Tata Institute of Social Sciences- School of Vocational Education

B.Voc. in Agriculture

Structure

Content

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 exits such as Diploma/Advanced Diploma under the NSQF. The B.Voc. Programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles and their NOSs 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.

In December 2011, Tata Institute of Social Sciences set up the **School of Vocational Education (SVE)** to provide immediate and definite interventions to improve the lives of the disadvantaged and marginalized youth, especially who are excluded by the formal school education system, through appropriate vocational training programmes. It has been set up with a vision of creating an ecosystem that would bring back the dignity of labour for blue collar streams of work and create sustainable sources of income. This project has been initiated under the aegis of **All India Council for Technical Education** (**AICTE**) proposed by the **Ministry of HRD**, **Government of India**.

1.1 Key Features:

Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of General Education.
- To ensure that the students have adequate knowledge and skills, so that they are work ready at each exit point of the programme.
- To provide flexibility to the students by means of pre-defined entry and multiple exit points.
- To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of 10+2 with vocational subjects.
- The certification levels will lead to Diploma/Advanced Diploma/B. Voc. Degree in Agriculture and will be offered under the aegis of the TISS. This is out-lined in the Table below.

The approach adopted by TISS-SVE is called the **Work Integrated Training programme (WITP)**. This Vocational Educational Programme is being implemented for the first time in India with a focus on job-specific

skills rather than providing only a broad based education. The aim is to enable the students to learn the skill by engaging in on-the-job training at real shop floor of the industry/company along with classroom theoretical training. Through this **"Earn while you Learn"** approach model, the trainee may also earn a modest stipend during on-the-job duration of the course. Although, this is not mandatory for any institution, TISS-SVE strongly encourages the training partners to adopt this practice.

Award	Duration	Corresponding NSQF level
Diploma	1 Year	5
Advanced Diploma	2 Years	6
B.Voc. Degree	3 Years	7

1.2. Eligibility for Admission

The eligibility condition for admission to B.Voc. programme in Agriculture shall be 10+2 or equivalent, in any stream

1.3. Employability

Considering the work integrated approach adopted by TISS:SVE the industry will be open to employ the students attached with them for the purpose of training as full time employees. We can assist in placements after completion of the course but no guarantee can be given.

2. Course Structure

The Vocational course is a three year program consists a combination of Practical, Theory and Generic (provided by TISS) courses. The three year program will be divided into 6 semesters; 2 semesters per year. 1st year will be a Diploma, 2nd year will be Advance Diploma & 3rd year will be a Degree.

The program is a work integrated training which include on-the-job training (practical) for 4 to 5 days a week and 1 day of theory training. The courses also include generic module for overall development of the candidate. The 1st two years of this program are in line with the Community College framework of the AICTE. The B. Voc Degree program is designed as per the UGC guidelines. The objective of the course is to provide immediate and definite interventions to improve the lives of the disadvantaged and marginalized youth, especially who are excluded by the formal school education system through appropriate vocational training programmes. The target beneficiaries would include organized and unorganized labour, women, children, dalits and tribals. There should be 6 month internship where learner will carry out all activity independently under supervision) last semester.

Curriculum

The curriculum in each of the years of the programmer would be a suitable mix of general education and skill development components.

Skill Development Components:

(i) The focus of skill development components shall be to equip students with appropriate knowledge, practice and attitude, so as to become work ready. The skill development components should be relevant to the industry as per its requirements.

(ii) The curriculum will necessarily embed within itself, National Occupational Standards (NOSs) of specific

job roles within the industry. This would enable the students to meet the learning outcomes specified in the NOSs.

(iii) The overall design of the skill development component along with the job roles selected will be such that it leads to a comprehensive specialization in one or two domains.

(iv) In case NOS is not available for a specific area / job role, TISS will get the curriculum for this developed in consultation with industry experts.

(v) The curriculum will focus on work-readiness skills in each of the three years.
Adequate attention will be given in curriculum design to practical work, on the job training, development of student portfolios and project work.

General Education Component:

(i) The general education component will adhere to the normal university standards. It will emphasize and offer courses which provide holistic development. However, it will not exceed 40% of the total curriculum.

(ii) Adequate emphasis will be given to language and communication skills.

The curriculum will be designed in a manner that at the end of year-

1, year-2 and year-3, students are able to meet below mentioned level descriptors for level 5, 6 and 7 of NSQF, respectively:

Level	Process required	Professional knowledge	Professional skill	Core skill	Responsibility
Level 5	Job that requires well developed skill, with clear choice of procedures in familiar context	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools materials and information	Desired mathematical skill, understanding of social, political and some skill of collecting and organizing information, communication.	Responsibility for own work and learning and some responsibility for other's works and learning

Level 6	Demands wide range of specialized technical skill, clarity of knowledge and practice in broad range of activity involving standard/ non-standard practices	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Reasonably good in mathematical calculation, understanding of social, political and, reasonably good in data collecting organizing information, and logical communication	Responsibility for own work and learning and full responsibility for other's works and learning
Level 7	Requires a command of wide ranging specialized theoretical and practical skill, involving variable routine and non-routine context	Wide ranging, factual and theoretical knowledge in broad contexts within a field of work or study	Wide range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Good logical and mathematical skill understanding of social political and natural environment good in collecting and organizing information, communication and presentation skill	Full responsibility for output of group and development

a. Professional knowledge is what a learner should know and understand with reference to the subject.
b. Professional skills are what a learner should be able to do.
c. Core skills refer tobasicskillsinvolvingdexterityanduseofmethods,materials,toolsandinstruments used to perform the job including IT skills needed for that job.
d. Responsibility aspect determines the (i) nature of working relationship, (ii) level of responsibility for self and others, (iii) managing change and (iv) accountability for actions.

The credits distribution as suggested by UGC for each of three years is as follows:

NSQF Level	Skill component Credits	General Education Credits	Normal calendar duration	Exit Points / Awards
Year 1	36	26	Six Semesters	B.Voc.
Year 2	36	24	Four semesters	Advanced Diploma
Year 3	36	24	Two semesters	Diploma
TOTAL	**108**	74		

Examination and Assessment

The assessment for the general education component will be done by the TISS as per the prevailing standards and procedures.

The assessment for the skill development components will necessarily focus on practical demonstrations of the skills acquired. TISS will consult the respective Sector Skill Council or COE for designing the examination and assessment pattern for the skill development components. TISS may also consider using the designated assessors of Sector Skill Councils/industry associations for the conduct of practical assessment or draw from the panel of examiners appointed by TISS-SVE.

TISS will establish a credit based assessment and evaluation system for the B.Voc. Programme.

3. Semester wise Distribution of Credits

Semester wise Credit distribution of Credits							
Semester	Agriculture Vocational Theory Credits	Agriculture Vocational Theory Hours	Agriculture Vocational Practical Credits	Agriculture Vocational Practical Hours	General Education Credits	General Education Hours	Total Hours
Semester 1	6	90	12	360	12	180	630
Semester 2	6	90	12	360	12	180	630
Semester 3	6	90	12	360	12	180	630
Semester 4	6	90	12	360	12	180	630
Semester 5	6	90	12	360	13	195	645
Semester 6	6	90	12	360	13	195	645
Total	36	540	72	2160	74	1110	3810

Theory 1 credit=15 Hours
Practical 1 credit=30 Hours

B.Voc in Agriculture

Course Introduction –

Indian Agriculture sector contributes around 23% in the GDP. It provides employment to more than 65% of the population. The sector is facing an increasing complex business environment due to integration of world market, technological advancement, development of the derivative market etc. To cater to this complexity skilled manpower is required to respond to the current situation and take quick and right decision. Agriculture being the prime focus on today's date for Indian economy requires skilled manpower across India. Further, the sector itself comprises of various sub-industries like Horticulture, Floriculture, Poultry, Organic Farming, and each industry has large number of job Opportunities. Above all, there are huge self employment opportunities in Agriculture Sector. Keeping it in mind, TISS-SVE has come up with B.Voc. (Agriculture) covering all aspects of Agriculture.

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 Agriculture Industry or become Entrepreneurs. The course curriculum for now has been designed for Year 1 - Semester I and II, completely on NSQF Framework and in alignment with the Qualification Packs designed by ASCI (Agriculture Skill Council of India) Sector Skills Council.

Employability/Skill enhancement

By pursuing training in this course, students are prepared for managerial and entrepreneurial careers in enterprises serving or dependent on agriculture and allied sectors and also receive specialized training as follows:

- Awareness and importance of Agriculture in our economy.
- How to address the demands of the agribusiness and allied sectors which are experiencing frequent changes.
- Use of latest techniques and tools in agriculture sector.
- Enables students acquire the competency to function as effective marketing managers.
- Special training as how to implement latest technology in agriculture.
- Ability to observe and understand the problems arising in the sector with a view of solving the same.
- To enhance the techno-managerial competence of extension functionaries.
- To acquaint the extension functionaries on the latest developments in the field of agricultural extension
- To equip the extension functionaries in latest tools and techniques for participatory decision making.
- To develop an insight into various extension models to enrich the agri - value chain.

- Training in agriculture marketing in rural and urban areas.
- Understanding the supply chain process and implementing the same.
- Ability to do market research.
- Organise various marketing activity.
- Understand and implement various marketing promotions.
- Selling loans to farmers through banks and financial institutions.

Duration of Course -

B.Voc course is a three year program & consists of a combination of Practical, Theory and Generic (provided by TISS) courses. The three year program will be divided into 6 semesters; 2 semesters per year. 1st year will be a Diploma, 2nd year will be Advance Diploma & 3rd year will be a Degree.

SYLLABUS FOR B.VOC IN AGRICULTURE

Semester Wise Courses:

Semester	Course Code	Course Title	Credits
I	AGR 101	Basic Botany and Introduction to Indian Agriculture	2
	AGR 102	Agronomical Principles and Crop Production Practices (Kharif Season)	2
	AGR 103	Farm Machinery & Post Harvesting Technology	2
	AGRVP 104	Vocational Practical 1	12
	GE 1.1	Functional English I	6
	GE 2.1	Personal Grooming	2
	GE 3.1	Computing Skills I	4
II	AGR 201	Agronomical Principles and Crop Production Practices (Rabi)	2
	AGR 202	Principles of Floriculture & Landscaping & Basic ideas of Agroforestry	2
	AGR 203	Indian Horticulture & Principles of Vegetables, Fruit Crops	2
	AGR VP 204	Vocational Practical 2	12
	GE 4.1	Communication Skills I	6
	GE 3.2	Computing Skills II	6
III	AGR 301	Concepts of Soil & Nutrient Management	2
	AGR 302	Principles of Irrigation management	2
	AGR 303	Principles of Agriculture Meteorology	2
	AGRVP 304	Vocational Practical 3	12
	GE 5.1	Financial Literacy	4
	GE 6.1	Digital Literacy	4
	GE 7.1	Basics of Legal & HR Policies	4
IV	AGR 401	Seed Production Technology	2
	AGR 402	Diagnosis of Crop Health problems	2
	AGR 403	Food Processing & Preservation	2
	AGR VP404	Vocational Practical 4	12
	GE 1.2	Functional English II	6
	GE 8.1	Basics of Accounting	6
V	AGR 501	Concept of Agroservice & Agriculture Extension	2
	AGR 502	Emerging concepts and practices in Agriculture	2
	AGR 503	Insect and their role in agriculture	2
	GE 4.2	Communication Skills II	6
	GE 9.1	Health and Fitness	2
	GE 10.1	Basics of Economics & Markets	4
	AGRVP 504	Vocational Practical 5	12
	AGR 601	Application of Microbiology in Agriculture	2
	AGR 602	Livestock , Poultry & Organic Farming Management	2

VI	AGR 603	Agro-processing Projects, Credit Planning & Corporate Farming	2
	GE 11.1	Entrepreneurship	6
	GE 12.1	Employment Readiness	6
	AGRVP 604	Vocational Practical 6	12

***(Please Note:** The broad curriculum outline for General Education component has duly been submitted to the Academic Council meeting on 25th July, 2014)*

Semester I

Course Title: AGR101-Basic Botany and Introduction to Indian Agriculture

Credits: 2

Total Credit Hours: 30

Course Objectives –

- To understand the basics of Agri farming
- To know the different crops in India.
- Having Basic ideas of Botany required for agriculture

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Introduction to Botany and general classification of plants	3
2	Parts of a typical flowering plant	3
3	Morphology of root, stem, leaf and flower	3
4	Structure and types of plant tissues	3
5	Internal structure of Dicot and Monocot Stems, Roots and a typical Leaf	3
6	Significance of life cycle with special reference to alternation of generations in Chlamydomonas, Rhizopus, Funaria, Adiantum, Pinus and a flowering plant	3
7	Importance of agriculture and its products in Indian economy	3
8	Major crops of India and their distribution viz. food grains, pulses, oil seed crops, cotton, fibre crop, sugarcane etc.	3
9	Farming systems/types of farming	3
10	Recent trends in Agriculture	3

Method of Teaching:

Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:

At end of semester Theory and practical (Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References

K.N. Bhatia & M.P. Tyagi : Elementary Biology
Dutta : Botany for degree Students

Suggested Reading

V.K. Jain : Fundamentals of Plant Physiology.
V.Verma : Text Book of Plant Physiology.
H.N. Srivastava : Plant Physiology.
N.C.E.R.T Class 11th and 12th : Biology

Course Title: AGR-102 Agronomical Principles and Crop Production Practices

(Kharif)

Credits: 2

Total Credit Hours: 30

Introduction and Course Objectives:

- To understand crop production & planning
- To know various crop production practices in India
- To know and understand the different crops cultivated in kharif season in India and their production technology

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Crops and their economic importance	2
2	Cropping systems and copping seasons in India	3
3	Crop Production Practices: Pre and post sowing, harvesting, storage etc.	4
4	Factors Affecting Crop Production	1
5	Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of kharif crops	5
6	Cereals – rice, maize, sorghum, pearl millet and minor millets	3
7	Pulses : pigeonpea, mungbean and urdbean	3
8	Oilseeds: groundnut, sesame and soybean	3
9	Fibre crops: cotton, jute and sunhemp	3
10	Forage crops: sorghum, maize, cowpea, cluster bean and napier	3

Method of Teaching:

Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:

At end of semester Theory and practical (Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal
assessment 30 marks for

oral examination.

References
Hand Book of Agriculture: ICAR.
Scientific crop production: C. Thakur

Suggested Reading

P.A.U Bulletin : Package of practices for Kharif Crops.
Chhidda Singh, Prem Singh & Rajbir Singh : Modern techniques of rasing field Crops.
Reddy S.R :
Agronomy of Field Crops

Course Title: AGR 103 Farm Machinery & Post Harvesting Technology
Credits: 2
Total Credit Hours: 30

Introduction and Course Objectives:

- To learn usage of agriculture tools & equipment
- To understand repair & maintenance of farm machinery
- To learn harvesting of crops
- To understand marketing of agri produce

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Common farm machines and implements of operation, adjustments, calibration	3
2	Principles, advantages and limitations of farm machines and implements – plough, narrow, water pumps, cultivator, tractor, thresher, winnower, plant protection equipment	3
3	Repair and maintenance of plant protection equipments (Knapsack sprayer, fogging machines, seed treating drums, power sprayer, foot sprayer), harrow, cultivator, thresher	3
4	Workshop tools and method, including welding, metal and wood fabrication tools, tool , Sharpening and threading	3
5	Importance of Post Harvest Operations	1
6	Post harvest losses in different farm produce	1
7	Cleaning, grading and drying of farm produce	2

8	Farm storage structures and storage of farm produce	2
9	Principles of processing of farm produce	3
10	Types of market. Function, structure and operation of Market	3
11	Marketing information and survey	3
12	Cooperative Marketing Federation, their operations and functions Packaging and transportation of farm produce	3

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References

- Handbook of Postharvest Technology: Cereals, Fruits, Vegetables, Tea, and Spices Hosahalli S. Ramaswamy, Arun S. Mujumdar, Amalendu Chakraverty
- Michael, A.M. and Ojha, T.P. 2004. Principles of Agricultural Engineering, Vol. I, Jain Brothers, New Delhi. 2. Jain, S.C. And Rai, C.R. 2001. Farm Tractor – Maintenance & Repair. 3. Culpin, C. 1978. Farm Machinery Granada Publishing Ltd., London

Suggested Readings

- Kepner, R.A., Bainer, R. and Barger, E.L. 1987. Principles of Farm Machinery, C.B.S. Publishers and Distributors, New Delhi.
- Smith, H.P. and Wilkes, L.H. 1979. Farm Machinery and Equipment, Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

Course Title: Vocational Practical
Credits: 12
Total Credit Hours: 360

Introduction and Course Objectives:
Student will learn equipment set up and routine procedure required to be able to effectively work in farm He/she will acquire skills to perform routine farm operation and be able to be skilled to maintain farm operation. After completion of this course student will able assist the farmers , scientific community , agro farms

Course content:/learning outcomes

Course Content

Practical Activities with relation to AGR 101

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Acquaintance with different agricultural resolutions viz. Green, White, Yellow, Rainbow, Blue and Golden revolutions	Making collage, charts/posters depicting these revolution.
2	Will learn about different crops food grains	Collection of food grains of different crops and making herbarium
3	Will learn about different crops	Video show different crops in the fields
4	Will learn about geographical distribution of different crops	Making map of India to show distribution of different crops
5	Will earn practical knowledge about farm practices.	Visit to agriculture farms to collect seeds of different crops and record various farm practices including preparation of fields and use of farm machinery.
6	Will understand about problems of farmer	Progressive farmer interaction by using advance ICT enabled platform for understanding the problems of farmer
7	Will learn to develop crop production plan	Developing the crop production plan for a farm, which can be implemented by a progressive farmer
8	Will Learn about different roots , stem and leaves systms	Morphological studies of roots, stems, leaves and flowers
9	Leran basi knowledge about histology and anatomy	Studies of permanent slides of histology and anatomy.. during the semester
10	Will learn about gametophytes and sporophytes of the plants pertaining to the life cycle	Morphological studies of gametophytes and sporophytes of the plants pertaining to the life cycle
11	Will gain knowledge about the local vegetation	General survey of the local vegetation through field trip

Practical Activities with relation to AGR 102

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Practical knowledge about farm practices	Visit to Agriculture Farms
2	Will gain more knowledge about crop production practices.	Project preparation on any one major crop of the areas on the basis of observations recorded in consultation with farmers.
3	familiarization with different crops: Plants and seeds.	Visit to farms for familiarization with different crops: Plants and seeds.
4	Will gain knowledge about different seasonal crops	Making collage, charts and posters for depicting crops and different seasons of their sowing and harvesting.
5	Will learn about nursery field preparation.	Nursery/field preparation before sowing by demonstration methods through videos / figures / visits.

6	Will learn about raising of crops	Raising of crops: practices and recording observations on flowering, maturity and seed / pod bearing, calculation of crop yield
7	Will gain knowledge about conditions favourable for different crops	Visit to meteorological observatory and recording data favorable for different crops
8	Will learn about soil types suitable for different crops	Collection of different types of soil followed by making herbarium depicting soils types for different crops.
9	Will learn about production practices major crops.	Case study/project preparation on production practices of any one major kharif crops .
10	Will learn about raising of crops	Rice nursery preparation and transplanting/seed bed preparation and sowing of Kharif crops
11	Will learn about calculation of seed rate	Calculations on seed rate;
12	Will learn about sowing different kharif crops	Sowing of any two of the following --soybean, pigeonpea, mungbean, maize, groundnut, and cotton
13	Will gain knowledge on seed size on germination and seedling vigour of soybean/groundnut	Effect of seed size on germination and seedling vigour of soybean/groundnut
14	Will learn about the Effect of sowing depth on germination of soybean	Effect of sowing depth on germination of soybean
15	Will be able to carry out Identification of weeds in rice, maize and soybean fields and study of weed control experiments in these crops	Identification of weeds in rice, maize and soybean fields and study of weed control experiments in these crops
16	Will gain knowledge about the top dressing	Top dressing of nitrogen in maize and rice and study of fertilizer experiments on rice, maize, sorghum and millets (Any two)
17	Will gain knowledge about yield contributing characters	Study of yield contributing characters, yield calculations, harvesting and yield estimation of above crops (Any two)

Practical Activities AGR 103

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Will learn about farm machineries	Project on farm machinery – list the farm equipments and their use
2	Will learn about farm machineries & their use	Familiarization with farm machinery and implements used for different operations
3	Will learn about farm machineries & their use	rmer interaction to understand the operational issues of farm machinery operation
4	Will learn about Repair and maintenance of plant protection equipment	pair and maintenance of plant protection equipment
5	Will learn about Handling of harvesting and post-harvesting farm machines	ndling of harvesting and post-harvesting farm machines
6	Will learn about Farm machineries used for seed treatment and dormancy breaking	Farm machineries used for seed treatment and dormancy breaking
7	Will learn about Cleaning, grading and drying different field and commercial crops	Cleaning, grading and drying different field and commercial crops
8	Will learn about Agri marketing	Generation of market information for agri- commodities like arrival, rate, different grades of produce etc
9	Will learn about Agri marketing	Collecting information on supply position of crop produce
10	Will learn to Identify packaging material	Identification of packaging material
11	Will gain practical knowledge about agriculture market & marketing	Visit to agricultural marketing societies, cooperative societies, mandies, fruits and vegetables
12	Will gain practical knowledge about agriculture market & marketing	Project on selling agri-produce in nearest mandi

Method of Teaching:
Hands on practical in industry/SKP aligned with theory

Method of Assessment & Weightage:
Competency
assessment.
Work place rounds
/visits
Work assignments.

Semester- II

Course Title: AGR 201 **Agronomical Principles & Crop Production (Rabi)**

Credits: 2

Total Credit Hours: 30

Course Objectives

- To understand crop production & planning
- To know various crop production practices in India
- To know and understand the different crops cultivated in Rabi season in India and their production technology

Sl No	Name of the topic	Hours/ Time required
1	Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of rabi crops	2
2	Cereals: wheat, barley	4
3	Pulses: chickpea, lentil, peas, french bean	4
4	Oilseeds: rapeseed and mustard, sunflower, safflower and linseed	4
5	Sugar crops: sugarcane and sugarbeet	4
6	Medicinal and aromatic crops such as mentha, lemon grass, citronella, palma rosa, isabgol and other important species	4
7	Commercial crops: potato and tobacco	4
8	Forage crops: berseem, lucerne and oat	4

Method of Teaching:

Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:

At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References

- Scientific crop production: C. Thakur.
- Field Crops: Y.M. Iyer.

Suggested Readings

- Medicinal plants: S.K. Jain.
- Text book of field crop Production 2004, ICAR, New Delhi.

Course Title: AGR 202 Principles of Floriculture & Landscaping & Basic ideas of Agroforestry

Credits: 2

Total Credit Hours: 30

Course Objectives

- To learn complete process of Floriculture cultivation
- To understand concepts of gardens, growing various types of flowers
- To understand agro forest production
- To learn various ways for agro forest production

Sl No	Name of the topic	Hours/ Time required
1	Introduction to floriculture: Scope and prospects	2
2	Principles and practices for growing elite plants, cut flowers production of seeds, plant material, bulbs etc	2
3	Factors affecting growing of floricultural plants	2
4	Role of growth regulation	3
5	Storage and marketing of cut flowers, seeds and bulbs	3
6	Concept of landscaping	3
7	Principles and designs of landscaping	3
8	Different types of gardens	3
9	Preparation of Bonsai	3
10	Flower arrangement : Western and Japanese	1
11	Application of Tissue culture technology in floriculture	1
12	Characteristics of agro-forestry– Classification, identification and economic importance	2
13	Characteristics of agro-forest producce– Classification, identification and economic importance	2

Method of Teaching:

Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:

At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.

20 marks for internal assessment 30 marks for oral examination.

References

- Mukhopadhay, A. (1987) Floriculture in India. Lyal Book Depot. Ludhiyana

Suggested Readings

Hand Book of Horticulture, ICAR publication

Course Title: AGR 203 Indian Horticulture & Principles of Vegetables , Fruit Crops Cultivation

Credits: 2

Total Credit Hours: 30

Course Objectives

- To learn complete process of Horticulture cultivation
- To understand preparation and management of Nursery
- To learn cultivation of vegetables &fruits
- To learn economics of fruits & vegetables production
- To understand complete process of mushroom cultivation

Sl No	Name of the topic	Hours/ Time required
1	**Basic concepts and** Contribution of Horticulture in Indian economy	1
2	Principles of nursery Raising of Horticultural crops: Propagation and practices in seed sowing	3
3	Nursery management of selected Horticulture crops	3
4	Importance and present status of fruit and vegetable industry	3
5	Classification of fruit and vegetable crops	1
6	Principles and practices in cultivation for growing different vegetables and fruits	3
7	Post-harvest technology of fruits and vegetables crops	3
8	Economics of fruit and vegetable production	2
9	Principles and practices in protected cultivation of plants	3
10	Construction of poly house	3

11	Package of practices for cultivation of important commercial plants in polyhouse	**3**
12	Maintenance of poly house	**2**

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal
assessment 30 marks for
oral examination.

References
Shanmugavellu, K.G. . Production Technology of Vegetable Crops
Niraj, N.P. (2006) Basic concept of vegetable science. IBDC, Luknow
Suggested Readings
Hand Book of Horticulture, ICAR publication

Course Title: **Vocational**
Practical Credits 12
Total Credit Hours 360

Introduction and Course Objectives:
Student will learn equipment set up and routine procedure required to be able to effectively work in ever expanding horticulture sector. He/she will acquire skills to perform routine farm operation and be able to be skilled to maintain farm operation. After completion of this course student will able assist the farmers , scientific community , agro farms & agro business and even he /she could start his/her own business
Course content:/learning outcomes

Course Content

Practical Activities with relation to AGR 201

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
	Gaoin Knowledge on Seed bed preparation and sowing	Seed bed preparation and sowing of wheat, sugarcane and sunflower (any one)
	Learn to calculate seed rate	Calculations on seed rate
	Learn the procedure to carry out Top dressing of nitrogen in wheat	Top dressing of nitrogen in wheat
	Study the effect of fertilizer with gaining knowledge on dose calculations	study of fertilizer experiments on wheat and mustard (any one)

	Identification of weeds	Identification of weeds in wheat and grain legumes
	Learn how to prepare herbarium	Preparation of harberium
	Learn about different types of herbicide and understand their effects on weed control	application of herbicide and study of weed control experiments in farm by farm visit
	Learn to identify plants / crops on basis of morphological features	Morphological characteristics of wheat, sugarcane, chickpea and mustard & identification of the crops
	Learn to calculate yield	Yield contributing characters of wheat etc
	Learn to carry out quality anaysis	Yield and quality analysis of sugarcane
	Learn about distribution of crops in states	Crop distribution in the state and the region and making charts / collage
	Gain knowledge about recent trends in rabi crops research	visit to research stations related to rabi crops

Practical Activities with relation to AGR 202

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Will learn about poly house, green house and plant nurseries	Visit to a poly house, green house and plant nurseries
2	Will learn about Cut flowers production practices	Cut flowers production practices
3	Acquaintance with various plant propagules	Acquaintance with various plant propagules
4	Will learn about Ornamental/elite plants raising in pots	Ornamental/elite plants raising in pots
5	Will learn about Disease and pest management in floriculture practices in poly house, green house and fields.	Disease and pest management in floriculture practices in poly house, green house and fields.
6	Will learn about Doses and application of growth hormones	Doses and application of growth hormones
7	Will learn about Storage and up keep of cut flowers	Storage and up keep of cut flowers
8	study landscaping in Gardens and parks	To study landscaping in Gardens and parks
9	Will learn Bonsai preparations	Undertaking Bonsai preparations
10	Will learn Identification of plants for tissue culture	Identification of plants for tissue culture
11	Acquaintance and use of lab equipment and sterilization	Acquaintance and use of lab equipment and sterilization
12	Will learn Isolation and cutting of single cell	Isolation and cutting of single cell
13	Will learn about Hardening & package of micro propogated plants	Hardening & package of micro propogated plants
14	Will learn about flower market	Market survey and calculation of demand and supply of different types of flowers and occasions
1 5	Visit to processing units of various agro-forest produce to acquaint with various processes.	Visit to processing units of various agro-forest produce to acquaint with various processes.
1 6	Will learn identification of medicinal plants and their parts	Visit to a herbal garden for identification of medicinal plants and their parts
17	Will learn preparation of herbarium	Collection of plants and preparation of herbarium

18	Will learn various Methods of nursery raising and cultivation of 1-2 medicinal plants	Methods of nursery raising and cultivation of 1-2 medicinal plants

Practical Activities with relation to AGR 203

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Will learn about nursery preparation	visit to a plant nursery for observations on nursery preparation and propogation techniques
2	Will learn to prepare seed bed	Preparation of seed bed
3	Will learn soil treatment technique	soil treatment
4	Will learn various Methods of planting and sowing of seeds	methods of planting and sowing of seeds
5	Will learn to prepare potting mixtures & potting of plants	Preparation of potting mixtures and potting of plants
6	Will learn about various Propagation methods used in horticulture crops i.e. Vegetative propeagation, cutting, layering , grafting etc.	Propagation methods used in horticulture crops i.e. Vegetative propeagation, cutting, layering , grafting etc.
7	Will learn about protected cultivation	undertaking protected & Filed cultivation for suitable crops (Any One)
8	Will learn about controlled cultivation , nursery cultivation and orchard cultivation technologies	Visit to controlled cultivation facility i.e. poly-house, Hydroponics ect & vegetable and fruit Nursery and orchard
9	Will learn about application of manure, fertilizers and growth hormones	Application of manure, fertilizers and growth hormones
10	Will learn about Uprooting and transplanting	Uprooting and transplanting
11	Study of various types of poly house and mist-chamber	Study of various types of poly house and mist-chamber
12	Will learn about Maintenance of polyhouse	Maintenance of polyhouse

Method of Teaching:
Hands on practical in industry/SKP aligned with theory

Method of Assessment & Weightage:
Competency
assessment.
Work place rounds
/visits
Work assignments

Semester – III

Course Title: AGR 301 Concepts of Soil & Nutrient Management

Credits: 2

Total Credit Hours: 30

Course Objectives –

- To understand the basics of Soil Formation , Soil Profile , Soil Components , properties
- To know the microorganisms of Soil
- To know about soil pollution and its control
- Learn to carry out physic-chemical analysis of soil sample and draw analytical conclusion from analysis .
- To prepare the students with necessary employability skills required for taking soil analyst as a profession or for setting up STL as part of entrepreneurship
- To understand role & various types of nutrients
- To understand the basics of Macro and Micro-elements requirements for plant growth
- To know about different types of manures
- To know about Different types of Chemical & Biofertilisers and their production & Application procedure
- Learn about different production process of compost , Vermicompost etc
- Learn to understand the effect of Chemical Fertiliser , Chemical fertiliser plus biofertilisr , Biofertiliser application on crop growth and productivity

Course Content

Sl No	Name of the topic	Hours/ Time required
1	Macro and Micro-elements essential for plant growth , Plant nutrient availability	1
2	Types of Nutrients and their role in crop production	1
3	Primary, secondary and micronutrients	1
4	Functions of nitrogen, phosphorus, potassium	1
5	Nutrient deficiency and toxicity symptoms – plant nutrient mobility in plant and symptom appearance location on plant/crop	3
6	Nutrient recommendations of Rice, Wheat, Soybean, Groundnuts and Cotton	1
7	Basic Concepts of integrated nutrient management	1
8	Soil formation , Soil Profile ,Components of soil	2
9	Physical properties of Soil , Elementary knowledge of soil taxonomy classification and soils of India	2
10	Soil water Soil air, composition, gaseous exchange, problem and plant growth,Soil temperature	2

11	Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability	**2**
12	Soil colloids , Soil organic matter ,Soil organisms	**2**
13	Concept of Soil Fertility	**1**
14	Manures: definition, profile of manure, importance Different groups/types , preparation , importance & Applications of bulky and concentrated manures, FYM , Green manure	**2**
15	Fertilizers: Importance ,sources , impact & Types , Fertilizer Application methods – Broadcasting, side placement, deep placement, foliar spraying *etc.,* N. P.K. carrying fertilizers – their agronomic efficiency, Secondary nutrient (Cu, Mg, S) supplying fertilizers , Fertilizer management, Fertiliser calculation , Fertilizer estimation and recommendation , mixing compatibility , role of Plant Growth Regulators , subsidy on fertilizers both chemical & organic , Concept of Direct Benefit Transfer (DBT)	**3**
16	Bio-fertilizers - i) Rhizobium, Azotobacter ,ii) Cyanobacteria (BGA), Azolla: their production , multiplication and field application	**2**
17	Application of Compost, Phosphocompost, Vermicompost , VAM	**2**
18	Basic Concepts of Sustainable Agriculture	**1**

Method of Teaching:

Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:

At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References

Brady: 1990 : Nature and properties of soil 10 th Edition
FAT (1980) Hand book on Fertilizer Technology
ICAR Handbook of manures and fertilizers (1971) publication

Suggested Readings

Mariakulandi and Manickam: 1975 : Chemistry of fertilizers and manures.
Biswas T.D. and S.K. Mukharjee (1994) : Text book of soil science 2nd edition

Course Title: AGR 302 Principles of Irrigation Management

Credits: 2

Total Credit Hours: 30

Course Objectives –

- To understand the importance and different methods of irrigation
- To know about conveyance of irrigation , irrigation scheduling , irrigation water quality management
- To know about integrated irrigation management
- Learn about different irrigation procedure by hands on training
- Learn to understand the quality of water by analysis
- By necessary Industry integration to learn and understand end to end irrigation management

Course Content -

Sl No	Name of the topic	Hours/ Time required
1	Importance of irrigation in crop production	5
2	Methods of irrigation: a) Surface irrigation – i) Border-strip, ii) Cheek basin, iii) Furrow, iv) Ring method (for chards) b) Sprinkler and Drip irrigation	5
3	Conveyance of irrigation: a) Conventional, b) Unlined & lined open channels, c) Fixed & Flexible pipes, d) Underground pipe system	5
4	Irrigation Scheduling: i) Time of irrigation, ii) Physiological stages of the crop, iii) Soil moisture status, iv) Soil-water tension, v) Evapo-transpiration	5
5	Poor quality irrigation water and their management	5
6	Integrated irrigation management , Water shed Management, Concepts of Fertigation	5

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References
Efficient use of irrigation water by - G. H. Sankara Reddi and T. Reddy, Kalyani Publishers, Ludhiana, India
Irrigation Water Management Principles and practices by - Dilip Kumar Majumdar.
Irrigation Theory and Practice by - A. M. Michael, Vikas Publishing House, New Delhi

Suggested Readings

Irrigation and Drainage by D. Lenka, Kalyani Publishers, Ludhiana, India.
Manual on irrigation agronomy – Misra R.D. and M. Ahmed, Oxford and IBH Publishing Co., New Delhi.

Course Title: AGR 303 Agriculture Meteorology

Credits: 2

Total Credit Hours: 30

Course Objectives –

- To understand the basics of earth & its atmosphere
- To know about different types of Atmospheric weather variables , learn and understand the atmospheric temperature , pressure , wind speed & direction , solar radiation , humidity , precipitation etc
- To know about relationship between agriculture and weather
- Learn to understand the monsoon
- By necessary Industry integration to learn and understand different measurement techniques of meterological parameters and integrating the obtained data for agricultural productivity

Course Content -

Sl No	Name of the topic	Hours/ Time required
1	The earth and its atmosphere, Environmental factors in agriculture	5
2	Atmospheric weather variables; Atmospheric pressure, its variation with height; Daily and seasonal variation of wind speed and direction , Nature and properties of solar radiation	5
3	Atmospheric temperature, daily and seasonal variations of temperature, heat balance of earth	5
4	Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, snow, rain and hail; Precipitation, cloud formation and movement	5
5	Agriculture and weather relations; Introduction to monsoon	5
6	Use of weather data for irrigation scheduling, pesticide sprays, fertilizer application	5

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References

Atmosphere, weather and climate – Barry R.G. and Charley R.J. The English Language Book Society and Mathuen and Co. Ltd., Sultolk.
Contemporary climatology – Handarson Sellers A. and Robinson P.J. Longman Scientific and Technical, England.

Suggested Books

Introduction to Agrometeorology – H.S. Mavi, Oxford and IBH Publishing Co., New Delhi.
Agricultural Climatology – J.R. Kakade

Course Title: Vocational
Practical Credits 12
TotalCreditHours 360

Introduction and Course Objectives:
Student will learn equipment set up and routine procedure required to be able to effectively work in everexpanding horticulture sector . He/she will acquire skills to perform routine farm operation and be able to be skilled to maintain farm operation. After completion of this course student will able assist the farmers , scientific community , agro farms & agro business and even he /she could start his/her own business

Course content:/learning outcomes

Course Content

Practical Activities with relation to AGR 301

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge of soil profile in field	Visiting farm , collect samples , Making models of Soil profile by Soil Profile Cards.
2	Study & learn about different types of soil sampling Tools	Study and demonstration and self operation of different soil sampling tools
3	Know & understand the methods of Collection , Processing & Storage of soil samples	Visit farmers field , Collection of Soil samples maintaining Standard Process , uniformity and depth, its processing and storage
4	Will learn, Gain knowledge & condition about soil Physical Properties and also will learn the methods of analysis , principles of analysis , instruments operational principles ,	Analysis of collected Soil samples in lab following standard analytical methods for determination of – • soil colour

	and determination of different Physical properties and also can deduct the result to draw conclusion about condition of soil of any geographical location.	• density • moisture content • porosity • soil texture • Soil structure • Soil Water holding capacity
5	Will learn, Gain knowledge & condition about soil Chemical Properties and also will learn the methods of analysis , principles of analysis , instruments operational principles , and determination of different Chemic properties and also can deduct the result to draw conclusion about condition of soil of any geographical location.	Analysis of collected Soil samples in lab following standard analytical methods for determination of – • pH • EC • Cation exchange capacity • Organic C • Available N.P.K. , S , Ca Mg
6	Will understand about Soil Mapping	Study of Soil Map
7	Study & gain knowledge of identification of different different manures, fertilizers & Bio-fertilizers	Visiting market & or commercial manufacturing unit and carry out Identification & Collection of different manures, fertilizers & Bio- fertilizers
8	Study & learn about different types Classification of Manures, Fertilizers and Biofertilizers	Making Chart on Classification of manures, fertilizers & Bio- fertilizers
9	Will learn, Gain knowledge about Planning , Procedure , Growth and management of Green Manuring	Visit the farm filed to see & document the process of Green manuring (Planning , Procedure , Growth and management)
10	Will learn, Gain knowledge about Preparation of household compost, phosphor-compost & Vermicompost	Visiting respective Compost making Industry and hands on training through demonstration and practical operation on production process of – 1. Vermicompost 2. Household compost 3. Phosphorcompost
11	Will learn, Gain knowledge about production process of Biofertilizers	Visiting respective Biofertiliser making Industry and hands on training through demonstration and practical operation on--- 1. production process of any one type of biofertilizer . 2. Maintenance of biofertilizers stains and their cultures
12	Will learn Calculation of fertilizer, measurement according to the recommended nutrient dose, crop nutrients requirement	Calculation of fertilizer, measurement according to the recommended nutrient dose, crop nutrients requirement
13	Will learn to Determine field capacity	Determination of field capacity
14	Will learn to Determine gypsum and lime requirement for alkali and acidic soil respectively	Determination of gypsum and lime requirement for alkali and acidic soil respectively
15	Will learn to identify right source of fertilizer according to farm and crop situation	Identification of right source of fertilizer according to farm and crop situation

16	Will learn to Estimate fertilizer and calibrating the same with ideal nutrient ration i.e. 4:2:1	Estimation of fertilizer and calibrating the same with ideal nutrient ration i.e. 4:2:1

Practical Activities with relation to AGR 302

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge of utilisation of water for irrigation in agro farm	Visiting farm and Study of Utilisation of water for irrigation in farm
2	Study & learn about different different methods of application of irrigation water and irrigation channels	Visit farm and Study through demonstration and self operation of 1.different methods of application of irrigation water and irrigation channels, 2. surface and sub-surface irrigation method 3. Sprinkler Method 4. Drip irrigation methods
3	Know & understand the irrigation scheduling	Visit farmers field & carry out Study of irrigation scheduling - a. Time of irrigation based on phonological stages and soil moisture status of the crop. b. Amount of water to be irrigated . c. Irrigation schedules for different important crops (any two of locally available).
4	Will learn, Gain knowledge different procedure of measurement of irrigation water	Visit the farm filed to see & self Measurement of irrigation water through 1. 'V' notch 2. meter gate
5	Will learn, Gain knowledge about Methods for testing quality of irrigation water	Visiting the farm filed , colleting and storing samples of irrigation water and hands on training on testing quality of irrigation water by use of water testing kit / Lab for the following parameters following Standard operating Procedure a. TDS b. EC c. Salinity d. pH e. Alkalinity and or Acidity f. Sodicity
6.	Will learn, Gain knowledge about irrigation Command area	Visit to irrigation command area and Meteorological observatory

Practical Activities AGR 303

Sn	Learning outcomes of vocational	Task assigned with vocational practical

	component aligned with theory	component
1	Study & gain knowledge of Agriculture meteorological unit	Visiting Agriculture meteorological unit and document and understand the reason of 1. Site selection for Agromet observatory 2. understand Layout plan of Agromet observatory (Agromet field unit)
2	Study & learn about different Instruments used and their working principles in Agriculture meteorological unit	Visit Agriculture meteorological unit and identify and understand of operational principles of different instruments used
3	Know & understand the procedure and importance of measurement of soil temperature	Visit Agriculture meteorological unit and Measurement of soil temperature & correlate with agriculture output
4	Know & understand the procedure and importance of measurement of gross minimum temperature	Visit Agriculture meteorological unit Measurement of gross minimum temperature & correlate with agriculture output
5	Know & understand the procedure and importance of measurement of rainfall	Visit Agriculture meteorological unit Measurement of rainfall & correlate with agriculture output
6.	Know & understand the procedure and importance of measurement of evaporation	Visit Agriculture meteorological unit Measurement of evaporation & correlate with agriculture output
7	Know & understand the procedure and importance of measurement of atmospheric pressure	Visit Agriculture meteorological unit Measurement of atmospheric pressure & correlate with agriculture output
8	Know & understand the procedure and importance of measurement of sunshine duration	Visit Agriculture meteorological unit Measurement of sunshine duration & correlate with agriculture output
9	Know & understand the procedure and importance of measurement of wind direction	Visit Agriculture meteorological unit Measurement of wind direction & correlate with agriculture output
10	Know & understand the procedure and importance of measurement of wind speed	Visit Agriculture meteorological unit Measurement of wind speed & correlate with agriculture output
11	Know & understand the procedure and importance of measurement of air temperature	Visit Agriculture meteorological unit Measurement of air temperature & correlate with agriculture output
12	Know & understand the procedure and importance of measurement of relative humidity	Visit Agriculture meteorological unit Measurement of relative humidity & correlate with agriculture output
13	Know & understand the procedure and importance of measurement of dew	Visit Agriculture meteorological unit measurement of dew & correlate with agriculture output

Semester - IV

Course Title: AGR 401 Seed Production Technology
Credits: 2
Total Credit Hours: 30

Course Objectives –

- To understand the basics of Seed & its importance in agricultural development
- To know about Basic principles of seed production
- Learn to understand the Quality control issues with seed Production, Post-harvest handling , Seed Testing
- By necessary Industry integration to learn and understand different seed production technology for variety of field crops , Seed Packaging , storing and transport mechanism , Hybrid seed production
- Enable students with necessary employability skills to help him/her to get gainful employment in evergrowing seed industry

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Seed – its importance in agricultural development , Introduction of seed industry in India	3
2	Seed morphology, development & classification , difference between seed and grain	4
3	Basic principles of seed production , Seed Production techniques of some important crops of India	5
4	Seed production in phases – Breeder seed, Foundation and Certified seed	3
5	Qualities of improved seed and maintenance of Purity	5
6	Post-harvest handling – thresning, cleaning, drying, grading, seed treatment	4
7	Viability of seeds and factors affecting it, Seed Packaging and packaging materials, Seed Storage	3
8	Seed testing, seed certification and seed Act	3

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References
Agrawal R.L. (1980). Seed Technology, Oxford and IBH Publecation Co., New Delhi. 2. Agrawal P.K. and Dadlani, M. (1987) . Techniques in Seed Science and Technology, South Asian Publisher, New Delhi.

Suggested Reading
Nema, N. P. (1986) Principles of Seed Certification and Testing. Allied Publishers, New Delhi.

Course Title: AGR 402 Diagnosis of Crop health Problems & Integrated Pest Management
Credits: 2
Total Credit Hours: 30

Course Objectives –

- To understand the Causes of health Problems of crops
- To know about diagnosis technique of health problems
- To know about prevention and control of health problems
- Learn to understand the monsoon
- By necessary Industry integration to learn and understand Identification, listing & impact , prevention and control strategy for different important agricultural crop species

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Causes of health Problems of crops	2
2	Diagnosis of health problems of cereals	2
3	Diagnosis of health problems of jute	3
4	Diagnosis of health problems of pulse	3
5	Diagnosis of health problems of oilseeds	3
6	Diagnosis of health problems of vegetables	3
7	Diagnosis of health problems of fruits	3
8	Diagnosis of health problems of flowers	3
9	Insecticides , Pesticides, fungicides , types and or classification , application , Effect on health and environment	2
10	Principles of IPM	2
11	Role of IPM in crop production	2
12	Different methods and strategies of IPM	2

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.

20 marks for internal assessment 30 marks for oral examination.

References

Principles of Insect Pest Management. Dhaliwal G.S. and Arora Ramesh
Introductaion to Insect Pest Management Metcalf R. L. Luckman W. H

Suggested Reading

Insect Pest Management Venugopal Rao

Course Title: AGR 403 Food Processing & Preservation
Credits: 2
Total Credit Hours: 30

Course Objectives –

- To understand the basic principles of food processing.
- To know the different methods of processing of foods
- To know about To know the bakery product manufacturing process
- To understand the basic principles of food preservation
- To understand principles of preparation of juices and squashes. Preparation of jam and jelly, food spolage and its control
- By necessary Industry integration to learn and understand different preparation ,processing , preservation , packaging , storing , marketing of preserved food
- Toenable learner with adequate employability skills so that he/she can get gainful employment in food processing and or preservation industry as well as can become an entrepreneur

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Importance & principles of food preservation	4
2	Importance & principles of Food processing	4
3	Different methods of Preservation of fruits and vegetables	5
4	Different methods of Preservation of processed foods	4
5	Principles of preparation of juices and squashes	4
6	Principles of preparation of Jam & Jelly	3
7	Spoilage in foods and their control strategies	3
8	Storage and marketing of processed and preserved products	3

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)

Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References
Handbook of Food Processing: Food Preservation - CRC Press

Course Title: Vocational
Practical Credits 12
TotalCreditHours 360

Introduction and Course Objectives:
Student will learn equipment set up and routine procedure required to be able to effectively work in everexpanding horticulture sector . He/she will acquire skills to perform routine farm operation and be able to be skilled to maintain farm operation. After completion of this course student will able assist the farmers , scientific community , agro farms & agro business and even he /she could start his/her own business

Course content:/learning outcomes

Course Content

Practical Activities with AGR 401

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about procedure of identification of seeds and sampling	siting agro farm and or seed production unit & Identification of different groups of seed and seed sampling and making chart with collected seeds
2	Study & learn about principles of seed production process in major cereal	siting agro farm and or seed production unit & Study and preparing report on Seed production process in major cereals (Any one depending on the place) : Wheat, Rice, Maize, Sorghum, Bajra and Ragi.
3	Know & understand about principles of seed production process in major pulse	siting agro farm and or seed production unit & Study and preparing report on Seed production in major pulses (Any one depending on the place): Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea.
4	Know & understand the procedure and principles of seed production process in	siting agro farm and or seed production unit

	major oilseed	& Study and preparing report on Seed production in major oilseeds (Any one depending on the place) : Soybean, Sunflower, Rapeseed, Groundnut and Mustard.
5	Know & understand the procedure and principles of seed production process in important vegetable crops	siting agro farm and or seed production unit & Study and preparing report on Seed production in important vegetable crops (Any Two) of the zone
6	Acquire knowledge on seed sampling and testing	siting agro farm and or seed production unit & Study the Seed sampling and testing: Physical purity, germination, viability,Moisture etc
7	Know & understand the procedure and principles of pre sowing, sowing of seeds	siting agro farm and or seed production unit & document , study and hands on training on Pre-sowing treatment of seeds/seedlings, Individual plot for seed raising (sowing to harvest)
8	Gain knowledge & understand the procedure and principles of Seed Packaging , storing and transport	siting agro farm and or seed production unit & document , study and hands on training on Seed Packaging , storing and transport mechanism
9	Gain knowledge about hybrid seed production technology	sit to seed producing farms and gain knowledge by watching the demonstration of hybrid seed production techniques

Practical Activities with relation to AGR 402

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about procedure of identification of pests , pathogens and parasite and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show of 1. Pests like nematodes, snails, slugs, insects, mites, birds and rodents. 2. Pathogens: fungi, bacteria, viruses, mycoplasma, protozoa and algae. 3. Flowering plant parasites-characteristics.
2	Study & learn about procedure of identification of health problems in major cereals and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show of health problems of cereals 1. Rice: mealy bug, GLH, BPH, WBPH,

		bug, stemborers, army caterpillars, leaf folders, ufra gall midge, hispa, blast, brownspot, BLB, BLS, sheath rot, foot-rot, false smut, scald 2. Wheat: termites, stemborer, aphids, seedling blight, smut, rusts, earcockle 3. Maize: stemborer, caterpillar, foot-rot, smuts, rust, downy mildews
3	Know & understand about principles of identification of health problems in sugarcane and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show of health problems of Sugarcane Leafhoppers, mothborers, termites, red rot, wilt, whip smut, ratoon stunt, pineapple diseases.
4	Know & understand the procedure and principles of identification of health problems in Jute and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show of health problems of Jute Semilooper, hairy caterpillar, stem rot, anthracnose, canker, root knot, wilt.
5	Know & understand the procedure and principles of identification of health problems in pulses and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show of health problems of pulses Bean group and Gram, Arhar, Pea group: Aphids, coreid bugs, pod borer complex, hairy caterpillar, stem fly, podfly, podapion, mosaic, powdery mildew, root rot, leaf spot anthracnose, wilt, rusts, blight.
6	Acquire knowledge on the process of identification of health problems in major Oil seeds and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show health problems of oilseeds: Mustard, Groundnut. Mustard: aphid, diamond backmoth, gingily, leaf webber, hairy caterpillars. Groundnut: termite, aphids, leafblight, white rust, club root, phyllody, rust, foot rot, seedling blight.
7	Acquire knowledge on the process of identification of health problems in vegetables and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show health problems of vegetables: Solanaceae: aphids, cut worms, fruit- shoot borer, mealy bug, Epilachna beetle; wilts, root rot, dieback, aerial blight. Malvaceae: jassids, white fly, aphids, leaf folder, fruit borer, mosaic, blackarm, boll rot, root knot;

		Cucurbitaceae: Epilachna beetle, fruity fly, red pumkin beetle, mosaic, powdery mildew, wilt, root rot; Cruciferae: aphids, diamond back moth, caterpillar, cabbage head borer; black rot, alternaria blight, Mo & B deficiency
8	Gain knowledge & understand the process of identification of health problems in fruits and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show health problems of fruits: Mango: hopper, mealy bug, fruit fly, trunk borer, bark eating borer, shootgall, leaf cutting weevil, malformation, leaf blight, anthracnose, canker, fruit rot; Citrus: leaf miner, psyla, white fly, scale, canker, gummosis, dieback, scab; Banana: weevil, wilt, pseudostem rot, sigatoga, bunchy top; Guava: wilt, root rot, scab; Coconut: wilt, budrot, gummosis, blight, fruit drop, rhinoceros beetle, rat
9	Acquire knowledge on the process of identification of health problems in flowers and their impact	Identification, listing & impact study by all or combination or any of the activity like field visit , slide show, video show of health problems of flowers: Rose, Chrysanthemum, Dahlia, Tuberose, etc. scale, mealy bug, aphids, leaf webbers; dieback. Backspot, powdery mildew; leaf blight, petal blights, slow wilt; foot rot, stemgall.
10	Understand the process of colletion of specimens and herbarium making and the importance of the same with respect to different plant diseases and assoiated health problem study	Visit Agro Field of the students hometown and Collection of specimens, Herbarium making-in both dry and pickle methods
11	Analytical knowledge gathering on Field Clinical Tests like hand lens examination and Ooze tests	Visit Agro Field and carry out Clinical tests like hand lens examination and Ooze tests in field
12	Analytical knowledge gathering on Clinical tests: Like moist-chambering, incubation and examination through Miroscopy	Carry out Clinical tests in Agro Research lab Like moist-chambering, incubation and examination with stereo and compound microscope
13	Gain knowledge on Seasonal Disease and Pests problem	Field visits for recording seasonal diseases & Pests
14	Identification of common weeds and their control measures	Collection of common weeds and their control measures
15	Will learn Rodent control	Rodent control
16	Will learn to Identify nematodes and their control	Identification of nematodes and their control

17	Will learn to Identify common biological agent to control insect, pest, plant pathogen and seeds	Identification of common biological agent to control insect, pest, plant pathogen and seeds
18	Will learn about pesticides & plant diseases	Identification of pesticides, collection and identification of plant disease specimen and insect pests of common crops of the area
19	Will learn to calculate pesticide dose	Calculation of pesticides for application of based

Practical Activities with relation to AGR 403

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about procedure of food processing	Visit to food processing industry and identify , learn and documentation of the reallife food processing principle and operations
2	Study & learn about procedure of operation of short term and cold storage and their roles in food preservation	Visit to Short-term storage and cold storage and getting hands on experience on their process of operation , operating principles and applications in food preservation
3	Know & understand about principles of different food preservation techniques	Visiting relevant industries and hands on training on 1. pasteurization 2. sterilization 3. planching 4. drying and dehydration 5. canning For any fruits and vegetables
4	Know & understand the procedure and principles of preparations of Squashes , RHS, syrups	Visit industry and learn with handson training for Preparation of 1. squashes 2. RHS 3. syrups.
5	Know & understand the procedure and principles of operation of backery	Visit to Backery to study of its product, bread, biscuit and submission of report on the process
6	Acquire knowledge on the process of preparation and preservation of Jam, Jelly, Marmalade	sit industry and learn with handson training for Preparation & Preservation of- Jam Jelly Marmalade
7	Acquire knowledge on the process of preparation and preservation of Pickles, Chutney, Sauces	sit industry and learn with handson training for Preparation & Preservation of Pickles Chutney Sauce

Method of Teaching:
Hands on practical in industry/SKP aligned with theory

Method of Assessment & Weightage:
Competency
assessment.
Work place rounds
/visits
Work assignments

Semester – V

Course Title: AGR 501 Concept of Agroservice & Agriculture Extension
Credits: 2
Total Credit Hours: 30
Course Objectives –

- To understand the basics concepts of Agro Services
- To know about different types of service required for socio economic development of the farming community
- Learn to understand cropping system and cropping pattern, Soil productivity and soil fertility and crop ecology
- By necessary Industry integration to learn and understand role and process of integrating the different agro services for agricultural productivity & growth
- To understand the concept of Extension education and its importance in agriculture and allied fields

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Basic Concepts of Agro Service its scope and importance	2
2	Types of service required for socio economic development of the farming community	3
3	Land Development, Planting, Plant protection, Harvesting as essential components of Agro Farm Services	3
4	Crop ecology – Microclimate, harvest index, sink source ratio Ideotype for some crops	3
5	Education- meaning and types. Extension Education and Agricultural Extension- meaning, objectives, principles and philosophy	3
6	Importance and problems of rural development. Agricultural and rural development programmes of pre and post independence era	3
7	Powers, functions and organizational set-up of three tier Panchayati Raj System	3
8	New trends in extension education and privatization of extension	3
9	Emergence of broad based extension Extension programme planning	2
10	Principles and steps in programme development process. Monitoring and evaluation of extension programmes.	2
11	scope and importance of agricultural journalism	1

12	Diffusion and adoption of innovations Capacity building of extension personnel and farmers	**2**

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References
Govt. of India: "Extension Education in Community Development" Directorate of Extension, Ministry of Food and Agri., Govt. of India New Delhi.
Supe S.V. "An Introduction to Extension Education," Oxford & IBH Publishing Company Pvt., Ltd., 66 Janpath, New Delhi 110001.

Suggested readings

Dahama, O.P. & Bhatnagar "Extension and Communication for Development" Exford & IBH Publishing Company, 66-Janpath, New Delhi 110001/
Dahama, O.P., Communication & Extension (Revised Edition) Ram Prasad & Sons, Agra.

Dahama, O.P. "Extension & Rural Welfare", Ram Prasad & Sons, Agra

Course Title: AGR 502 Emerging Concepts & Practices in Agriculture
Credits: 2
Total Credit Hours: 30
Course Objectives –

- To understand the importance and different methods of green house technology
- To know about different types of Green Houses
- To know about plant response to green house environment
- Learn about different equipments, materials of construction for traditional and low cost green houses
- Learn to understand the quality of water by analysis
- By necessary Industry integration to learn and understand end to end operation and management of green houses

- To understand the importance of e-Agriculture, concepts and applications Use of ICT in Agriculture
- To know about diversified use of ICT in Agriculture

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Protected Cultivation – Introduction, need, classification , Components of structures associated with protected cultivation and standards , Macro and micro climate control options , Design calibration , Crop management (existing and new crops) ,Irrigation, Fertilizer designing and fertigation	5
2	Introduction to Green house technology, Types of Green Houses, Plant response to green house environment	3
3	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 , solar green house, hot air green house heating systems, green house drying., Cost estimation and economic analysis.	4
4	Hi-tech Farming – Introduction, requirement, types	4
5	Systems , components , management procedures , crop established & their management under Hydroponic Farm and Aeroponics Farm systems	4
6	Crop Management Scheduling , Automation System , Fertilizer Designing and fertigation , Calibration of micro & macro climate of growing media and crop canopy	4
7	e-Agriculture, concepts and applications, Use of ICT in Agriculture. , IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; ,Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. ,E commerce in Agriculture	3
8	Emerging concepts like i. National e Market , ii) Fasal Beema Yojana ,iii) Soil Health program , iv) Agri Commodity exchange ,v) APMC acts , Seeds - Seed Act, Seed Rules and Seed (Control) Order , Fertilizer (Control) Order ,Pesticides - Insecticides Act, Insecticides Rules,, Insecticides (price: stocks display and submission of reports) Order Other related Acts - EC Act – Consumer Protection Act, WALT Act, Limitation Act and Act on Production and Distribution of Bio-Fertilizers, besides CrPC, CPC etc	3

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

Course Title: AGR 503 Insects & their role in Agriculture

Credits: 2

Total Credit Hours: 30

Course Objectives –

- To understand the importance of different economically beneficial insects
- To know about principles of rearing , production , processing , management , pest and disease control of related insects & processes associated with Beekeeping , Sericulture , Apiculture
- By necessary Industry integration to learn and understand end to end operational procedure and management of Beekeeping , Sericulture , Apiculture

Course Content –

Sl No	Name of the topic	Hours/ Time required
	General introduction to Phylum-Arthropoda, its various classes and their distinguishing characters. **Insect Morphology** : Body wall-structure, composition and functions; **Body divisions** Head (Structure and its appendages; structure, functions and modifications of antennae; Mouthparts-Biting and chewing, piercing and sucking, sponging, siphoning, chewing, and lapping); **Thorax**-its structure and appendages, modifications and functions of legs and wings, wing coupling apparatus and wing venation; **Abdomen**-its segments and appendages. **Anatomy**: Digestive, Excretory, Reproductive, circulatory, respiratory and nervous systems of grass hopper.	**6**
	Taxonomy: Insect Classification up to the level of families of agricultural importance	**2**
	Economic importance of insects, nature and extent of damage, life history and management of the major insect pests of following crops as mentioned against them 1. **Paddy** *Leptocorisa varicronis, Hieroglyphus Spp., Nilaparvata lugens, Nephotetix, spp., Mythimna separata* 2. **Jowar Maize** *Chilo partellus, Atherigona variosoccata, Scirpophaga, Excerpatalis, Chiloinfuscatelles* *3.* **Sugarcane** *Pyrilla prepussila* *4.* **Cotton** *Pectinophora gossypiella, Earias Spp., Sylepta derogata, Dysdercus Spp., Bemisia tabaci, Amrasca bigutulla*. 5. **Oilseeds** Lipaphis erysimi, Athalia proxima Bagrada Cruciferarun, Dasyneura	**9**

	lini 6. **Pulses** *Helicoverpa armigera Agrotis Spp., Etiella Zinckenella, Melanagromyza obtusa, Phytomyza atricornis* *7.* **Pests of Fruit crops** *Drosicha mangiferae, papilio Democlius, Diaphorina citri Phyllocnisris citrella, Eriosoma lanigerum* *8.* **Pest of Vegetable crops** *Leucinodes orbonalis, Epilachna viqintioctopunctata. Dacus cucurbitae, Plutella xylostella* *9.* **Pests of Stored Grains** *Sitophilus oryzae, Trogoderma granarium, Sitotroga cerealella, Callosobruchus chinensis Polyphagus pests Odontotermes obesus, Holotrichia consanguinea, Spilosoma obliqua, Spodoptera litura, Amshcta Spp*	
	Importance of beneficial Insects	**1**
	Principles , methods of rearing, bee biology , production of honey , enemies disease management of Beekeeping	**4**
	Types of silkworm, Principles of Mulberry cultivation, harvesting , cocoon management . Pest and diseases and their management	**4**
	Species of lac insect, biology, host plant, lac production, products	**4**

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References
General and Applied Entomology- B.V. David and T.N. Ananthkrishnan.
Agricultural Entomology for Indian Students- Khanna, S.S.

Suggested readings

Agricultural Entomology – Mathur and Upadhyay
A text book of applied Entomology Vol. I & II- K.P. Shrivastava

Course Title: **Vocational**
Practical Credits: 12
Total Credit Hours: 360

Introduction and Course Objectives:

Student will learn equipment set up and routine procedure required to be able to effectively work in ever expanding horticulture sector . He/she will acquire skills to perform routine farm operation and be able to be skilled to maintain farm operation. After completion of this course student will able assist the farmers , scientific community , agro farms & agro business and even he /she could start his/her own business

Course content:/learning outcomes

Course Content

Practical Activities with AGR 501

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about agroservice	Identification, listing and chart preparation on Agroservice, types and importance
2	Study & learn about Types of service required for socio economic development of the farming community	Identification, listing powerpoint presentation and small project on Types of service required for socio economic development of the farming community by visiting the relatedagroservice industry
3	Know & understand about Agro climatic zone and their importance	Chart preparation and zonation mapping of Agro climatic zone of concerned state where the hub is present
4	Know & understand the Soil classification	Chart preparation and zonation mapping on Soil classification with special reference to The concerned state where hub is located.
5	Know & understand concept of Land use	Chart preparation and zonation mapping on suitable land usewith special reference to The concerned state where hub is located.
6	Acquire knowledge on cropping system of India	sit farmers farm , Chart preparation , video show and powerpoint presentation on prevailing cropping system in India
7	Know and gain knowledge on prevailing Cropping patterns in India and their importance	sit farmers farm , Chart preparation , video show and powerpoint presentation on prevailing cropping pattern in India

8	Understand and gain knowledge on diversified field of crop ecology	Visit agro farm and study Crop ecology on the following – 1.Microclimate 2.harvest index 3.sink source ratio Ideotype for some crops
9	Basic knowledge gathering and learning about community involved agroservice facility	Visit an nearby agroservice offering organization and prepare a project report on the operation
10	Understand and gain knowledge about the Health of crop and seed and its productivity	Visit an agro research laboratory / and by hands on training gain knowledge about procedure and importance of Plant sample & seed analysis for important elements like below to know about status of the crop & seed – 1. Chlorophyll Content 2. Amino Acid Content 3. Protein estimation 4. Soluble sugar estimation 5. DNA Estimation
11	Gain knowledge about Agro development programmes	Visits to a village and kisan mandal to study the ongoing development programmes
12	Gaining knowledge about Panchayat Raj Institutions ,Gram Panchayat ,Zilla Praja Parishad	Visits to Panchayat Raj Institutions to study the functioning of Gram Panchayat (GP) & Zilla Praja Parishad (ZPP).
13	Understand about DRDA	Visit and study the District Rural Development Agency (DRDA) , Participation in monthly workshops of Training and Visit (T & V) System
14	Gain knowledge about Watershed Development	Visit to Watershed Development Project area
15	Learn about SHG and DWCRA	Visit to a village to study the Self Help Groups (SHGs) of DWCRA
16	Know about rural development work of NGO	Visit to a voluntary organization to study the developmental activities

Practical Activities with relation to AGR 502

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1.	Gain knowledge and learn about application of ICT in Agriculture	With consultation & interaction with local existing agro e commerce or e service provider in agriculture prepare a project on application of ICT in Agriculture

2.	Study & gain knowledge on Crop Simulation Models (CSM)	With consultation & interaction with local existing agro e commerce or e service provider in agriculture learn Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost
3.	Learn IT application for computation of water and nutrient requirement of crops	With consultation & interaction with local existing agro e commerce or e service provider in agriculture learn Hands on IT application for computation of water and nutrient requirement of crops
4.	Gain significant knowledge about computation of water and nutrient requirements of crop using CSM and IT tools	With consultation & interaction with local existing agro e commerce or e service provider in agriculture learn Hands on Computation of water and nutrient requirements of crop using CSM and IT tools
5.	Gain significant knowledge on Geospatial Technology for generating valuable information for Agriculture	Introductory hands on of Geospatial Technology for generating valuable information for Agriculture
6	Gain knowledge and learn about different type of green houses based on shape	Visit different agro farm and study of different type of green houses based on shape and take photograph and prepare the detailed report
7	Study & gain knowledge on the rate of air exchange in an active summer winter cooling system in Green House	Visit agro farm and determine the rate of air exchange in an active summer winter cooling system in Green House .
8	Learn determining drying rate of agricultural products inside green house	Visit agro farm and determine drying rate of agricultural products inside green house
9.	Gain significant knowledge about different equipments used in Green House	Visit agro farm and study of green house equipments
10.	Gain significant knowledge on irrigation systems used in greenhouses	Visit agro farm and understand irrigation systems used in greenhouses
11.	Gain knowledge about plant response to Green house environment	Visit agro farm and study plant response to Green house environment (any two plants)
12	Gain knowledge about Hi Tech Farming System	Visit , study and hands on practices to understand and know different Systems , components , management procedures , crop established & their management under Hydroponic Farm and Aeroponics Farm systems and submission of report on the same

Practical Activities with relation to AGR 503

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about identification of the different species of bee and understand the bee biology	Visit of Commercial farms dealing with Beekeepingand by hands on training know and document and identify the different species of honey bee and understand the bee biology through video, powerpoint and live observation
2	Gain significant knowledge about Beekeeping appliances	Visit of Commercial farms dealing with Beekeepingand by hands on training know and document and identify the different Beekeeping appliances
3	Know & understand the different commercial methods of rearing of bees	Visit of Commercial farms dealing with Beekeepingand by hands on training know the different commercial methods of rearing of bees
4	Will learn, Gain knowledge on different bee enemies and disease	Visit of Commercial farms dealing with Beekeeping and by hands on training know and document and identify the different bee enemies and disease
5	Will learn, Gain knowledge about Bee pasturage, bee foraging and communication	Visit of Commercial farms dealing with Beekeeping and by hands on training know and document Bee pasturage, bee foraging and communication
6.	Will learn, Gain knowledge about identification different types of silkworm, voltinism and biology of silkworm	Visit to farms and identify different types of silkworm, voltinism and biology of silkworm
7.	Will learn, Gain knowledge about Mulberry cultivation, Mulberry varieties , Methods of harvesting and preservation of leaves, Rearing, mounting and harvesting of cocoons	Visit to farms and through hands on training and project preparation on 1. Mulberry cultivation 2. Mulberry varieties 3. Methods of harvesting and preservation of leaves 4. Rearing, mounting and harvesting of cocoons
8.	Know & understand the process of identification the Species of lac insects and the host plants	Visit to farms and through hands on training and project preparation on 1. Identification of Species of lac insect 2. Identification of host plant
9.	Will learn, Gain knowledge about lac production	Visit to farms and through hands on training and project preparation on lac production – 1. seed lac 2. button lac, 3. shellac 4. lac- products
10	Will learn the process of collection , preservation and identification of insects	collection and preservation of insects from agro fields and identification of them by studying features

11	Will gain knowledge about the External features of Grasshopper/Blister beetle	External features of Grasshopper/Blister beetle
12	Will gain knowledge about Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus	Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus
13	Will be able to identify different insect larvae	Types of insect larvae and pupae

Method of Teaching:
Hands on practical in industry/SKP aligned with theory

Method of Assessment & Weightage:
Competency
assessment.
Work place rounds
/visits
Work assignments

Semester – VI

Course Title: AGR 601 Applications of Microbiology in Agriculture

Credits: 2

Total Credit Hours: 30

Course Objectives –

- To understand the importance and different methods of microbiological application in Agriculture
- To know about roles of microbes in soil fertility and crop production
- To know about role of microbes in biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste

- By necessary Industry integration to learn and understand microbiological procedures pertaining to agricultural development , necessary process management for production and quality maintenance of Biofertilizer, compost , VAM etc

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Introduction to microbial world.	3
2	Role of microbes in soil fertility and crop production	5
3	Carbon, Nitrogen, Phosphorus and Sulphur cycles	4
4	Biological nitrogen fixation, Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.	4
5	Microbes in human welfare silage production	4
6	biofertilizers, biopesticides, biofuel production	6
7	biodegradation of agro-waste	4

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References

Microbiology - M. J. Pelczar, E.C.S. Chan, N.R. Kreig
Microbiology - N. P. Saxena and D. K. Awasthi

Suggested reading :

Agricultural Microbiology – G. Rangaswami and Bagyaraj
Microbiology - R.P. Sing

Course Title: AGR 602 Livestock & Poultry & Organic Farming Management
Credits: 2
Total Credit Hours: 30

Course Objectives –

- To understand the importance of livestock in the national economy. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry
- To know about Housing principles, space requirements for different species of livestock and poultry
- To know about feeding system , diseases , Prevention and control of livestock and poultry
- By necessary Industry integration to learn and understand end to end process of operation of different industries dealing with livestock , Poultry , Dairy , Ornamental fishery
- With required knowledge enabling the learner to get gainful employment in ever expanding Livestock and Poultry related industry as well as enabling the learner to start his/ her own entrepreneurship
- To understand the principles of Organic farming
- To know about of insect, pest, disease and weed management under organic mode of production
- To know about Certification process associated with Organic products
- Learn about different methods of processing , leveling, economic considerations and viability, marketing and export potential of organic products

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Role of livestock in the national economy. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry	4

2	Reproduction in farm animals and poultry	**4**
3	Housing principles, space requirements for different species of livestock and poultry	**4**
4	Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.Feed ingredients & supplement for livestock and poultry	**4**
5	livestock and poultry diseases , Prevention and control	**4**
6	Types of fishes & their culture system , Basic Principles of fishery , Ornamental Fish Culture	**5**
7	Principles and scope of Organic farming in India , Organic nutrient resources and its fortification, Choice of crops and varieties in organic farming , Certification process and standards of organic farming	**5**

Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:
At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

References
A Textbook of Animal Husbandry - G.C. Banerjee.
Handbook of Animal Husbandry - ICAR, Krishi Anusandhan Bhawan, New Delhi.

Suggested reading :
Poultry Production - B. Panda and S.C. Mahapatra

Livestock Production and Management – N.S.R. Sastry and C.K. Thomas

Course Title: AGR 603 Agro-processing Projects and Credit Planning ,Food Grain Storage & Corporate Farming

Credits: 2

Total Credit Hours: 30

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Course Objectives –

- To understand procedure of preparation of projects, sources, terms and conditions of loans for financing agro-service and agro-processing projects.
- To know about credit planning for different forms of business organization
- To know about different Banks and financial organisations and their role in boosting agroeconomy

- Resource Requirement - Assets, financial, human resource,
- Learn about principles and practices of grain storage
- Learn about different strategies & methods and practical application of corporate farming
- By necessary Industry integration enable the learner with requisite business acumen & knowledge to start own entrepreneurship activity or being a management cadre help the existing business to grow and flourish

Course Content –

Sl No	Name of the topic	Hours/ Time required
1	Business opportunity in Agriculture & Agro Processing	3
2	Procedures for preparation of projects,legal need and documents required , sources, terms and conditions of loans for financing agro-service and agro-processing projects	3
3	Importance , Classification of credit, sources, purpose for which credit is advanced by the financial institutions, source-wise and purpose-wise rates of interest charged, repayment schedule, credit planning for different forms of business organization	5
4	**Grain storage, principles and practices**: Food grain storage structures, Rural storage structure, Bulk storage, Economics of storage and Processing of rice	3
5	**Corporate Farming :** Farm Planning , Resources estimation , Management of crops under Corporate Farming System , Harvest & Post Harvest management and Marketing Strategies adopted	3
6	Classification of small, medium and large scale manufacturing industries; Opportunities of Agro industries.	3
7	Trade license and registration marks; Sources of finance; Selection of land and factory sheds. Agencies for promotion of different types of industries; Source of machine and equipment for starting up a unit	3
8	Preparation of project report; Market feasibility reports; Techno-economic feasibility report on fruits and vegetable processing, bakery and confectionary, mushroom manufacture and soybean processing	3
9	Subsidy & Finance Schemes available for Food Processing Units. Schemes under Ministry of Food Processing, Ministry of Agriculture and other Departments for Finance as well as Subsidy for entrepreneurs. MIS Reporting, Clients Management, Maintenance of Books of Accounts	4

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Method of Teaching:
Class room teaching and demonstration, learner will actively be involved in learning by giving assignments, participating in symposium

Method of Assessment & Weightage:

At end of semester Theory and practical
(Oral) Examination will be conducted)
Total 100 marks 50 marks for theory examination.
20 marks for internal assessment 30 marks for oral examination.

Course Title: Vocational
Practical Credits 12
TotalCreditHours 360

Introduction and Course Objectives:

Student will learn equipment set up and routine procedure required to be able to effectively work in everexpanding horticulture sector . He/she will acquire skills to perform routine farm operation and be able to be skilled to maintain farm operation. After completion of this course student will able assist the farmers , scientific community , agro farms & agro business and even he /she could start his/her own business

Course content:/learning outcomes

Course Content

Practical Activities with relation to AGR 601

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about an agro microbiological laboratory	Visiting Agro microbiology laboratory and identify and understand different equipments used and their process of operation
2	Gain significant knowledge about microsopy	Microscope- parts, principles of microscopy, resolving power and numerical aperture
3	Know & understand the sterilization methods	Visiting Agro microbiology laboratory and or Agro Biotech Industry doing hands on training on the methods of sterilization
4	Will learn, Gain knowledge on different Nutritional media and their preparations	Visiting Agro microbiology laboratory and or Agro Biotech Industry doing hands on training on different Nutritional media and their preparations
5	Will learn, Gain knowledge about on enumeration of microbial population in soil	Visiting Agro microbiology laboratory and or Agro Biotech Industry doing hands on training on enumeration of microbial population in soil
6.	Will learn, Gain knowledge about different methods of isolation and purification of microbial cultures	Visiting Agro microbiology laboratory and or Agro Biotech Industry doing hands on training on different methods of isolation and purification of microbial cultures
7	Know & understand the process of isolation of	Visiting Biofertlizer Industry and

	Rhizobium from legume root nodule	submission of report after hands on training on process of isolation of *Rhizobium* from legume root nodule
8	Gain significant knowledge about process of isolation of *Azotobacter* from soil	Visiting Biofertlizer Industry and submission of report after hands on training on process of isolation of *Azotobacter* from soil
9	Will learn, Gain knowledge about process of isolation of *Azospirillum* from roots	Visiting Biofertlizer Industry and submission of report on process of isolation of *Azospirillum* from roots
10	Know & understand the process of isolation of BGA	Visiting Biofertlizer Industry and submission of report after hands on training on process of isolation of BGA
11	Gaining knowledge on Staining & microscopic examination	Staining and microscopic examination of microbes

Practical Activities with relation to AGR 602

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about identification methods of farm animals and poultry	Visit of Commercial farms dealing with livestock and poultry and by hands on training know and document the identification methods of farm animals and poultry
2	Gain significant knowledge about External body parts of livestock and poultry animals	Visit of Commercial farms dealing with livestock and poultry and by hands on training know and document the External body parts of 1. cattle 2. buffalo 3. sheep 4. goat 5. swine 6. poultry breeds
3	Know & understand the breeds of livestock and poultry and daily routine farm operations and farm records	Visit of Commercial farms dealing with livestock and poultry and by hands on training know and document the Housing principles, space requirements for different species of livestock and poultry
4	Will learn, Gain knowledge on feeding system of livestock and poultry	Visit of Commercial farms dealing with livestock and poultry and by hands on training know and document the feeding system of livestock and poultry
5	Will learn, Gain knowledge about method of identification of major livestock and poultry diseases , their Prevention and control strategies	Visit of Commercial farms dealing with livestock and poultry and by hands on training know and document the method of identification of major livestock and poultry diseases , their Prevention and control strategies
6.	Will learn, Gain knowledge about operation of a dairy	Visit to dairy and understand the dairy operation and submission of project report

		on the same
7.	Will learn, Gain knowledge about economics of cattle, buffalo, sheep, goat, swine and poultry production	Visit of Commercial farms dealing with livestock and poultry and submit project on economics of cattle, buffalo, sheep, goat, swine and poultry production
8.	Know & understand the process of identification , project planning , farm layout , trading , breeding of Ornamental fishes and understand the impact of ornamental fishery as an alternative livelihood option to rural youth and women	Visit to Commercial Ornamental fish farming farm and handn on training and documentation and project preparation on 1. Farm set up 2. Project layout and economics involved 3. Identification of important ornamental fishes 4. Rearing and breeding and trading of ornamental fishes 5. preparation of project report on impact of ornamental fishery as an alternative livelihood option to rural youth and women
9	Study & gain knowledge about the various components and their utilization in Organic Farming	Visit of organic farms to study the various components and their utilization and submission of report
10	Gain significant knowledge preparation of different compost , vermicompost , bio inoculants	Visit of organic farms and hands on training on Preparation of – 1. Enrich compost 2. Vermicompost 3. Bio-inoculants
11	Know & understand the quality control of different compost , vermicompost , bio inoculants	Visit of organic farms and or agro biotechnology industry and hands on training on quality analysis of – 1. Enrich compost 2. Vermicompost 3. Bio-inoculants

Practical Activities with relation to AGR 603

Sn	Learning outcomes of vocational component aligned with theory	Task assigned with vocational practical component
1	Study & gain knowledge about agro-service and agro-processing projects according to local potentiality	Carry out Survey and Preparation of some selected agro-service and agro-processing projects according to local potentiality
2	Gain significant knowledge about credit system for financing the potential agro-service projects by Bank and Financial Institutions	Frequent visits to the Banks and other financial institutions for collection of information regarding credit for financing the potential agro-service projects and on basis of obtained information preparation of project
3	Gain significant knowledge about credit system for financing the potential agro-processing projects by Bank and Financial Institutions	Frequent visits to the Banks and other financial institutions for collection of information regarding credit for financing

		the potential agro-processing projects and on basis of obtained information preparation of project
4	Will learn, Gain knowledge on operation of different storage structures and commercial milling plants	Visit to different storage structures and commercial milling plants and thoroughly learn the process of operation and prepare the project on the same
5	Will learn, Gain knowledge about SSI agro and rural units and their operation	Visits to SSI agro and rural units for collecting information regarding establishment of small enterprise and preparation of report and or project on the same
6.	Will learn, Gain knowledge about operation of warehouse	A visit to warehouse and preparation of report and or project on the operational procedure
7.	Will learn, Gain knowledge about by-products utilization	Visiting relevant industry and study by-products utilization of the following (any two) – 1. Oil from bran 2. Silica from husk, 3. HD board from rice husk 4. wheat chaff And prepare report on the same
8.	Gain Knowledge about corporate farming	Visit to corporate farming site and submission of project report on the same
9.	Gain knowledge and learn about identification and selection of viable business idea	With consultation & interaction with local existing agro entrepreneurs identification and selection of business idea
10	Study & gain knowledge drafting a Project Report on selected business idea	With consultation & interaction with local existing agro entrepreneurs draft a Project Report on selected business idea
11	Learn to prepare business plan and proposal formulation with respect to agriculture	With consultation & interaction with local existing agro entrepreneurs preparation of business plan and proposal writing
12	Gain significant knowledge about understand complete agro business cycle	Visit various Local Agro industries and understand complete agro business cycle and prepare a project report on the same
13	Gain significant knowledge about success of Start-ups in Agro Industry through case studies	Entrepreneur talks & interaction sessions : Lectures by Banks, Financial Institutes
14	Will learn, Gain knowledge on operation of different storage structures and commercial milling plants	Case Study of various Start-ups in Agro Industry
15	Will learn to prepare advertisement strategy for new agro based products	Interaction with commercial advertisement designers and prepare advertisement strategy for new agro based products

16	Will learn, Gain knowledge about Project Financing for the potential agro-business projects by Bank and Financial Institutions	Visits to local Banks, Financial Institutes for understanding Project Finance