone, High rainfall zone ,Hilly zone

Practical syllabus

Identification of crops – Agro eco system - Acquiring skill and Practicing tillage implements and special purpose implements - Practicing nursery bed preparation for low lands and irrigated uplands - Practicing special operations in wet lands - Land shaping - Learning and acquiring skills in seed treatment - Practicing sowing and transplanting - Practicing manual weeding -Irrigation layout for upland irrigated crops - Practicing application of organic manures and green manures - Inorganic fertilizers identification - Practicing various method of fertilizers - Fertilizer requirement calculation - Practicing earthing up - Measurement of growth and yield components - Visiting agromet observatory - Handling rain gauge, maximum, minimum, dry and wet bulb thermometers - Study of wind vane and anemometers – Evaporimeter - Collection of historic rainfall and temperature data - Computing mean of rainfall data and temperature data - Forecasts- Agro advisories

Practical schedule

Ex.No.	Contents to be dealt
1.	Low land - characteristics, identification of crops - Irrigated uplands - characteristics, identification of crops
2.	Drylands - characteristics, identification of crops

3.	Identification and acquiring skill in the primary tillage implements - country plough, mould board plough, disc plough, Melur plough
4.	Identification and acquiring skill in the secondary tillage implements - cultivators and harrows
5.	Identification and practicing special purpose implements - leveler, weeder, sub soiler
6.	Identification of seeds, green manures, organic manures
7.	Practicing implements used in rice cultivation - puddler, transplanter, weeders, harvester
8.	Skill learning and practicing nursery bed preparation for low lands
9.	Skill learning and practicing nursery bed preparation for irrigated uplands
10.	Practicing trimming and plastering in wet lands
11.	Land shaping and lay out of field for upland irrigated conditions
12.	Acquiring skills in seed treatment of plant protection chemicals
13.	Learning seed, seedling treatment and soil application of bio-fertilizers
14.	Practicing sowing - broadcasting, dibbling, sowing behind the plough, drill sowing or drilling – Transplanting
15.	Practicing manual weeding
16.	Irrigation layout for upland irrigated crops - surface, subsurface and pressurized irrigation
17.	Mid semester examination
18.	Practicing application of organic manures
19.	Practicing application of green manures and green leaf manures
20.	Identification of inorganic fertilizers
21.	Practicing various method soil application of fertilizers - broadcasting, band placement, point placement, sub soil placement, fertigation
22.	Practicing fertilizer requirement calculation and foliar application of fertilizers
23.	Practicing earthing up in major crops and understanding its importance
24.	Measurement of growth components of rice, maize, black gram, green gram, cotton
25.	Measurement of yield components of rice, maize, black gram, green gram, cotton
26.	Visit to agromet observatory
27.	Handling rain gauge and recording rainfall
28.	Handling of maximum, minimum, dry and wet bulb thermometers and recording of temperatures
29.	Study of wind vane, anemometers, open pan evaporimeter
30.	Collection of historic rainfall and temperature data and tabulation
31.	Computing mean of rainfall data; standard week wise, month wise and season wise
32.	Computing mean of temperature data; standard week wise, month wise and season wise

33.	Gathering information on forecasts and understanding agro advisories
34.	Final Practical examination

Course outcome

The course syllabus emphasizes practical experience on various principles and practices involved in agronomy and agricultural meteorology. Hence the students will certainly be benefited and gain confidence to become a successful entrepreneur in agriculture.

References / Text books

Yellamananda Reddy, T. and G.H. SankaraReddi. 2014. Principles of Agronomy. Kalyani Publishers, New Delhi.

Mavi, H.S. 1996. Introduction to Agrometeorology, oxford and IBH Publishing Co., New Delhi.

AGR D12	Irrigation and Weed Management	(1+1)
---------	--------------------------------	-------

Objectives

- ❖ To acquire knowledge on importance of water management in agriculture and develop skills on various aspects of water saving technologies to produce more yield per unit of water.
- ❖ To understand the significance of weed management in crop production and develop skills on various weed management practices to major field crops to get higher productivity.

Theory Syllabus

Role of water in plant growth – Water resources and irrigation potential of Tamil Nadu - Importance of irrigation - Soil moisture constants - Permanent Wilting Point, Field capacity, Available Soil moisture and Saturation - Crop water requirement- Factors affecting water requirement – Critical stages for irrigation and water requirement of crops – Water use Efficiency - Methods of irrigation: surface, sub-surface sprinkler and drip irrigation – Micro irrigation: layout, suitability, merits and scope – Water management for different field crops - Quality of irrigation water – Agronomic practices for use of poor quality water (saline, effluent and sewage water) for irrigation.

Weeds – Definition, classification and characteristics, harmful and beneficial effect of weeds - Classification and characteristics of weeds of different agro ecosystems-lowland weeds, irrigated upland and rainfed land weeds - Classification and characteristics of weeds – Aquatic, parasitic and obnoxious weeds - Crop weed interactions - Critical crop weed competition, competitive and allelopathic effects of weeds and crops. - Principles and methods of weed management: Preventive, cultural, mechanical, chemical, biological and alternate methods - Classification and characteristics of herbicides and herbicide formulations - Integrated weed management practices for major field crops - Weed management practices for parasitic and problematic weeds

Lecture Schedule

Lecture No.	Contents to be dealt
1.	Role of water in plants – importance of irrigation - water resources of Tamil Nadu.
2.	Soil moisture constants - permanent wilting point, field capacity, available soil moisture and Saturation - Plant water stress – causes – plant response and adaptations – methods to overcome plant water stress.
3.	Crop water requirement - components of crop water requirement, factors affecting crop water requirement - critical stages for irrigation – water requirement for different field crops - Water use efficiency.
4.	Methods of irrigation - merits, demerits, suitability of surface (flooding, beds and channels, border strip, ridges and furrows, check basin, ring basin, broad bed and furrows, surge irrigation) and sub-surface irrigation methods.
5.	Micro irrigation system (drip and sprinkler irrigation) - suitability, components, layout, operation, advantage and disadvantage, government support to popularize micro irrigation systems
6.	Water management for cereals (rice, wheat, maize, sorghum, ragi, minor millets) and pulses (blackgram&greengram, redgram, soybean).
7.	Water management for oilseeds crops (groundnut, sesamum and sunflower) and commercial crops (cotton and sugarcane)
8.	Quality of irrigation water –classification of quality of irrigation water based on different salts - agronomic practices for use of poor quality water (saline, effluent and sewage water).
9.	Mid semester examination
10.	Weeds – Definition, classification and characteristics, harmful and beneficial effect of weeds
11.	Classification and characteristics of weeds - Different agro ecosystems, Aquatic, parasitic and obnoxious weeds
12.	Crop weed interactions - Critical crop weed competition, competitive and allelopathic effects of weeds and crops.
13.	Principles and methods of weed management:Preventive, cultural, mechanical, chemical, biological and alternate methods
14.	Herbicides – merits and demerits of using herbicides – classification based on mode of action and method of application - herbicide formulations
15.	Herbicide interaction with agrochemicals –Fertilizers –Insecticides –Fungicides
16.	Integrated weed management practices for major field crops (rice, wheat, maize, sorghum, ragi, minor millets), pulses (blackgram&greengram, redgram, soybean),

	oilseeds (groundnut, gingelly, sunflower) and commercial crops (cotton and sugarcane)
17.	Weed management practices for parasitic weeds (Striga, Orobanche and Loranthus) and problematic weeds (Cynodon, Cyperus, Parthenium, Kattukandankathiri), Aquatic weeds (water hyacinth).

Practical syllabus

Measurement of irrigation water through water measuring devices (flumes and weirs) – Calculation of irrigation water requirement (problems) – Acquiring skill in land shaping for different surface irrigation methods – Operation and economics of sprinkler and drip irrigation systems – Scheduling of irrigation based on different approaches – On-farm irrigation structures – Visit to irrigation command area (Reservoirs and tanks) and water management institutes.

Identification, classification and characterization of weeds of different eco-system - Practicing Skill development on cultural and non chemical weed management - Identification of herbicides and their usage and method of application - Practicing Skill development on herbicide application techniques - Practicing skill development on spray equipment's and spray fluid calibration - Calculation of different weed indices - Calculation of herbicide quantity and recommendation for different eco systems - Practicing skill development on mechanical methods of weed control using different types of weeders .

Practical schedule

Ex No.	Contents to be dealt
1.	Measurement of irrigation water with flumes and weirs
2.	Land levelling and land shaping - Beds and channels - ridges and furrows, border strips - broad bed furrow method of irrigation- ring basin
3.	Scheduling of irrigation based on indicator plants, soil-sand mini plot technique, available soil moisture and IW/CPE ratio
4.	Definition for TMC,Cusec, Cumec, calculation of irrigation water based on water flow (discharge from open channel and motor pump) , depth of irrigation, IW/CPE ratio and area basis.
5.	Layout, operation and maintenance of drip and sprinkler irrigation systems.
6.	Observation of irrigation structures in wetlands and irrigated drylands.
7.	Visit to irrigation command area – Visit to irrigation management and training institute
8.	Identification, classification and characterization of weeds of different eco-system
9.	Mid-semester Examination
10.	Practicing skill development on cultural and non-chemical weed management
11.	Identification of herbicides and their usage and method of application

	(crop,chemical name & dose, trade name & dose and time of application.)
12.	Practicing skill development on spray equipment's and spray fluid calibration
13.	Practicing skill development on herbicide application techniques
14.	Calculation of different weed indices.
15.	Calculation of herbicide quantity and recommendation for different eco systems
16.	Practicing skill development on mechanical methods of weed control using different types of weeders (conoweeder, star weeder, power weeder and brush cutter).
17.	Final practical examination

Course Outcome

By undergoing the course of irrigation & weed management, the students can acquire both theoretical knowledge and practical experience for increasing water use efficiency in agriculture and effective weed management practices to get higher crop productivity.

References

1. Michael, A.M. 1997. Irrigation: Theory and Practice Vikas Publishers
2. Prihar, S.S. and B.S. Sandhu. 1987. Irrigation to field crops: Principles and Practices. ICAR Publication.
3. Sankara Reddy, G.H. and T. Yellamanda Reddy. 1997. Efficient use of irrigation water. Kalyani Publishers
4. Jaganathan R., and R.Jayakumar. 2003. Weed Science Principles, Kalyani Publishers, New Delhi.
5. Rao, V. S. 1983. Principles of Weed Science. Oxford and IBH Publishing Co. New Delhi.
6. Subramanian, S. A. Mohammed Ali and R. Jayakumar. 1991. All about Weed Control. Kalyani Publishers, New Delhi.

SAC D11	Basics of Soil Science	(1+1)
---------	------------------------	-------

Objectives

To impart basic knowledge about soil, its physical and chemical properties. To educate students about fundamental concepts and management of problem soils and poor quality water.

Theory Syllabus

Soil - composition and definition - Description of soil profile, Master horizons. Soil physical properties - Colour, Texture, Structure, Bulk density, Pore space, Soil water, Soil air, Soil temperature. Soil colloids - Ion exchange phenomena. Soil chemical properties - Soil pH and EC. Carbon and Nitrogen cycle - Soil Organic Matter and its importance on soil properties. Soils of Tamil Nadu. Problem soils - Physical constraints and their management - chemical constraints -

Acid, saline and sodic soils - Genesis, effect on soil and plant - Management aspects - Irrigation water quality - Management of poor quality water.

Lecture Schedule

Lecture No.	Contents to be dealt
1.	Soil - composition - mineral matter, organic matter, soil water, soil air - Soil definition - soil as a three dimensional body - Description of soil profile, Master horizons - elemental composition of earth crust - Comparison of soil with animal system - Definitions of pedology and edaphology - List of important soil properties – physical, chemical and biological.
2.	Soil colour - Role of minerals, organic matter, moisture - Munsell colour chart - Hue, Value, Chroma - Importance of soil colour. Soil Texture - définition - ISSS classification of soil particles - Textural triangle - Importance of soil texture.
3.	Soil structure - définition - Mechanism of aggregate formation - Cementing agents - Classification - Types, Classes, Grades - Factors affecting soil structure - Significance of soil structure
4.	Bulk density, Particle density and Pore space - Definition - Factors influencing bulk density - Optimum bulk density for crops.
5.	Soil water -Definitions of Infiltration, Percolation - Soil moisture constants - Field capacity, wilting point, hygroscopic coefficient, available soil water - Factors affecting soil water - Soil moisture measurement - Gravimetric, gypsum block, tensiometer.
6.	Soil air - Composition - Factors affecting composition of soil air - Significance in crop production. Soil temperature - Sources of soil heat - Effect of soil temperature on plant growth - Soil temperature management - Methods of measurement - Soil thermometer, IR thermometer.
7.	Soil colloids - organic and inorganic colloids - source of charges - Ion exchange - CEC and AEC and its significance.
8.	Soil reaction - definition of Soil pH - Measurement of soil pH, Ranges in soil pH, Acidic, neutral, alkaline, calcareous - Effect of pH on nutrient availability - Soil pH and microbial activity. Soil electrical conductivity - Measurement of soil EC - Rating of soil EC - Effect on crop growth.

9.	Mid-Semester Exam
10.	Carbon Cycle - Importance of carbon sequestration. Nitrogen Cycle - Nitrogen transformation - N fixation, ammonification, nitrification, denitrification, aminization, ammonia volatilization.
11.	Soil Organic Matter (SOM) - Sources - Factors affecting - Importance on soil properties
12.	Soils of Tamil Nadu - Area, properties, constraints, uses - Alluvial soil, Black Soil, Red Soil, Laterite soil.
13.	Problem soils - Physical constraints - Slow permeable soils, Excessively Permeable, Sub soil hardening /hard pan, Surface crusting, Fluffy paddy soils, Shallow soils - constraints and management.
14.	Problem soils - Chemical constraints - Acid soils - Genesis, effect on soil and plant - Management aspects.
15.	Problem soils – Saline and Sodic soils - Genesis, effect on soil and plant - Management aspects.
16.	Irrigation water quality - Ratings followed in Tamil Nadu based on Electrical Conductivity (EC), Sodium Absorption Ratio (SAR), Residual Sodium Carbonate (RSC) - Management of poor quality water.
17.	Remote Sensing –Concepts and Foundations – GIS. GPS and Drones for Precision Agriculture

Practical Syllabus

Soil profile - Master horizon identification - Soil sample collection - Determination of soil texture by feel method - Bulk density, particle density and pore space - Determination of soil moisture - soil colour - Analysis of soil pH and EC - Determination of gypsum requirement for sodic soils - Irrigation water quality analysis and interpretation of data.

Practical Schedule

Ex No.	Contents to be dealt
1.	Soil profile - Master horizon identification
2.	Soil sample collection and preparation
3.	Determination of soil texture by feel method
4.	Determination of bulk density, particle density and pore space by cylinder method
5.	Determination of bulk density by wax coating method, core sample method

6.	Determination of soil colour
7.	Determination of soil moisture by oven dry method
8.	Analysis of soil for pH and EC
9.	Mid-Semester Exam
10.	Computation of available soil moisture in soil layers
11.	Determination of gypsum requirement for sodic soil
12.	Irrigation water quality analysis - pH, EC, carbonate and bicarbonate
13.	Irrigation water quality analysis - Ca, Mg
14.	Irrigation water quality analysis - Na, K
15.	Interpretation of irrigation water quality using analytical data - SAR, RSC
16.	Observation of problem soils in local areas
17.	Final practical examination

Course Outcome

Basic knowledge about Soil Science, its important physical and chemical properties. Importance of soil constituents on soil properties. Knowledge about problem soils and weed management.

References

Dilip Kumar Das. 2004. Introductory Soil Science, Kalyani Publishers, New Delhi.

Sahaj, V.N. 2008. Fundamentals of Soils. Kalyani Publishers, New Delhi.

HOR D11	Propagation methods in Horticultural Crops	(0+1)
---------	--	-------

Objective

To understand and practice the propagation methods of horticultural crops

Practical syllabus

Selection of nursery site and layout of nursery components - Media for propagation of nursery plants and pot mixture preparation - Containers, tools and implements for nursery - Plant propagation structures - Practicing raised bed nursery - Protray nursery techniques- Preparation of cutting, layering , grafting and budding in horticultural crops - Specialized plant propagation parts in horticultural crops - Tissue culture methods of propagation in horticultural crops - Hardening and marketing of tissue culture plants - Project preparation for nursery establishment - Visit to commercial nursery production centers

Practical schedule

Ex. No	Contents to be dealt
1.	<p>Selection of nursery site and layout of nursery components</p> <p>Nursery-Definition- Importance of Nursery- Advantages of raising seedlings in nursery- Selection of site-Components of nursery- Layout of nursery - Land preparation-Collection and planting of mother plants-Management of Nursery - Storage of propagated plants in nursery beds</p>
2.	<p>Media for propagation of nursery plants and pot mixture preparation</p> <p>Media – Definition- Properties of good media – Soil, Sand, Peat, Sphagnum moss, Vermiculite, Perlite, Pumice, Leaf mould, Sawdust, Coco peat, Farm yard manure - Pot mixture preparation, Quality of pot mixture, Ingredients for pot mixture preparation, Pot mixture composition for different horticultural crops.</p>
3.	<p>Containers , tools and implements for nursery</p> <p>Containers – (Seed pan and seed boxes, Earthen pots, Polythene bags, Plastic pots) -Tools – (Rose can / Water can, Crow bar, Garden shears, Scythe, Digging fork, Shovel, Secateur, Budding and Grafting knife, Hand hoe, Spade Fruit Harvester, Garden rake, Pruning saw, Tree pruner, Garden fork, Iron pan, Rocker sprayer, Backpack sprayer) - Implements – (Rotavator, Cultivator, Disc plough, Bund former, Tractor drawn auger)</p>
4.	<p>Plant propagation structures</p> <p>Definition- Advantages & disadvantages - Greenhouse Covering Materials - Mist Chambers - Plastic tunnels- Poly-houses , Shade net houses</p>

5.	<p>Practicing raised bed nursery</p> <p>Advantages of raised bed nursery - Procedure for preparation of raised bed and seed sowing.</p>
6.	<p>Protray nursery techniques</p> <p>Protray- Advantages & disadvantages – Media – Seed rate – seedling raising – Cost of seedling production</p>
7.	<p>Preparation of cutting in horticultural crops</p> <p>Definition - Root cuttings - Stem cuttings (Hard wood cuttings, Semi hard wood, soft wood cuttings, herbaceous cuttings) – Leaf cuttings (Whole leaf with Petiole, Whole Leaf without Petiole, Leaf Sections)-Use of rooting hormones</p>
8.	<p>Preparation of layering in horticultural crops</p> <p>Definition- Advantages & disadvantages – Ground layering (Simple layering, Compound or serpentine layering, Tip layering, Trench Layering, Mound Layering) & air layering</p>
9.	<p>Mid semester practical examination</p>
10.	<p>Preparation of grafting in horticultural crops</p> <p>Definition – grafting, root stock, scion, advantages & disadvantages Inarching or approach grafting, Epicotyl or stone grafting, Softwood grafting, Side grafting, Whip or splice grafting, Whip and tongue grafting, Cleft grafting, Veneer grafting, Bark grafting, Bridge grafting</p>
11.	<p>Preparation of budding in horticultural crops</p> <p>Definition- advantages & disadvantages- Characters of rootstock for budding - Bud wood- Characters of bud wood- Shield or 'T' budding or '⊥' budding- Patch budding- Chip budding- Flap or forket budding- Ring budding- Flute budding</p>
12.	<p>Specialized plant propagation parts in horticultural crops</p> <p>Bulb, Corm, Tuber, Tuberos roots and stem, Rhizome, Runner, Offset Sucker, Division, Stolon, Bulbils, Crown</p>
13.	<p>Tissue culture methods of propagation in horticultural crops</p> <p>Definition – Totipotency- advantages & disadvantages- Steps in micro propagation</p>
14.	<p>Hardening and marketing of Tissue culture plants</p> <p>Definition- Acclimatization - steps in hardening of tissue culture plants –Market profile- Industries supplying tissue culture plants</p>

15.	Project preparation for nursery establishment Components of nursery – Mother block for scion – root stock – plant propagation structures (Mist chamber, shade net house) cost – fixed cost – recurring cost – cost analysis
16.	Visit to commercial nursery
17.	Final practical examination

Course outcome

The students will be familiarized with propagation techniques of major horticultural crops

References/ Text books

N Kumar 2010, Introduction to Horticulture, Oxford and IBH Publishing Co Pvt. Ltd., New Delhi, India

AGM D11	Basic and Applied Microbiology	(1+1)
---------	--------------------------------	-------

Objective

This course is designed to give students an understanding on the role of microorganisms in agriculture and industrial processes. The course encompasses the use of microorganisms in the manufacture of biological products like bio fertilizers, biocontrol agents using microorganisms, microbial value addition, wine making and preparation of fermented foods.

Theory syllabus

Microorganisms (bacteria, fungi, actinomycetes, yeast and algae). Importance of microorganisms. Beneficial microbes in agriculture and industry. Industrially important microorganisms and its application. Soil organic matter. Soil organic carbon- Humus- Decomposers- Heterotroph, Mesophiles, Thermophiles. Composting – different types, vermicomposting. Bio fertilizers – types, mass production methods and techniques. Production of liquid and carrier based bacterial bio fertilizers. Algal and Azollabiofertilizers production. Fungal biofertilizer - Production of VAM – dosage, method of application and storage. Biocontrol agents – Different types. Mass production of *Pseudomonas* and *Trichoderma*. Shelf life, dosage and methods of application. Bioinoculants. Traditional fermented food products. Fermented dairy products - cheese, probiotics, yogurt. Bread making, Wine making, Single cell protein- Spirulina production.

Theory Schedule

Lecture No.	Contents to be taught
1.	Microorganisms an overview. (Definition- microorganisms, microbiology. Characters of bacteria, fungi, actinomycetes, and algae, difference between prokaryotes and eukaryotes)
2.	Importance of microorganisms, Beneficial microbes in agriculture and industry – Industrially important microorganisms. (uses of microorganisms in various industries- butter industry , cheese industry, vinegar industry, milk industry- pasteurization, alcohol industry, tobacco curing, tea curing, leather tanning, fibre retting, sewage treatment, ensilages, medicine, Agriculture- soil microorganisms, bio fertilizers)
3.	Soil organic matter and humus formation. (Organic matter decomposition, components of humus and its uses)(Carbon and Nitrogen Cycles)
4.	Microorganisms involved in organic matter decomposition and their types

5.	Composting - methods of composting and vermicompost (Composting- definition, farm compost, town compost, windrow method of composting, Coimbatore method, Bangalore method and indore method of composting, vermicomposting)
6.	Biofertilizers- types of biofertilizers (Definition of biofertilizer, nitrogen fixing microorganisms, phosphorus solubilising microorganisms, phosphorus mobilizing microorganisms, potash solubilizing microorganisms, PGPR,)
7.	Mass production methods of bacterial biofertilizers- liquid and carrier based formulations. (production of <i>Azospirillum</i> , Phosphobacteria, Potash Solubilising bacteria, <i>Azotobacter</i> , <i>Rhizobium</i>)
8.	Cyanobacteria (BGA) and Azolla- mass production and application (BGA- field preparation, mass multiplication, harvesting and packing, method of application, Azolla- multiplication in tray or pit, dual culture method, uses)
9.	Mid semester examination
10.	VAM fungi production- dosage and method of application (mycorrhizae- definition, types of mycorrhizae, AM Fungi production – pit method, method of application)
11.	Biocontrol agent - types of biocontrol agents (bacterial, fungal and viral biocontrol agents, Biological disease control agents, biological pest control agents)
12.	Mass production of biocontrol agents (<i>Bacillus Subtilis</i> and <i>TrichodermaViride</i>)
13.	Shelf life and storage of biofertilizers and biocontrol agents (durability and storage conditions, viable cell count as per standards for liquid and solid biofertilizers)
14.	Traditional fermented food products (Idly, curd, athirasam, kool, bread, cheese, yogurt, sauerkraut, pickle etc)
15.	Fermented dairy products - cheese, probiotics, yogurt (raw materials, microorganisms involved in the production, types of cheese)
16.	Commercial production of bread and wine (raw materials, production process, microorganisms involved in the production)
17.	Single cell protein - Mass production of Spirulina (Spirulina- characters, uses, commercial production methods)

Practical syllabus

Description of glassware and instruments used in microbiology, Composting and vermicomposting, Types of media and carrier materials, culture media preparation for bacterial biofertilizers, Pilot scale production of bacterial biofertilizers, mass production of biofertilizers,

production of Algal and Azolla and VAM biofertilizers, Production of biocontrol agents, production of bread, cheese, yogurt and wine. Single cell protein production.

Practical schedule

Ex.No	Contents to be taught
1.	Description of glassware and instruments (Autoclave, laminar air flow chamber, hot air oven, fermentor, glassware) used in microbiology
2.	Composting of agricultural waste and effective microorganisms (EM)
3.	Vermicomposting
4.	Types of media and carrier materials for biofertilizer production (liquid and solid medium preparation,)
5.	Preparation of culture media for bacterial biofertilizerseg. <i>Azospirillum</i> and Phosphobacteria(Potassium solubilizer and PPFM)
6.	Pilot scale production of bacterial biofertilizers.
7.	Liquid biofertilizer production
8.	Visit to biofertilizer production laboratory
9.	Mid semester examination
10.	Mass production of Algal and Azollabiofertilizers
11.	AM Fungi mass production
12.	Production of biocontrol agents- <i>Pseudomonas</i>
13.	Production of cheese and yougurt
14.	Bread making – Visit to bakery unit
15.	Production of wine
16.	Spirulina production
17.	Final Practical Examination

Course Outcome

Students will have basic understanding on the role of microorganisms in agriculture and industrial processes. They will acquire knowledge on biofertilizers, biocontrol agents, composting, vermicomposting and microbial food products. This course will provide complete idea about integrated nutrient management and organic farming practices.

References

1. Michael J. Pelczar, JR., E.C.S. Chan, Noel R. Krieg, 2005. Microbiology
2. Casida, JR. L.E. 2006 Industrial Microbiology, New Age International Publishers, New Delhi.
3. Subba Rao, N.S., 1999. Soil Microorganisms and Plant growth, Oxford & IBA, New Delhi.

ENG D11	Farm Machinery and Post-Harvest Processing	(2+1)
---------	--	-------

Objective

To enable the students for acquiring the knowledge pertaining to farm power engine, tillage, tillage equipment, matching implements, land forming equipment, sowing methods, implements for intercultural operations, harvesting tools, unit operations, threshing, drier, rice processing, pulse milling, oil extraction.

Theory syllabus

Farm Power - Sources and their use in agriculture - Status in India - Engine – types - I.C. Engines – classification - Components - Principle and working of Two stroke and Four stroke engines – Diesel engine-Petrol engine – Comparison -Tillage – objectives- types - ploughing methods -Types of plough – Indigenous plough, Mould board plough, disc plough, chisel plough, subsoiler, Rotary plough - advantages and disadvantages - Secondary tillage equipment – cultivators, harrows - types - Tractors – types and application – matching implement - Power Tiller – Matching Implements - Land forming equipment – rotavator, puddler, bund former, Ridger, Leveller, Manuretrampller - Sowing methods - seed cum fertilizer drills - components and functions - Seed metering mechanism – Calibration of seed cum fertilizer drill - Planters – Functions – types - Pumps for irrigation – centrifugal and submersible - Implements for intercultural operations – weeding and earthing up implements -Sprayers and their functions- classification – Dusters - types and uses - Harvesting tools and equipment- sickles, reapers and combines

Post harvest losses – causes and estimates – unit operations of crop processing - Moisture content – hot air oven method - Properties of grains – mass, volume, density, porosity, surface area and sphericity - Threshing – threshers for different crops - parts, terminologies - Winnowing – manual and power operated winnowers- cleaning, grading and sorting - Types of screens - air screen cleaner- reciprocating and rotary types - Grain drying – principles - advantages - types - batch and continuous, mixing and non mixing - LSU drier – construction and operation - Storage of food grains – structures, factors affecting storage, traditional methods - types -bag and bulk storage - Silos – types- uses- advantages - Rice processing – raw and parboiling – advantages and disadvantages - Unit operations in rice processing – dehusking and polishing - Utilisation of wastes and by-products from rice mills - Pulse milling - wet, dry and CFTRI methods of pulse milling - Pulse milling equipments – construction and operation –Fruits and vegetable processing - processed products - Oil extraction methods and machineries

Theory Schedule

Lecture No.	Contents to be dealt
1.	Farm Power - Sources and their use in agriculture - Status of Farm power in India
2.	Engine – types - I.C. Engines – Components
3.	Principle and working of Two stroke and Four stroke engines – Diesel engine-Petrol engine - Comparison
4.	Tractors – types and application – matching implement
5.	Power Tiller – application -Components
6.	Tillage – objectives- types
7.	Primary tillage – objectives- ploughing methods
8.	Indigenous plough, Mould board plough, disc plough, chisel plough, subsoiler, Rotary plough
9.	Secondary tillage equipment – cultivators, harrows - types
10.	Land forming equipment – rotavator, puddler, bund former, Ridger, Leveller, laser leveller
11.	Sowing methods - seed cum fertilizer drills - components and functions
12.	Seed metering mechanism – Calibration of seed cum fertilizer drill
13.	Planters – Functions – types
14.	Implements for intercultural operations – weeding and earthing up
15.	Sprayers and their functions
16.	Harvesting tools and equipment
17.	Mid Semester Examination
18.	Pumps for irrigation – centrifugal and submersible
19.	Post harvest losses – causes and estimates – unit operations of crop processing
20.	Moisture content – thermo gravimetric method - wet basis and dry basis.
21.	Properties of grains – mass, volume, density, porosity, surface area and sphericity
22.	Threshing – threshers for different crops - parts, terminologies
23.	Winnowing – manual and power operated winnowers- cleaning, grading and sorting.
24.	Types of screens - air screen cleaner- reciprocating and rotary types
25.	Grain drying – principles - advantages - types - batch and continuous, mixing and non mixing

26.	LSU drier – construction and operation
27.	Storage of food grains – factors affecting storage, traditional methods - types -bag and bulk storage – Storage structures
28.	Rice processing – raw and parboiling – advantages and disadvantages
29.	Unit operations in rice processing – dehusking and polishing
30.	Utilisation of wastes and by-products from rice mills
31.	Pulse milling - wet, dry and CFTRI methods, equipments for milling
32.	Principles of fruits and vegetable processing
33.	Manufacturing of processed products from fruits and vegetables
34.	Oil extraction methods and machineries

Practical syllabus

Study of two and four stroke IC engines - MB plough and disc plough - measurement of size of cut - Study of secondary tillage implements - calibration of seed-cum-fertiliser drill - Identification of parts of tractor - power tiller - Study of Plant protection equipment - Study of weeders- harvester & tools - Moisture content determination using thermo gravimetric method - Determination of properties of food grains - Study of grain drying methods – sun drying-mechanical drying – advantages and disadvantages –Gutters and flooring - Visit to Modern Rice mill-Farm houses-sewage disposal structures-Sheds-Silos Poultry Structures -Thrashing Floor, Drying floor.

Practical schedule

Ex. No	Contents to be dealt
1.	Study of primary tillage equipments -MB plough and disc plough – chisel plough
2.	Study of secondary tillage implements – Disc harrow, cultivators
3.	Study of seed-cum-fertilizer drill & calibration –planters
4.	Identification of parts of tractor & power tiller
5.	Study of Plant protection equipments
6.	Study of weeders
7.	Study of harvester & tools
8.	Moisture content determination using thermo gravimetric method
9.	Mid Semester Examination
10.	Determination of properties of food grains
11.	Study of grain drying methods – sun drying- mechanical drying – advantages and disadvantages
12.	Visit to Modern Rice mill
13.	Study of Farm houses – types – sewage disposal structures – cess pool
14.	Study of Bore hole – Septic Tank Structures – Dispersion Trenches – Soak pit
15.	Study of Gutters & Floorings – loose housing system – Feeding Sheds and Milking Sheds – Silos – types – pit silo, Trench silo
16.	Study of Poultry Structures – Location and Types. Poultry Equipments –Feeders and Waterers – Brooder House Details – Thrashing Floor, drying floor
17.	Final Practical examination

Course outcome

The students will be familiarized with implements /equipments related to farm mechanization and Post Harvest Processing.

References/ Text books

JagdishwarSahay. 2010. Elements of Agricultural Engineering. Standard Publishers andDistributors. Delhi.461 p. ISBN: 81-8014-044-X.

Senthilkumar,T., Kavitha, R., and Duraisamy, V.M. 2015. A text book of Farm Machinery.ThannambikkaiPublication,Coimbatore. 233 p.ISBN: 978-93-81102-30-5.

COM D11	Introduction to Computer and its Applications	(0+1)
---------	---	-------

Objective:

To understand about use of computer and to learn basic computer applications

Practical syllabus

Introduction to computer components - Software types and user interface- Internet Utilities- Introduction to MS Office and MS Word- Introduction to MS Excel and MS PowerPoint

Ex.No	Contents to be dealt
1.	Computer - definition; Basic concepts of Hardware – Input devices, Output devices, Central Processing Unit (CPU); Software – System Software & Application Software; Applications of Computer.
2.	Computer Memory- Primary and Secondary memory; Definition of Data and Information; Assembling computer components – SMPS, keyboard, mouse, monitor and printer.
3.	System Software - Operating System definition; Working with GUI based Operating System- Windows OS; Exposure to current Operating Systems.
4.	User Interface - Using Mouse; Using right button of the mouse and Moving icons on the screen; Status Bar; Control panel; Use of Common Icons – Recycle Bin and Computer.
5.	Application Software - definition; Installing/Uninstalling an Application software; Virus and antivirus definition; Exploring Files – Creating, renaming and searching of files and folders, Usage of Help menus.
6.	Internet definition, Applications of Internet; World Wide Web and Web Browsers, Search Engines; Basic of Computer networks - LAN, WAN and MAN; Wireless network – WiFi.
7.	Connecting to internet; Internet Service Provider (ISP); Basics of internet connectivity and related troubleshooting; Understanding URL; Domain name; IP Address; Website-Agritech portal, Application of computer in agriculture.
8.	Basics of electronic mail (Email); Sending – attachment, BCC, CC and Receiving mails; Accessing sent mails, Spam, Trash; Email settings; Instant Messaging – chats.
9.	Mid Semester Practical Examination.
10.	Identifying different system software and application software in your computer; Introduction to Open Source Software – Office package and Google chrome; Introduction to MS Office package.

11.	MS Word basics - Opening, closing, saving and printing of documents with shortcuts; Text creation and manipulation – cut, copy, paste, redo and undo with shortcuts, Insert Ribbon – Illustrations, header & footer, symbols.
12.	Formatting of text; Table handling- insertion, deletion, alignment; Find and replace; Spell check.
13.	MS Excel basics -Creating, displaying the screen, identifying the components; Opening, saving, retrieving and closing spreadsheet.
14.	Formulas: Auto sum -Sum, Average, Count numbers, Min and Max; Create a line, bar and pie chart/graph.
15.	MS PowerPoint – Creating, Opening and Saving a presentation; Working with slides – insert, delete, layout; Insert: picture, clipart, smart art and shapes.
16.	Slide view – normal, slide sorter, slide show and handouts; Animations – slide and text transition.
17.	Final Practical Examination.

Course Outcome

Students will have basic understanding of the role of computers in Agriculture and allied area. They will acquire knowledge on complete application of different softwares in developing their computer usage skills.

Text book

1. **Computer Basics:** Absolute Beginners Guide, Michael Miller, 8th Edition, Que Publication
2. **Learning Computer, Fundamentals, MS Office and Internet & Web Technology,** Third Edition, Firewall Media Publication

References

1. Introduction to Computer Fundamentals, Bright SiawAgrijie , Second Edition, Trafford Publication
2. Basic Computer for Beginners, Web Wise Seniors, 2003
3. Learning MS Word and MS Excel – 2010, RohitKauraha

E References

https://www.tutorialspoint.com/computer_fundamentals/

<http://www.klientsolutes.com/uses-of-microsoft-office-applications-in-daily-life/>

LAN D11	English Language for Effective Communication	(0+1)
---------	--	-------

Objectives

To make the students competent in day-to-day and professional communication skills viz.,

- ❖ Listening to comprehend information
- ❖ Listening to take notes
- ❖ Speaking in personal and official contexts with clarity and confidence
- ❖ Delivering short speeches
- ❖ Application of Reading Techniques
- ❖ Reading for information and for note making
- ❖ Application of professional writing skills
- ❖ Participation in Group Discussion and Interviews

Practical syllabus

LISTENING: Introduction to listening - – listening comprehension – note taking- Listening to dialogue and summary making

SPEAKING: Introduction to speaking - Dialogue and Conversation - Principles of speech preparation- Presentation skills - self introduction - short speech (impromptu) - Professional speaking - welcome address & vote-of-thanks

READING: Reading techniques – SQ4R - skimming and scanning –Note-making & précis writing - Sentence completion & Sentence correction for competitive examinations

WRITING: Dialogue writing & paragraph writing - Essay writing – Graham’s flowchart - Letter writing – personal and official letter writing.

INTEGRATED SKILLS: Professional presentation skills – Group Discussion –Resume writing – Interview skills

Practical Schedule

Ex.No.	Contents to be dealt
1.	Introduction to listening – listening comprehension listening to IELTS audio/ video – note taking
2.	Principles of dialogue - Listening to dialogue – Practicing and summary making
3.	Introduction to speaking - Dialogue and Conversation - Principles of speech preparation- select speeches of eminent oratory (Martin Luther King’s I Have a Dream/ Winston Churchill’s We Shall Fight on the Beaches/ Bernard Shaw’s Spoken English and Broken English etc.)
4.	Presentation skills - self introduction - short speech (impromptu)- preparation of model speeches and demonstration
5.	Professional speaking one minutes speech and presentation - welcome address & vote-of-thanks
6.	Reading techniques – SQ4R application on a select essay- skimming and scanning – application by reading a select passages/ essay –classroom activities
7.	Note-making & précis writing- demonstration and exercise
8.	Sentence completion & Sentence correction for competitive examinations – worksheets from a select guide of a competitive examination
9.	Mid semester Practical Examination.
10.	Dialogue writing & paragraph writing – exercises- analysis of select dialogues and paragraphs - Practicing
11.	Essay writing – Graham’s flowchart- application of the flow chart on a model essay followed by exercises
12.	Letter writing – personal and official letter writing – study of select letters (e.g. Personal invitation, request letters, complain letters, job application)- exercises
13.	Professional presentation skills – study of model presentation from TED talks - classroom activity
14.	Group Discussion – presentation; Resume writing- study of select resumes and their components
15.	Exercise on preparing Resume of the individual student.
16.	Interview skills –preview of recorded interviews – study of principles – conduct of mock interview
17.	Final Practical Examination

Course Outcome

The students will be familiarized with speaking, listening, writing and reading skills in English and improve their presentation skills.

Text Books

1. Hariharan,S. *et al.*,*English for Effective Communication*. Coimbatore, Thannambikkai publications, 2014. Third edition.
2. Hariharan,S. *et al.*, *Soft Skills*. Chennai, MJ Publishers, 2009.

References

1. Goodale, Malcolm, *Professional Presentations*, Cambridge University, 2005.
2. Greenbaum Sidney, *Oxford English Grammar*, New Delhi, Oxford University Press. Peregoy, 2009.
3. Jones Daniel, *English Pronouncing Dictionary*, Cambridge University Press,2006.
4. Krishnaswamy. *Modern English A Book of Grammar Usage and Composition*, Chennai,Macmillan India Limited, 2010.
5. Murphy, Raymond. *Intermediate English Grammar*, Cambridge University Press; Second edition 1999)
6. Sundararajan, N, *Attentive Listening: How it Matters*, University News, March 19-25, 2005.

PED D11	PHYSICAL EDUCATION	(0+1)
---------	--------------------	-------

Practical Syllabus

17 Practical classes for each semester – 2 ½ hours each class (17 x 2½ = 42 ½ hours) – 17 classes will be converted into 40 practical hours and 2 ½ hours for evaluation

I Semester (20 Hours)

Exercises for strength, agility, co-ordination, flexibility, co-operation, vital capacity endurance, speed and for various systems of our body and team spirit.

Exercise for good posture – conditioning and calisthenics for various athletic activities *i.e.* (a) before start – arm stretch, hand stretch and cat stretch (b) loosening up jogging, bending and twisting (c) standing – lateral arc, triangle and hands to feet pose (d) sitting – camel kneel, spinal twist and supine knee bend (e) relaxation – the corpse pose, quick and deep relaxation. Basic Gymnastic exercises.

Participation of athletic events – Track & Field events: Track events: short distance, middle distance, long distance, relay race. Field events such as Long jump, High jump, Triple jump, Pole vault, Shot put, Discus, Hammer, and Javelin throw.

Skill development in anyone of the following games

Warming up, general and specific warming up Stretching exercises lead up games, advanced skill for all the games.

- **Basket Ball:** Dribbling, pass, two or three men pass, pivot, lay up shot, shooting, pass break, hook pass, screening, positional play, defense and offence tactics.
- **Volley Ball:** Fingering, under arm pass, overhead pass, setting, spiking, back pass, jump pass, stunts, elementary dive, flaying dive, roll, blocking and various types of services like under arm service, Tennis service, and jump service.
- **Ball Badminton:** Grip, service, foot work, fore hand stroke, back hand stroke, lob, smash, volley, wall practice, and spin service and defense tactics.
- **Football:** Dribbling, passing, dodging, kicking, heading, screening, chest pass, throwing, dragging, goal kick, defense and offence tactics.
- **Hockey:** Grip, bully, dribbling, hitting, drive, push strokes, scoop, flick, stopping, various types of passes, dodging, defence and offence tactics.
- **Kho-Kho:** Quadra ped, bi-ped, how to given kho, taking a direction, recede, parallel toe method, bullet tow method, distal method, foot out, dive, ring game, chains and persue and defense skills.
- **Chess:** Moves, move of king, move of pawns, move of rooks, move of bishops, move of queen, move of knights, en passant, castling, check and notation.
- **Kabaddi:** Raid, touch, cant, catch, struggle, various types of defense and offence tactics.

- **Cricket:** Grip, bowling, spin, leg spin, off spin, medium, batting, dive, sweep, mode of delivery, fielding, rolling etc.
- **Tennis:** Grip, forehand drive, back hand drive, stroke, backhand ground stroke, service, volley, smash, wall practice, foot work, defense and offence tactics.
- **Table Tennis:** Grip, tossing and serving, spin serve, rally, smash, flick, and defense and offence tactics.
- **Shuttle Badminton:** Grip, foot work, service, setting, smash, volley, forehand and back hand stroke, back hand serve and defense.
- Formation of pyramids

Yoga and meditation

Aims and objectives of yoga –for ailments, back pain, arthritis, abdominal problems, stress, fatigue, insomnia, obesity, circulation, hypertension, varicose veins, respiration, heart, digestion, headache, depression, addiction and eye problems.

Mental balance and importance development of concentration suriyanamaskar, pranayamam meditation – advance skills of any one of the games which were taught for the first semester.

1. Prayer
2. Surinanamaskar (12 steps)
3. Pranayamam (Breathing exercise)
4. Asanas (20 asanas)
5. Meditation
6. Closing prayer.

Standing Asanas: Veerabhatrasan, praiasan, paathakasthan, Tadasan, Vrkiasthan. Thirigonasana.

II Semester (20+ 2 ½ hours)

Athletics (Track & Field)

A.Track events

- a. **Sprint event:** Bullet start, Medium start, elongated start, set, pick up, finish, upsweep, down sweep, placement, receiving and exchanging. Skills & Techniques: Effective starting, acceleration, stride length, Finish. (100, 200, 400 Mts)
- b. **Middle distance** :(Arc start) Effective start, acceleration, maintain the speed, finish. (800, 1500 Mts)
- c. **Long distance:** (Arc start) Effective start, acceleration, maintain the speed and endurance, finish. (5000, 10,000 Mts)
- d. **Hurdles** (100, 110, 400 Mts) crouch start (Effective start, clearance the hurdles, maintain the speed, Finish.
- e. **Relay race** (4x100, 4x400 Mts) (Effective start, Acceleration speed, clearance the hurdles, maintain the speed, Finish.
- f. **Marathon** (42.195 Mts(Full marathon), 21.1 km (Half marathon)

B. Field events

1. Jumps (Long jump, High jump, Triple jump, pole vault)

- i. **Long jump Skills:** Approach run, take-off, Body in the air (hitch-kick, hanging), Landing. Speed, explosive power.
- ii. **High jump Skills:** approach, take off clearance, landing, Western roll, belly roll, eastern cut off, fass ferry flop.
- iii. **Tripple jump:** Approach run, take-off, Body in the air (hitch-kick, hanging), Landing. Speed, explosive power.

2. Throws: Shot put, Discus, hammer, and javelin. Grip, momentum, pre shift, sub phase, the wind up, foot work, entry to the turn, shift, angle of release, follow throw, delivery, front cross step, rear cross step, hop step, fuck method parry obraine, disco put, rotation, carry and glide.

3. Combined events:

- a. Pentathlon (5 events)
- b. Heptathlon (7 events)
- c. Decathlon (10 events)

Yoga and meditation

- I. **Sitting Asanas:** pathmasana, vajrasana, Janusirasasan , paschimotasan , Arthamatchindrasan, Komukasan
- II. **Prone posture:** Bhujangasan, salabasan, Yanasan, Dhanurasan, Arthasirasasan.
- III. **Supine posture:** Uthanapadasan, Navukasan, pavanamukthasan, vibarithakarani, Halasan.

Outcome

Participation in various tournaments and coaching camps, developing leadership qualities by organizing matches intramural and extramural and friendly matches.