SCHOOL OF AGRICULTURE

CURRICULUM

B.Sc. (Hons.) Agriculture

(As per 5th Dean's committee ICAR)

LINGAYA'S VIDYAPEETH

choose to know

Lingaya's Vidyapeeth (Deemed-to-be university)
Nachauli, Jasana Road, Old, Faridabad

PREFACE

This document contains information about the curriculum and teaching scheme of BSc. (Hons) Agriculture. The normal duration of this program will be fouryearsrespectively.Thisdocumentisaimedatprovidinganinsighttothe teachingfraternity, students and otheracademicstaffandhasbeendevelopedbythe faculty members of the School of Agriculture in consultation with external subject experts.

The aimtobea 'Par Excellence with Human Touch', where astudentcanlearnknowledge and skills in the chosen course of study with flexibility in selecting his/ her subjects as per interest. The National Policy of Education (NEP 2020), announced by the Government of India, lays emphasis mainly on the three parameters of higher education,namely,

1. Wide flexibility in selection of Program Elective Courses and University Elective Courses
2. Continuous Skilling all through the duration of theCourse
3. Multi Entry Multi Exit system with Credits saved in the Academic Bank of Credits (ABC).

AtSchool of Agriculture (Lingaya's Vidyapeeth) efforts have been made to ensure that the offered curriculum follows the ICAR 5th Dean's committee guidelines of UG syllabus and NEP 2020. Following features make SoA(LV) curriculum distinctive in empowering the students with knowledge and skills:

1) Choice Based Credit System (CBCS): In each semester a provision is made for a group of Elective subjects. The student will have a choice to study the elective subject of his choice.Normallytheelectivesubjectsareofferedinlateryearsbut atSoA (LV)theywillbe offered from the first year of studyitself.

2) PracticalSkilling:Foralmosteverysubjecttaughtinagivencourseofstudy,thestudent hastodoaprojectwhichwillbeevaluatedattheendofthesemester.Forsubjectswhere it is not feasible to do a project, the student will be writing a research based exhaustive termpaperonagiventopic.Inadditiontotheproject-basedlearning,thestudentwillbe frequentlyengagedininternshipswithindustry.Thus, inSoA (LV) curriculumtherewillbe multiple slots for internship.

3) ResearchatUndergraduateLevel:AtSoA (LV)theundergraduatestudentswillbegroomed to carryout research investigations by the mentoring faculty members and publish research papers authored bythem.

4) Lectures from Distinguished Mentors: A number of eminent academicians from India and abroad have consented to deliver lectures in their specializations to students of SoA (LV). A few leading experts from Industry too are there as SoA (LV) Distinguished Mentors. They will provide unparalleled knowledge through lectures and project guidance.

5) Value Added Programs (VAPS): Besides the prescribed curriculum, there will be specially designed subjects, called VAPs, which will be available to students to gain specialskills.

6) Competency Certificate Awarded at The End of Each Year: In line with multi-entry-multi-exit system enunciated in the NEP 2020; every student will be awarded a Competency Level Certificate at the end of each year on successful completion of the stipulated Credits. With such certificate (s), the student may find suitable employment, should he/she decide to temporarily discontinue the studies to re-join after agap.

It is hoped the document will be found useful to the readers.

INDEX

ABBREVIATIONS

Cr	-	Credit
L	-	Lecture
T	-	Tutorial
P	-	PracticalHours
ATT	-	Attendance
CWA	-	Class Work Assessment
PRA	-	Practical Assessment
MTE1	-	Mid Term Examination-I
MTE2	-	Mid Term Examination-II (Normally, MTE 2 shall be a design-based problem or open book test)
ESE	-	End Semester Examination

School of Agricultural
Lingaya's Vidyapeeth, Faridabad

VISION

To benefit the society at large by providing scientific knowledge to agriculture graduates for applying skills & techniques to identify problems in the farming community, industries & academia to be able to develop practical solutions to them.

MISSION

- To develop a leading center for providing the student responsive education in Agriculture and related sectors.
- To promote research and training on sustainable development of the agricultural productivity, cost reduction in farming, farm mechanization and livestock production.
- To promote the consultancy in agriculture for the local farm producers through integrated extension activities.
- To inculcate high regards for ethical principles and an understanding of human values and ethics and environmental sustainability.
- To encourage students for entrepreneurship and rural development.

Program Educational Objectives (PEOs):

- **PEO 1** Graduates of the program will develop a strong and competent knowledge in agricultural science required for critical learning and research.
- **PEO 2** Graduate students will develop diversified basic professional skills through various laboratory technical training, communication and presentation skills.
- **PEO 3** They will possess an ability to identify, formulate, and solve biological problems to contribute to service efforts to community in both the professional and private realm.
- **PEO 4**Gradates will integrate related topics from separate parts of the course such as crop production, crop improvement, crop protection, agrochemicals, crop residue management horticulture, post harvest technology, extension education, livestock management, farm management and production economics for successful career.

Program Outcomes (POs):

- **PO 1** Fundamental and core knowledge & understanding of plants, soil, environment and animals.
- **PO 2** Relevant knowledge of core concepts, principles, themes, terminology, and classification systems in the terrestrial biology disciplines covered in agriculture.
- **PO 3** Students will be able to access the primary literature, identify relevant works for a particular topic, and evaluate the scientific content of these works.
- **PO 4** Scientific explanation for the unity and diversity of life on earth using copious examples
- **PO 5** Quantitative, qualitative analysis and interpretation of biological data.
- **PO 6** An ability to function effectively on teams and individually to accomplish a common goal
- **PO 7** An ability to engage in Lifelong learning and continuing professional development
- **PO 8** Synthesis of information from the biological databases, and communication of it effectively in writing and presentations.

- **PO 9** Students will be able to apply multidisciplinary fundamentals of mathematical tools (statistics, calculus) and physical principles to the analysis of relevant agricultural concepts.
- **PO 10** Skills in designing and carrying out an advanced research project using appropriate methods and approaches.

Program-Specific Outcomes Statements (PSOs)

- **PSO 1** Proficient to assess the scope of agricultural science, appreciate the complexities of farming sector and address scientifically controversial issues in a rational way.
- **PSO 2** Ability to use knowledge imbibed for solving agricultural problems locally and globally.

Courses

1. Code: Each course shall bear a distinguishing code (as mentioned in the evaluation scheme) that identifies the discipline from which it is being offered.
2. Code numbers:
    a. First letter represents Agriculture course.
    b. Second and third letters branch of Agriculture.
    c. First number represents year, second number represents odd or even semester, and third number represents course of particular discipline in a semester, respectively.
3. There shall be four types of credit courses, "only theory courses", "only practical courses", "composite courses" and "credit seminar". The composite courses will consist of both theory and practical components.

Internal assessment

1. Internal assessment will be done in the form of Continuous Evaluation having at least two types of Examination i.e., Internal Examination and External Examination.
2. The internal examination shall be of following types:
    a. Sessional Examination
        i. Sessional Examination-I
        ii. Sessional Examination-II
    b. Assignments
    c. Practical Examination
3. If a student fails to appear at any of internal examination due to extremely genuine case(s), he/she may be permitted by the Dean, School of Agriculture (SOA) in consultation of Honourable Vice Chancellor of the University to appear at the make-up examination before the commencement of semester final examination.
4. If a student fails to take the permission for the make-up examination within the specific periods he/she shall be awarded zero mark in the missed examination.
5. Practical examination should be preferably taken before the commencement of semester final examination; however, in special case after the permission of the honourable Vice Chancellor of the University it may be scheduled after the semester final examination.
6. The external examination is the semester Final examination.
7. Semester final examination, back paper examination, duration of examination, Evaluation of answers scripts, Scrutiny, Tabulation, Preparation of result, Announcement of result, decision on use of unfair means, etc. shall be conducted as per university rule under the controller of examination (COE), Uttaranchal University as per academic calendar.
8. A course instructor may conduct class test, quiz, other examination to motivate students for self-study but results of such examination will not affect any of grade point.
9. Within 15 days of conducting the Internal Examination, the Course instructor will submit marks in the prescribed format to the HOD who will sign and forward to the Deputy Registrar or Joint Registrar or Controller of the Examination or Deputy Controller of Examination (who so ever is concern). The department may keep one copy of evaluation sheet for office use.

Credit Requirements

1. In order to qualify the B.Sc. (Hons.) Agriculture degree, a student shall be required to complete a minimum of 175 credits.
2. A student's programme of studies shall not be more than 26 credits at once in any semester.
3. The distribution of marks in B.Sc. (Hons.) Agriculture shall be as follow:

Examination and Evaluation System

The BOS Committee recommends Uniform Grading system as per recommendations of The Fifth Deans' Committee of ICAR to be followed with uniform OGPA requirements for award of degrees at all levels and uniform conversion formulae to be followed for declaration of I, II and III divisions, distinctions, etc. Declaration of division in the degree certificate to be made compulsory by all universities:

Examination

External theory (50%)

Internal Theory + Practical (50%)

- **Courses with theory and practical**

  Mid-term Exam (30%) + Assignment (5%) in practical oriented courses + Practical (15%)

- **Courses with only theory**

  Mid-term Exam (40%) + Assignment (10%)

- **Courses with only practical**:

  (100%) Internal

-Non-Gradial Compulsory Courses:

(100%) Internal

Paper to be set by external: HOD shall ensure the coverage of syllabus. If needed moderation question paper can be done.

Evaluation is to be done **i**nternally by the faculty other than the Course Instructor. Syllabus of the concerned course shall be sent to the external examiner, who shall prepare the question papers. For practical, it is recommended that examination shall be conducted by course instructor(s) and one teacher nominated by HOD.

CBCS grading system of B.Sc. (Hons.) Agriculture

Degree	Percentage of Marks Obtained	Conversion into Points
B.Sc. (Hons.) Agriculture	**100**	**10 Points**
	90 to <100	**9 to <10**
	80 to <90	**8 to <9**
	70 to <80	**7 to <8**
	60 to <70	**6 to <7**
	50 to <60	**5 to <6**
	<50 (Fail)	**<5**
	E.g., 80.76	**8.076**
	43.60	**4.360**
	72.50 (but shortage in attendance)	**Fail (1 point)**

OGPA	Division
Below 5.500	**Fail**
5.500 – 5.999	**Pass**
6.000 – 6.999	**II division**
7.000 – 7.999	**I division**
8.000 and above	**I division with distinction**

Evaluation:

GPA = Total points scored / Total credits (for 1 semester)

CGPA = ∑ Total points scored / Course credits

OGPA = ∑ Total points scored (after excluding failure points)/ Course credits

% of Marks = OGPA x 100/10

Course Regulation

1. The courses to be offered in a particular academic year or semester shall be decided by the BOS.
2. Allotment of courses, designating faculties as Course instructor shall be decided by the HOD well in advance of the commencement of a semester.
3. Towards introduction of a new course or revision of course, University rules will be followed.
4. There shall be no rigid rule or guideline regarding the minimum number of students required for offering a course. The course will be offered even for a single student.
5. There shall be the provision of inviting the Guest Lecturers to deliver lecture if required.

Courses Registration

A student has to register himself/herself in each course offered by the SOA in a semester and has to submit their registration form to the Registrar office in writing (in prescribed format) through the HOD. The students shall submit their choice of elective course during semester-IV, V and VI in the beginning of these semesters.

Attendance

Candidates will be allowed to appear for the Examination of a given Semester after completing minimum attendance as per the university rule. Any relaxation in minimum requirement of attendance for one or more students may be given as per the direction of Honorable Vice Chancellor or equivalent.

Examination, Paper setting and Evaluation

Examination, Paper setting, Moderation, Evaluation, Scrutiny and other related activities will be conducted as per the university rule/policy. However, HOD will nominate examiners for Internal and External examination.

Residential requirements

Minimum residential requirement for completion of B.Sc. (Hons.) Agriculture degree programme shall be four years or eight (8) semesters. A student must complete his/her degree in maximum duration of fourteen (14) semesters.

Discipline-wise Courses:

Discipline/Course title	Credit Hrs
Agronomy	
Fundamentals of Agronomy	4(3+1)
Introductory Agro-meteorology & Climate Change	2(1+1)
Crop Production Technology – I (*Kharif* crops)	2(1+1)
Crop Production Technology – II (*Rabi* crops)	2(1+1)
Farming System & Sustainable Agriculture	1(1+0)
Practical Crop Production - I *(Kharif* crops*)*	2(0+2)
Practical Crop Production - II *(Rabi* crops*)*	2(0+2)
Principles of Organic Farming	2(1+1)
Geo-informatics and Nanotechnology and Precision Farming	2(1+1)
Rainfed Agriculture & Watershed Management	2(1+1)
Total	**21(10+11)**
Genetics & Plant Breeding	
Fundamentals of Genetics	3(2+1)
Principles of Seed Technology	3(1+2)
Fundamentals of Plant Breeding	3(2+1)
Crop Improvement-I (*Kharif* crops)	2(1+1)
Crop Improvement-II (*Rabi* crops)	2(1+1)
Total	**13(7+6)**
Soil Science & Agricultural Chemistry	
Fundamentals of Soil Science	3(2+1)
Manures, Fertilizers and Soil Fertility Management	3(2+1)
Problematic soils and their Management	2(2+0)
Total	**8(6+2)**
Entomology	
Fundamentals of Entomology	4(3+1)
Pests of Crops and Stored Grain and their Management	3(2+1)
Management of Beneficial Insects	2(1+1)
Total	**9(6+3)**
Agricultural Economics	
Fundamentals of Agricultural Economics	2(2+0)
Agricultural Finance and Co-Operation	3(2+1)
Agricultural Marketing Trade & Prices	3(2+1)
Farm Management, Production & Resource Economics	2(1+1)
Total	**10(7+3)**
Agricultural Engineering	
Soil and Water Conservation Engineering	2(1+1)
Farm Machinery and Power	2(1+1)
Renewable Energy and Green Technology	2(1+1)
Protected Cultivation and Secondary Agriculture	2(1+1)
Total	**8(4+4)**
Plant Pathology	
Fundamentals of Plant Pathology	4(3+1)
Diseases of Field and Horticultural Crops and their Management-I	3(2+1)
Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
Principles of Integrated Pest and Disease Management	3(2+1)

Total	**13(9+4)**
Horticulture	
Fundamentals of Horticulture	2(1+1)
Production Technology for Fruit and Plantation Crops	2(1+1)
Production Technology for Vegetables and Spices	2(1+1)
Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
Total	**10(5+5)**
Food Science	
Principles of Food Science & Nutrition	2(2+0)
Total	**2(2+0)**
Agricultural Extension	
Fundamentals of Agricultural Extension Education	3(2+1)
Rural Sociology & Educational Psychology	2(2+0)
Entrepreneurship Development and Business Communication	2(1+1)
Communication Skills and Personality Development	2(1+1)
Total	**9(6+3)**
Biochemistry / Physiology / Microbiology/ Environmental Sciences	
Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
Fundamentals of Crop Physiology	2(1+1)
Agricultural Microbiology	2(1+1)
Environmental Studies & Disaster Management	3(2+1)
Introduction to Forestry	2(1+1)
Total	**12(7+5)**
Statistics, Computer Application and I.P.R.	
Statistical Method	2(1+1)
Agri- Informatics	2(1+1)
Intellectual Property Rights	1(1+0)
Total	**5(3+2)**
Animal Production	
Livestock and poultry Management	4(3+1)
Total	**4(3+1)**
Language	
Comprehension & Communication Skills in English (Gradial course)	2(1+1)
Total	**2(1+1)**
Remedial Courses	
Agriculture Heritage	1(1+0)
Introductory Biology	2(1+1)
Elementary Mathematics	2(2+0)
Total	**3(3+0) or 3(2+1)**
Non-Gradial Courses	
NSS/NCC/Physical Education & Yoga Practices	2(0+2)
Human Values & Ethics	1(1+0)
Educational Tour	2(0+2)
Total	**5(1+4)**

Discipline-wise summary of credit hours

S.N.	Group	Credit Hours
1.	Agronomy	21(10+11)
2.	Genetics & Plant Breeding	13(7+6)
3.	Soil Science & Agricultural Chemistry	8(6+2)
4.	Entomology	9(6+3)
5.	Agricultural Economics	10(7+3)
6.	Agricultural Engineering	8(4+4)
7.	Plant Pathology	13(9+4)
8.	Horticulture	10(5+5)
9.	Food Science	2(2+0)
10.	Agricultural Extension	9(6+3)
11.	Biochemistry / Physiology / Microbiology/ Environmental Sciences	12(7+5)
12.	Statistics, Computer Application and I.P.R.	5(3+2)
13.	Animal Production	4(3+1)
14.	Language/English	2 (1+1)
15.	Remedial Courses (Biol/ Math); Agriculture Heritage	3(3+0) or 3(2+1); 1(1+0)
16.	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
17.	Human Values and Ethics	1(1+0)
18.	Educational Tour	2(0+2)
Total		126 + 3 (for Bio / Math)/01(Agri) + 5 NC 126+3+1+5+ 9 credits elective
RAWE, AIA and ELP		20 +20
Grand Total		144+20+20=184

Elective Courses: A student can select three elective courses out of the following and offer during 4th, 5th and 6th semesters.

S.N.	Courses	Credit Hours
1.	Agri-business Management	3(2+1)
2.	Agrochemicals	3(2+1)
3.	Commercial Plant Breeding	3(1+2)
4.	Landscaping	3(1+2)
5.	Food Safety and Standards	3(2+1)

6.	Biopesticides & Biofertilizers	3(2+1)
7.	Protected Cultivation	3(2+1)
8.	Micro propagation Technologies	3(1+2)
9.	Hi-tech. Horticulture	3(2+1)
10.	Weed Management	3(2+1)
11.	System Simulation and Agro advisory	3(2+1)
12.	Agricultural Journalism	3(2+1)

Examination and Evaluation System

Fifth Deans' Committee of ICAR had deliberated on the examination and evaluation system being followed by different universities. The Committee recommends Uniform Grading system to be followed with uniform OGPA requirements for award of degrees at all levels and uniform conversion formulae to be followed for declaration of I, II and III divisions, distinctions etc. Declaration of division in the degree certificate to be made compulsoryby all universities:

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Student READY Programme

Student READY programmewas launched by the Hon"blePrimeMinister of India on 25th July, 2015

Introduction

The term **READY** refers to "Rural Entrepreneurship Awareness Development Yojana". To reorient graduates of Agriculture and allied subjects for ensuring and assuring employability and develop entrepreneurs for emerging knowledge intensive agriculture, the component envisages the introduction of the program in all the Agricultural Universities as an essential prerequisite for the award of degree to ensure hands on experience and practical training.

Component of the programme: It is proposed to include following components in Student READY program.

i. **Experiential Learning/Hands on Training –24weeks**
ii. **Skill Development Training - 24weeks**
iii. **Rural Agriculture Work Experience –10weeks**
iv. **In Plant Training/Industrial attachment –10weeks**
v. **Students Projects - 10weeks**

In some disciplines where some components, say, Experiential Learning is not possible at graduate level, the students will be given Hands on Training and/or Skill Development Training, but it should be (out of these 5 components) implemented for the complete year.

All the above-mentioned components are interactive and are conceptualized for building skills in project development and execution, decision-making, individual and team coordination, approach to problem solving, accounting, quality control, marketing and resolving conflicts, etc. with end-to-end approach.

- Experiential Learning helps the student to develop competence, capability, capacity building, acquiring skills, expertise, and confidence to start their own enterprise and turn job creators instead of job seekers. This is step forward for earning while learning concept. Experiential Learning is major step forward for High Quality Professional Competence, Practical Work Experience in Real Life Situation to Graduates, Production Oriented Courses, Production to Consumption Project working, Facilitates producing Job Providers rather than Job Seekers and Entrepreneurial Orientation.
- Rural Agriculture Work Experience also enable the students to gain rural experience giving them confidence and enhancing on farm problem solving abilities in real life situations especially in contact with farmers, growers etc.
- In-plant training for a short period of time in relevant industry to gain the knowledge and experience of the work culture. In Plant training by reputed organization either MNC"s or organized sectors provide an industrial exposure to the students as well as to develop their career in the high-tech industrial requirements.
- Skill development component include use of Agriculture Systems & devices for enhancing functional skill. It is expected that basic infrastructure and Experiential Learning Unit available university may help in boosting livelihood ensuring opportunity.
- Student Project is essential for students interested in higher education. Through this component, they will know how to identify research problem, experimental set up and writing report etc.

For the discipline of Dairy Technology, Food science & Technology and Agricultural engineering there will 20 weeks in-plant training in place of RAWE. The students of Veterinary science discipline will undergo six months training at hospitals.

All the components as per suitability of course i.e. Experiential Learning, Skill Development Training, Rural Agriculture Work Experience (RAWE), Internship/in-plant training and Student Projects are included in the final year of study for 2 semesters to provide entrepreneurial skills, confidence and hands on experience. There are 20 credits for Experiential Learning/Skill Development Training (24 weeks), 10 credits for RAWE (10 weeks programme) and 10 Credits for Industry Attachment/Student Project (10 weeks

attachment to industry).

Some of the important components of Student READY programme are given as follows:

I. Experiential Learning

a) Concept

The word "experiential" essentially means that learning and development are achieved through personally determined experience and involvement, rather than on received teaching or training, typically in group, by observation, study of theory or hypothesis, bring in innovation or some other transfer of skills or knowledge. Experiential learning is a business curriculum-related endeavour which is interactive.

EL is for building (or reinforcing) skills in Project development and execution, decision- making, individual and team coordination, approach to problem solving, accounting, marketing and resolving conflicts, etc. The programme has end to end approach. Carefully calibrated activities move participants to explore and discover their own potential. Both activities and facilitation play a critical role in enhancing team performance.

b) Objectives

EL provides the students an excellent opportunity to develop analytical and entrepreneurial skills, and knowledge through meaningful hands-on experience, confidence in their ability to design and execute project work.

The main objectives of EL are:

- To promote professional skills and knowledge through meaningful hands-on experience
- To build confidence and to work in project mode
- To acquire enterprise management capabilities

c) Duration

The experiential learning programme will be offered for 180 days (one semester) period in the final year. As the programme is enterprise oriented, students and faculty are expected to attend the activities of the enterprise even on institutional holidays with total commitment, and without any time limit or restriction of working hours for ELP. The Experiential Learning Programme shall be run for full year by making two groups and rotating activities of the final year in two groups.

d) Attendance

The minimum attendance required for this programme is 85%. The attendance of a student will be maintained at the EL unit. The attendance particulars shall be communicated to the Chief Executive Officer (Dean) by the Manager of the EL unit every week. The students will be eligible for the final evaluation of EL only when the attendance requirement is met with. Any student in the event of recording shortage of attendance has to re-register the EL when offered next by paying the assigned fee.

e) Students' Eligibility

To get the eligibility for registering the EL programme, the students should have completed all the courses successfully. No student should be allowed to take up the EL programme with backlog/repeat courses. The assignment/allotment of the EL programme shall be based on merit of the student at the end of 5^{th} Semester. A separate certificate should be issued to the students after successful completion of EL course. Allotment of EL programmes amongst students to different modules should be done strictly on the basis of merit at the end of fifth semester. In this work experience students will know exact problems of farming & suggest appropriate technology and finally useful in enhancing productivity and profitability at farmers end.

II. Rural Agricultural Work Experience

The Rural Agricultural Work Experience (RAWE) helps the students primarily to understand the rural situations, status of Agricultural technologies adopted by farmers, prioritize the farmer's problems and to develop skills & attitude of working with farm families for overall development in rural area. The timings for RAWE can be flexible for specific regions to coincide with the main cropping season.

Objectives

1. To provide an opportunity to the students to understand the rural setting in relation to agriculture and allied activities.

2. To make the students familiar with socio-economic conditions of the farmers and their problems.
3. To impart diagnostic and remedial knowledge to the students relevant to real field situations through practical training.
4. To develop communication skills in students using extension teaching methods in transfer of technology.
5. To develop confidence and competence to solve agricultural problems.
6. To acquaint students with on-going extension and rural development programmes.

III. In Plant Training (IPT)

Technology and globalization are ushering an era of unprecedented change. The need and pressure for change and innovation is immense. To enrich the practical knowledge of the students, in-plant training shall be mandatory in the last semester for a period of up to 10 weeks. In this training, students will have to study a problem in industrial perspective and submit the reports to the university. Such in-plant trainings will provide an industrial exposure to the students as well as to develop their career in the high tech industrial requirements. In-Plant training is meant to correlate theory and actual practices in the industries. It is expected that sense of running an industry may be articulated in right way through this type of industrial attachment mode.

OBJECTIVES

- To expose the students to Industrial environment, which cannot be simulated in the university
- To familiarize the students with various Materials, Machines, Processes, Products and their applications along with relevant aspects of shop management
- To make the students understand the psychology of the workers, and approach to problems along with the practices followed at factory
- To make the students understand the scope, functions and job responsibility-ties in various departments of an organization
- Exposure to various aspects of entrepreneurship during the programme period

The students will be required to submit the report on various aspects and will be issued certificates upon successful completion of the student READY components.

AGRICULTURE

Semester VII

Rural Agricultural Work Experience (RAWE) and Agro-Industrial Attachment (AIA) This program will be undertaken by the students during the seventh semester for a total duration of 20 weeks with a weightage of 0+20 credit hours in two parts namely RAWE and AIA. It will consist of general orientation and on campus training by different faculties followed by village attachment/unit attachment in University/ College/ KVK or a research station. The students would be attached with the agro-industries to get an experience of the industrial environment and working**.** Due weightage in terms of credit hours will be given depending upon the duration of stay of students in villages/agro-industries. At the end of RAWE/AIA, the students will be given one week for project report preparation, presentation and evaluation.

The students would be required to record their observations in field and agro-industries on daily basis and will prepare their project report based on these observations

Semester VIII

Experiential Learning Programme (ELP)/ Hands on Training (HOT)

This program will be undertaken by the students preferably during the eighth semester for a total duration of 24 weeks with a weightage of **0+20** Credit Hours. The students will register for any of two modules, listed below, of **0+10** credit hours each.

- Production Technology Bio-agents andBio-fertilizer
- Seed Production andTechnology
- Mushroom Cultivation Technology
- Soil, plant, water and seedTesting
- Poultry ProductionTechnology
- Hybrid Seed ProductionTechnologies
- Floriculture andLandscaping
- FoodProcessing
- CommercialHorticulture
- Agriculture WasteManagement
- Organic ProductionTechnology
- CommercialSericulture

In addition to these ELP modules other important modules may be given to the student.

UNDER GRADUATE CURRICULA

BACHELOR OF SCIENCE IN AGRICULTURE (HONS.)

SEMESTER - I

Course code	Course Title	Credit	L (hr)	P (hr)	IP	Test (2)	Assign. (2)	MTE (avg)	ESE	PRA	Total
BSAG-101	Fundamentals of Horticulture	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-102	Fundamentals of Plant Biochemistry and Biotechnology	3 (2+1)	2	2	10	5	5	15	50	15	100
BSAG-103	Fundamentals of Soil Science	3 (2+1)	2	2	10	5	5	15	50	15	100
BSAG-104	Introduction to Forestry	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-105	Comprehension and Communication Skills	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-106	Fundamentals of Agronomy	4 (3+1)	3	2	10	5	5	15	50	15	100
BSAG-107	Introductory Biology*	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-108	Elementary Mathematics*	2(2+0)*	2	0	15	10	10	15	50	0	100
BSAG-109	Agricultural Heritage*	1(1+0)*	1	0	15	10	10	15	50	0	100
BSAG-110	Rural Sociology & Educational Psychology	2 (2+0)	2	0	15	10	10	15	50	0	100
BSAG-111	Human Values and Ethics	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-112	NSS/NCC/Physical Education & Yoga Practices**	1 (0+1)**	0	2	20	-	-	-	-	80	100
TOTAL *R: Remedial course; **NC: Non-gradial courses		**19 (12 + 7)**	**12**	**14**							**1200**

II Semester EVEN session

Course code	Course Title	Credit	L (hr)	P (hr)	IP	Test (2)	Assign. (2)	MTE (avg)	ESE	PRA	Total
BSAG-201	Fundamentals of Genetics	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-202	Agricultural Microbiology	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-203	Soil and Water Conservation Engineering	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-204	Fundamentals of Crop Physiology	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-205	Fundamentals of Agricultural Economics	2(2+0)	2	0	15	10	10	15	50	0	100
BSAG-206	Fundamentals of Plant Pathology	4(3+1)	3	2	10	5	5	15	50	15	100
BSAG-207	Fundamentals of Entomology	4(3+1)	3	2	10	5	5	15	50	15	100
BSAG-208	Fundamentals of Agricultural Extension Education	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-209	Farm Machinery and Power	2(1+1)	1	2	10	5	5	15	50	15	100
TOTAL		**24(16+8)**	**16**	**16**							**900**

III Semester ODD session

Course code	Course Title	Credit	L (hr)	P (hr)	IP	Test (2)	Assign. (2)	MTE (avg)	ESE	PRA	Total
BSAG-301	Crop Production Technology – I *(Kharif Crops)*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-302	Fundamentals of Plant Breeding	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-303	Diseases of Field and Horticultural Crops and their Management –I	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-304	Communication Skills and Personality Development	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-305	Agri- Informatics	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-306	Production Technology for Vegetables and Spices	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-307	Environmental Studies and Disaster Management	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-308	Statistical Methods	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-309	Livestock and Poultry Management	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-310	Principles of Animal Nutrition	2(1+1)	1	2	10	5	5	15	50	15	100
TOTAL **NC: Non-gradial courses		24 (14+10) **	**15**	**20**							**1000**

IV Semester EVEN session

Course code	Course Title	Credit	L (hr)	P (hr)	IP	Test (2)	Assign. (2)	MTE (avg)	ESE	PRA	Total
BSAG-401	Crop Production Technology –II *(Rabi Crops)*	3(2+1)	2	4	10	5	5	15	50	15	100
BSAG-402	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-403	Renewable Energy and Green Technology	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-404	Problematic Soils and their Management	2(2+0)	2	4	15	10	10	15	50	0	100
BSAG-405	Production Technology for Fruit and Plantation Crops	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-406	Principles of Seed Technology	4(2+2)	1	2	10	5	5	15	50	15	100
BSAG-407	Farming System & Sustainable Agriculture	1(1+0)	1	2	15	10	10	15	50	0	100
BSAG-408	Agricultural Marketing Trade & Prices	3(2+1)	2	4	10	5	5	15	50	15	100
BSAG-409	Introductory Agro-meteorology & Climate Change	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-410	Breeding & Improvement of Farm Animals	2(1+1)	1	2	10	5	5	15	50	15	100
BSAG-411	Agribusiness Management*	3(2+1)	2	4	10	5	5	15	50	15	100
BSAG-412	Agrochemicals*	3(2+1)	2	4	10	5	5	15	50	15	100
BSAG-413	Commercial Plant Breeding*	3(1+2)	1	2	10	5	5	15	50	15	100
BSAG-414	Landscaping*	3(2+1)	2	4	10	5	5	15	50	15	100
TOTAL	***Elective Course**	**35(21+14)**	**16**	**40**							**1400**

V Semester ODD session

Course code	Course Title	Credit	L (hr)	P (hr)	IP	Test (2)	Assign. (2)	MTE (avg)	ESE	PRA	Total
BSAG-501	Agricultural Finance and Cooperation	3 (2+1)	2	2	10	5	5	15	50	15	100
BSAG-502	Manures, Fertilizers and Soil Fertility Management	3 (2+1)	2	2	10	5	5	15	50	15	100
BSAG-503	Pests of Crops and Stored Grain and their Management	3 (2+1)	2	2	10	5	5	15	50	15	100
BSAG-504	Principles of Integrated Pest and Disease Management	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-505	Crop Improvement-I *(Kharif Crops)*	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-506	Entrepreneurship Development and Business Communication	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-507	Geo informatics and Nano-technology and Precision Farming	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-508	Practical Crop Production – I (*Kharif* crops)	2 (0+2)	0	4	20	-	-	-	-	80	100
BSAG-509	Intellectual Property Rights	1(1+0)	1	2	15	10	10	15	50	0	100
BSAG-510	Food Safety and Standards*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-511	Biopesticides & Biofertilizers*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-512	Protected Cultivation*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-513	Micro propagation Technologies*	3(1+2)	1	4	10	5	5	15	50	15	100
TOTAL	***Elective Course**	**33(19+14)**	**19**	**30**							**1300**

VI Semester EVEN session

Course code	Course Title	Credit	L (hr)	P (hr)	IP	Test (2)	Assign. (2)	MTE (Avg)	ESE	PRA	Total
BSAG-601	Rainfed Agriculture & Watershed Management	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-602	Protected Cultivation and Secondary Agriculture	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-603	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)	2	2	10	5	5	15	50	15	100
BSAG-604	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-605	Management of Beneficial Insects	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-606	Crop Improvement-II (Rabi crops)	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-607	Practical Crop Production –II (Rabi crops)	2 (0+2)	0	4	40	0	0	0	0	60	100
BSAG-608	Principles of Organic Farming	2 (1+1)	1	2	10	5	5	15	50	15	100
BSAG-609	Farm Management, Production & Resource Economics	3 (2+1)	1	2	10	5	5	15	50	15	100
BSAG-610	Hi-tech. Horticulture*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-611	Weed Management*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-612	System Simulation and Agro-advisory*	3(2+1)	2	2	10	5	5	15	50	15	100
BSAG-613	Agricultural Journalism*	3(2+1)	2	2	10	5	5	15	50	15	100
	Educational Tour**	2(0+2)	0	0	20	0	0	0	0	80	100
TOTAL *Elective Course, **NC: Non-gradial courses		**34(18+16)**	**17**	**28**							**1400**

VII Semester		
Activities	**No. of weeks**	**Credit Hours**
Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE & AIA) **READY-Component-I**		14
RAWE- 411 (Rural Agricultural Work Experience)		
1. General orientation & On campus training by different faculties	1	
2. (a) Village attachment training programme	8	
i. Orientation and Survey of Village		
ii. Agronomical Interventions		
iii. Plant Protection Interventions		
iv. Soil Improvement Interventions (Soil sampling and testing)		
v. Fruit and Vegetable production interventions		
vi. Food Processing and Storage interventions		
vii. Animal Production Interventions		
viii. Extension and Transfer of Technology activities		
(b) Attachment in University/College/KVK/research Station	5	
READY- Component –II		
AIA- 412 (Agro Industrial Attachment)		
• Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03weeks. • Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing-value addition, Agri-finance institutions etc.	3	4
Plant Clinic • Seed/Sampling production, Pesticide/insecticide, post harvest industries, processing- value addition, Agri -finance institutions etc.	2	2
Activities and Tasks during Agro-Industrial Attachment Programme		
i. Acquaintance with industry and staff		
ii. Study of structure, functioning, objective and mandates of the industry		
iii. Study of various processing units and hands-on trainings under supervision of industry staff		
iv. Ethics of industry		
v. Employment generated by the industry		
vi. Contribution of the industry promoting environment		
vii. Learning business network including outlets of the industry		
viii. Skill development in all crucial tasks of the industry		
ix. Documentation of the activities and task performed by the students		
x. Performance evaluation, appraisal and ranking of students		
Total		**20**

VIII Semester

READY- Component –III (Experiential Learning Programme)
Modules for Skill Development and Entrepreneurship

A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII Semester

Course code	Title of module	Department	Credits
ELP-421	Production Technology for Bio-agents andBiofertilizer	Soil Science & Agricultural Chemistry	0+10
ELP-422	Seed Production Technology	Genetics & Plant Breeding	0+10
ELP-423	Mushroom Cultivation Technology	Plant Pathology	0+10
ELP-424	Soil,Plant,Water and Seed Testing	Soil Science & Agricultural Chemistry	0+10
ELP-425	Commercial Beekeeping	Entomology	0+10
ELP-426	Poultry Production Technology	Animal Production	0+10
ELP-427	Commercial Horticulture	Horticulture	0+10
ELP-428	Floriculture and Landscaping	Horticulture	0+10
ELP-429	Food Processing	Agricultural Engineering	0+10
ELP-430	Agriculture Waste Management	Agricultural Engineering	0+10
ELP-431	Organic Production Technology	Agronomy	0+10
ELP-432	Commercial Sericulture	Entomology	0+10

Grand Total (Credit Hours) =185

SEMESTER – I

1. BSAG-101 Fundamentals of Horticulture (NEW) 2(1+1) Theory

S. No.	Course Objectives
1.	Students will get basic knowledge about horticulture course and its scope.
2.	Students can get hands on training practical knowledge and Demonstrate the safe use of equipment, chemicals and tools used in the industry.
3.	Identify and explain benefits of professional organizations in the horticulture industry and to understand basic problems comes under horticulture production technology.
4.	To know the importance of market and industrial value of different horticultural crops.

Unit	Content	Teaching hours
I	Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops;	3
II	Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment.	3
III	Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy.	5
IV	Medicinal and aromatic plants; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.	3

Experiment	Topic
1)	Identification of garden tools.
2)	Identification of horticultural crops.
3)	Preparation of seed bed/ nursery bed.
4)	Practice of sexual and asexual methods of propagation including micro-propagation.
5)	Layout and planting of orchard.
6)	Training and pruning of fruit trees.
7)	Preparation of potting mixture.
8)	Fertilizer application in different crops.
9)	Visits to commercial nurseries/orchard.

S. No.	Course Outcomes (CO)
CO 1	Understanding of the composition, fertility and biology of soil and how they relate to good plant growth.

CO 2	Identify and prescribe sustainable options in horticulture which benefit the environment while maintaining productivity and economic viability.
CO 3	Apply horticultural skills and knowledge to operate various business entities found in the horticultural industry.
CO 4	Identify and practice safe use of tools, equipment and supplies used in horticulture careers and Propagate, grow, and maintain plants in horticulture production systems.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Fruit Culture in India Sham Singh and others	1963
2)	Principles of Horticulture and fruit growing Kunte and Yawalkar	2005
3)	Production Technology of Fruit Crops Shanmugvelu, K.G.	1989
4)	Handbook of Horticulture ICAR Publication	2001

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	3	3	2	2	2	-	-	-	1	1	1
CO-2	1	2	3	2	2	3	2	-	1	1	2	1	2
CO-3	2	1	2	1	1	1	2	-	1	1	1	2	2
CO-4	1	2	2	2	3	2	2	-	1	-	1	1	1
Average	1.5	1.8	2.5	2.0	2.0	2.0	2.0	-	1.0	1.0	1.3	1.3	1.5

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Mid term Theory Exam	Assignment	Practical			
BSAG-101	Fundamentals of Horticulture	1	0	2	30	5	15	50	100	2(1+1)

2. BSAG-102 Fundamentals of Plant Biochemistry and Biotechnology 4(3+1) Theory

S. No.	Course Objectives
1.	To introduce the basic knowledge of plant biotechnology and plant biochemistry.

2.	To introduce the history of plant tissue culture, preparation of solution, various biochemical test.
3.	To introduce the recent advances in plant biotechnology.
4.	To familiar them tissue culture laboratory, basic techniques of biotechnology.

Unit	Content	Teaching hours
I	Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Poly saccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.	10
II	Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Somaclonal variation and its use in crop improvement.	10
III	Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids, cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture,cellsuspensionculture,callusculture,antherculture,pollencultureandovule culture and their applications;	11
IV	Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and theirsignificance; Embryo rescue and its significance; somatic hybridization and cybrids; chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.	11

Experiment	Topic
1)	Qualitative tests of carbohydrates and amino acids.
2)	Quantitative estimation of glucose/ proteins.
3)	Titration methods for estimation of amino acids/lipids,
4)	Effect of pH, temperature and substrate concentration on enzyme action,
5)	Paper chromatography/ TLC demonstration for separation of amino acids/ Mono saccharides.
6)	Sterilization techniques.
7)	Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium.

8)	Callus induction from various explants.
9)	Micro-propagation, hardening and acclimatization.
10)	Demonstration on isolation of DNA.
11)	Demonstration of gel electrophoresis techniques and DNA finger printing.

S. No.	Course Outcomes (CO)
CO 1	Able to know what are the basic technologies involved in plant biochemistry and biotechnology as well as how these technologies are used for the production of useful products.
CO 2	Students can figure out the measures to prevent the various stresses of any crop, how to identify resistant sources.
CO 3	Know how to isolate DNA form the leaf and how to identify biochemical given in a sample.
CO 4	Know the role various role of biomolecules such as carbohydrate, protein, lipid etc in life and They can use their skills for the identification of resistant sources for various stresses.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Bhatia S. C., Biochemistry in Agricultural Sciences, Shree Publication House, New Delhi.	1984
2)	PurohitS.S.,Biochemistry-FundamentalsandApplications,Agrobios,Jodhpur	2009
3)	Veerkumari L., Biochemistry, MIP Publishers, Chennai	2007
4)	Rastogi S. C. Biochemistry Tata McGraw-Hill Education, New Delhi.	2003
5)	David L. Nelson and Michael M. Cox. Lehninger Principles of Biochemisry, 6thEd .Macmillan Learning, NY, USA	2012

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	2	1	2	2	1	-	-	-	1	1	1	1
CO-2	1	1	2	2	1	1	-	-	-	1	1	1	1
CO-3	1	2	1	2	3	1	-	-	-	1	1	1	2
CO-4	1	1	1	2	2	1	-	-	-	1	1	1	1
Average	1.0	1.5	1.3	2.0	2.0	1.0	-	-	-	1.0	1.0	1.0	1.3

Course Code	Course Title	Periods per week	Evaluation Scheme			Credit (Theory + Practical)
			Internal Exam	External Theory	Subject Total	

								Exam		
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG- 102	Fundamentals of Plant Biochemistry and Biotechnology	2	0	2	30	5	15	50	100	3(2+1)

3. BSAG -103 Fundamentals of Soil Science3(2+1) Theory

S. No.	Course Objectives
1.	To gain basic knowledge of soil fertility and productivity.
2.	To study Importance or Significance of soil macronutrient and micronutrients.
3.	To Assess and develop importance of soil physical and chemical properties.
4.	To study about soil pollution and mitigation process.

Unit	Content	Teaching hours
I	Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation.	6
II	Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India; Soil water retention, movement andavailability;Soilair,composition,gaseousexchange,problemandplantgrowth,	7
III	Soil temperature; source, amount and flow of heat in soil; effect on plant growth, Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability; soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation	8
IV	Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.	7

Experiment	Topic
1)	Study of soil profile in field.
2)	Study of soil sampling tools, collection of representative soil sample, its processing and storage.
3)	Study of soil forming rocks and minerals.
4)	Determination of soil density, moisture content and porosity.
5)	Determination of soil texture by feel and Bouyoucos Methods.

6)	Studies of capillary rise phenomenon of water in soil column and water movement in soil.
7)	Determination of soil pH and electrical conductivity.
8)	Determination of cation exchange capacity of soil.
9)	Study of soil map.
10)	Determination of soil colour.
11)	Demonstration of heat transfer in soil.
12)	Estimation of organic matter content of soil.

S. No.	Course Outcomes (CO)
CO 1	To gain basic knowledge of soil fertility and productivity.
CO 2	To study Importance or Significance of soil macronutrient and micronutrients.
CO 3	To Assess and develop importance of soil physical and chemical properties.
CO 4	To study about soil pollution and mitigation process.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Fundamentals of Soil Science. 2nd Ed. Indian Society of Soil Science, New Delhi- 110 012. pp. 728.	2009
2)	Brady, N. C. The Nature and Properties of Soils. 15th edition Publisher: Pearson Education, ISBN: 978-0133254488	2016
3)	Biswas, T.D.; Mukherjee, S.K. Text Book of Soil Science 2nd Ed. Tata McGraw Hill Publisher, Delhi pp 433	1995
4)	Jakson, M.L. Soil Chemical Analysis. Printice Hall, India, Pvt. Ltd. New Delhi. Pp 498.	1973
5)	Chapman, H.D., and P.F. Pratt. Methods of analysis for soils, plants and waters. Division of Agricultural Sciences, University of California	1961

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	2	1	1	1	1	-	-	1	1	-	2
CO-2	3	2	1	1	1	1	1	-	-	1	1	-	1
CO-3	3	2	1	1	2	-	1	-	-	1	1	-	1

CO-4	3	2	2	1	1	2	1	-	-	1	2	-	2
Average	3.0	2.3	1.5	1.0	1.3	1.3	1.0	-	-	1.0	1.3	-	1.5

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-103	Fundamentals of Soil Science	2	0	2	30	5	15	50	100	3(2+1)

4. BSAG-104 Introduction to Forestry (New)2(1+1) Theory

S. No.	Course Objectives
1.	To impart detail theoretical as well as practical knowledge of forestry and various other related allied branches of forestry science and to provide a basic understanding of emerging problems in the fields of forest by organizing visits to farm forest, industrial plantation, dense forest and open forest , nurseries and orchards.
2.	To bestow knowledge regarding various modern techniques used in tree plantation for sustainable development in India and to learn the applications of various fields of agriculture like horticulture, vegetable science, forestry, livestock production and others for raising the income of the marginal farmers.
3.	To provide detailed knowledge on the subject to improve the farmer's condition by their contributions regarding basic and modern knowledge about organic farming and Learn to follow scientific and economic approach along with environmental principles underpinning forestry production and effective use of land.
4.	To provide knowledge on legal and ethical environmental issues which are impacting forestry organizations and exhibit an understanding and appreciation of the ethical implications of decisions and To learn critical thinking and problem-solving skills which will ultimately help the students to achieve success in future.

Unit	Content	Teaching hours
I	Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, and salient features of Indian Forest Policies. Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers;	3
II	Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method;	5
III	Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.	3

IV	Agro-forestry–definitions, importance, criteria of selection of tree sin agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of theregion.	3

Experiment	Topic
1)	Identification of tree-species.
2)	Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees.
3)	Height measurement of standing trees by shadow method, single pole method and hypsometer.
4)	Volume measurement of logs using various formulae.
5)	Nursery lay out, seed sowing, vegetative propagation techniques.
6)	Forest plantations and their management.
7)	Visits of nearby forest based industries.

S. No.	Course Outcomes (CO)
CO 1	Knowledge of role trees in almost all terrestrial ecosystems and provide a range of products and services to rural and urban people.
CO 2	The benefits that trees provide are best sustained by integrating trees into agriculturally productive landscapes.
CO 3	To study the sustainable utilization of land through agro-forestry and study of economically importance of tree and various purposes for growing of tree.
CO 4	To study scientific management of trees such as creation, conservation and utilization of their resources.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Dwivedi. A. P. 1993.Textbook of Silviculture. International Book Distributors.	1993
2)	Khanna,L.S.1989. Principles and Practice of Silviculture. Khanna Bandhu, 7 Tilak Marg, DehraDun	1989
3)	Chaturvedi, A.N and L.S. Khanna. 2011. Forest Mensuration and Biometry (5th edition). KhannaBandhu. Dehra Dun. 364 pp.	2011
4)	Husch, B., Beers, T.W. and Kershaw, J. J.A. 2002.Forest Mensuration (4th edition).John Wiley & Sons, Nature.456pp.	2002

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4

CO-1	3	3	2	3	2	2	3	-	-	1	1	2	3
CO-2	3	3	2	3	2	2	3	-	-	1	1	2	3
CO-3	2	3	2	3	2	2	3	-	-	1	1	2	3
CO-4	2	2	1	2	2	2	2	-	-	1	1	2	3
Average	2.5	2.8	1.8	2.8	2.0	2.0	2.8	-	-	1.0	1.0	2.0	3.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-104	Introduction to Forestry	1	0	1	30	5	15	50	100	3(2+1)

5. BSAG-105 Communication English 2(1+1) Theory

S. No.	Course Objectives
1.	Knowledge of Professional, cultural and cross-cultural communication.
2.	Basics concept of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication.
3.	Knowledge of reading and comprehension of general and technical articles, precise writing, summarizing, abstracting.
4.	Basic concepts of group discussion, organizing seminars and conferences and time management: Personal organization, prioritizing and balancing; Cosmopolitan culture.

Unit	Content	Teaching hours
I	War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.	3
II	Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.	4
III	Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.	4
IV	The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.	3

Experiment	Topic

1)	Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature).
2)	Oral Communication: Phonetics, stress and intonation,
3)	Conversation practice. Conversation: rate of speech, clarity of voice, speaking.
4)	Listening, politeness &Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills.
5)	Mock Interviews: testing initiative, team spirit, leadership, intellectual ability.
6)	Group Discussions.

S. No.	Course Outcomes (CO)
CO 1	Knowledge of professional, cultural and cross-cultural communication.
CO 2	Basic knowledge of structural and functional grammar; meaning and process of communication, verbal and nonverbal communication.
CO 3	Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting.
CO 4	Basic concepts of group discussion, organizing seminars and conferences and personal organization, prioritizing and balancing; Cosmopolitan culture, Group discussions.

S.No.	Name of Authors/ Books / Publishers	Year of Publication / Reprint
1)	Krishnaswamy,. N and Sriraman, T. 1995. Current English for Colleges.Macmillan India Ltd. Madras.	1995
2)	Balasubrmanyam M. 1985. Business Communication. Vani Educational Books, New Delhi.	1985
3)	Naterop, Jean, B. and Rod Revell. 1997. Telephoning in English. Cambridge University Press, Cambridge.	1997
4)	Mohan Krishna and Meera Banerjee. 1990. Developing Communication Skills. Macmillan India Ltd. New Delhi.	1990

Articulated Attainment

Cos	PO-1	PO -2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	-	-	1	1	-	1	3	2	1	3
CO-2	2	2	2	-	-	1	1	-	1	2	2	1	2
CO-3	1	1	2	-	-	-	-	-	-	1	1	-	2
CO-4	1	1	2	-	-	-	-	-	-	-	-	-	-
Average	1.8	1.5	2	-	-	0.5	0.5	-	0.5	1.5	1.3	0.5	1.8

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-105	Communication English	1	0	2	30	5	15	50	100	2(1+1)

5. BSAG-106 Fundamentals of Agronomy 4(3+1)

S. No.	Course Objectives
1.	To provide a basic understanding of emerging problems in the fields of agriculture by organizing visits to agricultural fields, nurseries and orchards.
2.	To bestow knowledge regarding various modern techniques used in farming for sustainable agriculture in India.
3.	To provide a basic understanding of the market and post-harvest handling of agricultural produce and to provide detailed knowledge on the subject to improve the farmer's condition by their contributions regarding basic and modern knowledge about organic farming.
4.	Learn to follow scientific and economic approach along with agricultural production and effective use of land.

Unit	Content	Teaching hours
I	Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency,	10
II	water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.	10
III	Weeds- importance, classification, and crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.	11
IV	Growth and development of crops, factors affecting growth and development, plant id eotypes, Croprotationanditsprinciples,adaptationanddistributionofcrops,cropmanagement technologies in problematic areas, harvesting and threshing ofcrops.	11

Experiment	Topic
1)	Identification of crops, seeds, fertilizers, pesticides and tillage implements
2)	study of agro climatic zones of India
3)	Identification of weeds in crops,
4)	Methods of herbicide and fertilizer application,
5)	Study of yield contributing characters and yield estimation

6)	Seed germination and viability test,
7)	Numerical exercises on fertilizer requirement,
8)	Study of yield contributing characters and yield estimation
9)	Seed germination and viability test, cc plant population, herbicides and water requirement
10)	Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill,
11)	Study of soil moisture measuring devices,
12)	Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

S. No.	Course Outcomes (CO)
CO 1	Exploits the knowledge developed by basic and allied sciences for higher crop production.
CO 2	Aims at obtaining maximum production at minimum cost.
CO 3	The advancement of knowledge and better understanding of plant and environment, agricultural practices are modified or new practices developed for high productivity.
CO 4	To study the application of basic agronomic methodology for healthy environment and study for optimum growth, management and improvement of field crop with the objective of increasing food, fiber, oil seed and other agriculture products.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Gopal Chandra De. Fundamentals of Agronomy. Oxford and IBH Publishing	1980.
2)	Panda, S.C, .AgronomyAgribios Publication, New Delhi.	2006
3)	Rao V.S., Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.	2006
4)	Gupta, O.P. , Modern Weed Management Agribios India Publication	2008
5)	Palaniappan, S.P., Cropping Systems in the tropics – Principles and Practices.Willey Eastern Ltd., New Delhi.	1996
6)	Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India.	2018
7)	Sankaran, S and Subbiah Mudliyar, V.T. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.	1991

Articulated Attainment

COs	PO-1	PO -2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	1	2	-	-	-	-	1	-	1	2
CO-2	2	1	2	-	1	1	-	-	-	-	-	-	1

CO-3	2	2	3	-	1	-	1	-		1	1	1	1
CO-4	2	3	3	-	1	1	-	-	-	1	-	-	1
Average	2.3	2.0	2.5	1.0	1.3	1.0	1.0	-	-	1.0	1.0	1.0	1.3

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-106	Fundamentals of Agronomy	3	0	2	30	5	15	50	100	4(3+1)

7. BSAG -107 Introductory Biology (New) 2(1+1) Theory

S. No.	**Course Objectives**
1.	Basic concepts of diversity, characteristics and origin of living world.
2.	Knowledge of evolution and eugenics and flowing plants, seed and seed germination.
3.	Significance of crop and animals and its classifications.
4.	Basic concepts of Binomial nomenclature and classification Cell and cell division.

Unit	**Content**	**Teaching hours**
I	Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.	4
II	Binomial nomenclature and classification Cell and cell division.	3
III	Morphology of flowing plants. Seed and seed germination.	3
IV	Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae. Role of animals in agriculture.	4

Experiment	Topic
1)	Morphology of flowering plants – root, stem and leaf and their modifications.
2)	Inflorence, flower and fruits.
3)	Cell, tissues & cell division.
4)	Internal structure of root, stem and leaf.
5)	Study of specimens and slides.
6)	Description of plants - Brassicaceae, Fabaceae and Poaceae.

S. No.	Course Outcomes (CO)
CO 1	Origin of living world- Basic concepts of diversity, characteristics.
CO 2	Evolution and eugenics- Basic concepts and knowledge.
CO 3	Significance of flowing plants, seed and seed germination.
CO 4	Basic concepts of Binomial nomenclature and basic concepts of classification Cell and cell division.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Botany-An introduction to Plant Biology by Jamesh D. Mauseth, Publisher- Continental Prakashan 1962,Pune	1962
2)	A class- book of Botany by A.C. Dutta, Publisher- Oxford University press YMCA Library Building. 1 Jai Singh Road, New Delhi 110001, India	2014-15
3)	Anatomy of seed Plants by A.C. Datta, Sigh V. Pande P.G, Publisher- Sai printopack New Delhi Rastogi, Publication Meerut	2007

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	2	1	1	1	1	1	1	1	1	1	2
CO-2	2	2	1	2	1	1	-	1	1	-		-	1
CO-3	2	2	2	1	-	-	1	1	1	1	1	1	1
CO-4	1	2	1	1	2	1	-	1	1	1	-	-	1
CO-5	-	1	-	-	2	-	-	1	1	3	1	2	1

CO-6	1	1	1	1	1	1	1	1	1	1	1	1	1
Average	1.8	1.5	1.4	1.2	1.4	1.0	1.0	1.0	1.0	1.4	1.0	1.3	1.2

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-107	Rural Sociology & Educational Psychology	2	0	0	40	10	-	50	100	2(2+0)

8. BSAG -108 Elementary Mathematics (New) 2(2+0) Theory

S. No.	**Course Objectives**
1.	Basic concepts of mathematics, distance formula, section formula (internal and external division) and knowledge of Equation of co-ordinate axes, Equation of lines parallel to axes.
2.	Knowledge of Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.
3.	General equation of a circle, Equation of circle passing through three given points.
4.	Basics of Differential Calculus Definition of function, limit and continuity, Simple problems on limit.

Unit	**Content**	**Teaching hours**
I	Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two straight lines, Angles between two straight lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.	8
II	Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whosediametersislinejoiningtwo points(x1,y1)&(x2,y2),Tangent and Normaltoagivencircleatgivenpoint(Simpleproblems),Conditionoftangencyofa line y = m x + c to the given circle x 2 + y 2 = a 2.	6
III	DifferentialCalculus:Definitionoffunction, limitandcontinuity,Simpleproblems on limit, Simple problems on continuity, Differentiation of x n , e x , sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based onit).	8

IV	Integral Calculus : Integration of simple functions, Integration of Product of two functions, Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication,TransposeandInverseupto3rdorder,Propertiesofdeterminantsup to 3rd order and theirevaluation.	6

S. No.	Course Outcomes (CO)
CO 1	Students will have basic knowledge of distance formula, section formula (internal and external division) and knowledge of Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.
CO 2	Basics of Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points.
CO 3	Differentiation of xn, ex, sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions.
CO 4	Logarithmic differentiation (Simple problem based on it).

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	A Text Book of Mathematics, 11th Part-I and Part II, 12th Part-I and Part-II Maharashtra State Board of secondary and Higher secondary Education-Pune.	2012
2)	Mensuration- I by Pierpoint.	2011
3)	A text book Agricultural Mathematics by Ms. A. A. Chaudhari et.al.	2014

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	-	1	2	1	-	-	-	-	-	-	-	-
CO-2	2	-	1	2	1	-	-	-	-	-	-	-	-
CO-3	1	-	1	2	1	-	-	-	-	-	-	-	-
CO-4	2	1	1	2	2	1	1	-	-	-	-	-	-
Average	1.8	1.0	1.0	2.0	1.3	1.0	1.0	-	-	-	-	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-108	Elementary Mathematic	2	0	0	40	10	-	50	100	2(2+0)

9. BSAG -109 Agricultural Heritage (New Course)1(1+0) Theory

S. No.	Course Objectives
1.	Basic knowledge of Agriculture and heritage.
2.	Status of agriculture and farmers in society, indigenous traditional knowledge of farmers.
3.	Knowledge to increase the production and productivity of Agriculture and significance of Crop and its classifications.
4.	Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.

Unit	Content	Teaching hours
I	Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance of heritage to present day agriculture;	3
II	Past and present status of agriculture and farmers in society; Journey of Indian agriculture and its development from past to modern era;	3
III	Plant production and protection through indigenous traditional knowledge; Crop voyage in India and world; Agriculture scope; Importance of agriculture and agricultural resources available in India;	4
IV	Crop significance and classifications; National agriculture setup in India; Current scenario of Indian agriculture; Indian agricultural concerns and future prospects.	4

S. No.	Course Outcomes (CO)
CO 1	Agriculture and heritage-basic knowledge and concepts.
CO 2	Basics and concepts of indigenous traditional knowledge and status of farmers.
CO 3	Importance of agriculture and agricultural resources available in India.
CO 4	classifications of crop and its significance to farmers and Indian agriculture Current scenario and future prospects.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Nene, Y.L. and Choudhary, S.L. (2002). Agricultural heritage of India. *Asian Agri.History foundation, Secundrabad.*	2002
2)	Randhawa, M.S., (1980-86). A history of Agriculture in India. Vol. I, II, III and IV. *Indian council of Agricultural Research, New Delhi*.	1980

3)	Raychaudhuri, S.P. (1964). Agriculture in ancient India. Indian council of Agricultural Research, New Delhi.	1964
4)	Ayachit, S.M. (Tr) 2002. KashyapiyaKrishisukti (A treatise on Agriculture by Kashyapa). Agri. – History Billetin No. 4. Asian – Agri. History foundation, Secundrabad	2002

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	-	-	2	1	-	-	1	1	1	-	-
CO-2	3	2	2	2	1	1	2	2	2	2	1	-	1
CO-3	1	1	1	1	2	-	-	-		1		1	2
CO-4	2	2	1	1	2	1	-	-	-	1	-	-	1
CO-5	1	1	-	-	1	1	-	-	1	1	-	2	2
CO-6	3	2	2	-	1	1	2	2	2	2	1	-	1
Average	2.2	1.7	1.5	1.3	1.5	1.0	2.0	2.0	1.5	1.3	1.0	1.5	1.4

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-109	Agriculture Heritage	1	0	0	40	10	-	50	100	1(1+0)

10. BSAG -110 Rural Sociology & Educational Psychology 1(1+0) Theory

S. No.	**Course Objectives**
1.	Basics of Sociology and Rural sociology and in depth knowledge of study of Social Groups, Social Stratification, Culture concept.
2.	Knowledge of Functional literacy, non-formal education of rural youth and basics to eradicate social evils, awareness programmes, consumer awareness.
3.	Educational psychology: Meaning & its importance in agriculture extension.
4.	Basic knowledge of Personality, Learning, Motivation, Theories of Motivation.

Unit	**Content**	**Teaching hours**
I	Sociology and Rural sociology: Definition and scope, its significance in agriculture extension, Social Ecology, Rural society, Social Groups, Social Stratification.	4

II	Culture concept, Social Institution, Social Change & Development.	3
III	Educational psychology: Meaning & its importance in agriculture extension.	3
IV	Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.	4

S. No.	Course Outcomes (CO)
CO 1	Students will have knowledge of Sociology and Rural sociology.
CO 2	Knowledge of Functional literacy, non-formal education of rural youth.
CO 3	Students will have knowledge of Educational psychology: Meaning & its importance in agriculture extension.
CO 4	Basic knowledge of Personality, Learning, Motivation, Theories of Motivation.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Ray, G.L., Extension Communication and Management. Kalyani Publishers. Fifth revised and enlarged edition.	2003
2)	Dahama, O.P. and Bhatnagar, O.P. (2003). Education and Communication for Development. Oxford and IBH Publishing Co. Pvt. Ltd.	2003
3)	Chitambar, J.B. (2008). Introductory Rural Sociology. New Age International (P)Limited.	2008
4)	Sachdeva, D. R. and Bhushan, V (2007). An Introduction to Sociology. KitabMahal Agency.	2007

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	2	1	1	1	1	1	1	1	1	1	2
CO-2	2	2	1	2	1	1	-	1	1	-		-	1
CO-3	2	2	2	1	-	-	1	1	1	1	1	1	1
CO-4	1	2	1	1	2	1	-	1	1	1	-	-	1
CO-5	-	1	-	-	2	-	-	1	1	3	1	2	1
CO-6	1	1	1	1	1	1	1	1	1	1	1	1	1

Average	1.8	1.5	1.4	1.2	1.4	1.0	1.0	1.0	1.0	1.4	1.0	1.3	1.2

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-110	Rural Sociology & Educational Psychology	2	0	0	40	10	-	50	100	2(2+0)

11. BSAG-111 Human Value and Ethics1(1+0) Theory

S. No.	**Course Objectives**
1.	To understand value and ethics, goal and mission of life.
2.	To solve case study of ethical lives.
3.	To understand basic knowledge of decision making.
4.	To understand basic knowledge of motivation.

Unit	**Content**	**Teaching hours**
I	Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life.	3
II	Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction. Decision Making. Motivation.	4
III	Sensitivity. Success. Selfless Service. Case Study of Ethical Lives. Positive Spirit.	3
IV	Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.	4

S. No.	**Course Outcomes (CO)**
CO 1	Understand value and ethics of life.
CO 2	Acquaint principals and philosophy in life.
CO 3	Understand mission and vision of life and Understand Case on ethical lives and spirituality.
CO 4	Understand importance of motivation.

S. No.	**Name of Authors/ Books / Publishers**	**Year of Publication/ Reprint**
1)	Gaur RR, Sangal R &Bagaria GP. 2011. A Foundation Course in Human Values and Professional Ethics. Excel Books.	2011

2)	Nagrajan R. S. 2006. Professional Ethics and Human Values. Text book. New Age International (P) Ltd Publishers.	2006
3)	Sharma RP & Sharma M. 2011. Value Education and Professional Ethics. Kanishka Publishers.	2011
4)	SrivastavaS.2011.HumanValuesandProfessionalEthics.SKKataria&Sons.	2011

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	-	1	1	-	-	2	-	-	2	2	-	1	-
CO-2	-	1	1	-	-	2	-	-	2	2	-	1	-
CO-3	-	1	1	-	-	2	-	-	2	2	-	1	-
CO-4	-	1	1	-	-	2	-	-	2	2	-	1	-
Average	-	1.0	1.0	-	-	2.0	-	-	2.0	2.0	-	1.0	-

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-111	Human Values & Ethics (non gradial)	1	0	0	40	10	-	50	100	1(1+0)

SEMESTER - II

1. BSAG-201 Fundamentals of Genetics3(2+1) Theory

S. No.	Course Objectives
1.	Basic knowledge of concept and history of genetics and to learn about the Mendelian Genetics.
2.	To impart the knowledge of the structure and functions of different cell organelles.
3.	To familiarize the students about the basics of gene interactions and genetic variance.
4.	To study the replication, transcription and translation in prokaryotes and eukaryotes.

Unit	Content	Teaching hours
I	Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity. Architecture of chromosome; chromonemata, chromosome matrix, chromomeres, centromere, secondary constriction and telomere; special types of chromosomes. Chromosomaltheoryofinheritance-cellcycleandcelldivision-mitosisandmeiosis	7
II	Probability and Chi-square. Dominance relationships, Epistatic interactions with example.Multiplealleles,pleiotropismandpseudoalleles,Sexdeterminationandsex linkage, sex limited and sex influencedtraits,	6
III	Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural and numerical variations in chromosome and their implications, Use of haploids, dihaploids and double dhaploidsinGenetics. Mutation, classification, Methods of inducing mutations&CIBtechnique, mutagenic agents and induction ofmutation.	7
IV	Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders. Nature, structure & replication of genetic material. Protein synthesis, Transcription and translation almechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.	8

Experiment	Topic
1)	Study of microscope.
2)	Study of cell structure.
3)	Mitosis and Meiosis cell division.
4)	Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross,
5)	Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis.
6)	Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division,
7)	Two-point test cross and three-point test cross data. Study on sex linked in heritanceinDrosophila.
8)	Study of models on DNA and RNA structures.

S. No.	Course Outcomes (CO)
CO 1	Students learned about the definition, history and concept of genetics and Know the experiments performed by Mendel and also the Mendel's Law.
CO 2	Students familiarize with the different cell organelles, structure and functions.
CO 3	Gained the knowledge of the various gene interactions, cytoplasmic genes and the genetic variance.
CO 4	Studied the mechanism of replication, transcription and translation in both prokaryotes and eukaryotes.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Principle of Genetics, E.J.Gardner, M.J. Simmons, D.P. Snustad Wiley India (P)Ltd.	1981
2)	Fundamentals of Genetics, B. D. Singh Kalyani Publication, New Delhi.	2014
3)	Genetics Sushant Elrod and William Stansfield McGraw Hill Publishing company Limited, New Delhi.	2017
4)	Elements of Genetics Phundansingh Kalyani Publication, New Delhi	2010
5)	Genetics M.W. StrickbeargerPeerson education, Inc.	1985

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	1	1	2	1	-	-	-	-	-	-	2
CO-2	3	2	2	3	3	3	-	-	-	-	-	-	2
CO-3	2	2	1	2	2	2	1	-	-	-	-	-	2
CO-4	2	1	1	3	2	1	1	-	-	-	-	-	2
Average	2.5	1.8	1.3	2.3	2.3	1.8	1.0	-	-	-	-	-	2.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-201	Fundamentals of Genetics	2	0	2	30	5	15	50	100	3(2+1)

2. BSAG-202 Agricultural Microbiology 2(1+1) Theory

S. No.	Course Objectives
1.	To know about microbes structure.
2.	Familiar with different types of useful microbes in agriculture.
3.	Knowledge of microbiology in silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.
4.	Knowledge of different microbes, their mode of reproduction, genetics

Unit	Content	Teaching hours
I	Introduction. Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth. Bacterial genetics: Genetic recombination transformation, conjugation and transduction, plasmids, transposon.	4
II	Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.	3
III	Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.	4
IV	Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste	3

Experiment	Topic
1)	Introduction to microbiology laboratory and its equipments;
2)	Microscope- parts, principles of microscopy, resolving power and numerical aperture.
3)	Methods of sterilization. Nutritional media and their preparations.
4)	Enumeration of microbial population in soil- bacteria, fungi, actinomycetes.
5)	Methods of isolation and purification of microbial cultures.
6)	Isolation of *Rhizobium* from legume root nodule.
7)	Isolation of *Azotobacter* from soil.
8)	Isolation of *Azospirillum*from roots.
9)	Isolation of BGA.
10)	Staining and microscopic examination of microbes.

S. No.	Course Outcomes (CO)
CO 1	Student is able to know regarding microbial world, cell structure, Prokaryotic and eukaryotic microbes.
CO 2	Learn about Bacterial genetics, Role of microbes in soil fertility and crop production.
CO 3	Students are able to know about sowing time of different varieties according to temperature.
CO 4	Regarding atmospherics biological nitrogen fixation, Rhizosphere and phyllosphere and by the end of course students will be able to understand the role of microbes in human welfare.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1	R P Singh, General Microbiology. Kalyani Publishers.	2007
2	Sullia,S.B,andShantaram.GeneralMicrobiology.OxfordandIBH.	1998
3	Jamaluddin, M. Malvidya, N. and Sharma, A. General Microbiology. Scientific Publishers, Washington.	2006
4	Prescott, L.M. Harley, J.P. and Klein, D.A (5ed) 2002. Microbiology. Mc Graw Hill Publishers, Newyork	2002

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	3	2	3	3	2	-	1	1	-	1	-
CO-2	3	3	3	2	3	3	2	-	1	1	-	1	-
CO-3	3	3	3	2	3	3	2	-	1	1	-	1	-
CO-4	3	2	2	2	2	3	2	-	1	1	-	1	-
Average	3.0	2.8	2.0	2.0	2.8	3.0	2.0	-	1.0	1.0	-	1.0	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-202	Agricultural Microbiology	1	0	2	30	5	15	50	100	2(1+1)

3. BSAG-203 Soil and Water Conservation Engineering 2(1+1) Theory

S. No.	Course Objectives
1.	To introduce the concept of soil and water conservation.
2.	To learn about the meaning, definition and agents of soil erosion.
3.	To study about the soil estimation and soil loss measurement techniques.
4.	To familiarize the students about the concept of contouring and To aware the students about the water harvesting and its techniques.

Unit	Content	Teaching hours

I	Introduction to Soil and Water Conservation causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion. Gully classification and control measures.	5
II	Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.Principlesoferosioncontrol: Introduction tocontouring,stripcropping. Contour bund. Graded bund and benchterracing.	6
III	Grassed water ways and their design. Water harvesting and its techniques.	4
IV	Wind erosion: mechanics of wind erosion, types of soil movement. Principles of wind erosion control and its control measures.	5

Experiment	Topic
1)	General status of soil conservation in India.
2)	Calculation of erosion index.
3)	Estimation of soil loss.
4)	Measurement of soil loss.
5)	Preparation of contour maps.
6)	Design of grassed water ways.
7)	Design of contour bunds.
8)	Design of graded bunds.
9)	Design of bench terracing system.
10)	Problem on wind erosion.

S. No.	Course Outcomes (CO)
CO 1	Students learned about the meaning, definition and concept of soil and water conservation.
CO 2	Learned about the meaning, definition and agents of soil erosion.
CO 3	Students learned about the soil estimation and soil loss measurement techniques.
CO 4	Students knew about the concept of contouring and Familiarized about the water harvesting and its techniques.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Principles of Agril. Engg.- Vol – II by A. M. Maichael& T. P. Ojha Jain Brothers, New Delhi	2011
2)	Soil and Water Conservation Engineering by R. Suresh, Standard Publishers Distributrs, Delhi	2000

3)	Soil Conservation in India by Rama Rao M.S.V. ICAR, New Delhi.	1974
4)	Agricultural Engineer's Handbook by Richey *et al* Tata McGraw-Hill Publishing Company Ltd, Nw York	1961

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	2	1	1	2	1	-	-	2	1	1	2
CO-2	2	1	2	1	1	1	1	-	-	1	-	-	3
CO-3	2	1	-	1	-	-	1	-	-	2	-	2	1
CO-4	1	2	1	1	1	2	1	-	-	1	2	1	2
Average	1.8	1.5	1.7	1.0	1.0	1.7	1.0	-	-	1.5	1.5	1.3	2.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-203	Soil and Water Conservation Engineering	1	0	2	30	5	15	50	100	2(1+1)

4. BSAG-204 Fundamentals of Crop Physiology2(1+1)

S. No.	**Course Objectives**
1.	To introduce the basic knowledge of crop physiology.
2.	To introduce the history of crop physiology
3.	To introduce the recent advances in crop physiology
4.	To familiar students different practical aspects of crop physiology.

Unit	**Content**	**Teaching hours**
I	Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology;	3
II	Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants;	4
III	Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown;	3
IV	Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.	4

Experiment	Topic
1)	Study of plant cells
2)	Structure and distribution of stomata
3)	Imbibition, osmosis, plasmolysis, measurement of root pressure
4)	Rate of transpiration, Separation of photosynthetic pigments through paper chromatography,
5)	Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients,
6)	Estimation of relative water content,
7)	Measurement of photosynthetic CO_2 assimilation by Infra-Red Gas Analyzer (IRGA).

S. No.	Course Outcomes (CO)
CO 1	Able to know what are the basic technologies involved in physiology and how they are used in crop improvement.
CO 2	Can use the basic knowledge regarding plant physiology in crop improvement.
CO 3	Impart knowledge to the students on different plant metabolic processes and their functions in plants.
CO 4	By the end of course the students will be able to study the growth and development of plants and study of nutrients and plant growth regulator and their applications in agriculture.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	A Text Book Plant Physiology Dr. V. Verma Emkay Publisher, Delhi-110 051	2005
2)	PlantPhysiology C. P. Malik Kalyani Publisher,Ludhiana	2005
3)	Plant physiology S. Mukharji and A. K. Ghosh New central book agency, Kolkatta	2005
4)	Plant physiology Taiz & Zeiger, E Sinaurasso. Inc, USA	2010
5)	Plant Physiology – fundamentals & applications Arvind kumar& S. S. Purohit Agrobios(India), Jodhpur	2005

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	2	1	2	2	1	-	-	-	1	-
CO-2	3	2	2	2	1	2	2	1	-	-	-	1	-
CO-3	3	2	2	2	1	2	2	1	-	-	-	1	-
CO-4	3	2	2	2	1	2	2	1	-	-	-	1	-
Average	3.0	2.0	2.0	2.0	1.0	2.0	2.0	1.0	-	-	-	1.0	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-204	Fundamentals of Crop Physiology	1	0	2	30	5	15	50	100	2(1+1)

5. BSAG-205Fundamentals of Agricultural Economics 2(2+0) Theory

S. No.	Course Objectives
1.	To understand scope and nature of economics.
2.	To understand basic concepts of desire, demand and supply.
3.	To understand consumer's equilibrium, price determination and how to run industry.
4.	To understand money barter system, inflation, deflation and To understand role of banking in modern economy and elements of economics.

Unit	Content	Teaching hours
I	*Economics:* Meaning, scope and subject matter, definitions, activities, approachesto economic analysis; micro and macroeconomics, positive and normative analysis. Natureofeconomictheory; rationality assumption, concept of equilibrium, economic laws as generalization of humanbehavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.	6
II	Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country. *Demand:* meaning, law ofdemand, schedule anddemandcurve, determinants, utilitytheory;lawofdiminishingmarginalutility, equi-marginalutility principle. Consumer's equilibrium and derivation of demand curve, concept of consumersurplus.Elasticityofdemand: concept and measurement of price elasticity, income elasticity and crosselasticity.	7
III	Production: process, creation of utility, factors of production, input output relationship.*Lawsofreturns*: Law ofvariableproportionsandlawofreturnstoscale. *Cost:* concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfectmarkets. Price determination under perfect competition; short run and long run equilibriumoffirm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.	8

IV	*National income:* Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socioeconomicdeterminants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, supply, general price index, inflation and deflation.Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy.	7

S. No.	Course Outcomes (CO)
CO 1	Students will learn scope and nature of economics and Students will learn basic concepts of desire, demand and supply.
CO 2	Students will understand consumer's equilibrium, price determination and how to run industry.
CO 3	They will understand how money barter system, inflation, deflation.
CO 4	They will understand role of banking in modern economy and elements of economics.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Dewett, K.K. and Chand, A.2009 Modern Economic Theory S. Chand and Co.,New Delhi	2009
2)	Dewett, K.K. and Varma, J.D. 1986 Elementary Economics S. Chand and Co., New Delhi.	1986
3)	Subba Reddy, S, Raghu Ram, P., Sastry, T.V.N. and Bhavani Devi, I. 2010	2010
4)	Jhingan, M.L.1990 Advanced Economic Theory Vikas Publishing House, New Delhi	1990

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	1	3	2	-	-	3	1	-	3	-
CO-2	2	1	2	1	3	2	-	-	3	1	-	3	-
CO-3	2	1	1	1	3	2	-	-	3	1	-	3	-
CO-4	2	1	1	1	3	2	-	-	3	1	-	3	-
CO-5	2	1	1	1	3	2	-	-	3	1	-	3	-
Average	2.0	1.0	1.3	1.0	3.0	2.0	-	-	3.0	1.0	-	3.0	-

Course Code	Course Title	Periods per week	Evaluation Scheme			Credit (Theory +
			Internal Exam	External	Subject	

		L	T	P	Midterm Theory Exam	Assignment	Practical	Theory Exam	Total	Practical)
BSAG-205	Fundamentals of Agricultural Economics	2	0	0	40	10	-	50	100	2(2+0)

6. BSAG-206 Fundamentals of Plant Pathology 4(3+1) Theory

S. No.	Course Objectives
1.	To learn about Plant Pathology, concepts, nomenclature, classification and characters of pathogens.
2.	To develop understanding of disease identification, nature of pathogens and different strategies for management of plant diseases.
3.	To learn for applying principles and methods for plant disease management and to learn for applying fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen.
4.	To develop the skills of crops diseases identification and marketing of relevant pesticides.

Unit	Content	Teaching hours
I	*Introduction*: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: disease triangle and tetrahedron and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused bythem.	11
II	Diseases and symptoms due to abiotic causes. *Fungi*: general characters, definition of fungus, somatic structures, types of fungal thalli fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions, sub-divisions, orders andclasses.	10
III	*Bacteria and mollicutes*: general morphological characters. Basic methods of classification and reproduction. *Viruses*: nature, structure, replication and transmission. Study of phanerogamic plant parasites. *Nematodes:* General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera, Meloidogyne*, *Anguina, Radopholus*etc.)	11
IV	Growth and reproduction of plant pathogens. Liberation / dispersal ansurvivalofplantpathogens.Typesofparasitismandvariabilityinplantpathogens. Pathogenesis. Role of enzymes, toxins and growth regulators in disease development. Defense mechanism in plants**.** Epidemiology: Factors affecting disease development. Principlesandmethodsofplantdiseasemanagement.Nature,chemicalcombination, classification, mode of action and formulations of fungicides andantibiotics.	10

Experiment	Topic
1)	Acquaintance with various laboratory equipment and microscopy.
2)	Collection and preservation of disease specimen.
3)	Preparation of media, isolation and Koch's postulates.
4)	General study of different structures of fungi.
5)	Study of symptoms of various plant diseases.
6)	Study of representative fungal genera
7)	Staining and identification of plant pathogenic bacteria. Transmission ofplant viruses.
8)	Study of phanerogamic plant parasites.
9)	Study of morphological features and identification of plant parasitic nematodes.
10)	Sampling and extraction of nematodes from soil and plant material, preparation of nematode mounting.
11)	Study of fungicides and their formulations. Methods of pesticide application and their safe use.
12)	Calculation of fungicide sprays concentrations**.**

S. No.	Course Outcomes (CO)
CO 1	Student will acquaint about concepts of plant pathogens, major disease causing organisms and their etiology.
CO 2	To provide specific knowledge about host pathogen interactions.
CO 3	Recognition of plant disease is the first step in doing something about them.
CO 4	To give specific knowledge about environment and disease development.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Agrios, GN. 2010. Plant Pathology. Acad. Press.	2010
2)	Singh RS. 2008. Plant Diseases.8th Ed. Oxford & IBH. Pub. Co.	2008
3)	Singh RS. 2013. Introduction to Principles of Plant Pathology. Oxford and IBH Pub. Co.	2013
4)	Verma JP. 1998. The Bacteria. Malhotra Publ. House, New Delhi.	1998
5)	Goto M. 1990. Fundamentals of Plant Bacteriology. Academic Press, New York.	1990

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	1	1	1	-	2	-	-	-	-	-	-
CO-2	3	1	1	1	1	-	2	-	-	-	-	-	-
CO-3	2	1	1	2	-	-	1	-	-	-	-	-	-
CO-4	2	1	1	1	1	-	-	-	-	-	-	-	-
CO-5	2	1	1	1	-	-	1	-	-	-	-	-	-
Average	2.4	1.0	1.0	1.2	1.0	-	1.5	-	-	-	-	-	-

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-206	Fundamentals of Plant Pathology	3	0	2	30	5	15	50	100	4(3+1)

7. BSAG-207 Fundamentals of Entomology 4(3+1) Theory

S. No.	**Course Objectives**
1.	To educate the basic concept of entomology, insect collection and preservation, dissection, and morphology of insects and to develops an understanding of anatomy, physiology, the taxonomy of insects, and the effect of biotic and abiotic factors on insects.
2.	To demonstrate the principles of Pest surveillance, Pest forecasting, recent and traditional methods of pest management including IPM.
3.	To enable to evaluate the economic importance of insects and eco-friendly control measures for pest management to sustainable agriculture.
4.	To learn formulating the application of Insecticides and mass production techniques of Bio-control agents.

Unit	**Content**	**Teaching hours**
I	History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors– temperature,moisture,humidity,rainfall,light,atmosphericpressureandair currents. Effect of biotic factors – food competition, natural and environmental resistance.	10

II	Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.	10
III	Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order.ClassificationofclassInsectauptoOrders,basicgroupsofpresentdayinsects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera:Thripidae;	10
IV	Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae,Scarabaeidae;Hymenoptera:Tenthridinidae,Apidae.Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae,Tephritidae.	12

Experiment	Topic
1)	Methods of collection and preservation of insects including immature stages;
2)	External features of Grasshopper/Blister beetle;
3)	Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus.
4)	Types of insect larvae and pupae;
5)	Dissection of digestive system in insects (Grasshopper);
6)	Dissection of male and female reproductive systems in insects (Grasshopper);
7)	Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.
8)	Insecticides and their formulations.
9)	Pesticide appliances and their maintenance.
10)	Sampling techniques for estimation of insect population and damage.

S. No.	Course Outcomes (CO)

CO 1	To be able to identify morphological characteristics, feeding habit and habitat of agriculturally important insect-pest.
CO 2	To be able to apply concepts and analytical approaches in evolutionary biology, genetics and other areas of insect biology of the student's choice.
CO 3	To be able to categorize insects based on basic ecological, behavioural, morphological, physiological, or developmental attributes and to be able to examine insects deeply within a biological level of analysis and make strategies for successful pest management strategy.
CO 4	To be able to understand about different families and orders of class Insecta which cause economic losses for human beings.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Chapman, R. F. – The Insects : Structure and Functions	1969
2)	Pant N.C. and Swaraj Ghai – Insect Physiology and Anatomy	1981
3)	Nayar, K. K.; Anathkrishanan T.N. and B.V.David – General and Applied Entomology	1976
4)	David, B. V. and T. Kumarswami – Elements of Economic Entomology	2015

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1	1	1	1	1	2	1	-	-	2	2	1	2
CO-2	2	2	1	1	-	1	1	-	-	1	-	-	1
CO-3	1	1	-	1	2	-	1	-	-	2	-	2	1
CO-4	1	2	2	1	1	2	1	-	-	1	1	1	2
CO-5	1	-	2	-	1	-	-	-	-	-	-	1	-
Average	1.2	1.5	1.5	1.0	1.3	1.7	1.0	-	-	1.5	1.5	1.3	1.5

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-207	Fundamentals of Entomology	3	0	2	30	5	15	50	100	4(3+1)

8. BSAG-208 Fundamentals of Agricultural Extension Education3(2+1) Theory

S. No.	Course Objectives
1.	To acquaint knowledge on meaning, concept, objectives, principles, philosophy of extension management and to develop an understanding on the process, steps, principles and monitoring and evaluation involved in agricultural extension programme development for transfer of technology.
2.	To develop skills about genesis of agricultural extension, extension efforts in pre- and post independence era along with specific agricultural programmes and to apply new trends in agricultural extension like private extension, market led extension, expert systems, farmer led extension and cyber extension.
3.	To enable to evaluate different facets of rural development programmes, community development programmes, rural leadership for capacity development of extension clienteles.
4.	To learn about apply communication strategies using agricultural journalism for innovation, diffusion and adoption of agricultural technologies by applying various models of communication and transfer of technology.

Unit	Content	Teaching hours
I	**Education**: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post- independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.).	10
II	New trends in agricultureextension:privatizationextension,cyberextension/e-extension,market- led extension, farmer-led extension, expert systems,etc. Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Philosophy of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.	8
III	Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, ICT Applications in TOT (New and Social Media), media mix strategies; communication: meaning and definition;	6
IV	PrinciplesandFunctionsofCommunication,modelsandbarrierstocommunication. Agriculturejournalism;diffusionandadoptionofinnovation:conceptandmeaning, process and stages of adoption, adoptercategories.	4

Experiment	Topic
1)	To get acquainted with university extension system.
2)	Group discussion- exercise;
3)	Handling and use of audio visual equipment and digital camera and LCD projector;
4)	PreparationanduseofAVaids,preparationofextensionliterature–leaflet,booklet,folder, pamphlet news stories and successstories;
5)	Presentation skills exercise; micro teaching exercise;
6)	A visit to village to understand the problems being encountered by the villagers/ farmers;
7)	To study organization and functioning of DRDA and other development departments at district level;
8)	Visit to NGO and learning from their experience in rural development;
9)	Understanding PRA techniques and their application in village development planning;
10)	Exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio andtelevision.

S. No.	Course Outcomes (CO)
CO 1	Education; Extension Programme planning Meaning, Process, Principles and Steps in Programme Development.
CO 2	Extension systems in India: Extension efforts in Pre-independence era .
CO 3	New trends in agriculture extension: privatization extension.
CO 4	Monitoring and evaluation – concept and definition, monitoring, and evaluation of Extension programmes, Transfer of Technology- Concept and models.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Kelsey, L.D. and Hearne, G.C. Cooperative Extension Work, Comstar Publishing Associate, New York.	1963
2)	Samanta, R.K. Development Communication for Agriculture. BR Publishing Corporation, Delhi.	1990
3)	Singh, A.K., Lakhan Singh, R. and Roy Burman. Dimensions of Agricultural Extension. Aman Publishing House, Meerut	2006
4)	Sandhu, A.S. Textbbok on Agricultural Communication: Process and Methods. Oxford and IBH Publishing Pvt.Ltd., New Delhi.	1993

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	3	-	2	3	3	2	2	1	1	2	1
CO-2	3	1	3	-	2	3	3	3	1	1	1	2	1
CO-3	3	2	3	-	3	2	3	3	2	1	1	2	1
CO-4	3	2	3	-	3	2	3	2	1	1	1	2	1
CO-5	2	2	3	-	2	2	3	3	1	1	1	2	1
CO-6	1	2	3	-	2	2	3	3	1	1	1	3	1
Average	2.3	1.7	3.0	-	2.3	2.3	3.0	2.7	1.3	1.0	1.0	2.2	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-208	Fundamentals of Agricultural Extension Education	2	0	2	30	5	15	50	100	3(2+1)

9. BSAG-209 Farm Machinery and Power 2(1+1) Theory

S. No.	**Course Objectives**
1.	To explain why agricultural machinery and equipment are important.
2.	To develop ability to identify different areas of agriculture where machinery and equipment are used.
3.	To describe some of the different types of agricultural machinery and equipment used for crop production.
4.	To analyze the operation of farm machinery equipments and evaluate the harvesting, threshing and land preparation (heavy) machinery needed for agricultural farm.

Unit	**Content**	**Teaching hours**
I	StatusofFarmPowerinIndia,SourcesofFarmPower,I.C.engines,workingprinciples of I Cengines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solvedproblems,	4
II	Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of atractor,FamiliarizationwithPowertransmissionsystem:clutch,gearbox,differential and final drive of a tractor , Tractortypes,	4
III	Cost analysis of tractor power and attached implement, Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for interculturaloperations,	3
IV	Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshingequipment.	3

Experiment	Topic
1)	Study of different components of I.C. engine.
2)	To study air cleaning and cooling system of engine.
3)	Familiarization with clutch, transmission, differential and final drive of a tractor,
4)	Familiarization with lubrication and fuel supply system of engine.
5)	Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving,
6)	Familiarization with operation of power tiller, Implements for hill agriculture,
7)	Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow .
8)	Familiarization with seed cum-fertilizer drills their seed metering mechanism and calibration, planters and trans planter
9)	FamiliarizationwithdifferenttypesofsprayersanddustersFamiliarizationwithdifferent inter cultivation equipment,
10)	Familiarization with harvesting and threshing machinery.

S. No.	Course Outcomes (CO)
CO 1	Student will be able to understand various sources of farm power and their uses.
CO 2	Student will be able to understand about working of IC Engines and their uses in modern equipments.
CO 3	Student will be able to understand about various parts of tractors and their mechanism.
CO 4	Student will be able to understand the financial aspects of using farm power and the various implements used in agriculture farm for various purposes.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Principles of Agricultural Engineering Vol. 1. Reprint Edition: 2012. by T. P. Ojha, A. M. Michael, Jain Brothers, New Delhi	2012
2)	Elements of Agricultural Engineering by JagadishwarSahay. Forth Edition, 2010 Standard Distributor and Publishers, New Delhi	2010
3)	AgriculturalEngineeringbyOPSinghal(2011)AmanPublishingHouse, Meerut	2011
4)	Principles of Farm Machineies by R A Kepner, R Bainer, E C Barger (2000) CBS Publishers and Distributors, Delhi	2000

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PsO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	1	2	-	-	-	-	-	-	-	-	2
CO2	2	1	1	2	-	-	-	-	-	-	-	-	2

CO3	2	1	1	2	-	-	-	-	-	-	-	-	2
CO4	2	1	1	2	-	-	-	-	-	-	-	-	2
Average	2.0	1.0	1.0	2.0	-	-	-	-	-	-	-	-	2.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-209	Farm Machinery and Power	1	0	2	30	5	15	50	100	2(1+1)

SEMESTER-III

1. BSAG-301Crop Production Technology-I (Kharif Crops)2(1+1) Theory

S. No.	Course Objectives
1.	To define the kharif season crops, its classification (cereal crops ,oilseed crops, pulse crops, sugar crops, fodder crops) and its importance in agriculture and national economy
2.	To discuss the production techniques of kharif crops and their origin, economic importance, geographical distribution and botanical description.
3.	To develop skill to Implement the sowing methods of kharif crops in the field and their management.
4.	To enable to distinguish all kharif crops (rice, millet, soybean, moong, etc.) with their cultivation practices.

Unit	Content	Teaching hours
I	Origin, geographical distribution, economic importance, soil and climatic requirements,varieties,	4
II	Cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and finger millet,	4
III	Pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean;	3
IV	fibre crops- cotton & jute; forage crops-sorghum, cowpea, cluster bean and napier.	3

Experiment	Topic
1)	Rice nursery preparation, transplanting of rice.
2)	Sowing of soybean, pigeonpea and mungbean. Maize, Groundnut and cotton.
3)	Effect of seed size on germination and seedling vigour of kharifseason crops,
4)	Effect of sowing depth on germination of kharif crops.
5)	Identificationofweedsinkharifseasoncrops,topdressingandfoliarfeedingofnutrients,
6)	study of yield contributing characters and yield calculation of kharif season crops,
7)	Studyofcropvarietiesandimportantagronomicexperimentsatexperimentalfarm.Study of forageexperiments,
8)	Morphological description of kharif season crops,
9)	Visit to research centers of related crops.

S. No.	Course Outcomes (CO)
CO 1	Acquaint the knowledge on kharif season crops, its classification (cereal crops ,oilseed crops, pulse crops, sugar crops, fodder crops) and importance in agriculture and national economy.
CO 2	Discuss the production techniques of kharif crops and their origin, economic importance, geographical distribution and botanical description.

CO 3	Implement the sowing methods of kharif crops in the field and their management.
CO 4	Distinguish all kharif crops (rice, millet, soybean, moong , etc.) with their cultivation practices.

S.No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Modern technique of raising field crops by Chiddasingh	1983
2)	Agronomy of field crop by S.R. Reddy	2008
3)	Hand book of Agriculture, ICAR New Delhi	2020

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	1	-	1	-	-	1	2	2	1	1
CO-3	2	1	1	1	1	-	1	-	1	2	-	1	-
CO-4	2	1	1	1	-	1	-	-	1	1	1	1	1
Average	2.3	1.5	1.5	1.0	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-301	Crop Production Technology – I (Kharif Crops)	1	0	2	30	5	15	50	100	2(1+1)

2. BSAG-302 Fundamentals of Plant Breeding 3(2+1) Theory

S. No.	Course Objectives
1.	To introduce students with various contribution of plant breeding and field of its milestone in agriculture
2.	To understand genetics of qualitative and quantitative characters, population genetics.
3.	To study major breeding objectives and procedures including conventional as well as innovative approaches biotechnological tools used for development of varieties.
4.	To explain various natural system such as male sterility, SI important for designing hybrid seed production methodology.

Unit	Content	Teaching hours

I	Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility- genetic consequences, cultivar options.	7
II	Domestication, Acclimatization and Introduction; Centres of origin/ diversity,componentsofGeneticvariation;Heritabilityandgeneticadvance;Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multilineconcept.	7
III	Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes Ear to row method, Modified Ear to Row, recurrent selection schemes; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties;	7
IV	Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.	7

Experiment	Topic
1)	Plant Breeder's kit, Study of germplasm of various crops.
2)	Study of floral structure of self-pollinated and cross pollinated crops.
3)	Emasculation and hybridization techniques in self & cross pollinated crops.
4)	Consequences of inbreeding on genetic structure of resulting populations.
5)	Study of male sterility system.
6)	Handling of segregation populations.
7)	Methods of calculating mean, range, variance, standard deviation, heritability.
8)	Designs used in plant breeding experiments, analysis of Randomized Block Design.
9)	To work out the mode of pollination in a given crop and extent of natural out-crossing.
10)	Prediction of performance of double cross hybrids.

S. No.	Course Outcomes (CO)
CO 1	Listing out various contribution, the significance of plant breeding and its milestone in the field of agriculture.
CO 2	Develop an understanding about modes of selection, the evolution of crops, conservation of genetic resources, population genetics and significance of IPR in crop improvement.

CO 3	Sketching the breeding objectives and implementation of different selection methods and hybridization techniques for various field crop.
CO 4	Distinguish the breeding method for self, cross and asexually propagated crops.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Plant Breeding Principles and Methods B. D. Singh Kalyani Publication New Delhi.	2018
2)	Principles and Practices Plant Breeding J. R. Sharma McGraw Hill Publishing company Limited , New Delhi.	1994
3)	Introduction to Plant Breeding R. C. Choudhary Oxford and IBH. Publishing Company, New Delhi.	2008
4)	Elementary Principles of Plant Breeding R. C. Choudhary Oxford and IBH. Publishing Company, New Delhi.	2020

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	1	2	3	1	-	1	-	-	-	-	1
CO-2	3	3	1	1	3	3	-	1	-	-	-	-	1
CO-3	2	2	1	3	3	2	1	1	-	-	-	-	1
CO-4	2	3	1	3	2	2	1	1	-	-	-	-	1
Average	2.5	2.8	1	2.3	2.8	2.0	1.0	1.0	-	-	-	-	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-302	Fundamentals of Plant Breeding	2	0	2	30	5	15	50	100	3(2+1)

3. BSAG-303 Diseases of Field & Horticultural Crops & their Management-I 3(2+1)

S. No.	Course Objectives
1.	To educate basic knowledge of the causal organisms and systematic positions involved in causing pathogens in crops are studied.
2.	To develop understanding about isolation of culture, techniques, identification and biology of pathogens in the laboratory.
3.	To enable to demonstrate of field, horticultural, medicinal crops and cash crops studied symptoms,

	involved pathogen, disease cycle, best possible management practices available and solved causing reducing yield in crops.
4.	To develop skills for applying fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen, manage crops disease corresponding to involved pathogen and examine loss in quality and yield and to develop skills about detection and diagnosis of plant diseases and application of pesticides.

Unit	Content	Teaching hours
I	Symptoms, etiology, disease cycle and management of major diseases of following crops **Fieldcrops:** Rice Maize Sorghum Bajra Finger millet	7
II	**Oilseed:** Groundnut **Pulses:** Soybean, Black & green gram Pigeonpea, **Cash Crop:** Caster Tobacco	7
III	**Horticultural Crops:** Guava Banana Papaya Pomegranate	7
IV	**Cruciferous vegetables:** Cruciferous vegetables: Brinjal,Tamato, Okra Beans, Ginger, Colocasia **Plantation Crops** Coconut, Tea, Coffee	7
	Total	28

Practical

Experiment	Topic
	Identification and histopathological studies of selected diseases of field and Horticultural cropscoveredintheory.CollectionandpreservationofdiseaseSpecimen(Note:Students should submit 50 pressed and well-mountedspecimens)
1)	Rice: blast, brownspot, bacterial blight, sheath blight, false smut, KhairaAndtungro
2)	Maize: stalkrots,downymildew,leafspots,Sorghum:smuts,grain mold And anthracnose, Bajra: downy milde wander got;
3)	Finger millet: Blast and leafspot, Groundnut: early and late leaf spots,wilt.
4)	Soybean: Rhizoctonia blight,bacterialspot,seed and seedling rot and mosaic,Pigeonpea:Phytophthora blight, wilt and sterility mosaic
5)	Black&greengram:Cercosporaleafspotandanthracnose,webblightandYellowmosaic,
6)	Castor: Phytophthora blight; Tobacco: black shank,black root rot and Mosaic
7)	Guava: wilt and anthracnose; Papaya:footrot,leaf curl and mosaic, Papaya Ring spot,
8)	Banana:Panama wilt, bacterial wilt, Sigatoka and bunchy top
9)	Pomegranate:bacterialblight,wilt
10)	Cruciferous vegetables:Alternaria leaf spot and black rot,
11)	Tomato: damping off, wilt,early and lateblight, buck eye rot and leaf curl And mosaic
12)	Brinjal: Phomopsis blight and fruitrot and Sclerotiniablight,
13)	Okra:Yellow Vein Mosaic,Beans:anthracnose and bacterial blight
14)	Ginger:softrot;Colocasia:Phytophthora blight;

15)	Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust
16)	Field visit for the diagnosis of field problems

S. No.	Course Outcomes (CO)
CO 1	By the end of this course students studied symptoms, involved pathogens, disease cycle, best possible management practices available and able to resolve the problem of yield reduction in crops.
CO 2	In this course students will be able to prepare culture, identify and understand the biology of pathogens in the laboratory and students will able to understand best possible management of field crops.
CO 3	In this course students apply different fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen, manage crops disease corresponding to involved pathogen and examine loss in quality and yield.
CO 4	By the end of this course students develop skills about detection and diagnosis of plant diseases and application of pesticides.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Agrios, GN. Plant Pathology. Acad.Press	2010
2)	Diseases of Horticultural Crops fruits By VermaL.Rand Sharma R.c,Indus Publishing company,New Delhi	1999
3)	Diseases of fruit crops By V.N.Pathak,Oxford& IBH publication, New Delhi	1986
4)	Diseases of fruit crops By R.S. Singh, Oxford & IBH publication, New Delhi	1986
5)	Diseases of Fruits and vegetables S.A.M.H.Naqvi, Springer Science &Business Media	2007
6)	Diseases of Plantation Crops By P. Chowdappa, Pratibha Sharma IPS263pp	2014
7)	Advances in the diseases of Plantation crops & spices P.Santha Kumari, International Book Distributing Company, 247 pp	2004
8)	Mehrotra R S & Aggarwal A. Plant Pathology.7 Ed.Tata Mc Graw Hill Publ.Co.Ltd	2007
9)	Vegetable Diseases: A Colourfull Handbook by Steven T. Koike, Peter GladersandAlbertPaulus, Academic Press,pp 448	2006
10)	Diseases of Vegetables crops by R.S.Singh Oxford & IBH publication, New Delhi	1987
11)	Plant Diseases Singh RS.2008 Ed .Oxford&IBH.Pub.Co.	2008
12)	Diseases of Crops Plantsin India By PHI learning Pvt. Ltd, pp 548	2009
13)	Diseases of Vegetable crops by AlferdSteferud, Biotech Books, NewDelhi	2005
14)	Mehrotra RS & Aggarwal A. Plant Pathology. 7Ed.Tata Mc Graw Hill Publ.Co. Ltd	2007

15)	Diseases of Vegetable Crops, Diagonosisand Management Dinesh Singh and P.Chodappa, Today and Tomorrow Printers,pp734	2014

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	1	1	-	-	-	-	-	-	-	-
CO-2	1	2	1	1	1	-	1	-	-	-	-	-	-
CO-3	1	1	1	2	-	-	1	-	-	-	-	-	-
CO-4	1	-	1	1	1	-	-	-	-	-	-	-	-
CO-5	-	1	1	1	-	-	1	-	-	-	2	-	-
Average	1.3	1.3	1.0	1.3	1.0	-	1.0	-	-	-	2.0	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-303	Diseases of Field and Horticultural Crops and their Management -I	2	0	2	30	5	15	50	100	3(2+1)

4. BSAG-304 Communication Skills and Personality Development 2 (1+1) Theory

S. No.	Course Objectives
1.	To understand how communication works, gain active listening and responding skills.
2.	To develop skills to analyze the importance of body language in effective communication.
3.	To develop understanding to acquire different strategies of reading texts and inculcate confidence by providing opportunities for oral and written expressions.
4.	To develop evaluative thinking on variations between General & Technical Articles with the way of writing, how to prepare for public speaking and the principles to be followed and significance of Field Diary & Lab Record for an agriculture student.

Unit	Content	Teaching hours
I	Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills,	4
II	Oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.	3

III	Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation,	4
IV	Public speaking; Group discussion. Organizing seminars and conferences.	3

Experiment	Topic
1)	Listening and note taking, writing skills, oral presentation skills;
2)	Field diary and lab record;
3)	Indexing, footnote and bibliographic procedures.
4)	Reading and comprehension of general and technical articles,
5)	Precise writing, summarizing, abstracting;
6)	Individual and group presentations.

S. No.	Course Outcomes (CO)
CO 1	Acquaint the knowledge on Listening, Speaking, Reading and Writing Skills along with classification; General & Technical Article and writing principles of these articles; comparison between Individual & Group presentation; organization of seminars & conferences and formats of Public Speaking.
CO 2	Develop the understanding on usage of different classified skills according to situations, reading and writing of general & technical articles and the preparation and planning before organizing seminars and conferences.
CO 3	Develop the skill of students towards general & technical writing, principles of reading and writing of general & technical articles and implication.
CO 4	Develop the evaluative thinking on variations between General & Technical Articles with the way of writing, how to prepare for public speaking and the principles to be followed and significance of Field Diary & Lab Record for an agriculture student

S. No	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	BalasubramanianT.1989.ATextbookofPhoneticsforIndianStudents. Orient Longman, NewDelhi.	1989
2)	Balasubrmanyam M. 1985. Business Communication. Vani Educational Books, New Delhi.	1985
3)	Verma, KC. 2013. The Art of Communication. Kalpaz.	2013
4)	Mamatha Bhatnagar and Nitin Bhatnagar. 2011. Effective Communication and Soft Skills. Person Education.	2011
5)	Hornby, A.S. 1975. Guide to patterns and usage in English. Oxford University, New Delhi.	1975

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	-	-	1	1	-	1	3	2	1	3

CO-2	2	2	2	-	-	1	1	-	1	3	2	1	2
CO-3	2	1	1	-	-	1	1	-	1	2	2	1	2
CO-4	1	1	1	-	-	1	1	-	1	1	1	1	1
Average	**2**	**1.5**	**1.5**	**-**	**-**	**1**	**1**	**-**	**1**	**2.3**	**1.8**	**1.0**	**2.0**

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-304	Communication Skills and Personality Development	1	0	2	30	5	15	50	100	2(1+1)

5. BSAG-305 Agri-Informatics 2(1+1) Theory

S. No.	**Course Objectives**
1.	To acquaint with basic terms of software and hardware, input/output devices, database, World Wide Web, DBMS in Agriculture, ICT in Agriculture, etc.
2.	To develop understanding of application software, smart phone apps, programming languages, geospatial technology for generating valuable agri-information, decision support systems, etc.
3.	To develop skills in selection of input and output devices, software utilization, appropriate ICT tools, preparation of crop-planning using IT tools, etc.
4.	To educate for applying computer models for understanding plant processes, IT application for computation of water and nutrient requirement of crops, computer-controlled devices (automated systems) for agri-input management and smart phone apps in agriculture for farm advises, market price, postharvest management, etc.

Unit	**Content**	**Teaching hours**
I	IntroductiontoComputers,OperatingSystems,definitionandtypes,ApplicationsofMS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture,	3
II	World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations. E-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes.	4
III	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;	4

IV	Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.	3

Experiment	Topic
1)	Study of Computer Components, accessories, practice of important DOS Commands.
2)	Introductionofdifferentoperatingsystemssuchaswindows,Unix/Linux,Creating,Files & Folders, FileManagement.
3)	Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document.
4)	MS-EXCEL-Creatingaspreadsheet,useofstatisticaltools,writingexpressions,creating graphs, analysis of scientificdata.
5)	MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system.
6)	Introduction to World Wide Web (WWW).
7)	Introduction of programming languages.
8)	Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools.
9)	Introduction of Geospatial Technology for generating valuable information for Agriculture.
10)	Hands on Decision Support System. Preparation of contingent crop planning.

S. No.	Course Outcomes (CO)
CO 1	To acquaint with basic terms of software and hardware, input/output devices, database, World Wide Web, DBMS in Agriculture, ICT in Agriculture, etc.
CO 2	To develop understanding of application software, smart phone apps, programming languages, geospatial technology for generating valuable agri-information, decision support systems, etc.
CO 3	To develop skills in selection of input and output devices, software utilization, appropriate ICT tools, preparation of crop-planning using IT tools, etc.
CO 4	To educate for applying computer models for understanding plant processes, IT application for computation of water and nutrient requirement of crops, computer-controlled devices (automated systems) for agri-input management and smart phone apps in agriculture for farm advises, market price, postharvest management, etc.

S.No	Name of Authors/ Books / Publishers	Year of Publication/ Reprint

1)	Computer Fundamentals by Pradeep K. Sinha and Priti Sinha, III edition, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.	2004
2)	Mastering Office Professional for window 95, BPB Publications, B-14, Connaught Place, New Delhi – 110 001.	2012

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	3	2	2	1	1	1	1	-	-	1	-	1	2
CO-2	2	1	2	-	1	1	-	-	-	-	1	-	1
CO-3	1	2	2	1	2	-	-	-		1		1	2
CO-4	2	2	1	1	2	1	-	-	-	1	-	-	1
Average	2.0	1.8	1.8	1.0	1.5	1.0	1.0	-	-	1.0	1.0	1.0	1.5

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-305	Agri-Informatics	1	0	2	30	5	15	50	100	2(1+1)

6. BSAG-306 Production Technology for Vegetable and Spices 2 (1+1) Theory

S. No.	Course Objectives
1.	To educate the production technology of vegetables and spices.
2.	To educate basic knowledge of new planting systems and fertilizer application in the field.
3.	To educate basic knowledge of seed production of vegetables.
4.	To develop skills to analyze harvesting time and techniques of various vegetable and spices crops, storage conditions.

Unit	Content	Teaching hours
I	Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and	3
II	cultivation practices such as time of sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting and yield, physiological disorders, of important vegetable.	4

III	spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean,Peas; Cole crops such as Cabbage, Cauliflower, Knol-khol;	3
IV	Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).	4

Experiment	Topic
1)	Identification of vegetables & spice crops and their seeds.
2)	Nursery raising.
3)	Direct seed sowing and transplanting.
4)	Study of morphological characters of different vegetables & spices.
5)	Fertilizers applications.
6)	Harvesting & preparation for market.
7)	Economics of vegetables and spices cultivation.

S. No.	Course Outcomes (CO)
CO 1	Educate about concepts of vegetable and spices production, Importance in human nutrition and national economy, etc.
CO 2	Describe about origin, area, production, improved varieties, soil and climate requirement for different season vegetable and spice crops, etc.
CO 3	Execute the various cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, etc.
CO 4	Analyze the harvesting time and techniques of various vegetable and spices crops, storage conditions and requirements as per the cultivated crops, etc.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Vegetables, B. Choudhary	2014
2)	Vegetable, Tuber and Spices S.Thamburaj	2014
3)	Production technology of vegetable crops S. P. Singh	1989
4)	Introduction to spices and plantation crops N.Kumar and others	2020

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	2	1	2	-	2	-	-	-	1	-	2	1

CO-2	2	2	2	1	-	-	1	-	-	-	1	2	-
CO-3	1	1	1	1	-	1	-	-	-	2	1	-	1
CO-4	1	2	1	1	-	-	1	-	-	-	-	-	-
Average	1.3	1.8	1.3	1.3	-	1.5	1.0	-	-	1.5	1.0	2.0	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-306	Production Technology for Vegetables and Spices	1	0	2	30	5	15	50	100	2(1+1)

7. BSAG-307 Environmental Studies and Disaster Management 4(3+1) Theory

S. No.	**Course Objectives**
1.	To give an outline of the environment and its various challenges and understand the complex relationships components of the environment.
2.	To develop skills in identification of useful natural resources and their management practices and to enhance the awareness of the factors sensitive to the environment and environmental challenges.
3.	To make understand the values, feelings and participation of society in protection activities of the environment.
4.	To encourage individual or community involvement to the overall benefit of the environment.

Unit	**Content**	**Teaching hours**
I	Multidisciplinary nature of environmental studies Definition, scope and importance. Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. • Equitable use of resources for sustainable lifestyles.	11

II	Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	10
III	Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, and watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control ofPollution)Act.WildlifeProtectionAct.ForestConservationAct.Issuesinvolvedin enforcement of environmental legislation. Publicawareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.	11
IV	Disaster Management Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents. Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.	**10**

Experiment	**Topic**
1)	Pollution case studies. Case Studies-
2)	Fieldwork:Visittoalocalareatodocumentenvironmentalassetsriver/forest/grassland/ hill/mountain,

3)	Visit to a local polluted site-Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and
4)	Study of simple ecosystems-pond, river, hill slopes, etc.

S. No.	Course Outcomes (CO)
CO 1	Acquire the knowledge of the environment and its various challenges and understand the complex relationships components of the environment.
CO 2	Develop the skills in identification of useful natural resources and their management practices and aware about the factors sensitive to the environment and environmental challenges.
CO 3	Understand the values, feelings and participation of society in protection activities of the environment.
CO 4	Encourage to individual or community involvement to the overall benefit of the environment.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Ecology and Environment by P.D. Sharma, Rastogi Publication. Meerut	2009
2)	Environmental Sciences by S.S. Purohit, Q.J. Shammi and A.K. Agrawal, Student Edition, Jodhpur.	2007
3)	Disaster Management by Sarthak Singh. Oxford Book Company.	2010
4)	The biodiversity of India, Maplin Publishing Pvt. Ltd., Ahmadabad.	2002

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	2	2	1	1	-	-	-	3	1	-
CO-2	3	2	2	2	2	1	1	-	-	-	3	1	-
CO-3	3	2	2	2	2	1	1	-	-	-	3	1	-
CO-4	3	2	2	2	2	1	1	-	-	-	3	1	-
CO-5	3	2	2	2	2	1	1	-	-	-	3	1	-
Average	3.0	3.0	2.0	3.0	3.0	3.0	3.0	2-.0	2-.0	2.0	2.0	3.0	3.0

-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-	Environmental	2	0	2	30	5	15	50	100	3(2+1)

307	Studies and Disaster Management									

8. BSAG-308 Statistical Methods2(1+1) Theory

S. No.	Course Objectives
1.	To educate basics terms used in statistics and biostatistics.
2.	To develop understanding of use of various formulas, principles and methods of statistical calculations used in agriculture.
3.	To develop skills in methods of collection of any type of data, classification of data, presentation of data, analysis of data, descriptive statistics, parametric and non-parametric tests, etc.
4.	To develop ability to analyze results of statistical calculations and their validation and to develop ability to make statistical hypothesis and design experiment in agriculture.

Unit	Content	Teaching hours
I	Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof).	4
II	SimpleProblemsBasedonProbability.Binomial&PoissonDistributions,Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation.	3
III	LinearRegressionEquations.IntroductiontoTestofSignificance,Onesample&two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.	4
IV	Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.	3

Experiment	Topic
1)	Graphical Representation of Data.
2)	Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles.
3)	Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles.
4)	Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data).
5)	Moments, Measures of Skewness & Kurtosis (Grouped Data).
6)	Correlation & Regression Analysis.
7)	Application of One Sample t-test.
8)	Application of Two Sample Fisher's t-test.
9)	Chi-Square test of Goodness of Fit.

10)	Chi-Square test of Independence of Attributes for 2 ×2 contingency table.
11)	Analysis of Variance One Way Classification.
12)	Analysis of Variance Two Way Classification.
13)	Selection of random sample using Simple Random Sampling

S. No.	Course Outcomes (CO)
CO 1	Educate basics terms used in statistics and biostatistics.
CO 2	Develop understanding of use of various formulas, principles and methods of statistical calculations used in agriculture.
CO 3	Develop the skills in methods of collection of any type of data, classification of data, presentation of data, analysis of data, descriptive statistics, parametric and non-parametric tests, etc.
CO 4	Develop the ability to analyze results of statistical calculations and their validation and develop the ability to make statistical hypothesis and design experiment in agriculture.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Statistical methods for Agricultural workers by Panse V.G. Sukhatme P.V.	1978
2)	Statistical Methods by Snedocor and Cochran.	1967
3)	A Text book of Agriculture Statistics by R. Rangaswami	1998
4)	Statistics for Agriculture Sciences by Nageshwar Rao G.	2017

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	-	1	2	1	-	-	-	-	-	-	-	-
CO-2	2	-	1	2	1	-	-	-	-	-	-	-	-
CO-3	1	-	1	2	1	-	-	-	-	-	-	-	-
CO-4	2	1	1	2	2	1	1	-	-	-	-	-	-
CO-5	2	1	1	2	2	1	1	-	-	-	-	-	-
Average	1.8	1.0	1.0	2.0	1.3	1.0	1.0	-	-	-	-	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			

BSAG-308	Statistical Methods	1	0	2	30	5	15	50	100	2(1+1)

9. BSAG-309 Livestock& Poultry Management 3(2+1) Theory

S. No.	Course Objectives
1.	To focus on different advancements in the fields of animal rearing and its production with special importance on environmental and also its production management.
2.	To educate students to identify the different species of domestic animals i.e. cattle, buffalo, sheep, poultry etc.
3.	To develop skills of handling and care management, disease management of different livestock and poultry.
4.	To acquaint students with basic knowledge of feedstuffs and Nutrients and their functions, Feed ingredients for ration for livestock and poultry, Feeding of livestock and poultry.

Unit	Content	Teaching hours
I	Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry.	6
II	Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers. Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.	8
III	Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.	8
IV	Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.	6

Experiment	Topic
1)	External body parts of cattle, buffalo, sheep, goat, swine and poultry.
2)	Handling and restraining of livestock.
3)	Identification methods of farm animals and poultry.
4)	Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records.
5)	Judging of cattle, buffalo and poultry.
6)	Culling of livestock and poultry.
7)	Planning and layout of housing for different types of livestock.
8)	Clean milk production, milking methods.
9)	Hatchery operations, incubation and hatching equipment.
10)	Management of chicks, growers and layers.
11)	Debeaking, dusting and vaccination.

12)	Economics of cattle, buffalo, sheep, goat, swine and poultry production.
13)	Computation of rations for livestock. Formulation of concentrate mixtures.

S. No.	Course Outcomes (CO)
CO 1	Give knowledge of indigenous and exotic breeds of cattle, buffalo, sheep , goat and poultry birds (poultry, duck, fowl).
CO 2	Develop the understanding of principles, planning, and technical approach for reproduction management in different farm animals. And introduce the diseases of livestock and poultry and its prevention (including vaccination schedule) and control of important diseases of livestock and poultry.
CO 3	Develop the ability to select types of houses suited in specific climatic conditions for best management of calves, growing heifers and milch animals.
CO 4	Develop the understanding digestion system of livestock and poultry, classification of feedstuffs, nutrients and their functions, feed supplements, feed additives, and feeding of livestock and poultry and develop ability to calculate daily ration of cattle.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Sheep Production and Breeding – C. L. Arora and R. C. Garg	1998
2)	Livestock and poultry Production – Harban Singh and Moore, E. N. (1968)	1968
3)	Goat, Sheep and Pig Production and Management – Jagdish Prasad, (1996), Kalyani	1996
4)	Text Book of Animal Husbandry – G. C. Banergee (1999), 9th ed Oxford and IBH	1999

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	2	2	2	1	1	1	1	-	-	1	1	1	2
CO-2	2	1	2	2	1	1	1	-	-	-	-	-	1
CO-3	2	2	-	1	-	-	1	-		1	1	1	1
CO-4	2	2	1	1	2	1	-	-	-	2	-	-	1
CO-5	2	2	-	1	2	1	-	-	-	2	-	-	1
Average	2.0	1.8	1.7	1.2	1.5	1.0	1.0	-	-	1.5	1.0	1.0	1.2

Course Code	Course Title	Periods per week	Evaluation Scheme			Credit (Theory +
			Internal Exam	External	Subject	

		L	T	P	Midterm Theory Exam	Assignment	Practical	Theory Exam	Total	Practical)
BSAG-309	Livestock and Poultry Management	3	0	2	30	5	15	50	100	4(3+1)

10. BSAG-310 Principles of Animal Nutrition 2(1+1)

S. No.	Course Objectives
1.	To focus on different advancements of nutrient chemical composition of animal and its food, digestive system of farm animals.
2.	To educate students to identify the Carbohydrates, lipid and protein content.
3.	To educate students to essential minerals and vitamins.
4.	To acquaint students with basic knowledge of feeds and partition of feed energy within animal system.

Unit	Content	Teaching hours
I	Introduction to expanding field of nutrient chemical composition of animal and its food, digestive system of farm animals. Metabolism of carbohydrates lipids and proteins in ruminants and non-ruminants.	4
II	Carbohydrates, lipid and protein content in various classes of feeds. Concept of essential amino acids for non-ruminants and protein quality of feeds.	3
III	The absorption and metabolism of essential minerals and vitamins: symptoms of their deficiencies: minerals and vitamin content of various classes of feeds.	3
IV	The nutritive evaluation of feeds for energy and protein, digestibility of feeds and partition of feed energy within animal system of expressing energy values of feeds nutrient requirements of farm animals for maintenance, growth, reproduction and lactation. Growth stimulating substances.	4

Practicales

Experiment	Topic
1)	Understanding the nutritive value of feed stuffs.
2)	Study of forages, fodders, cereals, cereal offal's andoilcakes.
3)	Study of animals avain and marine offal's minerals and vitamins supplements and other feed 40 additives.
4)	Proximate analysis of feed samples for musture, crude protein, crude fat, crude fiber, ash and nitrogen free extractive.
5)	Formulation of least cost ration for cattle, buffaloes, sheep, goat, swine and poultry.

S. No.	Course Outcomes (CO)
CO 1	To focus on different advancements of nutrient chemical composition of animal and its food, digestive system of farm animals.
CO 2	To educate students to identify the Carbohydrates, lipid and protein content.
CO 3	To educate students to essential minerals and vitamins.
CO 4	To acquaint students with basic knowledge of feeds and partition of feed energy within animal system.

S. No.	Name of Authors/ Books / Publishers	Year ofPublication/ Reprint
1)	Principles Of Animal Nutrition And Feed Technology-D.V. Reddy	2018
2)	Applied Nutrition Livestock Poultry Rabbits And Laboratory Animals 3Ed- REDDY D. V	2020
3)	Veterinary Pathology 7Ed- SASTRY G. A	2019

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	-	1	2	1	-	-	-	-	-	-	-	-
CO-2	2	-	1	2	1	-	-	-	-	-	-	-	-
CO-3	1	-	1	2	1	-	-	-	-	-	-	-	-
CO-4	2	1	1	2	2	1	1	-	-	-	-	-	-
CO-5	2	1	1	2	2	1	1	-	-	-	-	-	-
Average	1.8	1.0	1.0	2.0	1.3	1.0	1.0	-	-	-	-	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-310	Principles of Animal Nutrition	1	0	2	30	5	15	50	100	2(1+1)

SEMESTER – IV

1. BSAG-401 Crop Production Technology - II *(Rabi* crops) 2(1+1)

S. No.	Course Objectives
1.	To define the rabi season crops, its classification (cereal crops ,oilseed crops, pulse crops, sugar crops, fodder crops) and its importance in agriculture and national economy.
2.	To discuss the production techniques of rabi crops and their origin, economic importance, geographical distribution and botanical description.
3.	To implement the sowing methods of rabi crops in the field and their management.
4.	To develop skills to distinguish all rabi crops (wheat, barley, pea, chickpea, mustard, sugarcane etc.) with their cultivation practices.

Unit	Content	Teaching hours
I	Cereals–Wheat, sorghum, barley and maize (graincorn, sweet corn and babycorn) Pulses–Chickpea, lentil, pea, Frenchbean	4
II	Oil seeds–Sunflower, safflower mustard and linseed Sugarcrop – Sugarcane and sugarbeet	3
III	Other crops – Potato, tobacco and sweet potato Medicinal and aromaticcrops-mentha,lemongrass and citronella	4
IV	Foragecrops– Lucerne,berseem,maize,oat and sorghum	3
	Total	14

Practical

Experiment	Topic
1)	Sowing methods of wheat
2)	Sowing method ofsugarcane,
3)	Identification of weeds in rabi season crops,
4)	Study of morphological characteristics of rabicrops
5)	Calculations of plant population, seed rate and fertilizersdoses.
6)	Study of yield contributing characters of rabi season crops
7)	Study of important agronomic experiments of rabi crops at experimental farms.
8)	Study of rabi for age experiments
9)	Oil extraction of medicinal crops
10)	Visit to research stations of related crops.

S. No.	Course Outcomes (CO)
CO 1	Acquaint the knowledge on the rabi season crops, its classification (cereal crops ,oilseed crops, pulse crops, sugar crops, fodder crops) and its importance in agriculture and national economy.

CO 2	Discuss the production techniques of rabi crops and their origin, economic importance, geographical distribution and botanical description.
CO 3	Implement the sowing methods of rabi crops in the field and their management.
CO 4	Distinguish all rabi crops (wheat, barley, pea, chickpea, mustard, sugarcane etc.) with their cultivation practices.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Modern technique of raising field crops by Chiddasingh	2020
2)	Agronomy of field crop by S.R.Reddy	2016

Articulated attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	1	-	1	-	-	1	2	2	1	1
CO-3	2	1	1	1	1	-	1	-	1	2	-	1	-
CO-4	2	1	1	1	-	1	-	-	1	1	1	1	1
Average	2.3	1.5	1.5	1	1	1	1	-	1	1.8	1.5	1	1

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-401	Crop Production Technology –II (Rabi Crops)	1	0	2	30	5	15	50	100	2(1+1)

2. BSAG-402Production Technology for Ornamental Crops, MAP and Landscaping2(1+1)

S. No.	Course Objectives
1.	To define concepts of ornamental crop production, medicinal and aromatic plants and landscaping, Importance of medicinal and aromatic plants in national economy, etc.
2.	To discuss various principles of landscaping, uses of landscape trees, shrubs and climbers, production technology of important ornamental crops, etc.
3.	To demonstrate various Package of practices for loose flowers and their transportation, storage house and required condition for cut and loose flower, etc.
4.	To investigate the various problems with the production technology of medicinal and aromatic plants, etc.

Unit	Content	Teaching hours
I	ImportanceandscopeofornamentalcropsandlandscapingImportanceandscopeof medicinal and aromaticplants Principles of landscaping Landscapeuses of trees, shrubs and climbers Productiontechnologyofimportant cut flowers like roseunderprotectedconditions	3
II	Production technology of important cut flowers like gerbera, Carnation underprotectedconditionsProductiontechnologyofimportantcutflowerslikelilium and orchids under protected conditions Production technology of important cut flowers like gladiolus, tuberoseunderopenconditions.	4
III	Production technology of important cut flowers like chrysanthemum under open conditions. Package of practices for loose flower slikemarigoldandjasmineunder openconditions.Productiontechnologyofimportantmedicinalplantslikeasparagus, aloe, costus. Production technologyofimportant medicinal plants like Cinnamon periwinkle,isabgol.	4
IV	Production technology of important aromatic plants like mint, lemongrass, citronella, palmarosa. Production technology of important aromatic plants like ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops Processing and value addition in MA Psproduce	3
	Total	14

Practical

Experiment	Topic
1)	Identification of Ornamental plants and flower crops
2)	Identification of Medicinal and Aromatic Plants
3)	Propagation of Ornamental plant
4)	Propagation of medicinal and aromatic plants
5)	Nursery bed preparation and seed sowing
6)	Training and pruning of Ornamental plants
7)	Planning and layout of garden
8)	Bed preparation and planting of MAP
9)	Protected structures–care and maintenance

10)	Intercultural operations inflowers
11)	Intercultural operations in MAP
12)	Harvesting and post harvest handling of cut flowers
13)	Harvesting and post harvest handling of loose flowers
14)	Processing ofMAP
15)	Visitto commercial flower
16)	Visitto MA Punit

S. No.	Course Outcomes (CO)
CO 1	To define concepts of ornamental crop production, medicinal and aromatic plants and landscaping, Importance of medicinal and aromatic plants in national economy, etc.
CO 2	To discuss various principles of landscaping, uses of landscape trees, shrubs and climbers, production technology of important ornamental crops, etc.
CO 3	To demonstrate various Package of practices for loose flowers and their transportation, storage house and required condition for cut and loose flower, etc.
CO 4	To investigate the various problems with the production technology of medicinal and aromatic plants, etc.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Flori culture and Landscaping by T.K.bose	2001
2)	Floriculture in India by Randhawa and Mukhopadhay	1998
3)	Fundamentals of Floriculture by Laury	1950
4)	Complete Home Gardening by Dey,S.C.	2012
5)	Landscape Gardening & Design with Plants– Supriya Kumar Bhattacharjee	2004
6)	Lands caping principles and practices– JackE. Ingels	2018

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	2	2	1	-	1	-	-	-	1	1	1	1
CO-2	2	2	2	-	-	-	1	-	-	2	1	1	2
CO-3	1	1	1	1	-	1	-	-	-	1	2	2	2
CO-4	1	1	1	2	-	-	1	-	-	1	2	2	1

Average	1.3	1.5	1.5	1.3	-	1.0	1.0	-	-	1.3	1.5	1.5	1.5

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-402	Production Technology for Ornamental Crops, MAP and Landscaping	1	0	2	30	5	15	50	100	2(1+1)

3. BSAG-403 Renewable Energy and Green Technology2(1+1)

S. No.	**Course Objectives**
1.	To educate the importance of renewable energy and its resources, utilization of wastes and protection of the environment.
2.	To develop understanding of benefit from utilization the biomass, solar and wind energy.
3.	To develop skill in utilization of renewable energy recourses/ gadgets.
4.	To develop ability to apply renewable energy in the agricultural sector.

Unit	**Content**	**Teaching hours**
I	ClassificationofenergysourcesEnergyutilizationpatternincropproductionBiofuels: Introduction, Ethanol production process, Biodiesel production process, Environmental Benefits	3
II	Biogas:Introduction,processdescription,Constituentsofbiogas,mainfeaturesofbiogas plant, Classification &Popular designs,Applications Gasifier :Types of gasifier, Gasification process, Producergasanditsconstituents	4
III	Bio-oil: PyrolysisorDestructivedistillation Solar Energy:IntroductionCollectionand applications Solar Energy Devices: Solar Cooker Solar Water Heater Solar Distillation (solarstill)	3
IV	Solar Dryer Solar Pond Solar Photo-voltaic System (SPV) Wind energy (Introduction, characteristics, measurement equipment, conversion systems,uses of wind energy systems) Some other Renewable Energy Sources: Ocean thermal energy conversion, Tidal energy, Geothermal Energy, Hydrogen Energy, Fuel cells, Hydroelectric. Use of New and Renewable energy sources in energy Conservation	4
	Total	14

Practical

Experiment	**Topic**

1)	Study of floating drum biogas plants.
2)	Study of fixed drum biogas plants
3)	Study of differentty pes of gasifiers.
4)	Study of the production process of biodiesel
5)	Study of production process of ethanol.
6)	Study of Solar Photovoltaic fencing.
7)	Study of box type solar cooker.
8)	Study of parabolic cooker.
9)	Study of solarwater heater.
10)	Study of solar dryer.
11)	Study of solarwater pumping system.
12)	Study of solar lightning system.
13)	Study of solar photo voltaic system.
14)	Study of solar distillation system.
15)	Study of the solar pond.
16)	Visitto Renewable energy integrated plant.

S. No.	Course Outcomes (CO)
CO 1	To educate the importance of renewable energy and its resources, utilization of wastes and protection of the environment.
CO 2	To develop understanding of benefit from utilization the biomass, solar and wind energy.
CO 3	To develop skill in utilization of renewable energy recourses/ gadgets.
CO 4	To develop ability to apply renewable energy in the agricultural sector.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Non-conventional Energy Sources by G.D Rai 5 Edition.KhannaPubhishers,Delhi	1988
2)	Renewable EnergyTheory and Practiceby N.S. Rathore, N. L. Panwar, A.K.Kurchania. Himanshu Publications, Udaipur.	2008
3)	Handbook of Agricultural Engineering, ICAR Publication.	2012

4)	Solar Energy Utilization by G.D.Rai 5 Edition.KhannaPubhishers,Delhi.	1995
5)	Solar Energy: Principles of Thermal Collection and Storage by S.P.Sukhatme& J.K. Nayak 3 Edition. McGraw Hill Education, Delhi.	2010
6)	Principle of Renewable Energy–Twidelland Weir.	2015
7)	Principle of Energy Conversion. CulpA.W.McGraw Hill Pub.Co.Inc.	1991
8)	DufeeJ.A.and Beckman W.A.Renewable Energy Sources.E and F A Spon. Ltd.London	1986
9)	Biotechnology and Other Alternative Technologies for Utilization of Biomass and Agricultural Wastes by AmlenduChakravarti.	1989
10)	Biogas Technology; Apractical Hand book by K.C. Khandalwaland S.S Mahdi,	1986

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1	2	1	2	2	1	-	-	-	1	1	2	-
CO-2	1	1	2	2	1	1	-	-	-	1	1	2	-
CO-3	1	2	1	2	3	1	-	-	-	1	1	2	-
CO-4	1	1	1	2	2	1	-	-	-	1	1	2	-
Average	1.0	1.5	1.3	2.0	2.0	1.0	-	-	-	1.0	1.0	2.0	-

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-403	Renewable Energy and Green Technology	1	0	2	30	5	15	50	100	2(1+1)

4. BSAG-404 Problematic soils and their Management 2 (1+1)

S. No.	Course Objectives
1.	To familiarize students with the problematic soils under different Agro-ecosystems.
2.	To make Understanding basic knowledge and concepts of Soil quality, health, waste land and problem soil in India and identify processes resulting in deterioration of soil physical and chemical properties.
3.	To provide wide knowledge to the students about reclamation and management of saline, sodic and acid soil. Quality and standards of irrigation water.
4.	To educate about application of remote sensing and GIS for judicious use of fertilizers and application of macro & micronutrients and lowering down the soil problem.

Unit	Content	Teaching hours
I	Soil degradation: Concept, types, factors and processes. Soil quality and soil health: definition and concept, soil quality indicators. Characteristics of healthy soils. Distribution and extent of wastel and problematic soils in India and Maharashtra. Categorization of problem soils based on properties.	3
II	Saline soils, alkali Soils, saline-alkali soils, degrade dalkali soils, Coastalsa line soils: definition, formation, characteristics, effect on plant growth, reclamation and management. Acidand acid sulphates oils: definition, formation, characteristics, effectonplant growth, reclamation and management Calcareous Soil: definition, formation, characteristics, effectonplantgrowth, reclamation and management. Erodedsoils and compacted soils: definition, formation, characteristics, effectonplantgrowth, reclamation and management.	4
III	Submerged soils and flooded soils: definition, formation, characteristics, effectonplantgrowth, reclamation and management Pollutedsoils: definition, source sandtheirremediation. Waterpollution: definition, sources and theirremediation. Quality of Irrigation water and itssuitabilityfor irrigation. Utilization of saline and sewage waterin Agriculture.	4
IV	Remote sensing and GISin diagnosis and management of problem soils. Multi purpose tree species and bioremediation of soils. Land capability classification and Land suitability classification. Problematic soils under different Agro-eco system.	3
	Total	14

Practical

S. No.	Topic
1	Preparation of saturation paste extract.
2	Determination of p H and EC_e.
3	Determination of cations (Ca, Mg, Na and K) and computation of SAR.
4	Determination of ESP of soils.
5	Determination of gypsum requirement of sodic soil.

6	Determination of calcium carbonate from soil.
7	Determination of lime requirement of acidic soil.
8	Collection of irrigation water and sewage water.
9	Determination pH and EC from irrigation water.
10)	Determination of cations (Ca, Mg, Na and K) from irrigation water.
11)	Determination of anions (CO_3, HCO_3, Cl and SO_4) from irrigation waterandRSCandSAR.
12)	Determination of BOD and COD.
13)	Satellite image analysisby visual method.

S. No.	Course Outcomes (CO)
CO 1	To familiarize students with the problematic soils under different Agro-ecosystems.
CO 2	To make Understanding basic knowledge and concepts of Soil quality, health, waste land and problem soil in India and identify processes resulting in deterioration of soil physical and chemical properties.
CO 3	To provide wide knowledge to the students about reclamation and management of saline, sodic and acid soil. Quality and standards of irrigation water.
CO 4	To educate about application of remote sensing and GIS for judicious use of fertilizers and application of macro & micronutrients and lowering down the soil problem.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Richards L.A..Diagnos is and Improvement of Salineand Alkali Soils. United State Department of Agriculture.	1954
2)	Maliwal, G.La. and SomaniL.L.Nature Properties and Management of Sine and Alkali Soils. Agro tech Publishing Academy, Udaipur 313002.pp.335.	2010
3)	Mahendran, etal. Soil Resource Inventory and Management of Problamatic[i.e.Problematic]Soils.PublishedbyAgrotechPublishing AcademySBN10:818321097X/ISBN13:9788183210973	2012
4)	Abrol,I.P.,Yadav,J.S.PandMassoud,F.I.Salt-AffectedSoilsandtheir Management. FAO Soils Bulletin39. Food And Agriculture Organization Of The United Nations,Rome	1988
5)	Tyagi,N.K.andP.S.Minhas.AgriculturalSalinityManagementinIndiaPublished by CSRI., Kernal.(PriceRs.500/-).	1998
6)	Yaduvanshi, N.P.S. Chemical Changes and Nutrient Transformation in Sodic/ Poor Quality water Irrigated Soils. PublishedbyCSRI.,Kernal.	2008
7)	Yada vand D.K.Sharma, Salinity Management for Sustainable Agriculture in Canal Commands.PublishedbyCSRI.,Kernal.	2011
8)	Twenty five years of research on management of salt affected soils & use of saline water inagriculture, Publishedby CSRI., Kernal.	1998

9)	Patil, V. D. and Mali C.V. Fundamentals of Soil Science, Aman Publication, Meerut.	2007
10)	Das, D. K. Introductory Soil Science	2015
11)	Brady, N.C.TheNature and Propertiesof Soils. 15thedition Publisher: Pearson Education, ISBN:978-0133254488	2016
12)	The chemistry of Soil–FirmanBear	2012
13)	Text Book of Pedology Conceptsand Applications–J.Sehgal	2015

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	1	1	1	1	2	1	-	-	1	3	1	2
CO-2	2	2	2	1	-	1	1	-	-	1	-	-	3
CO-3	1	1	-	1	2	-	1	-	-	2	-	2	1
CO-4	2	1	1	1	1	2	1	-	-	1	5	1	2
Average	1.5	1.25	1.33	1	1.33	1.6	1	-	-	1.25	1.25	1	2

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-404	Problematic Soils and their Management	2	0	0	40	10	-	50	100	2(2+0)

5. BSAG-405 Production Technology for Fruit and Plantation Crops 2(1+1)

S. No.	**Course Objectives**
1.	To define importance and scope of fruit and plantation crop industry in India.
2.	To discuss various concepts of high density planting, new techniques of high density planting.
3.	To develop ability to demonstrate preparation and application of plant growth regulators to the crops.
4.	To develop skill to distinguish different fruits and plantation crops, symptoms of disorders, diseases, insects and pests etc.

Unit	**Content**	**Teaching hours**
I	Importance and scope of fruit and plantation crop industry in India Highdensityplanting;UseofrootstocksSpecialHorticulturepractices	4

II	Productiontechnologiesforthe cultivation ofmajorfruitsMango Banana, Citrus, Grape, Guava, Litchi, Papaya, Apple, Pear and Peach	4
III	Minor fruits- pineapply& Pomegranate Minor fruits-Jackfruit & Strawberry	3
IV	Nut crops; plantation crops-Coconut &Arecanut Cashew Tea, coffee & rubber	3
	Total	14

Practical

S. No.	Topic
1)	Seed propagation
2)	Scarification and stratification of seeds
3)	Propagation methods for fruit crop sincluding Micro-propagation
4)	Propagation methods for plantation crops including Micro-propagation
5)	Description and identification of fruit
6)	Description and identification of Plantation crops
7)	Preparation of plant bioregulators and their uses
8)	Establishment of commercial nursery,Nursery Act
9)	Establishment of model orchard and its economics
10)	Inter cropping and multistoried cropping
11)	Rejuvenation of old senile orchards
12)	Pests of above fruit and plantation crops
13)	Diseases of above fruit and plantation crops
14)	Physiological disorders of above fruit and plantation crops
15)	Visitto commercial orchard of fruits
16)	Visitto commercial orchard of plantationcrop

S. No.	Course Outcomes (CO)
CO 1	To define importance and scope of fruit and plantation crop industry in India.
CO 2	To discuss various concepts of high density planting, new techniques of high density planting.
CO 3	To develop ability to demonstrate preparation and application of plant growth regulators to the crops.
CO 4	To develop skill to distinguish different fruits and plantation crops, symptoms of disorders, diseases, insects and pests etc.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Handbook of Horticulture, ICA Rpublication	2019
2)	Tropical and Subtropical Fruitcrops by T..K..Bose	2021
3)	Fruit Culturein India, Sham Singh	1963
4)	Physiology of Fruit Production by Amar Singh,	2003
5)	Advances in Horticulture by Ed by K.L.Chadha	2019
6)	Temperate fruits, Mitra, Thakur and Bose	1992
7)	Introduction to spices and Plantation crops by N. Kumar	2018
8)	Spices & Condiments, J S Pruthi, National Book Trust, New Delhi	2001

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	2	2	1	2	-	-	-	-	-	1	-	1	-
CO-2	1	2	2	-	-	-	-	-	-	-	-	-	-
CO-3	2	1	1	1	-	-	-	-	-	2	1	-	-
CO-4	1	1	2	-	-	-	-	-	-	-	1	-	-
Average	1.5	1.5	1.5	1.0	-	-	-	-	-	0.75	0.5	0.25	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-405	Production Technology for Fruit and Plantation Crops	1	0	2	30	5	15	50	100	2(1+1)

6. BSAG-406 Principles of Seed Technology4(2+2)

S. No.	Course Objectives
1.	To study scope and importance of seed technology in agriculture.
2.	To understand seed production techniques in various field crops.
3.	To acquaint students with maintenance of seed processing, seed quality, seed storage and marketing.
4.	To accustom students with various seed control act, order and tests for confirming status of seed.

Unit	Content	Teaching hours
I	Seedandseedtechnology:introduction,definitionandimportanceDeteriorationcauses of crop varieties and the ircontrol& Maintenance of geneticpurityduringseed production Seedquality: definition. Characters of good quality seed	6
II	Different classes of seed. Foundation and certified seed production of important cereals **(Wheat,Sorghum,Maize,Rice&Bajara)**Foundation and certified seed production of important pulses (PigeonPea, Green Gram, Black Gram &Chick Pea) Foundationandcertifiedseedproductionofimportantoilseeds(Soybean,Sunflower, Safflower, GroundnutandCotton)	6
III	Foundationandcertifiedseedproductionofimportantfoddercrops(FodderSorghum, Lucern, Berseem) Foundation and certified seed production of important vegetable crops (Tomato,Brinjal,Chilli,Onion& Okra) Seed certification, phases of certification, procedure for seed certification,fieldinspectionSeedActand Seed Act enforcement. Duty and powers ofseedinspectr, offences and penalties. Seed scontrol order1983. Varietal identification through Grow Out Test and Electrophoresis Molecular and biochemical test. Detection of genetically modified crops.	8
IV	Transgene contamination innon-G Mcrops, G Mcropsandorganic seed production Seeddrying, processing and the irsteps.Seed testing for quality assessment. Seed treatment, its importance, method of application and seed packing.Seedstorage: general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage Seed marketing: structure and organization, sales generation activities, promotionalmedia.Factorsaffectingseedmarketing, Role of WT O and OE C Din seedmarketing.	8
	Total	28

Practical

Experiment	Topic
1)	Seed production in major cereals:Wheat and Rice
2)	Seed production in :Sorghum and Bajara
3)	Seed productionin : Maize.
4)	Seed productionin major pulses:Greengram and Blackgram
5)	Seed production in pulses:Pigeonpea and Lentil
6)	Seed production in pulses: Gram and Fieldpea
7)	Seed production in major oil Seeds :Soybean,Rapeseed& Mustard
8)	Seed production in major vegetable crops: Brinjal and Tomato.
9)	Seed production in vegetable crops: Chilliand Okra.
10)	Seed production in vegetable crops:Onion
11)	Seed productionin :Pumpkin, Bottlegourd
12)	Seed productionin :Bittergourd, Ridgegourd,Spongegourd

13)	Seed samplingand testing procedure
14)	Physical purity test
15)	Seed moisturetest
16)	Germination test –types of germination
17)	Germination test –different methods of germination
18)	Seed viability test
19)	Seed and seedling vigourtest
20)	Genetic purity test :GrowOutTest
21)	Genetic purity test :Electrophoresis
22)	Seed certification :Procedure
23)	Field inspection, preparation of field inspection report
24)	Visit to seed production farms of cereal crops
25)	Visit to seed production farms of oil seed crops
26)	Visit to seed production farms of pulse crops
27)	Visit to seed production farms of fiber crops
28)	Visit to seed testing laboratories
29)	Visit to seed processing plant

S. No.	Course Outcomes (CO)
CO 1	Acquaint with scope and importance of seed technology in agriculture and the role of officials and legislation, seed act and seed order in quality seed production.
CO 2	Develop an understanding of various seed production techniques for different field crops, the importance of maintenance of purity of crop varieties, and factors causing deterioration of variety.
CO 3	Execution of various phases of seed certification, field inspection, and seed purity testing.
CO 4	Analyze the factors related to genetic and physical purity of seed and its health status of seeds of a variety during seed processing.

S. No.	Title of Book Author/Authors Publisher	Year of Publication/ Reprint
1)	Seed Technology R. L. Agrawal Oxford and IBH. Publishing Company, New Delhi.	2018
2)	SeedScienceandTechnologySubirSenNGhoshKalyaniPublicationNewDelhi	2014
3)	Principles of Seed Technology Phundan Singh Kalyani Publication New Delhi.	2020-21
4)	Seed Science and Technology N. C .Singhal Kalyani Publication New Delhi.	2016

5)	Seed Technology DhirenderKhareandMohanBhale Scientifice Publishers,JodhaPur	2014
6)	Vegetable Seed Production Nempal Singh, D.K.Singh, Y.K.Singh and Virendra kumar international Book Distribution Company, Lucknow.	2006

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	-	-	3	1	3	1	-	-	-	-	-
CO2	3	3	1	1	3	3	2	-	-	-	-	-	-
CO3	3	3	1	1	3	2	1	-	-	-	-	-	2
CO4	2	2	1	-	2	-	1	-	2	-	2	-	2
Average	2.75	2.5	1	1	2.75	2	1.75	1	2	-	2	-	2

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-406	Principles of Seed Technology	1	0	4	30	5	15	50	100	3(1+2)

7. BSAG-407 Farming System & Sustainable Agriculture1(1+0)

S. No.	Course Objectives
1.	To define the farming system and sustainable agriculture, its importance and its scope.
2.	To classify the different farming systems according to agro-climatic zones in India.
3.	To implement the integrated farming system and sustainable method of agriculture.
4.	To differentiate between modern and sustainable agriculture and different farming systems.

Unit	Content	Teaching hours
I	Farming systems–Definition, scope, concept and objective of Farming Systems Classification of Farming systems and factors affectingitDefinition of Cropping systems, cropping pattern, Multiple cropping systems and its classification, advantage sand disadvantages.	4
II	Study of efficientCropping systems and allied enterprises.Assessmenttools for determining production and efficiencies in cropping systems and farming systems (Based on land useefficiency, biological potential and economiccriteria).Sustainable Agriculture: Definition, Principles, Goals, Problems and its importance in Agriculture, Sustainability Index and Conservation Agriculture.	4
III	Impact of LEIA (Low Externa lInput Agriculture) and HEIA (High External Input Agriculture) on crop productivity and sustainableagriculture.IntegratedFarmingSystem, historical background, characteristics, objectives, components and its advantages.	3

IV	Development of site specific IF Smodels for different Agroclimatic zones, its resource useefficiencyandoptimizationtechniqueFarmingsystemsinrelationtoenironment,itsresource cycling and flow of energy VisittovariousIFS models.	3
	Total	**14**

S. No.	Course Outcomes (CO)
CO 1	Acquaint the knowledge on farming systems and sustainable agriculture, its importance and its scope.
CO 2	Classify the different farming systems according to agro-climatic zones in India.
CO 3	Implement the integrated farming system and sustainable method of agriculture.
CO 4	Differentiate between modern and sustainable agriculture and different farming systems.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Cropping systems Theory and Practice -Chatterjee B.N. and Maiti S.	1984
2)	Cropping And Farming System by S C Panda	2014

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	-
CO-2	2	2	2	1	-	1	-	-	1	2	2	1	-
CO-3	2	1	1	1	1	-	1	-	1	2	-	1	-
CO-4	2	1	1	1	-	1	-	-	1	1	1	1	-
Average	2.3	1.5	1.5	1.0	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-407	Farming System & Sustainable Agriculture	1	0	0	40	10	-	50	100	1(1+0)

8. BSAG-408Agricultural Marketing Trade & Prices 3(2+1)

S. No.	Course Objectives
1.	To educate the basic concept of agricultural marketing, market structure, marketing mix, marketing segmentation, demand and supply, producer surplus etc.
2.	To make understand the different product life cycle and its different aspects, product, price, place, promotion, advertising, personal selling, sales promotion and publicity etc.
3.	To apply the different marketing functions, exchange functions, physical functions, processing functions, etc and to develop skill to analyze the marketing channels for different farm products, Integration, efficiency, costs and price spread etc.
4.	To enable to evaluate the role of the Government in agricultural marketing, Public sector institutions-CWC, SWC, FCI, CACP & DMI etc.

Unit	Content	Teaching hours
I	Market and Marketing–Meaning –Definitions –Components of market –Market structure – Meaning–Components–Market conduct –Market performance Agricultural Marketing – Meaning–Definition–Scope– Subjectmatter– Importance of Agricultural Marketing in economic development. Classification of markets–On the basis of location,Areaofcoverage, timespan, volume of transaction, nature of transaction, number of commodities, degree of ncompetition, nature of commodities, stage of marketing, extent of public intervention,typeofpopulationserved,accrualofmarketingmarginsMarketingmix and mark et segmentation, Demand, supply and producer'ssurplusofagri- commodities: nature and determinants of demand and supply of farmproducts.	7
II	Producerssur plus-Meaning-Marketable sur plus-Marketed surplus- importance- factors influencing marketable surplus-Marketing channels– Definition Productlife cycle (PLC) and competitive strategies: Meaningand stages in PLC; characteristics of PLC; Strategies in different stages of PLC; pricing and promotion strategies: Pricing consider ations and approaches–cost based and competition based pricing; Market promotion – advertising, personal selling, sales promotion and publicity– their meaning and merits &demerits; Marketing process and functions:Marketingprocess- concentration, dispersion and equalization; Marketing functions–Meaning- exchange functions–buying and selling; Physical functions – storage, transport and processing Facilitating functions– packaging, branding, grading, quality control and labeling(Agmark); Market function naries and marketing channels:TypesandImportanceofagenciesinvolvedinagriculturalmarketing; Meaning and definition of marketing channel;number of channel levels; marketing channels for different farm products; Market integration-definition-types of market integration- horizontal,verticalandconglomeration-	8
III	Marketing efficiency-meaning-definitions-technical orphysicalor operational efficiency-pricingor allocative efficiency Marketing cost-margins-pricespread- factors affecting the costs of marketing-reasons for high ermarketing costs of agricultural commodities-ways of reducing marketing costs for farm products. Role of Govt. inagriculturalmarketing-Remedial measures- Regulatedmarkets-definition- important features of regulated markets,functions, progress anddefects. Publicsectorinstitutions-Warehousing-meaning-ware housingin India- Central Warehousing Corporation (CWC)-working of warehouses-advantages- State Warehousing Corporations (SWC)-Food Corporation of India (FCI)-objectives- functions	6

IV	Cooperative marketing-meaning-structure-Functions of Cooperative marketing societies-National Agricultural Cooperative Marketing Federation (NAFED) and State Agricultural Cooperative Marketing Federations (MARKFED)- StateTrading- objectives-Types of state trading. Riskin marketing: Types of riskin marketing; Speculation&hedging;anoverviewoffuturestrading;Characteristicsofagricultural product prices-agricultural price stabilization-need for agricultural pricepolicy-commissionforAgricultural cost andPrices (CACP)-administered prices- minimum support price, procurement price andissueprice. Trade:ConceptofInternationalTrade and its need,International trade-definition- difference between international and inter-regional trade-freetradevsprotectionTheories of absoluteandcomparativeadvantagePresentstatus and prospects of international trade in agri-commodities; GATT and WTO; AgreementonAgriculture(AoA) and itsimplicationsonIndian agriculture; Trade Related Intellectual Property Rights (TRIPS)	7
	Total	28

Practical

Experiment	Topic
1)	Plotting and study of demand and supply curves
2)	Calculation of elasticities
3)	Study ofrelationship between market arrivals and prices of some selected Commodities
4)	Computation of marketable and market d surplus of important commodities
5)	Study of price behavior over time for some selected commodities;
6)	Visit to a local market to study various marketing functions performed by Different agencies,
7)	Visit to regulated market
8)	Identification of marketing channels for selected commodity
9)	Collection of data regarding marketing costs, margins and price spread.
10)	Presentation of reportin the class.
11)	Visit to market in stitution–NAFED to study their organization and functioning.
12)	Visit to SWC to study their organization and functioning.
13)	Visit to CWC to study their organization and functioning.
14)	Visit to cooperative marketing society to study their organization and functioning.
15)	Application of principles of comparative advantage of international trade.
16)	Final practical exam.

S. No.	Course Outcomes (CO)
CO 1	Remember the concept of agricultural marketing, market structure, marketing mix, marketing segmentation, demand and supply, producer surplus etc.

CO 2	Identify the product life cycle and its different aspects, product, price, place, promotion, advertising, personal selling, sales promotion and publicity etc.
CO 3	Apply the different marketing functions, exchange functions, physical functions, processing functions, etc and analyze the marketing channels for different farm products, Integration, efficiency, costs and price spread etc.
CO 4	Evaluate the role of of Government in agricultural marketing, Public sector institutions-CWC, SWC, FCI, CACP & DMI etc.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Acharya S.S and Agarwal N L, Agricultural Marketing in India. Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi	2006
2)	Kahlon, A.S and Tyagi.D S, Agricultural Price Policy in India. Allied Publishers Pvt. Ltd., New Delhi.	1983
3)	Kulkarni, K R. Agricultural Marketing in India. The Co-operators Books Depot, Mumbai.	1964
4)	Mamoria, C.B. and Joshi. R L. Principles and Practices of Marketing in India, Kitab Mahal, Allahabad	1995
5)	Mamoria, C.B., Agricultural Problems in India, Kitab Mahal, Allahabad	1973
6)	SubbaReddy, S., P.RaghuRam., P. Sastry, T.V.N. and Bhavani Devi I. Agricultural Economics., Oxford & IBH Publishing Company Private Ltd., New Delhi,	2010

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	2	1	-	1	1	-	-	3	1	1	-
CO-2	1	2	-	1	-	1	2		-	2	1	1	-
CO-3	2	1	2	1	2	1	2	-	-	2	2	1	-
CO-4	1	1	1	1	2	1	1	-	-	1	3	1	-
CO-5	1	1	1	1	2	1	1	-	-	1	3	1	-
Average	1.4	1.2	1.5	1.0	2.0	1.0	1.4	-	-	1.8	2.0	1.0	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-408	Agricultural Marketing Trade & Prices	2	0	2	30	5	15	50	100	3(2+1)

9. BSAG-409 Introductory Agro-meteorology & Climate Change2(1+1)

S. No.	Course Objectives
1.	To impart the knowledge of earth atmosphere, its composition, extent, structure, atmospheric weather variables, monsoon and importance in Indian agriculture and educate about Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.
2.	To develop understanding of the relationship between weather variables and agriculture, factors affecting the particular weather-variables, common weather hazards, methods of weather forecasting, methods of mitigation of climate change and global warming, etc.
3.	To develop skills in utilization of climatic normal of a crops, identification of weather variables which may affect development of crops and livestock production, modification of micro and macro climate for best crop yields, minimization of losses by using weather forecasting, etc.
4.	To develop skills in uses and safety measures of instruments installed in agro-meteorological observatory and to develop ability to analyze the observations of different weather variables by instruments installed in agro-meteorological observatory and to prepare suitable conditions for field crops.

Unit	Content	Teaching hours
I	Meaning and scope of agricultural meteorology Earth's atmosphere –its composition, extentandstructure;Atmosphericweather variables Atmospheric pressure–its variation with height Wind-types of wind, daily and seasonal variation of windspeed, cyclone, anticyclone, land breeze and sea breeze	3
II	Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, netradiation, albedo Atmospheric temperature – temperature in version,lapserate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balanceof earth	3
III	Atmospheric humidity – concept of saturation, vapourpressure,Processofcondensation, formation of dew, fog, mist, frost, cloud Precipitation –process of precipitation,typesofprecipitationsuchasrain,snow,sleetandhailCloudformation and classification Artificial rainmaking ; Monsoon mechanism and importance in Indianagriculture	3
IV	Weather hazards -drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-waveand cold wave Agriculture and weather relations Modifications of crop micro climate Climatic normals for cropandlive stock production. Weather forecasting – types of weather forecast and the iruses Climate change, climatic variability, global warming ,causes of climate change and its impact on regional and national Agriculture	5
	Total	14

Practical

Experiment	Topic
1)	Visit of Agro meteorological Observatory.
2)	Sites election of observatory, exposure of instruments and weather data Recording.
3)	Measurement of air temperatures, it stabulation and variation.

4)	Measurement of soil temperature.
5)	Measurement of rainfall.
6)	Measurement of wind speed and wind direction.
7)	Measurement of evaporation with the help of open pan evaporation.
8)	Measurement of evapotranspiration.
9)	Measurement of sunshine duration using Campbell Stoke s sunshine Recorder.
10)	Measurement of solarradiation.
11)	Measurement ofAtmospheric pressure.
12)	Measurement of Relative Humidity with the help ofAssmann's psychrometer
13)	Determination of Vapourpressure, R Hand dewpoint temperature using hygrometric table
14)	Preparation of Synopticcharts.
15)	Study ofAutomatic Weather Station

S. No.	Course Outcomes (CO)
CO 1	Impart the knowledge of earth atmosphere, its composition, extent, structure, atmospheric weather variables, monsoon and importance in Indian agriculture and educate about Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.
CO 2	Develop the understanding of the relationship between weather variables and agriculture, factors affecting the particular weather-variables, common weather hazards, methods of weather forecasting, methods of mitigation of climate change and global warming, etc.
CO 3	Develop skills in utilization of climatic normal of a crops, identification of weather variables which may affect development of crops and livestock production, modification of micro and macro climate for best crop yields, minimization of losses by using weather forecasting, etc.
CO 4	Develop skills in uses and safety measures of instruments installed in agro-meteorological observatory and ability to analyze the observations of different weather variables by instruments installed in agro-meteorological observatory and to prepare suitable conditions for field crops.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Agricultural Meteorology- G.S.L.H.V. Prasad Rao, Kerala Agricultural University Publications.	2003
2)	Text book of Agricultural Meteorology –M.C. Varshneya and P. Balkrishna Pillai.	2004

3)	Introduction to Agro- meteorology-H.S.Mavi	1986
4)	OurAtmosphere- SmitaBhutani	2005
5)	Atmosphere, weather and climate–Barry R.G. and Charley R.J. The English Language Book Society and MathuenandCo.Ltd., Sultolk.	1968
6)	Climate, weather and cropsin India–D.Lenka.	2006
7)	Meteorology–S.R.Ghadekar	2008

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	3	3	2	2	1	-	-	-	-	-	-	-	-
CO-2	3	3	2	2	3	-	-	-	-	-	-	-	-
CO-3	2	2	2	2	3	1	-	-	-	-	-	-	-
CO-4	3	3	2	2	3	-	-	-	-	-	-	-	-
CO-5	3	1	1	2	-	-	-	-	-	-	-	-	1
CO-6	3	3	2	3	1	-	-	-	-	-	-	-	-
Average	2.8	2.5	1.8	2.2	2.2	1.0	-	-	-	-	-	-	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-410	Introductory Agro-meteorology & Climate Change	1	0	2	30	5	15	50	100	2(1+1)

10. BSAG-411 Agri-Business Management*3(2+1)

S. No.	**Course Objectives**
1.	To educate the concept of agri-business, agro-based industries and its classification, Institutional arrangement, procedures to set up agro based industries, etc.
2.	To understand primary and support activities and their linkages, Business environment, PEST & SWOT analysis, etc.
3.	To apply the different Management functions, Roles & activities, Organization culture, Capital Management and Financial management of Agribusiness, etc.
4.	To analyze the Marketing Management, Segmentation, targeting & positioning, Marketing mix and marketing strategies, Consumer behavior analysis, etc.

Unit	**Content**	**Teaching hours**
I	Transformation of agriculture into agribusiness, various stakeholders and components of agribusinesssystems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive featuresof Agribusiness Management: Importance and needs of agro-based industries, Classification of industriesand types of agro based industries.	7

II	Transformation of agriculture into agribusiness, various stakeholders and components of agribusinesssystems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive featuresof Agribusiness Management: Importance and needs of agro-based industries, Classification of industriesand types of agro based industries.	7
III	Purpose or mission, goals orobjectives, Strategies, polices procedures, rules, programs and budget. Components of a business plan,Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, Supervision, communications, control. Capital Management and Financial management of Agribusiness.Financial statements and their importance.	7
IV	Marketing Management: Segmentation, targeting &positioning.Marketing mix and marketing strategies. Consumer behavior analysis, Product Life Cycle (PLC). Sales &Distribution Management. Pricing policy, various pricing methods. Project Management definition, projectcycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal andevaluation techniques.	7
	Total	28

Practical

Experiment	Topic
1)	Study of agri-input markets: Seed, fertilizers, pesticides.
2)	Study of output markets: grains, fruits, vegetables,flowers.
3)	Study of product markets, retails trade commodity trading, and value added products.
4)	Study offinancing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD.
5)	Preparations of projects and Feasibility reports for agribusiness entrepreneur.
6)	Appraisal/evaluationtechniques of identifying viable project- Non-discounting techniques.
7)	Case study of agro-based industries.
8)	Trend and growth rate of prices of agricultural commodities.
9)	Net present worth technique for selection of viable project.
10)	Internal rate of return.

S. No.	Course Outcomes (CO)
CO 1	Educate the concept of agri-business, agro-based industries and its classification, Institutional arrangement, procedures to set up agro based industries, etc and understand the primary and support activities and their linkages, Business environment, PEST & SWOT analysis, etc.
CO 2	Apply the different Management functions, Roles & activities, Organization culture, Capital Management and Financial management of Agribusiness, etc.

CO 3	Develop ability to analyze the Marketing Management, Segmentation, targeting & positioning, Marketing mix and marketing strategies, Consumer behavior analysis, etc.
CO 4	Evaluate the Product Life Cycle (PLC), Sales & Distribution Management, various pricing methods, Project Appraisal and evaluation techniques, etc.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	-	2	2	1	2	2	3	3	2	1
CO-2	1	2	2	-	2	2	2	1	1	2	1	3	1
CO-3	2	1	1	-	1	2	2	2	2	2	2	3	1
CO-4	2	1	2	-	1	2	1	2	2	1	1	2	1
Average	1.8	1.3	1.5	-	1.7	2.0	1.5	1.8	1.8	2.0	1.8	2.7	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Midterm Theory Exam	**Internal Exam**		**External Theory Exam**	**Subject Total**	
		L	**T**	**P**		**Assignment**	**Practical**			
BSAG-411	Agribusiness Management	1	0	2	30	5	15	50	100	3(2+1)

11. BSAG-412Agrochemicals*3(2+1)

S. No.	**Course Objectives**
1.	To recognize the role of agrochemicals in agriculture and its management for sustainable agriculture.
2.	To identify various classes of Herbicides, Fungicides, Fertilizers and their importance in agriculture.
3.	To Analyze Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant.
4.	To differentiate the Manufacturing of Mixed and complex fertilizers, Fertilizer logistics and marketing.

Unit	**Content**	**Teaching hours**
I	An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human andanimal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainableagriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides.Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Modeof action-Bordeaux mixture and copper oxychloride.Organic fungicides- Mode of action-Dithiocarbamates-characteristics, preparation and use of Zineb and maneb.	7
II	Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics anduse. Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine,Organophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Actand rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant.	7

III	Theircharacteristics and uses.Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks andManufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation ofbone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of Potassiumchloride, potassium sulphate and potassium nitrate.	7
IV	Mixed and complex fertilizers: Sourcesand compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers:Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insectrepellent.	7
	Total	28

Practical

Experiment	Topic
1)	Sampling of fertilizers and pesticides.
2)	Pesticides application technology to study about various pesticidesappliances.
3)	Quick tests for identification of common fertilizers.
4)	Identification of anion and cation in fertilizer.
5)	Calculation of doses of insecticides to be used.
6)	To study and identify various formulations of insecticideavailable kin market.
7)	Estimation of nitrogen in Urea.
8)	Estimation of water soluble P2O5 and citrate solubleP2O5 in single super phosphate.
9)	Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flamephotometer.
10)	Determination of copper content in copper oxychloride.
11)	Determination of sulphur content insulphur fungicide.
12)	Determination of thiram. Determination of ziram content.

S. No.	Course Outcomes (CO)
CO 1	Understand the role of agrochemicals in agriculture and its management for sustainable agriculture.
CO 2	Recognize various classes of Herbicides, Fungicides, Fertilizers and their importance in agriculture.
CO 3	Examine Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of insecticides in soil & plant.
CO 4	Develop ability to analyze the Manufacturing of Mixed and complex fertilizers,Fertilizer logistics and marketing.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	-	1	1	-	-	1	1	3	2	1
CO-2	1	3	2	-	3	2	1	-	2	1	2	1	-
CO-3	1	3	2	-	3	2	1	-	2	1	3	1	-
CO-4	1	3	3	-	3	2	1	-	3	1	2	1	-
Average	1.3	2.5	2.0	-	2.5	1.8	1.0	-	2.0	1.0	2.5	1.3	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Midterm Theory Exam	**Internal Exam**		**External Theory Exam**	**Subject Total**	
		L	**T**	**P**		**Assignment**	**Practical**			
BSAG-412	Agrochemicals	2	0	2	30	5	15	50	100	3(2+1)

12. BSAG-413-Commercial Plant Breeding*3(1+2)

S. No.	**Course Objectives**
1.	To study about types of crop and modes of reproduction
2.	To understand genetics of qualitative and quantitative characters and their inheritance.
3.	To study major breeding objectives and procedures including conventional as well as innovative approaches used for development of improved varieties.
4.	To learn Seed production technology in different classes of field crop.

Unit	**Content**	**Teaching hours**
I	Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.	3
II	Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment.	4
III	Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.	3
IV	IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.	4
	Total	14

Practical

Experiment	Topic
1)	Floral biology in self and cross pollinated species, selfing and crossing techniques.
2)	Techniques of seedproduction in self and cross pollinated crops using A/B/R and two line system.
3)	Learning techniques in hybridseed production using male-sterility in field crops.
4)	Learning techniques in hybridseed production using male-sterility in field crops.
5)	Concept of rouging in seed production plot.
6)	Concept of line its multiplication and purification in hybrid seed production.
7)	Role of pollinators in hybrid seedproduction.
8)	Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard,sunflower, castor, pigeon pea, cotton and vegetable crops.
9)	Sampling and analytical procedures for puritytesting and detection of spurious seed.
10)	Seed drying and storage structure in quality seed management.
11)	Screening techniques during seed processing viz., grading and packaging.
12)	Visit to public private seedproduction and processing plants.

S. No.	Course Outcomes (CO)
CO 1	Acquaint with various types of crops and modes of plant reproduction, line development, and maintenance.
CO 2	Develop an understanding of varietal testing release and notification system in India.
CO 3	Applying advance and conventional seed production techniques in important field crops.
CO 4	Compare the various class of seed as per purity, DUS testing, source, and generation system.

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	2	-	2	1	1	-	-	-	-	-	-
CO-2	2	2	2	-	2	2	1	-	-	-	-	-	1
CO-3	2	1	2	-	3	2	1	-	1	-	-	1	-
2CO-4	1	-	1	-	2	1	-	-	-	-	-	-	1
Average	2	2	1.8	-	2.3	1.5	1.0	-	1.0	-	-	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-413	Commercial Plant Breeding	1	0	2	30	5	15	50	100	3(1+2)

13. BSAG-414-Landscaping* 3(2+1)

S. No.	Course Objectives
1.	To understand importance and scope of landscaping.
2.	To identify principles of landscaping, garden styles and types.
3.	To examine factors influencing landscaping and gardening.
4.	To investigate landscaping of urban, rural areas, and Peri-urban landscaping, bonsai and lawn establishment.

Unit	Content	Teaching hours
I	Importance and scope of landscaping. Principles of landscaping, garden styles and types, terracegardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc.	7
II	Gardens for special purposes. Trees: selection, propagation,planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, plantingschemes, architecture.	6
III	Climber and creepers: importance, selection, propagation, planting, Annuals:selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents.Pot plants: selection, arrangement, management.	7
IV	Bio-aesthetic planning: definition, need, planning;landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places likebus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions.Bonsai: principles and management, lawn: establishment and maintenance. CAD application.	8
	Total	28

Practical

Experiment	Topic
1)	Identification of trees, shrubs, annuals, pot plants.
2)	Propagation of trees, shrubs and annuals, care andmaintenance of plants, potting andrepotting.
3)	Identification of tools and implements used in landscapedesign.
4)	Training and pruning of plants for special effects, lawn establishment and maintenance.
5)	layout offormal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) anddesigning of conservatory and lathe house.

6)	Use of computer software, visit to important gardens/parks/institutes.

S. No.	Course Outcomes (CO)
CO 1	Acquaint with importance and scope of landscaping.
CO 2	Identify various garden styles, types and its components such as terrace gardening, vertical gardening.
CO 3	Analyze various factors influencing landscaping and gardening such as plant selection.
CO 4	Outline and planning of landscaping of urban, rural areas, and Peri-urban landscaping, bonsai and lawn establishment.

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	2	1	1	3	-	-	3	-	-	-	1
CO-2	2	2	1	1	2	2	-	-	3	1	1	1	1
CO-3	2	3	3	1	2	3	-	-	3	2	-	2	-
2CO-4	2	2	3	1	1	3	-	-	3	1	1	-	-
Average	2.0	2.3	2.3	1.0	1.5	2.8	-	-	3.0	1.3	1.0	1.5	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-414	Landscaping	2	0	2	30	5	15	50	100	3(2+1)

SEMESTER – V

1. BSAG-501Agricultural Finance and Co-Operation3(2+1) Theory

S. No.	Course Objectives
1.	To educate the basic concept of rural credit, its structure and salient features.
2.	To make understand the terminology and facts about agriculture Finance and Cooperation.
3.	To learn apply for loan as now they are aware about lending procedure of credit institutions.
4.	To enable to analyze the financial statements i.e., balance sheet and income statement and use it to know the performance of an institution and enable to evaluate the credit structure of different credit institutions.

Unit	Content	Teaching hours
I	Agricultural Finance- meaning, scope and significance, credit needs and its role in Indianagriculture.Agriculturalcredit:meaning,definition,need,classification.Credit analysis: 4 R's, and 3C's ofcredits. Sourcesofagriculturalfinance:institutionalandnon-institutionalsources,commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unitcost.	8
II	An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit.Preparation and analysis of financial statements – Balance Sheet and Income Statement.	7
III	Basic guidelines for preparation of project reports- Bank norms – SWOT analysis. Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.	7
IV	Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives,farmers'servicecooperativesocieties,processingcooperatives,farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC,NAFED.	6

Experiment	Topic
1)	Determination of most profitable level of capital use.
2)	Optimum allocation of limited amount of capital among different enterprise.
3)	Analysis of progress and performance of cooperatives using published data.
4)	Analysis of progress and performance of commercial banks and RRBs using published data.
5)	Visittoacommercialbank,cooperativebankandcooperativesocietytoacquirefirsthand knowledge of their management, schemes andprocedures.
6)	Estimation of credit requirement of farm business – A case study.

7)	Preparation and analysis of balance sheet – A case study.
8)	Preparationandanalysisofincomestatement–Acasestudy.Appraisalofaloanproposal – A case study.
9)	Techno-economic parameters for preparation of projects.
10)	Preparation of Bankable projects for various agricultural products and its value added products.
11)	Seminar on selected topics.

S. No.	Course Outcomes (CO)
CO 1	Able to remember the rural credit structure and its salient features and understand the terminology and facts about agriculture Finance and Cooperation.
CO 2	Able to apply for loan as now they are aware about lending procedure of credit institutions.
CO 3	Able to analyze the financial statements i.e., balance sheet and income statement and use it to know the performance of an institution.
CO 4	Able to evaluate the credit structure of different credit institutions and able to create a project report of a new agri- project.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Ghosal, S.N., Agricultural Financing in India, Asia Publishing House, Bombay, 1966	1966
2)	John, J. Hamptron., Financial Decision Making: Concepts, Problems and Cases, Prentice- Hall of India , New Delhi, 1983	1983
3)	Mukhi, H R. Cooperation in India and Abroad. New Heights Publishers, New Delhi, 1983	1983
4)	Subba Reddy, S., P.Raghuram., P. Sastry, T.V.N. and Bhavani Devi I. Agricultural Economics., Oxford & IBH Publishing Company Private Ltd., New Delhi, 2010	2010

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	2	1	1	1	2	1	-	-	2	3	1	2
CO-2	1	1	1	1	1	1	1	-	-	1	-	2	1
CO-3	2	2	2	1	2	-	1	-	-	2	-	2	1
CO-4	1	1	1	1	1	1	1	-	-	1	5	1	2
CO-5	1	1	1	1	1	1	1	-	-	1	5	1	2
CO-6	1	1	1	1	1	1	1	-	-	1	5	1	2
Average	1.25	1.5	1.3	1	1.3	1	1	-	-	1.5	1.3	1.5	1.5

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-501	Agricultural Finance and Cooperation	2	0	2	30	5	15	50	100	3(2+1)

2. BSAG-502 Manures, Fertilizers and Soil Fertility Management3(2+1)

S. No.	Course Objectives
1.	To provide basic knowledge about organic manures & fertilizers and preparation of manures.
2.	To develop understanding about the chemical fertilizers, their composition and classification.
3.	To develops skills for making recommended fertilizer doses in the crop field and method of their application to the crops.
4.	To develops skills to analyze nutrients available in soil and in plants and Learns the application of remote sensing and GIS for diagnosis and management of problem soils.

Unit	Content	Teaching hours
I	History of soil fertility and plant nutrition. Soil as a source of plant nutrients, essential and beneficial nutrients and their role. Criteria of essentiality, forms of nutrientsinsoil. Introduction and importance of organic manures.Sources of organic matter, recycling, composition and C:N ratio. Definition, properties and classification of bulky and Concentrated organic manures, their composition andNutrientvailability.	7
II	Preparation of FYM, composts, Different methods of composting, decomposition process And nutrient losses during handling and storage. Vermi composting, green manuring; types, advantages and Disadvantages and nutrientvailability. Sewage and sludge, Biogas plants lurry; their composition Andeffectonsoilandplant growth. Integrated nutrient management; concept, components and importance. Fertilizer;Definitionandtheir classification; N fertilizers:classification,manufacturingprocess and properties their fateandreactioninsoils.	7
III	Phosphatic fertilizers, manufacturing process and properties, classification, their fate and reactioninsoils.Potassic fertilizers: classification, manufacturing process, properties, their fate and reactioninsoils.Complex fertilizers their fate and reaction in the soil.Nano fertilizers. Secondary &micronutrient fertilizers: Types, composition, Reaction in soil and effect on crop growth. Soil amendments. Handling and storage of fertilizers: Fertilizer control order.Mechanismof nutrient transport to plants: Factors affecting nutrient vailabilitytoplants. Measures to over come deficiencies andtoxicities.	7
IV	ChemistryofsoilN,P,K,calcium,magnesium,sulphurandmicronutrients.Soilfertility evaluation and different approaches Soil Testing (Available nutrients): Chemical methodsandcriticallevelsofdifferentnutrientsinsoil.Plantanalysismethods:Critical levels of nutrients, DRIS approach, rapid tissue test, indicator plants. Soil test based fertilizer recommendations tocrops. Methods and scheduling of nutrient applications for Different soils and crops grown under rainfed and irrigated conditions. Factors in fluencing nutrients use efficiency (NUE) in respect of N, P, K, S, Feand Zn fertilizers.	7
	Total	28

Practical

Experiment	Topic
1)	Principle and application of spectro-photometry/ Colorimetry.
2)	Principle and application of flame photometry and atomic absorption Spectro photometer (AAS).
3)	Determination of moisture from organic manures and its preparation for Nutrient analysis.
4)	Determination of organic carbon from organic manures by ignition method.
5)	Estimation of available nitrogen in soil (Alkaline permanganate method)
6)	Estimation of available phosphorus in soil.
7)	Determination of available potassium in soilusing flame photometer.
8)	Determination of exchangeable Ca &Mgin soil by EDTA method.
9)	Estimation of available sulphur in soil (Turbidity method).
10)	Estimation of DTPA extra ctable micronutrients from soil using AAS.
11)	Estimation of total Nfrom plant sample by Micro Kjeldahl's method.
12)	Plantanalysis for P, K, secondary and micronutrients.
13)	Fertilizeradulterationtest/identificationofadulterationinfertilizer/ Detection of adulteration in fertilizers (Rapidtest).
14)	Determination of nitrate, nitrogen content of potassium nitrate.
15)	Determination of water solublephosphorusinsuperphosphate (PumbertonMethod).
16)	Determination of acid soluble phosphorus from rock phosphate.
17)	Determination of total potassium content of muriate of potash (flame Photometer).
18)	Determination of zin ccontent from micronutrient fertilizer (EDTA Method).

S. No.	Course Outcomes (CO)
CO 1	Develop the basic knowledge about organic manures & fertilizers and preparation of manures.
CO 2	Students will be able to learn about the chemical fertilizers, their composition and classification.
CO 3	Develop the skills for making recommended fertilizer doses in the crop field and method of their application to the crops.
CO 4	Analyze the nutrients available in soil and in plants and Learns the application of remote sensing and GIS for diagnosis and management of problem soils.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Maria kulandi and Manickam Chemistry of fertilizers and manures.	1975
2)	Mariakulandi and Manickam Chemistry of manuresan fertilizers	1975
3)	Tandon H.L.S. Recycling of crop, animal, human and industrial Wastes in Agriculture.FDCO, Delhi	1994
4)	Krishnaand Murthy Manual on compost and other organic manures.	1978
5)	RakshitA.Manures Fertilizers and Pesticides Paper back–Import.CBS Publishing; 1ST edition, pp. 266.	2015
6)	ZhongqiHeandHailinZhang) Applied Manure and Nutrient Chemistry for Sustainable Agriculture and Environment Paperback–Import.Springer. pp. 379.	2016
7)	Havlin, JohnL, SamuelL. Tisdale (Author), WernerL. Nelson (Author), JamesD. Beaton Soil Fertility and Fertilizers (8^{th}Edition) 8^{th}Edition. Published by PrenticeHall.Pp.528.	2004
8)	Havlin, JohnL..Soil Fertility and Fertilizers:AnIntroduction to Nutrient Management PublishedbyPrentice Hall.Pp.528.	2004
9)	JamesF.Power,Rajendra Prasad Soil Fertility Management for Sustainable Agriculture. CRC Press Tayloer and Francis Group..Textbook- pp. 384.ISBN9781566702546	1997
10)	ISSS.Fundamentals of Soil Science. 2^{nd}Ed.Indian Society of Soil Science, New Delhi- 110012.Pp. 728.	2009
11)	Das D.K. Introductory Soil Science, 3^{rd} revised and Enlarged Ed, Kalyani Publisher, Ludhiana.Pp. 645.	2011
12)	ICAR Handbook of manures and fertilizers publication.	1971
13)	YawalkarK.S.Manures& fertilizer:	1992
14)	Somawanshi, etal. Laboratory Methods for Analysis of Soil, Irrigation Waterand Plants., Department of Soil Science and Agricultural Chemistry, MPKV., Rahuri. Revised Ed. Pp.307.	2012
15)	Jakson, M.L. Soil Chemical Analysis. PrinticeHall, India, Pvt. Ltd. New Delhi.pp 498.	1973

16)	Pageet.al. Methods of Soil Analysis, Part1 and 2. Chemical and Microbiological Properties. 2Ed. Soil Science Soc. ofAmericaAm.Soc.Agron.,Madison, Wisconsin, USA.	1982
17)	Chapman, H.D., and P.F.Pratt. Methods of analysis for soils, plants and waters. Division of Agricultural Sciences, University of California.	1961
18)	Brady, N.C.The Nature and Properties of Soils.15 the dition Publisher: Pearson Education, ISBN: 978-0133254488.	2016
19)	ISSS. Fundamentals of Soil Science. 2nd Ed. Indian Society of Soil Science, New Delhi-110 012. pp. 728.	2009
20)	Das, D.K. Introductory Soil Science, 3rd revised and Enlarged Ed, Kalyani Publisher, Ludhiana.pp. 645.	2011
21)	Tisdale, S.L. and Nelson, W.L.andBeaqton, J.D. Soil Fertility and fertilizers.7thEd.Macmillan Publishing Company, 445 Hutchinson Avenue, Columbus.	2010
22)	Yawalkar, K.S.,Agarwal,J.P.andBokde, S.ManuresandFertilizers.Agri-Horticultural Publication.	1967
23)	Chopra, S. L. and Kanwar, S.L. and Rakshit, J.S.Analytical Agricultural Chemistry.KalyaniPublisher.	2014
24)	Handbook of fertilizers use FAI publication	1980

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	2	1	1	1	2	1	-	-	3	3	1	2
CO-2	2	1	-	1	-	1	1	-	-	1	-	-	1
CO-3	1	1	2	1	2	-	1	-	-	1	-	1	1
CO-4	2	2	2	-	-	2	1	-	-	2	3	1	2
Average	1.5	1.5	1.7	1.0	1.5	1.7	1.0	-	-	1.8	3.0	1.0	1.5

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-502	Manures, Fertilizers and Soil Fertility Management	2	0	2	30	5	15	50	100	3(2+1)

3. BSAG-503Pests of Crops and Stored Grain and their Management 3(2+1)

S. No.	Course Objectives

1.	To memories the Identification, taxonomy, host range, biology and bionomics, nature of the damage and preventive and curative control measures of crop and stored grain pests.
2.	To develop understanding of operating various pesticide appliances as a knap-sack sprayer, foot sprayer, aerosol, fumigators, etc, for pesticide application.
3.	To make able to examine insect infestation, loss assessment, pesticide doses, and preparation of solution to spray for pest management.
4.	To develop ability to formulating the crop-wise IPM modules for sustainable agriculture and Storage structure and methods of grain storage to minimize the risk of food security.

Unit	Content	Teaching hours
I	**Distribution, biology, nature of damage and management of insect pests of……..Cereals** Rice -Paddy stem borer, Greenleaf hopper, Brownplanthopper, Whitebackedplanthopper, Gallmidge, Paddy grasshopper, Blue beetle, Caseworm, Armyworm, Gundhibug,Hispa, Leaf folder Sorghum– Shootfly, Stemborer,Aphids,Delphacids, Grasshopper,Earheadmidge,Earhead caterpillars Maize –Shoot fly,Stemborer,Armyworm,CobearwormBajra–Shoot fly, Blister beetle Wheat –Stem borer,Aphids,Termites, Minor millets-**Pulses–Pigeonpea, chickpea, mungbean, urdbean, cowpea, pea** Pigeon pea – Podborer, Plumemoth,Podfly,Spottedpodborer, Leafwebber, Mites Chickpea– Grampodborer,Aphids,CutwormMungandUrdbean – Aphids, Leafeatingcaterpillar,Semilooper, Podborer Cowpea andPea– Aphids,Bluebutterfly, Podborer.	8
II	**Oilseeds-** Groundnut– Leaf miner, Hairy caterpillar, Tobacco leafeatingcaterpillar, Aphids, Thrips, Whitegrub, Pod sucking bug Castor – Semi looper, Capsule borer, Jassids, Tobacco leaf eating Caterpillar Sunflower – Capitulum borer, Hairy caterpillar, Jassids, Thrips, Whitefly, Stemborer Safflower– Aphids, Capitulum borer,Guzia weevil Mustard –Aphids,Sawfly,LeafwebberLinseed–Gallfly Soybean– Stemfly, Girdlebeetle, Leafminer, Tobacco leaf eating caterpillar, Whitefly, Semilooper,Grampod borer Sesamum –Tilhawkmoth,Gallfly, leaf eating caterpillar Niger – Semilooper,Grampod borer.	7
III	**Fibercrops–** Cotton– Aphids,Jassids, Thrips, Whitefly,Mealy bugs, Spotted bollworm,Americanbollworm,Pinkbollworm,Tobaccoleafeatingcaterpillar,Leaf folder, Semi looper, Redcottonbug, Dusky cotton bug,GreyweevilSunhempandMesta –Sun hemp hairycaterpillar, **Sugarcane crops** Sugarcane– Early shoot borer, Internode borer, Top shootborer, Whitefly, Pyrilla, Woolly aphids,Mealybug,Scale insect, Termites,Whitegrub. **Non-insect pests of above crops–**Crabs, Snails and Slugs, millepedes,Mites,Ratsandsquirrels,	6
IV	StoredgrainpestsBiologyanddamageofPrimaryandSecondarypestsPrimarystore grainpests-Internal feeders- Riceweevil,lesser grain borer, pulse beetle and Angoumois grain moth External feeders- khapra beetle, Indian meal mothSecondary store grain pests– Rustred flour beetle,Sawtoothedgrainbeetle, Longheaded beetle Primary and Secondary store grain pests- Rice moth Non insect pests, mites, rodents,birds and microorganisms associated with stored grain and their management Preventive and curative methods of storedgrainpests Storage structure and methods of grain storage and fundamental principles of grain storemanagement.	7
	Total	28

4.

Practical

Experiment	Topic
1)	Pests of Rice
2)	Pests of Sorghum
3)	Pests of Maize,Bajra,Wheat and Miner millets
4)	Pests of Pigeon pea
5)	Pests of Chickpea,Mung bean, Urd bean,Cowpea and Pea
6)	Pests of Groundnut
7)	Pests of Castor and Sunflower
8)	Pests of Safflower,Mustard,Linseed
9)	Pests of Soybean,Sesamum and Niger
10) & 11)	Pests of Cotton,Sunhemp and Mesta
12)	Pests of Sugarcane
13)	Non insect pests of field crops
14) & 15)	Store grain pests
16)	Noninsect pests, mites, rodents, birds and microorganisms associated with stored grainand their management
17)	Preventive and curative methods of stored grain pests
18)	Storage structure and methods of grainst or ageandfundamentalprinciplesof grainstoremanagement.

S. No.	Course Outcomes (CO)
CO 1	Memories the Identification, taxonomy, host range, biology and bionomics, nature of the damage and preventive and curative control measures of crop and stored grain pests.
CO 2	Develop the understanding of operating various pesticide appliances as a knap-sack sprayer, foot sprayer, aerosol, fumigators, etc, for pesticide application.
CO 3	Develop the ability to examine insect infestation, loss assessment, pesticide doses, and preparation of solution to spray for pest management.
CO 4	Formulate crop-wise IPM modules for sustainable agriculture and Storage structure and methods of grain storage to minimize the risk of food security**.**

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	A.S.AtwalandG.S.Dhaliwal:AgriculturalPests of South Asia and their Management	2015
2)	B.V. DavidandV.V.Rammurthy:Elements of Economic Entomology	2016

3)	PedigoL.P. : Entomology and Pest Management.	2014
4)	Venu Gopal Rao: Insect Pest Management.	2004
5)	B.P.Khare: Storage Entomology	1972

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1	2	2	1	1	2	1	-	-	2	1	1	2
CO-2	1	1	2	1	1	1	1	-	-	1	-	-	3
CO-3	2	1	-	1	-	-	1	-	-	2	-	2	1
CO-4	1	2	1	1	1	2	1	-	-	1	2	1	2
Average	1.3	1.5	1.3	1.0	1.0	1.3	1.0	-	-	1.5	1.5	1.0	2.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-503	Pests of Crops and Stored Grain and their Management	2	0	2	30	5	15	50	100	3(2+1)

4. BSAG-504 Principles of Integrated Pest and Disease Management 3(2+1)

S. No.	**Course Objectives**
1.	To educate concepts, tools and principles of Integrated Pest and Disease Management.
2.	To develop understanding of the role of IPM in sustainable agriculture as the future of modern plant protection in pest and disease control strategy and develop skills about methods of detection and diagnosis of insect pest and diseases and application of different pest and disease control techniques.
3.	To develop skills to analyze agricultural ecosystem, level of pest damage, Pest risk and timing of different pest control tactics to manage the pest population effectively.
4.	To enable to evaluate Economic Injury Level and Economic Threshold Level for timely application of control measures for pest management.

Unit	**Content**	**Teaching hours**
I	Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles andtoolsofIPM.Economicimportanceofinsectpests,diseases and pest risk analysis. Methods of detection and diagnosis of insect pest and diseases.	7

II	Calculation and dynamics of economic injury level and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.	7
III	Ecological management of crop environment. Introduction to conventional pesticides for the insect pests and disease management. Survey surveillance and forecasting of Insect pest and diseases. Development and validation of IPM module.	7
IV	Implementation and impact of IPM (IPM module for Insect pest anddisease.Safetyissuesinpesticideuses.Political,socialandlegalimplicationof IPM. Case histories of important IPMprogrammes	7
	Total	28

Practical

Experiment	Topic
1)	Methods of diagnosis and detection of various insect pests, and plant diseases,
2)	Methods of insect pests and plant disease measurement,
3)	Assessment of crop yield losses, calculations based on economics of IPM, Identification of biocontrol agents, different predators and natural enemies.
4)	Mass multiplication of *Trichoderma, Pseudomona*s, *Trichogramma*, NPV etc.
5)	Identification and nature of damage of important insect pests and diseases and their management.
6)	Crop (agroecosystem) dynamics of a selected insect pest and diseases.
7)	Plan & assess preventive strategies (IPM module) and decision making.
8)	Crop monitoring attacked by insect, pest and diseases.
9)	Awareness campaign at farmer's fields.

S. No.	Course Outcomes (CO)
CO 1	Educate concepts, tools and principles of Integrated pest and disease management.
CO 2	Develop understanding of the role of IPM in sustainable agriculture as the future of modern plant protection in pest and disease control strategy and development of skills about methods of detection and diagnosis of insect pest and diseases and application of different pest and disease control techniques.
CO 3	Analyze agricultural ecosystem, level of pest damage, Pest risk and timing of different pest control tactics to manage the pest population effectively.
CO 4	Evaluate Economic Injury Level and Economic Threshold Level for timely application of control measures for pest management.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Metcalf, R.L. and Luckman W.H.Introductionto Insect Pest Management.WileyInterSciencepublishing,NewYork.	1982
2)	G.S.DhaliwalandRameshArora Integrated Pest Manageemnt. Concepts and Approaches. Kalyani publishers, New Delhi.	2001
3)	Larry P.Pedigo.Entomology and Pest Management.LarryP.Pedigo.Mac Millan publishing company, NewYork.	1991
4)	Yazdani G.S.andAgarwalM.L.Elements of Insect Ecology. Naroji publishing house, New Delhi.	1979
5)	HufakarC.V.Ecological Entomology	1998
6)	Clark L.R., Gier P.W., RughasR.D.and Marris R.F. The Ecology and Insect Population.	1967
7)	OdumE.P.Fundamentals of Insect Ecology	1997
8)	GuptaS.K.Plant Mites ofIndia,	1995

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1	1	1	1	1	2	1	-	-	2	2	1	2
CO-2	2	2	1	1	-	1	1	-	-	1	-	-	1
CO-3	1	2	-	1	2	-	1	-	-	2	-	2	1
CO-4	1	1	2	-	1	2	1	-	-	1	1	1	2
CO-5	1	-	2	1	1	-	-	-	-	-	-	1	-
Average	1.2	1.5	1.5	1	1.2	1.3	1	-	-	1.5	1.5	1.2	1.5

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory	Subject Total	
		L	T	P	Midterm Theory	Assignment	Practical			
BSAG-504	Principles of Integrated Pest and Disease Management	2	0	2	30	5	15	50	100	3(2+1)

5. BSAG-505 Crop Improvement – I (*Kharif*) 2(1+1)

S. No.	Course Objectives
1.	To study scope and importance of seed technology in agriculture.

2.	To understand seed production techniques in various field crops.
3.	To acquaint students with maintenance of seed processing, seed quality, seed storage and marketing.
4.	To accustom students with various seed control act, order and tests for conforming status of seed.

Unit	Content	Teaching hours
I	Centre of origin, Distribution of species, wildrelative indifferent crops Cereals- Rice, Maize, Sorghum, Pearlmillet, and Fingermillet. Pulses- Pigeonpea, Urdbean, Blackgram, Mung bean, Cowpea, Soybean. Oilseed-Groundnut, Castor, Sesame, Sunflower. Fodder: Berseem, Lucerne, ricebean. Cashcrops: Cotton, Tobacco. Vegetable: Ridge gourd, bottlegourd, Snakegourd, Bitter gourd. Horticulturalcrop-Mango, Cashewnut, Citrus, Pomegranate, Guava. DefinitionofPGR, Genepool,Kindsofgermplasm,genepoolconcept,Geneticerosion, Germplasm collection and conservation, Types andmethods.	3
II	Floral Biology- Emasculation and mode of pollination (Definition And Types) Study of genetics of qualitative and quantitative characters- Inheritance of qualitative characters, pleiotrophy, Penetrance and Expressivity, Threshold character and modifying genes. Inheritance of quantitative character-Multiple factor hypothesis, Transgenic segregation, Role of environment of quantitative inheritance, Difference between quantitative and qualitative character, Major Specific Breeding objective, Conventional Breeding methods- Introduction, Mass selection, pure line selection, Pedigree method, Bulk method and back cross method along with examples of varieties. Modern innovative approaches-somatic Hybridization, transgenic breeding and marker assisted selection.	4
III	Biotic stress tolerance: Breeding for disease and insect resistance Disease resistance: Introduction, mechanism of disease resistance genetic resistance type of genetic resistance, gene for genehypothesis, Genetics of resi stance sources of resistance breeding methods and practical achievement. Insect resistance: Introduction, mechanism of insect resistance basis of insect resistance, Genetics of insect resistance sources of insect resistance, breeding methods, practical achievement. Breeding for Abiotic stress: Drought resistance- Drought introduction, Drought resistance, Mechanism of drought resistance, Basis of drought resistance sources of drought resistance, breeding method.Salinity: Breeding for salt tolerance, breeding approaches, screening techniques, practical achievements.	4
IV	Breeding for quality: Introduction, Quality traits, Nutrition and nutrients, Nutritional quality of cereals and pulses, Genetic of nutritional traits, Sources of nutritional quality, Breeding methods, screening techniques, Breeding for low toxic substance,practical achievements. Seed production technology inself pollinated crops-Rice wheat, Cross pollinated- Maize, Sorghum Vegetatively propagated crop. Potato, Sugarcane Hybrid seed productionof Maize, Rice Sorghum, Pigeon pea and Pearl millet. Ideotypeconceptincropimprovement-Introduction,Typesofideotype,characteristics of Ideo type, Major steps in Ideo type breeding, Ideo type of Rice, wheat, Sorghum, practical achievements, merits and demerits. Characteristics of climate resilientcropsViz.Wheat, Sorghum, maize, soybean, cotton.	3
	Total	14

Practical

Experiment	Topic
1)	Emasculation and hybridization techniques in different crop species : Rice, Maize
2)	Emasculation and hybridization techniques in Sorghum & Pearl Millet
3)	Emasculation and hybridization techniques in Ragi & Pigeon pea
4)	Emasculation and hybridization techniquesin Urd bean & Mung bean,Soybean
5)	Emasculation and hybridization techniques in Groundnut,Seasame& Sunflower
6)	Emasculation and hybridization techniques in Caster, Cotton
7)	Emasculation and hybridization techniques in Cow pea & Tobacco
8)	Maintenance breeding of different Kharif crops
9)	Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods
10)	Study of field techniques for seed production and hybrid seeds production in Kharif crops
11)	Estimation of heterosis, inbreeding depression and heritability
12)	Layoutof field experiments
13)	Study of quality characters, donorparents for different characters
14)	Visit to seed production plots
15)	Visit to AICRP plots of pulse & sorghum
16)	Visit to AICRP plots of oil seed & cotton

S. No.	Course Outcomes (CO)
CO 1	Remember the evolutionary history of important field crops along with their centre of origin, its wild species and wild relatives that can be utilized in crop improvement.
CO 2	Develop the understanding of germplasm conservation, utilization, and genetics of qualitative and quantitative characters, and their inheritance.
CO 3	Analyze breeding procedures and methods breeding objectives in different crop important for the development of improved varieties.
CO 4	Able to differentiate seed production technology in different classes of Kharif field crop.

S. No.	Title of Book Author /Authors Publisher	Year of Publication/ Reprint
1)	Crop Breeding and Biotechnology Hari Har Ram Kalyani Publication NewDelhi.	2014
2)	Breeding of Asian Field crops D.A.SleperJ.M.PoehlmanBlackwellPublishers	2006

3)	Principle and Procedures of Plant Breeding Bio technological and Conventional Approach G.S. ChahalS.S.GoslaNarosa Publishers House.NewDelhi.	2002
4)	Plant Breeding Principle and Methods.B.D.Singh Kalyani Publication NewDelhi.	2009

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	3	2	1	1	-	-	-	-	-	-
CO2	1	1	2	2	1	2	-	-	1	-	-	-	-
CO3	2	-	2	2	-	-	-	-	-	-	-	-	-
CO4	2	-	1	1	1	1	1	-	1	-	-	-	-
CO5	3	2	1	1	3	2	1	-	-	-	-	-	-
Average	2.2	1.3	1.6	1.8	1.8	1.5	1	-	1	-	-	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-505	Crop Improvement-I *(Kharif Crops)*	1	0	2	30	5	15	50	100	2(1+1)

6. BSAG-506 Entrepreneurship Development and Business Communication 2(1+1)

S. No.	Course Objectives
1.	To acquaint knowledge on the concept of Business, Enterprise, Entrepreneurs and Entrepreneurship Development.
2.	To develop understanding on different government policies and programmes in entrepreneurship development.
3.	To enable to evaluate the principles of Business Leadership Skills, Problem Solving Skills, Managerial Skills, Problem Solving Skills and Project Planning.
4.	To enable to analyze SWOT analysis and formulation of project, implement planning, formulation and preparation to set-up their own business.

Unit	Content	Teaching hours
I	**Entrepreneur:** Meaning, definitions, characteristics of Entrepreneurship Assessment of entrepreneurship skills, identifying potential Entrepreneurs **Entrepreneurship development –**Concept of entrepreneurship, Process of entrepreneurship development	3
II	Achievement motivation and entrepreneurship development Generation, in cubationandcommercializationofbusinessideasandinnovationsSWOTanalysis:Concept and technique Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises(SMEs/SSIs)	3

III	Supply chain management,TimemanagementandTotalquality management **Market Survey :** Meaning, objectives, methods of conducting survey Formulation of project, financialanalysisofprojectCommunication–Meaningandprocessofcommunication Communication skills for entrepreneurship–Written communication,Verbal communication,Investigatingandanalyzing,PlanningandOrganizing,Negotiatingand persuading, Cooperative (Team work),Leadership andNumeracy	4
IV	Developing different skills for entrepreneurship – Leadership Skills, Speaking Skills, Listening Skills, Organizational skill, Managerial skills, Problem solving skill Writing Skill–Businessletter,lettersofenquiry,quotation,orders,andtenders,complaintletterOral presentation skills–Preparation,presentationand Evaluation Advertisements–Meaning,types,forms,functions	4
	Total	14

Practical

Experiment	Topic
1)	Assessing entrepreneur potential
2)	Assessment of problem solving ability
3)	Exercises increativity
4)	Conducting market survey to know the demands for different products
5)	Preparing advertisements for popularization of products and newswriting
6)	Preparing project proposals
7)	Individual and group presentations and evaluation of presentation
8)	Individual and group presentations and evaluation of presentation
9)	Telephonic conversation :Rateofspeech, clarity of voice, speaking and listening politeness, telephonicetiquettes
10)	Conducting meeting– Purpose, procedure, participation,physicalarrangements, Recording and writing of minutes of meeting
11)	Seminarand conferences: Useofbody language
12)	Conducting mock interviews–testing initiative, team spirit and leadership
13)	Group discussion and debate soncurrent topics
14)	Visit to entrepreneur ship institute/ case study of successful entrepreneurs
15)	Presentations by the students

S. No.	Course Outcomes (CO)
CO 1	Acquaint the knowledge on the concept of Business, Enterprise, Entrepreneurs and Entrepreneurship Development.

CO 2	Develop the understanding on different government policies and programmes in entrepreneurship development.
CO 3	Evaluate about the principles of Business Leadership Skills, Problem Solving Skills, Managerial Skills, Problem Solving Skills and Project Planning.
CO 4	Develop ability for SWOT analysis and formulation of project, implement planning, formulation and preparation to set-up their own business.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Akhouri, M.M.P., Mishra,S.P. and Sengupta, Rita Trainers Manual on Developing Entrepreneurial Motivation, NIESBUD,NewDelhi	1989
2)	Betty, GorddanB. Entrepreneurship,Playing to Win, Taraporewala, Mumbai	1979
3)	Entrepreneurship Development Institute in India Developing New Entrepreneurs, EDII, Ahmedabad, NISIET,Library:338.93/EDI/87/25104.	1987
4)	Mancuso, Joseph The Entrepreneurs Handbook, Vol.I&II, Artech HouseInc. USA.	1974
5)	Patel,V.G. Entrepreneurship Development in India and its relevant Developing Countries, Entrepreneurship Development Institute of India,Ahmedabad,NISIET,Library:338.93(540)/PAT/87/25103.	1987
6)	Singh, A. K., Lakhan Singh,R.and Roy Berman Dimensions of Agricultural Extension, Aman Publishing House,Meerut.	2006
7)	Mondal Sagarand G.L. Ray TextBook of Entrepreneurship and Rural Development.Kalyani Publishers, Ludhiana.ISBN 978-81-272-5599-2	2009

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	2	1	2	2	2	3	3	1	1	1	1
CO-2	3	3	2	1	2	2	2	2	3	1	1	1	1
CO-3	2	2	1	-	1	1	1	2	3	1	-	1	-
CO-4	1	1	-	-	-	1	1	1	3	-	-	-	-
Average	2.3	2.3	1.7	1.0	1.7	1.5	1.5	2.0	3.0	1.0	1.0	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm	Assignment	Practical			

					Theory Exam					
BSAG-506	Entrepreneurship Development and Business Communication	1	0	2	30	5	15	50	100	2(1+1)

7. BSAG-507 Geo-informatics and Nanotechnology and Precision Forming2(1+1)

S. No.	Course Objectives
1.	To familiarize the concept of simulation and modeling in agriculture.
2.	To develop awareness of issues and concern of precision farming in context of Indian agriculture.
3.	To develop understanding of the basic concept of geoinformatics, its tool and techniques (GPS, GIS, Remote sensing, STCR, etc.) and application in precision farming.
4.	To develop understanding of the concept of nanotechnology, its tools and techniques, its application and future prospects in agriculture.

Unit	Content	Teaching hours
I	Precision agriculture: concepts and ntechniques; the irissues and concerns reference for Indian agriculture, Geo-informatics system-Definition, concepts, tool and techniques;theiruseinPrecisionfarming.CropdiscriminationandYieldmonitoring	3
II	soilmapping; fertilizer recommendation using geo spatial technologies Spatial data and the irmanagementinGISRemote sensing concepts and application in agriculture Image processing and interpretation Global positioning system (GPS), components and its functions	4
III	Introduction to crop Simulation Models Uses of crop simulation models for optimization of Agricultural Inputs STCR approach for precision agriculture Nano technology - Definition, concepts and techniques Briefintroductionabout nano scale effects, nano-particles	4
IV	Nano-pesticides, nano-fertilizers, nano-sensors Use of nano technology in seed & water for scaling-up farm Productivity Use of nano technology in fertilizer & plant protection for scaling up farm productivity	3
	Total	14

Practical

Experiment	Topic
1)	Introduction to GIS software, spatial data creation and editing
2)	Introduction to image processings of tware
3)	Visual and digital interpretation of remote sensing image by software
4)	Generationof spectral profiles of different objects
5)	Supervised and unsupervised classification and acreage estimation
6)	Multi spectral remote sensing for soil mapping

7)	Soil fertility map by GIS
8)	Creation of productivity and management zone by GIS
9)	VRT technique for fertilizer recommendation
10)	STCR technique for fertilizer recommendation for targeted yield
11)	Calculation of crops tress geospatial technique
12)	Agricultural Survey by GPS and DGPS
13)	Formulation and characterization of nanoparticles
14)	Applications of nanoparticles in agriculture
15)	Project srelated by precision farming.

S. No.	Course Outcomes (CO)
CO 1	Acquaintthe concept of simulation and modeling in agriculture.
CO 2	Make aware of issues and concern of precision farming in context of Indian agriculture.
CO 3	Understand of the basic concept of geo-informatics, its tool and techniques (GPS, GIS, Remote sensing, STCR, etc.) and application in precision farming.
CO 4	Understand of the concept of nanotechnology, its tools and techniques, its application and future prospects in agriculture.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	GIS: Fundamentals, Applications &Implementations –Dr. K E langovan New India publishing Agency, NewDelhi.	2006
2)	Remote sensing, GIS and wetland management-Er Tasneem Abbasi &Prof.S. A. Abbasi	2009

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2	2	2	1	-	1	-	1	1	1	1	-
CO2	3	2	2	2	1	-	-	-	1	1	-	-	-
CO3	3	2	2	2	1	-	-	-	-	1	-	-	-
CO4	3	2	2	2	1	-	-	-	-	1	-	-	-
Average	3.0	2.0	2.0	2.0	1.0	-	-	-	-	1.0	1.0	1.0	-

Course Code	Course Title	Periods per week	Evaluation Scheme			Credit (Theory +
			Internal Exam	External	Subject	

		L	T	P	Midterm Theory Exam	Assignment	Practical	Theory Exam	Total	Practical)
BSAG-507	Geo-informatics and Nano-technology and Precision Farming	1	0	2	30	5	15	50	100	2(1+1)

8. BSAG-508 Practical Crop Production -1 *(Kharif* crops)1(0+1)

S. No.	Course Objectives
1.	To acquaint the knowledge on the method of field preparation for crop production and arrange the resources required in the field.
2.	To develop understanding on production techniques of major Kharif season crops according to resources available in the field.
3.	To educate to Apply the production techniques of crops in the practical crop production field.
4.	To enable to examine the production of sown crops in the practical crop production field.

Experiment	Topic
1)	Introduction, aims and objectives of practical crop production–Allotment of plot and its history.
2)	Study of seed production of kharif crops
3)	Study of mechanization and resource conservation of kharif crops
4)	Study of physical and chemical properties of the allotted plot to the students.
5)	Study of package of practices for growing kharif crop (timely, late and rainfed).
6)	Study of farm inventorie sand records
7)	Preparation of calendar of operation for kharif crop.
8)	Study of preparatory, secondary tillage and seed bed preparation for kharif crop.
9)	Sowing and seed treatment of kharif crop.
10)	Study of integrated nutrient management of kharif crop
11)	Study of water management to kharif crop.
12)	Determination of germination/emergence count of kharif crop.
13)	Study of growth and yield contributing characters of kharif crop.
14)	Study of interculturing and weed management in kharif crop.
15)	Study of integrated insect pest and diseases managementin kharif crop

16)	Study of crop maturity signs and harvesting of kharif crops
17)	Threshing, drying, winnowing, storage and preparation of produce for Marketing of kharif crop.
18)	Study of cost of cultivation and work in gout netreturns per student
19)	Study of post-harvest technology of kharif crop.
20)	Summary report of practical crop production
21)	Study of weekly weather record for kharif season.

S. No.	Course Outcomes (CO)
CO 1	Acquaint the knowledge on the method of field preparation for crop production and arrange the resources required in the field.
CO 2	Develop the understanding on production techniques of major Kharif season crops according to resources available in the field.
CO 3	Apply the production techniques of crops in the practical crop production field.
CO 4	Examine the production of sown crops in the practical crop production field.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Modern technique of raising field crops by Chidda Singh	2020
2)	Agronomy of field crop by S. R. Reddy	2016
3)	Handbook of Agriculture, ICAR NewDelhi	2006

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-508	Practical Crop Production – I (Kharif crops)	0	0	4	0	0	100	0	100	2(0+2)

9. BSAG-509 Intellectual Property Rights1(1+0)

S. No.	Course Objectives
1.	To study about meaning of intellectual property and differentiate it from tangible property and understand history of IPR development with various treaty and conventions
2.	To study various form of intellectual properties so that they can analyze them as per their eligibility for their protection.
3.	To be aware about GI, ITK, and protection of plant varieties, researcher's right and framer's right.
4.	To enable to evaluate ethical and professional issues which arise in the intellectual property law.

Unit	Content	Teaching hours
I	Introduction and meaning of intellectual property, brief introduction toGATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapesttreaty, etc. Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Tradesecrets.	4
II	PatentsAct1970andPatentsysteminIndia, patentability,processandproductpatent, filing of patent, patent specification, patentclaims, Patent opposition and revocation, Penalties for infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.	4
III	**UPOV-**Origin and history in cluding a brief introduction to UPOV for protection of plantvarieties,ProtectionofplantvarietiesunderUPOV,PPV&FRActofIndia,Plant breedersrights, Registration of plant varieties under PPV & FR Act2001	3
IV	Researcher and farmers rights, Traditional knowledge- meaning and rights of TK holders. Conventionon Biological Diversity, International treaty on plant geneticresourcesforfoodandagriculture(ITPGRFA).IndianBiologicaldiversityAct,2002and its salient features, access and benefitsharing	3
	Total	14

S. No.	Course Outcomes (CO)
CO 1	Acquaint with the meaning of intellectual property and differentiate it from tangible property and develop the understanding about the history of IPR development with various treaties and conventions, laws of IPR, various forms of IPR property, and their importance in research.
CO 2	Apply intellectual property law principles (including copyright, patents, designs, and trademarks) to real problems and analyze the social impact of intellectual property law and policy.
CO 3	Make able to different various forms of intellectual properties and eligibility for their protection.
CO 4	Evaluate ethical and professional issues which arise in the intellectual property law arising in intellectual property such as, designs, music, copyright, trademarks, designs, information technology and thesis or theory written by the students during their project work.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Introduction to Intellectual Property Rights by H.S. Chawla, Oxford & IBHPublishingCo.Pvt.Ltd.113-BShahpurJat,2ndFloor,AsianGames Village side NewDelhi110 049, India2.	2020
2)	Encyclopedia of Intellectual Property rights Volume No.1 to 10 by Priyanjan Trivedi	2008
3)	Plant Breeding by B.D.Singh Kalyani Publication	2006
4)	Intellectual Property Right Under Golbalization by Talwar S. Serials Publication, New Delhi.	

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1	2	1	1	-	-	-	-	-	-
CO2	2	2	2	-	2	2	1	-	-	-	-	-	1
CO3	2	1	2	2	3	2	1	-	1	-	-	1	-
CO4	1	-	1	1	2	1	-	-	-	-	-	-	1
CO5	1	-	1	1	2	1	-	-	-	-	-	-	1
Average	2.0	2.0	1.8	1.3	2.3	1.5	1.0	-	1.0	-	-	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-509	Intellectual Property Rights	1	0	0	40	10	-	50	100	1(1+0)

10. BSAG-510 Food Safety and Standards* 3(2+1)

S. No.	Course Objectives
1.	To acquaint with importance of food safety management and risks of food safety
2.	To identify sources of food contamination and their control.
3.	To examine food laws and standards- Indian food regulatory regime, fssa, global scenario cac. other laws and standards.
4.	To analyze the safe practices surface sanitation and Personal Hygiene and newer approaches to food safety.

Unit	Content	Teaching hours

I	Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design. Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control.	8
II	Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures. Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series.	6
III	TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis.Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC.	7
IV	Other laws and standards related to food. Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.	7
	Total	28

Practicles

Experiment	Topic
1)	Water quality analysis physico-chemical and microbiological.
2)	Preparation of different types of media.
3)	Microbiological Examination of different food samples.
4)	Assessment of surface sanitation by swab/rinse method.
5)	Assessment of personal hygiene.
6)	Biochemical tests for identification of bacteria.
7)	Scheme for the detection of food borne pathogens.
8)	Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000.

S. No.	Course Outcomes (CO)
CO 1	Understand the importance of Food Safety Management, Packaging, Product and Nutritional labelling, Scope, Factors, Hazards and Risks of Food Safety.
CO 2	Identification of the sources of food contamination and their control.
CO 3	Interpreting the food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards.
CO 4	Follow safe practices Surface Sanitation and Personal Hygiene and newer approaches to food safety.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	The Food Safety & Standards Act-2006 alongwith Rules & Regulation- Virag Gupta	2006
2)	Encyclopedia of Food Safety- Yasmine Motarjemi	2013
3)	Encyclopedia of Food Microbiology- Carl A. Batt; Pradip Patel; Richard K. Robinson	2014

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	-	-	1	3	-	-	3	1	1	3	1
CO-2	1	3	2	-	1	3	-	-	2	1	1	-	-
CO-3	3	2	1	-	1	3	-	-	3	2	3	-	-
CO-4	1	3	2	-	1	3	2	-	3	1	3	1	1
Average	1.8	2.5	1.7	-	1.0	3.0	2.0	-	2.8	1.3	2.0	2.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-510	Food Safety and Standards	2	0	2	30	5	15	50	100	3(2+1)

11. BSAG-511 Biopesticides & Biofertilizers* 3(2+1)

S. No.	Course Objectives
1.	To understand the history, concept, quality control and application of biopesticides and biofertilzers, their importance, scope and potential.
2.	To distinguish the structure and characteristic features of various bacterial biofertilizers.
3.	To examine storage, shelf life, quality control and marketing and factors influencing the efficacy of Biopesticides & Biofertilizers.
4.	To analyze the mechanism of Production technology of Biopesticides & Biofertilizers.

Unit	Content	Teaching hours
I	History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides. Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes.	7

II	Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide. Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizersAzospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobium and Frankia; CynobacterialbiofertilizersAnabaena, Nostoc,	8
III	Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization. Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers.	7
IV	FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.	6
	Total	28

Practicles

Experiment	Topic
1)	Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhyzium etc. and its production.
2)	Identification of important botanicals
3)	Visit to biopesticide laboratory in nearby area.
4)	Field visit to explore naturally infected cadavers.
5)	Identification of entomopathogenic entities in field condition.
6)	Quality control of biopesticides.
7)	Isolation and purification of Azospirillum , Azotobacter, Rhizobium, P-solubilizers and cyanobacteria.
8)	Mass multiplication and inoculums production of biofertilizers.
9)	solation of AM fungi -Wet sieving method and sucrose gradient method.
10)	Mass production of AM inoculants.

S. No.	Course Outcomes (CO)
CO 1	Comprehend the history, concept, quality control and application of biopesticides and biofertilzers, their importance, scope and potential.
CO 2	Develop ability to differentiate the structure and characteristic features of various bacterial biofertilizers.
CO 3	Interpret storage, shelf life, quality control and marketing and factors influencing the efficacy of Biopesticides & Biofertilizers.
CO 4	Evaluate mechanism of Production technology of Biopesticides & Biofertilizers.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Handbook Of Biofertilizers And Biopesticides- A M Deshmukh; R M Khobragade; P P Dixit	2007
2)	Biofertilizers And Biopesticides - H. C. Lakshman, Channabasava A	2014
3)	Biofertilizers Technology - N. Ramanathan	2010

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	-	1	1	-	-	1	1	3	2	1
CO-2	1	3	2	1	3	2	1	-	2	1	2	1	-
CO-3	1	3	2	1	3	2	1	-	2	1	3	1	-
CO-4	1	3	3	1	3	2	1	-	3	1	2	1	-
Average	1.3	2.5	2.0	1.0	2.5	1.8	1.0	-	2.0	1.0	2.5	1.3	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-511	Biopesticides & Biofertilizers	2	0	2	30	5	15	50	100	3(2+1)

12. BSAG-512 Protected Cultivation* 3(2+1)

S. No.	Course Objectives
1.	To define Greenhouse technology, types of greenhouse, design criteria of green house, materials of construction for traditional and low cost green houses, etc.
2.	To develop understanding of different irrigation systems used under greenhouse for crop production, planting system and techniques, etc.
3.	To develop skill to use of different greenhouse equipment for different purposes, etc.
4.	To develop ability to select correct greenhouse equipment and their applications in the protected structure for different crops, etc.

Unit	Content	Teaching hours
I	Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house.	8
II	Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers.	6

III	Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops. Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.	8
IV	Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.	6
	Total	28

Practicles

Experiment	Topic
1)	Raising of seedlings and saplings under protected conditions.
2)	use of protrays in quality planting material production.
3)	Bed preparation and planting of crop for production.
4)	Inter cultural operations.
5)	Soil EC and pH measurement.
6)	Regulation of irrigation and fertilizers through drip, fogging ad misting.

S. No.	Course Outcomes (CO)
CO 1	Understand about the irrigation systems used under greenhouse for crop production, planting system and techniques, etc.
CO 2	Develop the skill to use of different greenhouse equipment for different purposes, etc.
CO 3	Define Greenhouse technology, types of greenhouse, design criteria of green house, materials of construction for traditional and low cost green houses, etc.
CO 4	Develop ability to apply the correct greenhouse equipments in the protected structure for different crops, etc.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Protected Cultivation and Smart Agriculture- Sagar Maitra, Dinkar J Gaikwad and Tanmoy Shankar	2012
2)	Protected Cultivation of Horticultural Crops- Kumar, P. N., Kadam, G. B. and Ramesh Kumar.	2014
3)	A Text Book on Protected Cultivation and Secondary Agriculture- Amit Deogirikar, Dr. Balasaheb Sawant Konkan Krishi Vidypeeth	2019

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	2	1	2	3	1	-	2	1	1	-	-
CO-2	2	2	2	1	2	3	1	-	2	1	1	-	-
CO-3	1	3	3	1	3	1	-	-	3	-	-	-	-

CO-4	1	3	3	1	3	1	-	-	3	-	-	-	-
Average	1.5	2.5	2.5	1.0	2.5	2.0	1.0	-	2.5	1.0	1.0	-	-

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Midterm Theory Exam	**Internal Exam**		**External Theory Exam**	**Subject Total**	
		L	**T**	**P**		**Assignment**	**Practical**			
BSAG-512	Protected Cultivation	2	0	2	30	5	15	50	100	3(2+1)

13. BSAG-513 Micro propagation Technologies* 3(1+2)

S. No.	**Course Objectives**
1.	To remember the important historical milestones, advancement and future prospects of micro-propagation.
2.	To understand the concepts and principles of micro propagation.
3.	To identify the plant regeneration pathways.
4.	To analyze the concept, necessity, procedure and requirements for production of synthetic seeds.

Unit	**Content**	**Teaching hours**
I	Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell)	4
II	Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),	4
III	Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures,	3
IV	Production of secondary metabolites ,Somaclonal variation, Cryopreservation	3
	Total	14

Practicles

Experiment	**Topic**
1)	Identification and use of equipments in tissue culture Laboratory.
2)	Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants.
3)	Preparation of stocks and working solution, Preparation of working medium.
4)	Culturing of explants :Seeds, shoot tip and single node, Callus induction.
5)	Induction of somatic embryos regeneration of whole plants from different explants.

6)	Hardening procedures.

S. No.	Course Outcomes (CO)
CO 1	Enlist the important historical milestones, advancement and future prospects of micro-propagation.
CO 2	Study the concepts and principles of micro propagation.
CO 3	Develop ability to recognize the plant regeneration pathways.
CO 4	Evaluate the concept, necessity, procedure and requirements for production of synthetic seeds.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Micropropagation: Technology and Application- P. Debergh (Editor), Richard H. Zimmerman	1991
2)	Micropropagation: Technology and Application- P. Debergh, Richard H. Zimmerman	1991
3)	Plant Micropropagation- John Wiley & Sons	2010

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	1	2	-	1	2	1	-	2	1	1	-	-
CO-2	2	2	1	-	1	1	1	-	2	1	-	-	-
CO-3	2	2	1	-	1	1	1	-	2	1	-	-	-
CO-4	2	1	2	-	1	1	1	-	3	-	1	-	-
Average	2.3	1.5	1.5	-	1.0	1.3	1.0	-	2.3	1.0	1.0	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-513	Micro propagation Technologies	1	0	2	30	5	15	50	100	3(2+1)

SEMESTER – VI

1. BSAG-601 Rainfed Agriculture and Watershed Management2(1+1)

S. No.	Course Objectives
1.	To define rainfed agriculture, rainfall distribution and collection of rainwater.
2.	To classify the crops and their growing regions according to the rainfall.
3.	To enable to execute the production techniques of crops and rainwater harvesting in rainfed areas.
4.	To examine the seasonal rainfall and different types of watershed and its components.

Unit	Content	Teaching hours
I	Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershedinIndia, Problems andprospectsofrainfedagricultureinIndia,Soilandclimaticconditions prevalentinrainfedareas	4
II	Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought	3
III	Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices Management of crops inrainfedareas	3
IV	Contingent cropplanning for aberrant weather conditions Concept,objective,principles and components of watershed Management, Factors affecting water shed management	4
	Total	28

Practical

Experiment	Topic
1)	Studies on Agro-climate zones of India
2)	Studies on Agro-climate zones of Uttarakhand
3)	Studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons
4)	Studies on cropping pattern of different rain fed areas in the country
5)	Demarcation of rain fed area on map of India
6)	Studies on interpretation of meteorological data (rainfall, temperature, humidity etc.)
7)	Studies on critical growth stages of different crops and irrigation scheduling for survival of crops

8)	Studies on drought,its classification and effect on crop growth
9)	Study on effective rainfall and its calculations
10)	Studies on different soil and moisture conservation practices for mitigating moisture stress
11)	Studies on watershed,its characteristics and delineation of model water shed
12)	Studies on field demonstrationon soil and moisture conservation measures
13)	Studies on field demonstration on water harvesting studies
14)	Visit to rain fed research station/watershed areas

S. No.	Course Outcomes (CO)
CO 1	Acquaint rainfed agriculture, rainfall distribution and collection of rainwater.
CO 2	Develop ability to classify the crops and their growing regions according to the rainfall.
CO 3	Execute the production techniques of crops and rainwater harvesting in rainfed areas.
CO 4	Examine the seasonal rainfall and different types of watershed and its components.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Sustainable Development of Dry land Agriculture in India – R. P Singh	2016
2)	Dry Farming Technology in India–P.Rangaswamy	1982
3)	DrylandresourcesandTechnology –Vol. 8 L.LSomani,K.N.Bansal	2019
4)	PhysiologicalAspect of Dry land Farming–U.SGupta	1984
5)	Principles of Agronomy S.R.Reddy	2018
6)	Dryland Technology– M.L.Jat, S.R. Bhakar, A.K.Sharma , A.K.Kothri	2016
7)	Climate,Weather and Crops in India –D.Lenka	1998

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	1	1	1	-	-	1	2	2	1	1
CO-3	2	2	1	2	1	-	1	-	1	2	-	1	-
CO-4	2	1	2	1	-	1	-	-	1	1	1	1	1
Average	2.3	1.8	1.8	1.3	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-601	Rainfed Agriculture & Watershed Management	1	0	2	30	5	15	50	100	2(1+1)

2. BSAG-602 Protected Cultivation and Secondary Agriculture 2(1+1)

S. No.	Course Objectives
1.	To impact knowledge on the cultivation of different crops under controlled conditions.
2.	To give knowledge about the establishment of different types of greenhouse.
3.	To make them aware about the different research investigation under greenhouse.
4.	To encourage to interact with the farmers to give knowledge about the protected cultivation.

Theory

Unit	Content	Teaching hours
I	Green house technology - Green house technology: Introduction, History of green house, Advantages of green house, Greenhouse effect. Types of Greenhouses-Types ofGreenhouses: GreenhousetypebasedonShape,Utility,ConstructionandCoveringmaterials, Plant response to green houseenvironment-Plant response to Greenhouse environment: Light, Temperature, Relative Humidity, Ventilation and Carbondi- oxide. Planning and Design of greenhouse-Planning and Design of greenhouse: Site selection and orientation, structural design and covering materials.	4
II	Materialsofconstruction-Materialsofconstructionfortraditionalandlowcostgreen house: Wood, G.I., aluminum, steel, R.C.C.and Glass Irrigation Systems used in green house –Irrigation Systems used in green house: Rules of watering,OverheadSprinklers, Drip irrigation system andFoggers(Mistspraying)\ Design criteria of green house for Cooling and Heating purposes-Design criteria of green house for Cooling and Heating purposes : Cooling – Natural ventilation, for cedventilation Heating-Heating system,solar heating system,Water&Rockstorage.	5
III	Engineering Properties- Engineering Properties of cereals,Pulses and oil seed.Their applications in PHT equipment design and operation: Physical properties:Size and Shape(Roundness and Sphericity) Porosity, Coefficient of friction,and angle of repose,Thermalproperties:Definition of Drying and Dehydration – Drying and Dehydration:Definition of drying and dehydration,Utilities/Importanceofdrying Grain drying Theory- EMC definition, Thin layer drying and deep bed drying, Moisture Measurements-Moisture measurements:Moisture content and its measurement, Moisture content representation: Dry basis and wet basis Moisture Content determination Methods:-Direct methods-Air oven method,Vacuum oven method and Infra-red method Indirect Methods-Electrical resistance method and Di-	4

	electric method, Various Drying Methods- Various Drying Methods: Sun drying, Mechanical DryingMechanicalDryingMethods:- Contact drying,Convection drying, Radiation drying.	
IV	NumericalonMoisturecontentanditsrepresentation-NumericalonMoisturecontent and its representation: Conversion of wet basis moisture contents to dry basis moisture contents Conversion of dry basis moisture contents to wet basis moisture contents, Problem s ondryingProblems onmoisturecontentsProblem No.1 &No.2Commercial Grain Dryers – Commercial Grain Dryers: Construction and working principle - Deep beddryer, Flat bed dryer, Recirculating dryer – (LSU and Baffle dryers), Tray dryer and Solar dryers Material Handling Equipments- Material Handling Equipment's: Construction and working principle - Conveyor- Belt conveyor and Screw conveyor Elevator-Bucket elevator.	3
	Total	14

Practical

Experiment	**Topic**
1)	Study of Different Types of Green Houses
2)	Study of Green House Covering and Constructional Materials
3)	Study of Cooling System Usedin Green House
4)	Study of Instruments and Equipments used in Green House
5)	Study of Irrigation Systems UsedinGreenHouse
6)	Cost Estimation of Poly-house for 560 sqm.
7)	Visitto Commercial GreenHouse
8)	Determinationof Moisture Content of Various Grains by Oven Method
9)	Determination of Moisture Content of Various Grains by Universal Moisture Meter
10)	Determination of Moisture Content of Various Grains by Infrared Moisture Meter
11)	Determination of Physical Properties of Grains
12)	Study of LSU and Baffle Dryers
13)	Study of Tray and Solar Dryers
14)	Study of Material Handling Equipments- Belt Conveyor,Screw Conveyor And Bucket Elevator
15)	Visitto Seed Processing Plant
16)	Visitto Post HarvestLaboratories

S. No.	Course Outcomes (CO)
CO 1	Students learned the fundamental principles of crop cultivation under controlled conditions.
CO 2	This course helped students to know the design criteria and material for construction of greenhouse.
CO 3	Students able to perform the various research investigations under greenhouse.
CO 4	Students can easily interact with the farmers to give knowledge about the protected cultivation.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Green House Technology &ManagementbyK. Radha Manohar C. IgathinathaneB.S.Publications4-4-309, SultanBazar, Hyderabad-500095.	2000
2)	Unit Operations of Agricultural Processing byK.M.Sahay and K.K.Singh Vikas Publishing HousePvt.Ltd. NewDelhi-110007	2009
3)	Postharvest Technology of Cereals, Pulsesand Oilseeds by A.Chakraverty Oxford & IBH Publishing Co.Pvt.Ltd.,66 Janpath,NewDelhi-110001.	1997
4)	Green House management by LRTaft Biotech Books,Delhi	1997
5)	Post Harvest Technology and Quality management of Fruits and Vegetables by P.Suresh Kumar, V R Sagarand M KanwatAgrotech Publishing Academy,Udaipur	2009
6)	A TextBook of Green house and Post Harvest Technology by B.P.Sawant, J. M. Potekar, H.W.Awari Nikita Publication, Latur.	2008
7)	Green House Technology by G.N.Tiwari and R.K.Goyal (1998) Narosa publishing House, 6 community Centre, Panchsheel Park NewDelhi- 110017	1998
8)	Green House Technology and Application by V M Salokhe and A K Sharm Agrotech Publishing Academy, Udaipur	2006

9)	Emerging TrendsinPHTandUtilizationof Plant Food by NK hetarpauletalAgrotech Publishing Academy,Udaipur	2003
10)	Green House Operation and Management by Nelson and P au lV Prentice Hall,USA	1994

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	1	1	-	1	1	-	-	1	1	2	-
CO-2	2	1	-	2	-	-	-	-	-	-	2	1	1
CO-3	1	-	2	-	-	1	-	-	-	2	-	1	2
CO-4	1	2	2	1	-	2	1	-	-	1	2	2	2
Average	1.5	1	1.3	1	-	1	-	-	-	1	1.3	1.5	1.3

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-602	Protected Cultivation and Secondary Agriculture	1	0	2	30	5	15	50	100	2(1+1)

3. BSAG-603 Diseases of Field and Horticultural Crops and their Management-II 3(2+1)

S. No.	**Course Objectives**
1.	To educate basic knowledge of the causal organisms and systematic positions involved in causing pathogens in crops are studied and develop understanding about isolation of culture, techniques, identification and biology of pathogens in the laboratory.
2.	To demonstrate of field, horticultural, medicinal crops and cash crops studied symptoms, involved pathogen, disease cycle, best possible management practices available and solved causing reducing yield in crops.
3.	To make understand the application of fungicides and antibiotics (mode of action and formulations) on the basis of Nature of pathogen, manage crops disease corresponding to involved pathogen and examine loss in quality and yield.
4.	To develop skills about detection and diagnosis of plant diseases and application of pesticides.

Unit	**Content**	**Teaching hours**

I	Symptoms, etiology, disease cycle and management of major diseases of following cropsFieldcrops:Wheat:Rusts,loosesmut,Karnalbunt,powderymildew,Alternaria blight, Sugarcane: Red rot, Smut, Wilt, Grassy shoot, Ratoon stunting and Pokka Boeng	6
II	Oilseed : Sunflower: Sclerotinia stem rot and Alternaria blight, Rust,Downy mildew Mustard:Alternariablight,Whiterust,Downy mildew and Sclerotinia stem rot Pulses: Gram:wilt, greymould and Ascochyta blight Lentil:rust and wilt Linseed:Alternaria bud blight, Rust, Powdery mildew Pea: Downy mildew, Powdery mildew and Rust,wilt	7
III	Cash Crop Cotton: Rootrot, Wilt, Anthracnose, and blackarm, Dahiya diseases, leaf curlof cotton, 2-4-Dinjury Mango: Dieback, Athracnose, Mango - malformation, bacterial blight and powdery mildew, Spongy tissue,Red rust, Pink diseases, Loranthus, Stone graft Mortality, Lime induce chlorosis Citrus: Citrus canker, Gummosis, Fruit rot, Citrus greening, Anthracnose, Tristeza, Citrus Exocortis, Scab of citrus, Mottle leaf of citrus Grapevine: Downy mildew,Powderymildew,Anthracnose,Bacterial Canker, Grapefan-leaf virus Apple:Scab, Powdery mildew,FireblightandCrowngall,MosaicPeach:leafcurlStrawberry:Leafspot	8
IV	Vegetables:Potato:Earlyandlateblight,blackscurf,leafroll,andMosaic,Cucurbits: Downymildew,powderymildew,wilt,Angularleafspot,Mosaic,TOSPOvirusOnion: Purple blotch, and Stem phylium blight, Downy mildew, Smut, Smudge, Erwinia rot Garlic :Neck and bulbrot, and Stem phyliumblight,Blemish, Blackmould. Chilli: Anthracnose and fruitrot, Wilt and leaf curl Coriander: Stemgall, Powderymildew, Wilt Turmeric: leafspot Ornamental Crops Marigold: Botrytis blight, Alternaria blight Rose: Dieback, Powdery mildew and Black leafspot.	7
	Total	28

Practical

Experiment	Topic
	Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Collection and preservation of diseases pecimen (Note: Students should submit 50 pressed and well-mounted specimens)
	Field crops
1)	Wheat:Rusts,loosesmut,Karnalbunt,powdery mildew, Alternaria blight, and earcockle
2)	Sugarcane:Redrot,Smut,Wilt,Grassyshoot,Ratoon stunting and Pokka Boeng
3)	**Oilseed**
4)	Sunflower: Sclerotiniastem rot and Alternariablight,Rust,Downy mildew
5)	Mustard:Alternariablight,Whiterust,Downy mildew and Sclerotinia stem rot
6)	**Pulses**

7)	Gram: wilt, grey mouldandAscochytablight, Pea: Downy mildew, Powdery mildew and Rust, wilt
8)	Lentil: rust and wilt,Linseed:Alternaria bud blight, Rust ,Powdery mildew
9)	**CashCrop**
10)	Cotton:Rootrot,Wilt,Anthracnose,and black arm,Dahiyadiseases,leaf curl of cotton, 2-4-Dinjury
11)	Horticultural Crops
12)	Mango:Dieback,Anthracnose,Mango-mal formation, bacterial blight and powdery mildew, Spongy tissue, Red rust, Pink diseases, Loranthus, Stone graft Mortality, Lime induced chlorosis
13)	Citrus:Citruscanker,Gummosis,Fruitrot,Citrus greening, Anthracnose,Tristeza, Citrus Exocortis,Scab of citrus, Mottle leaf of citrus
14)	Grapevine:Downymildew,Powderymildew,Anthracnose,BacterialCanker,Grapefan-leaf virus
15)	Peach:leaf curl, Apple:Scab,Powdery mildew,Fire blight and Crown gall, Mosaic.Strawberry:Leafspot
16)	**Vegetables**
17)	Potato:Early and late blight,blackscurf,leafroll,and Mosaic
18)	Cucurbits:Downymildew,powderymildew,wilt, Angular leaf spot, Mosaic,TOSPOvirus
19)	Onion: Purple blotch, and Stem phyliumblight, Downy mildew,Smut, Smudge,Erwiniarot
20)	Garlic :Neck and bulb rot,and Stemphylium blight, Blemish,Blackmould
21)	Chilli:Anthracnose and fruit rot,Wiltandleafcurl.Coriander:Stemgall, Powdery mildew,Wilt.Turmeric: leaf spot
22)	Ornamental Crops
23)	Marigold:Botrytis blight, Alternaria blight, Rose: Dieback, Powdery mildew and Black leaf spot
24)	Field visit for the diagnosis of field problems

S. No.	Course Outcomes (CO)
CO 1	Educate basic knowledge of the causal organisms and systematic positions involved in causing pathogens in crops are studied and develop the understanding about isolation of culture, techniques, identification and biology of pathogens in the laboratory.
CO 2	Demonstrate of field, horticultural, medicinal crops and cash crops studied symptoms, involved pathogen, disease cycle, best possible management practices available and solved causing reducing yield in crops.
CO 3	Develop the ability to select correct fungicides and antibiotics (mode of action and

	formulations) on the basis of nature of pathogen, manage crops disease corresponding to involved pathogen and examine loss in quality and yield.
CO 4	Develop the skills about detection and diagnosis of plant diseases and application of pesticides.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Agrios, GN. Plant Pathology. Acad.Press	2010
2)	DiseasesofHorticulturalCropsfruitsByVermaL.RandSharmaR.c,IndusPublishingcompany,NewDelhi	1999
3)	Diseases of fruit crops By V.N.Pathak, Oxford & IBH publication,New Delhi	1986
4)	DiseasesoffruitcropsByR.S.Singh,Oxford&IBHpublication,NewDelhi	1986
5)	Diseases of Fruits and vegetables S. A.M.H. Naqvi, Springer Science & Business Media	2007
6)	Diseases of Plantation Crops By P.Chowdappa, Pratibha Sharma IPS263 pp	2014
7)	Advances in the diseases of Plantation crops & spices P. Santha Kumari, International Book Distributing Company, 247 pp	2004
8)	Mehrotra R S & Aggarwal A. Plant Pathology.7 Ed. Tata McGraw Hill Publ.Co. Ltd	2007
9)	Vegetable Diseases: A Colour full Hand book by Steven T. Koike, Peter Gladers and Albert Paulus, Academic Press, pp 448	2006
10)	Diseases of Vegetables crops by R. S. Singh Oxford & IBH publication, New Delhi	1987
11)	Plant Diseases. Singh R S. Ed. Oxford & IBH. Pub. Co.	2008
12)	Diseases of Crops Plants in India By PHI learning Pvt. Ltd, pp 548	2009
13)	DiseasesofVegetablecropsbyAlferdSteferud,BiotechBooks,NewDelhi	2005
14)	MehrotraRS&AggarwalA.PlantPathology.7Ed.TataMcGrawHillPubl. Co. Ltd	2007
15)	Diseases of Vegetable Crops, Diagonosis and Management Dinesh Singh and P.Chodappa,Today and Tomorrow Printers, pp 734	2014
16)	Singh H. House-hold and Kitchen Garden Pests-Principles and Practices.KalyaniPublishers.	1984

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	1	-	-	-	-	-	-	-	-	-	-	-
CO-2	1	2	1	1	1	-	2	-	-	-	-	-	3
CO-3	1	1	1	2	-	-	1	-	-	-	-	-	-
CO-4	1	-	1	1	1	-	-	-	-	-	-	-	1
CO-5	-	1	1	1	-	-	3	-	-	-	2	-	2
Average	1.3	1.3	1.0	1.3	1.0	-	2.0	-	-	-	2.0	-	2.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-603	Diseases of Field and Horticultural Crops and their Management-II	2	0	2	30	5	15	50	100	3(2+1)

4. BSAG-604 Post-harvest Management and Value Addition of Fruits and Vegetables 2(1+1)

S. No.	Course Objectives
1.	To define the importance of post harvest management for reducing losses between harvesting and consumption.
2.	To enable to identify quality (appearance, texture, flavor and nutritive value) of products as well as various post harvest management techniques.
3.	To develop skill to design and development of various products related to food processing or prevent the food from microorganism or enzymatic spoilage, i.e. self-decomposition of the food by naturally occurring enzymes within it.
4.	To educate about Implementation of post harvest technology to increase the shelf life of food products.

Unit	Content	Teaching hours
I	Importance of fruits and vegetables,extent and possible causes of post-harvest losses Pre-harvest factors affecting post harvest quality and Maturity Ripening and changes occurring during ripening	3
II	Respirationandfactorsaffectingrespirationrate,RoleofethylenePost-harvestdiseases & disorders Heat,chilling& freezing injury Harvesting and fieldhandling	3
III	Storage (ZECC, Coldstorage, CA, MA, and Hypobaric) Value addition concept Principles and methods of preservation, Intermediate moisture food-Jam,jelly,marmalade,preserve, candy– Concepts and Standards	4

IV	Fermented and non-fermented beverages Tomato products-Concepts and Standards Drying/Dehydration of fruits and vegetables–Concept and methods,osmotic drying Canning-– Concepts and Standards Packaging of products	4
	Total	14

Practical

Experiment	Topic
1)	Applications of different types of packaging containers for shelf lifeextension
2)	Effect of temperature on shelf life and quality of produce.
3)	Demonstration of chilling and freezing injury in vegetables and fruits.
4)	Extraction and preservation of pulps and juices.
5)	Preparation of Jam
6)	Preparation of Jelly
7)	Preparation of RTS and nectar
8)	Preparation of squash and syrup
9)	Preparation of osmotically dried products
10)	Preparation of fruit bar and candy
11)	Preparation of tomato products
12)	Preparation of canned products.
13)	Layout and planning of pack house
14)	Layout and planning of processing unit
15)	Quality evaluation of products-- physico-chemical and sensory.
16)	Visit to processing unit/industry.

S. No.	Course Outcomes (CO)
CO 1	Define the fundamentals application of post and pre harvest technologies in agricultural commodities and post harvest management and novel packaging techniques.
CO 2	Identify various problems (storage, shelf life of food product spoilage etc.) faced by the farmers.
CO 3	Design and development of various products related to food processing or prevent the food from microorganism or enzymatic spoilage, i.e., self-decomposition of the food by naturally occurring enzymes within it.
CO 4	Design and development of various products related to food processing.

S. No.	Title of Book/ Authors	Year of Publication/ Reprint
1)	Fruits and vegetables Preservation Girdharilal,Sidappa and Tondan	2009
2)	Post Harvest Physiology, Handling, Utilization of tropical and subtropical fruits and vegetables E.R.B. Pantastico	1975
3)	Preservation of fruits and vegetables–Principals and Practices Shrivastava and Sangeev Kumar	2017
4)	Commercial fruits and Vegetable Products W. V. Cruess	1959
5)	Post Harvest Handling and Processing of Fruits and Vegetables Unknown Binding by I S SinghV.Singh	2012

Articulated attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PsO1	PSO 2	PSO 3	PSO 4
CO1	3	-	1	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	2	-	1	-	-	-	-	2	-	-
CO3	2	1	-	2	-	1	-	-	-	-	2	-	-
CO4	-	-	1	1	-	1	1	-	1	-	-	1	-
Average	2.3	1.0	1.0	1.6	-	1.0	1.0	-	1.0	-	2.0	1.0	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-604	Post-harvest Management and Value Addition of Fruits and Vegetables	1	0	2	30	5	15	50	100	2(1+1)

5. BSAG-605 Management of Beneficial insects 2(1+1)

S. No.	Course Objectives
1.	To study about the importance of beneficial Insects, beekeeping, sericulture, lac-culture, pollinators, weed killers, predators and parasitoid.
2.	To develop skills to understand about commercial methods of rearing honey bees, silkworm lac insects and pollinators, and their enemies.
3.	To study about modern techniques and equipment for healthy production in apiculture, lac-culture and sericulture.
4.	To enable to evaluate specific major parasitoids and predators commonly being used in biological control.

Unit	Content	Teaching hours
I	Importance of beneficial insects in Agriculture,Honeybee,Silkworm,Lacinsects,Bio agents as natural enemies,Various Institutes related to beneficial insects **Apiculture:**Introduction and history of Beekeeping Beekeeping, morphology and anatomy,beebiology,Pollinating plants and their cycle, bee conservation Commercial methods of beerearing, equipmentsused,seasonal management of bees	3
II	Beehives and their description, Bee pasturage, bee foraging, behavior and communication Enemies-Insect pests and diseases of honeybee and their management. **Sericulture:**Related terminologies, History and development of silkworms in India, types of silkworm,voltinism and biology of silkworm, Mulberry cultivation, crop varieties, method of harvesting and preservation of mulberry leaves Rearinghouseandrearingappliances of mulberry silkworm, methods of disinfection and hygiene Silkworm rearing, mounting, harvesting and marketing of cocoons Pest and diseases of silkworm and their management.	4
III	Lac culture:Species of lac insect,morphology,biology, behaviour, host plants Lac production and its uses, Types of lac- seed lac,buttonlac, shellac,andlac-products Biocontrol agents(Natural Enemies):Introduction of bioagents, Ideal characteristics of bioagents,Successfulexamplesof biological control General classification: Important insect orders bearing predators and parasitoids used in pest control Identification of major parasitoids and predators commonly used in biological control of crop pests.	3
IV	Major parasitoids: Trichogrammasp., Chelonus black burni, Cotesia (Apanteles)sp., Braconsp., Epiricaniamelanoleuca,Goniozusnephantidis,Campoletischloridae, Majorpredators:Chrysoperlasp.,Australian ladybird beetle- Cryptolaemus montrouzieriWeedkillers:Zygogrammabicolorata, Neochetinaspp. Mass multiplication and field release techniques of some important parasitoids: T.chilonis, Chelonus black burni, Cotesia/Bracon, Goniozusnephantidis, Epiricaniamelanoleuca, Mass multiplication and field release techniques of important predators: Chrysoperlasp. Australian ladybird beetle, Weed predators/killers: Zygogrammabicolorata, Neochetina sp. Important species of pollinator and scavengers with their importance.	4
	Total	14

Practical

Experiment	Topic
1)	Studies onhoneybeecolony:Bee species and castes of bees
2)	Beekeeping appliances and seasonal management
3)	Bee enemiesand diseases
4)	Bee pasturage,bee foraging and communication
5)	Types of silkworm,voltinism and biology of mulberry silkworm
6)	Mulberry cultivation, mulberry varieties and methods of harvesting of leaves

7)	Rearing of mulberry silkworm on artificial diet/natural mulberry leaves
8)	Studies on strains/species of lac insect, host plant and their identification
9)	Identification of other important pollinators and scavengers.
10)	Mass production of host insect-Corcyra cephalonica St.
11)	Mass multiplication of parasitoids:Trichogrammachilonis,Chelonusblackburnii,Goniozusnephantidis
12)	Mass multiplication of predators:Chrysoperlasp.andAustralian lady beetle-Cryptolaemus montrouzieriMulsant
13)	Visit to research and training Institution/Unit of Beekeeping, Sericulture, Lac
14)	Culture and Bioagent production units.

S. No.	Course Outcomes (CO)
CO 1	This course will help the students to remember the knowledge of Importance of beneficial Insects, Beekeeping, sericulture and lac culture etc.
CO 2	The students will understand about commercial methods of rearing honey bees, silkworm lac insects and pollinators, and their enemies.
CO 3	This course will help students in applying the modern techniques and equipment for healthy production in apiculture and sericulture.
CO 4	After completing the course, the students will be able to evaluate specific major parasitoids and predators commonly being used in biological control.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Singh,S.,Beekeepingin India– ICAR,NewDelhi., 214p.	1975
2)	Sunita,N.D,Guled,M.B,Mulla,S.R and Jagginavar,Beekeeping, UAS Dharwad	2003
3)	Mishra,R. C.and Rajesh Gar.Prospective in Indian Apiculture.Agrobios,Jodhpur.	2002
4)	Singh, D. and Singh,D.P.A Hand Book of Beekeeping, Agrobios(India).	2006
5)	Paul De Bachand Devid Rosen Biological control by natural enemies.Cambridge University Press; 2edition	1991
6)	H.O. AgrawalM.K. SethSericulturein India In 4 Vols.	2000
7)	Tribhuwan Singh.Principles and Techniques of Silkworm Seed Production,Discovery publishing HousePvt.Ltd	2015
8)	M. L. Narasaiah.Problems and Prospects of Sericulture. Discovery publishing House Pvt.Ltd.	2013

9)	Ganga, G. and Sulochana Chetty,J.AnIntroductionto Sericulture (2ndEdn.).Oxford & IBH publishing Co. Pvt.Ltd., NewDelhi.	1997
10)	Krishnaswamy, S.(Ed).Sericulture Manual-Silkworm Rearing. FAO Agril. Services bulletin,Rome.	1978
11)	Glover,P. M. Lac Cultivation in India.Indian Lac Research Institute, Ranchi.	1937
12)	Jolly, M. S. Appropriate Sericulture Techniques. International Centre for Training and Research in Tropical Sericulture, Mysore, 209.	1987
13)	K.P.Srivastava.ATextBook on Applied Entomology.Vol. I & II, Kalyani Publishers, Ludhiana	2020
14)	B. R. David and V.V.Ramamurthy.Elements of Economic Entomology,7 Edn.Namrutha Publications, Chennai	2016

Articulated attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PsO1	PSO2	PSO3	PSO-4
CO1	3	2	2	-	1	-	-	-	-	-	2	1	-
CO2	2	1	2	-	-	-	-	-	-	-	1	-	1
CO3	1	2	1	-	2	-	-	-	-	-	-	-	-
CO4	2	2	2	-	1	-	-	-	-	-	1	-	1
Average	2	1.8	1.8	-	1.3	-	-	-	-	-	1.3	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-605	Management of Beneficial Insects	1	0	2	30	5	15	50	100	2(1+1)

6. BSAG-606 Crop Improvement-II *(Rabi* crops) 3(2+1)

S. No.	Course Objectives
1.	To study about germplasm conservation, utilization and centre of origin of various rabi field crops.
2.	To understand genetics of qualitative and quantitative characters and their inheritance.
3.	To study major breeding objectives and procedures including conventional s well as innovative approaches used for development of improved varieties.
4.	To learn Seed production technologyin different classes of rabi field crop.

Unit	Content	Teaching hours
I	Cereals –Wheat,oat and barley-Centers of origin,Distribution of species, wild relatives,Floral biology, Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,abiotic and bioticstress tolerance and quality(physical,chemical, nutritional), Pulses –Chickpea-Centers of origin,Distribution of species, wild relatives,Floralbiology,Majorbreedingobjectives and procedures including conventional andmoderninnovativeapproaches for development of hybrids and varieties for yield,abioticandbioticstress tolerance and quality (physical, chemical,nutritional) Oilseeds–Sunflower and Safflower-Centers of origin, Distribution of species,Wildrelatives,Floralbiology,Majorbreedingobjectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,abioticand biotic stress tolerance and quality(physical,chemical,nutritional).	8
II	Oilseeds–Linseed,Rape seed and Mustard-Centers of origin, Distribution of species,wildrelatives,Floralbiology,Major Breeding objectives and procedures including conventional and Modern innovative approaches for development of hybrids and Varieties for yield,abioticandbioticstress tolerance and quality (physical, chemical,nutritional) Fodders–Napier, Bajra, Sorghum,Maize and Berseem- Centers of origin, Distribution of species,wildrelatives,Floralbiology,Majorbreedingobjectives and procedures including conventional and modern innovative approaches fordevelopmentofhybridsandvarietiesforyield,abioticandbioticstresstoleranceand quality (physical, chemical,nutritional).	7
III	Cash -Sugarcane- Centers of origin,Distributionofspecies,wildrelatives,Floralbiology,Majorbreedingobjectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,abioticandbioticstress tolerance and quality (physical, chemical,nutritional) Vegetable-Potato- Centers of origin,Distribution of species, wild relatives,Floralbiology,Majorbreedingobjectivesand procedures including conventional and modern innovative approaches fordevelopmentofhybridsandvarietiesforyield,abioticandbioticstresstoleranceand quality (physical, chemical,nutritional) Vegetable-Field pea-Centers oforigin,	6
IV	Distribution of species, wild relatives,Floralbiology,Majorbreedingobjectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield,abioticand biotic stress tolerance and quality (physical, chemical,nutritional) Horticultural crops-Mango,AonlaandGuava- Centers of origin, Distribution of species,wildrelatives,Floralbiology, Major Breeding objectives and procedures including conventional and Modern innovative approaches for development of hybrids and Varieties for yield,abioticandbioticstress tolerance and quality (physical, chemical, nutritional) Plant genetic resources, its utilization and conservationAdaptabilityandstabilityHybridseedproductiontechnologyinRabicrops- Sunflower, Safflower,Castor,RabiSorghumIdeo type concept and climate resilient crop varieties for future- Wheat, Rice,Maize,SorghumandCotton.	7
	Total	28

Practical

Experiment	Topic

1)	Emasculation and hybridization techniques in wheat,oat& barley
2)	Emasculation and hybridization techniques in chick pea & lentil
3)	Emasculation and hybridization techniques in field pea,rape seed & mustard
4)	Emasculation and hybridization techniques in sunflower
5)	Emasculation and hybridization techniques in potato & berseem
6)	Emasculation and hybridization techniques in sugarcane & cowpea
7)	Emasculation and hybridization techniques in safflower
8)	Handlingof germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods
9)	Study of field techniques for seed production and hybrid seeds production in Rabi crops
10)	Estimation of heterosis,in breeding depression and heritability
11)	Layoutof field experiments
12)	Study of quality characters,study of donor parents for different characters
13)	Visit to seed production plots
14)	Visit to AICRP plots of Safflower & Chick pea
15)	Visit to AICRP plots of Sunflower & Rabi sorghum

S. No.	Course Outcomes (CO)
CO 1	Remembering the evolutionary history of important field crops along with their centre of origin, its wild species and wild relatives that can be utilized in crop improvement.
CO 2	Develop the understanding of germplasm conservation, utilization, and centre of origin of various rabi field crops, genetics of qualitative and quantitative characters, and their inheritance.
CO 3	Applying breeding procedures, and objectives in different crop important for the development of improved varieties.
CO 4	Make able to differentiate seed production technology in different classes of rabi field crop.

S. No.	Title of Book Author/Authors Publisher	Year of Publication/ Reprint
1)	Crop Breeding and Biotechnology Hari Har Ram Kalyani Publication New Delhi.	2019
2)	Breeding of Asian Field crops D.A.SleperJ.M.Poehlman Blackwell Publishers	2006

3)	Principle and Procedures of Plant Breeding G.S.Chahal, S.S.GoslaNarosa Publishers House.New Delhi.	2002

Articulated Attainment

COs POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	1	2	-	2	1	1	-	-	-	-	-	-
CO2	1	1	2	-	1	2	-	-	1	-	-	-	-
CO3	2	-	2	-	-	-	-	-	-	-	-	-	-
CO4	2	-	1	-	1	1	1	-	1	-	-	-	-
CO5	3	2	1	-	3	2	1	-	-	-	-	-	-
Average	2.2	1.3	1.6	-	1.8	1.5	1	-	1	-	-	-	-

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-606	Crop Improvement-II *(Rabi crops)*	1	0	2	30	5	15	50	100	2(1+1)

7. BSAG-607 Practical Crop Production -II *(Rabi* crops) 1(0+1)

S. No.	Course Objectives
1.	To acquaint knowledge on Rabi season crops , tools uses in crop production,weed and irrigation management.
2.	To develop understanding on the production techniques of major Rabi season crops according to resources available in the field.
3.	To develop skills about the production techniques of Rabi crops in the practical crop production field.
4.	To develop skill to examine the production of sown crops in the practical crop production field.

Experiment	Topic
1)	Introduction, aims and objectives of practical crop production–Allotment of Plot and its history.
2)	Study ofseed production of rabi crops
3)	Study of mechanization and resource conservation of rabi crops
4)	Study of physical and chemical properties of the allotted plot to the students.
5)	Study of package of practices for growing rabi crop (timely, late and rainfed).
6)	Preparation of calendar of operation for rabi crop.
7)	Study of preparatory, secondary tillage and seed bed preparation for rabi crop.

8)	Sowing and seed treatment of rabi crop.
9)	Study of integrated nutrient management of rabi crop.
10)	Study of water management to rabi crop.
11)	Determination of germination/emergence count of rabi crop.
12)	Study of growth and yield contributing characters of rabi crop.
13)	Study of inter culturing and weed management in rabi crop.
14)	Study of integrated insect pest and diseases management in rabi crop
15)	Study of crop maturity signs, harvesting of rabi crop
16)	Threshing,drying,winnowing,storageand preparation of produce for Marketing of rabi crop.
17)	Study of cost of cultivation and working out net returns per student
18)	Study of post harvest technology of rabi crop
19)	Summary report of practical crop production
20)	Study of weekly weather record for rabi season.

S. No.	Course Outcomes (CO)
CO 1	Acquaint knowledge on Rabi season crops, tools uses in crop production, weed and irrigation management.
CO 2	Develop the understanding on the production techniques of major Rabi season crops according to resources available in the field.
CO 3	Develop the skills about the production techniques of Rabi crops in the practical crop production field.
CO 4	Examine the production of sown crops in the practical crop production field.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Modern technique of raising field crops by Chiddasingh	2020
2)	Agronomy of field crop by S. R. Reddy	2016
3)	Hand book of Agriculture,ICAR, New Delhi	2006

Articulated Attainment

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	3	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3

CO4	3	3	3	3	3	3	3	3	3	3	3	3	3
Average	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-607	Practical Crop Production –II (*Rabi* crops)	0	0	4	-	-	100	-	100	2(0+2)

8. BSAG-608 Principles of Organic Farming 2(1+1)

S. No.	Course Objectives
1.	To make understanding of basic aspects of Organic farming: Importance, Principles, scopes, etc. and basic concepts of ecosystem.
2.	To make understanding of various initiatives taken by the government at both state and central level and NGOs for the promotion of organic agriculture and its present status in India.
3.	To acquaint the students with the choice of crops and varieties to be grown for organic farming and know about insect, pest, diseases and weed management in organic mode of production.
4.	To familiarize students with the certification process and standards of organic farming and understanding of marketing, export and potential of organic products.

Unit	Content	Teaching hours
I	Organic Farming,Definition,Principles and its ScopeinIndiaandworld Initiative taken by Govt, NGO and Organizations for promotion of Organic Agriculture Organicecosystem and their concepts	4
II	Organic nutrient, resources and its fortification, Restriction to Nutrient use in Organic Farming Choice of Crops and Varieties in Organic Farming Fundamentals of insect pest and disease management under organic mode of production	4
III	Weed Management in Organic mode of Production OperationalstructureofNPOP,CertificationprocessandStandardsofOrganicFarming	3
IV	Processing, Labeling and Economic consideration andits viability In Organic production Export potential of Organicproducts	3
	Total	14

Practical

Experiment	Topic
1)	Visit to Organic Farm to study the various components and their utilization
2)	Study of Preparation methods for Enriched compost.

3)	Study of Preparation methods for Vermicompost and vermiwash.
4)	Study of biofertilizers and bio-inoculants
5)	Study of preparation of Biodynamic compost and cowpatpit
6)	Study of quality analysis of compost and vermin compost.
7)	Study of cropresidue management and green manuring
8)	Study of indigenous technology knowledge (ITK) fornutrient, insect, disease Andweed management.
9)	Study the method of preparation and Production cost of Panchagavya, Beejamrut and JeevamrutinOrganicfarming
10)	Study the method of preparation and Production cost of Dashparni, Neem Seed extract, in Organic farming
11)	Study of post-harvest management in Organic Farming.
12)	Study of Quality aspects: Grading, Packing, Handling.
13)	Visit to Biocontrol Laboratory and Biofertilizer and vermicompost Unit

S. No.	Course Outcomes (CO)
CO 1	Students develop knowledge of principles of organic farming in context of improving human health and amelioration of the environment.
CO 2	Students learn government schemes and the role of NGOs in producing organic products.
CO 3	Students develop skill for selection of crops and varieties for best organic produce.
CO 4	Develops knowledge of certification methods of organic produce.

S. No.	Title of BookAuthor/Authors Publisher	Year of Publication/ Reprint
1)	Organic Farming: Theory and Practices by Palaniappan S.P. and Annadurai, K.	2010
2)	Organic Farmingin India, Problems and Prospects by Thapa, U. and Tripathi,P.	2018
3)	Trends in Organic Farming in India by Agrobios Publication and S S Purohit and D. Gehlot	2006
4)	Handbook of Organic Farming. And A. K. Sharma	2002
5)	Recent Developments in Organic farming by J.M.L. Gulati and T. Barik	2011

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	1	1	1	-	1	2	1	-	-	-	2	1	-
CO-2	1	2	2	-	-	1	1	-	-	1	-	-	1
CO-3	1	1	1	-	2	-	1	-	-	2	-	2	1
CO-4	1	2	1	-	1	2	1	-	-	1	1	1	2

Average	1.0	1.5	1.3	-	1.3	1.6	1.0	-	-	1.3	1.5	1.0	1.3

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Internal Exam			External Theory Exam	Subject Total	
		L	T	P	Midterm Theory Exam	Assignment	Practical			
BSAG-608	Principles of Organic Farming	1	0	2	30	5	15	50	100	2(1+1)

9. BSAG-609 Farm Management, Production & Resource Economics 3(2+1)

S. No.	Course Objectives
1.	To educate the basic concept and terminology of farm management, different terms, principles and laws of farm management, different types of farm, etc.
2.	To make understanding of various types of production function, decision making, cost, farm planning and budgeting, farm inventory, balance sheet, profit and loss accounts, etc.
3.	To apply the different law and principles of farm management, relationship between factor and product, etc.
4.	To enable to evaluate the important issues in farm management etc.

Unit	Content	Teaching hours
I	Farm Management–Meaning–Definitions–Scope–Objectives –Relationship with other sciences Farm–Meaning– Definition–itstypesandcharacteristics– factors determining size of farms Economic principles applied to farm management –Principle of variable proportions– Determination of optimum input and optimum output. Minimum loss principle (Cost Principle)-Principle of factor Substitution Principle of product substitution – Law of Equi-marginal returns– Opportunity cost principle Principle of comparative advantage–Time comparison principle Types of farming– Specialization, Diversification, Mixed farming, Dry farming and Ranching–factors influencing types of farming.	6
II	Types of farm business organizations– Peasant farming, Co- operative farming,Capitalistic farming, Collective farming and State farming, Meaning and concept of cost–types of costs– cost concepts– farm income measures–Gross in come,farmbusinessincome,familylabourincome,netfarmincome&farminvestment income, Farm business analysis–meaning and concept of farm income and profitability– technical and economic efficiency measures Farm records and accounts– importance– types of farm records Needed to maintain on farm Farminventory– methods of valuation–net selling price, cost less depreciation, market price, costmethod, replacement cost less depreciation and income capitalization methods. Balance sheet or Networthstatement– Assets, liabilities and networth–ratio measures Income statement or profit and loss statement–Receipts,expenses and net income ratio measures Income statement or profit and loss statement–Receipts, expenses and net income – ratio measures Farm planning– Meaning–Need for farm planning–typesof farm plans– simple farm planandwholefarmplan– Characteristics of a good farm plan–basic steps in farm planning.	8

III	Farm budgeting– Meaning–types of farm budgets –Enterprise budgeting–Partial budgeting and whole farm budgeting. Linear programming–Meaning– Assumptions– Advantages and limitations Risk and uncertainty in agriculture–nature and sources of risks– Production and technical risks–Price or marketing risk–Financial risk– methods of reducing risk Agricultural Production Economics– Definition–Nature –Scope and subject matter of Agricultural Production Economics– Objectives of Production Economics– Basic Production Problems. Lawofreturns–Lawofincreasingreturns–Lawofconstantreturns–Lawofdecreasing returns Factor-product relationship–production function and its types– Elasticity of production - Three stages of production function Factor-factor relationship–Isoquant and their characteristics–MRTS–Types of factor substitution Iso-costlines– Characteristics–Methods of determining Least-Cost Combination of resources– Expansion path –Isoclines–Ridgelines.	7
IV	Product-product relationship– Production possibility curve–Marginal rate of product substitution– Types of enterprise relationships – Joint products–Complementary– Supplementary –Competitive and Antagonistic products Iso-revenueline and characteristics– Methods of determining optimum combination of products–Expansion path –Ridgelines Resource productivity– Returns to scale Resource economics – Definition,subject matter and scope – Differences between NRE and agricultural economics, Naturalresourcesclassificationandcharacteristics–ResourceDepletionandcausesfor thesamePositiveandnegativeexternalitiesinagricultureInefficiencyandwelfareloss, solutions Important issues in economics and management of common Property resources of land,water, pasture and forest resources,etc.	7
	Total	28

Practical

Experiment	Topic
1)	Basic concepts and terms
2)	Determination of optimum input and output, and least cost combination of Inputs
3)	Determination of profitable combination of products and application of principle of equi-marginal returns
4)	Seven types of costs and their computation
5)	Farm cost concepts and their imputation procedure
6)	Depreciation methods
7)	Farm holding survey
8)	Livestock– Farm survey
9)	Estimation of cost of cultivation and farm income measures of major crops
10)	Farm inventory analysis
11)	Farm financial analysis–Preparation and analysis of balance e sheet
12)	Preparation andanalysis of profit and loss statement
13)	Preparation of farm plans
14)	Preparation of enterprise budget and partial budge
15)	Study of farm management aspects related to Agriculture college farm

16)	Final Practical Examination

S. No.	Course Outcomes (CO)
CO 1	Educates the concept of farm management, different terms, principles and laws of farm management, different types of farm, etc.
CO 2	Develop understanding of various types of production function, decision making, cost, farm planning and budgeting, farm inventory, balance sheet, profit and loss accounts, etc.
CO 3	Apply the different law and principles of farm management, relationship between factor and product, etc.
CO 4	Evaluate the important issues in farm management etc.

S. No.	Title of Book Author/Authors Publisher	Year ofPublication/ Reprint
1)	Economics of Agricultural Production and Resource Use: Heady, Earl O, Prentice Hall of India, Private Limited, New Delhi,	1964
2)	Introduction to Agricultural Economic Analysis: BISHOP,C.E., & TOUSSAINT, W.D., NEWYORK,John Wiley and Sons,Inc.,London,	1958
3)	Fundamentals of Farm Business Management: S. S. Joh l, J.R. Kapur, Kalyani Publishers, New Delhi	2015
4)	AgriculturalEconomics:SubbaReddyS.,RaghuramP.,Neelakanta Sastry T.V., Bhavani DeviI., Oxford and IBH Publishing Company, Private Limited, New Delhi,	2006
5)	Farm Management Economics: Heady Earl OandHeral d R.Jenson, Prentice Hall, New Delhi,	1954
6)	Elements of Farm Management Economics: I. J.Singh, Affiliated East-West press, Private Limited, NewDelhi	1997
7)	Introduction to Farm Management:Sankhayan,P.L.,Tata–McGraw–Hill Publishing Company Limited,NewDelhi,	1983
8)	Resource Economics:A.Randall Wiley, OxfordIndia Publication	1981
9)	Environmental Economics:R.N.Bhattacharya, Oxford India Publication	2002
10)	Hand Book of Environmental Economics :K.Chopra and Vikram Dayal, Oxfor India Publication	2009
11)	Resource Economics:Conrad, Jon M,Cambridge University Press	2012
12)	Environmental economics: Prakash Vohra, Common wealth Publishers	2014
13)	Natural Resource Economics: Theory and Applications in India: Kerr, John M, MarothiaD.K.,KatarSingh,Ramasamy C & Bentley W.R., Oxford & IBH Publishing ompany,PrivateLimited,New Delhi,	1997
14)	Environmental Economics: Sankar U, Oxford University Press,	2001

15)	Environmental and Natural Resource Economics: Tietenberg T.6 Ed. AddisonWesley	2003

Articulated Attainment

Cos	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO -1	PSO -2	PSO -3	PSO -4
CO-1	1	1	2	1	-	1	1	-	-	3	1	1	1
CO-2	1	1	-	1	-	1	2	-	-	2	1	1	1
CO-3	2	1	2	1	2	1	2	-	-	2	2	1	1
2CO-4	1	1	2	1	2	2	1	-	-	1	2	1	1
Average	1.3	1.0	1.5	1.0	1.0	1.3	1.5	-	-	2.0	1.5	1.0	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Internal Exam			**External Theory Exam**	**Subject Total**	
		L	**T**	**P**	**Midterm Theory Exam**	**Assignment**	**Practical**			
BSAG-609	Farm Management, Production & Resource Economics	1	0	2	30	5	15	50	100	2(1+1)

10. BSAG-610 Hi-tech. Horticulture* 3(2+1)

S. No.	**Course Objectives**
1.	Define importance of hi tech horticulture, Nursery management, micro propagation of horticultural crops, etc.
2.	Develop sustainable and economically profitable agri-business mode on hi-tech horticulture.
3.	Implement the science of production skills under protected cultivation.
4.	Analyze prospective entrepreneurs for employment generation.

Unit	**Content**	**Teaching hours**
I	Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods,	7
II	Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management,	7
III	high density orcharding, Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS),	7

IV	Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.	7
	Total	28

Practical

Experiment	Topic
1)	Types Of Polyhouses And Shade Net Houses.
2)	Intercultural Operations.
3)	Tools And Equipments Identification And Application.
4)	Micro Propagation.
5)	Nursery-Protrays.
6)	Micro-Irrigation, EC, Ph Based Fertilizer Scheduling.
7)	Canopy Management.
8)	Visit To Hi-Tech Orchard/Nursery.

S. No.	Course Outcomes (CO)
CO 1	Define importance of hi tech horticulture, Nursery management, micro propagation of horticultural crops, etc.
CO 2	Develop sustainable and economically profitable agri-business mode on hi-tech horticulture.
CO 3	Implement the science of production skills under protected cultivation.
CO 4	Analyze prospective entrepreneurs for employment generation.

S. No.	Title of BookAuthor/AuthorsPublisher	Year ofPublication/ Reprint
1)	Hi-Tech Horticulture: Volume 1: Crop Improvement Nursery AndRootstock Management-Sachin Tyagi	2019
2)	Hi Tech Horticulture: Volume 06: Advanced Techniques- Sachin Tyagi	2019
3)	Horticultural Crop Varieties-S. Thamburaj, M. Kannan And V. Kanthaswamy	1997
4)	Nutritional Disorders In Crop Plants-S. Mohandass, T.N. Balamohan And G. Arjunan	2000

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	2	2	2	-	2	3	2	2	3	1	1	-	-
CO-2	2	2	2	-	2	3	2	2	3	1	1	-	-

CO-3	1	3	3	-	3	1	2	2	3	-	-	-	-
CO-4	1	3	3	-	3	1	2	2	3	-	-	-	-
Average	1.5	2.5	2.5	-	2.5	2.0	2.0	2.0	2.5	1.0	1.0	-	-

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Midterm Theory Exam	**Internal Exam**		**External Theory Exam**	**Subject Total**	
		L	**T**	**P**		**Assignment**	**Practical**			
BSAG-610	Hi-tech. Horticulture	2	0	2	30	5	15	50	100	3(2+1)

11. BSAG-611 Weeds Management * 3(2+1)

S. No.	**Course Objectives**
1.	Discuss about weed, its harmful and useful effect on agricultural crops , weedicide use in agriculture for weed control.
2.	Identify the different agricultural crop weeds and their growing habit for their control.
3.	Operate the weedicide sprayer (knap sap sprayer, foot sprayer, hand sprayer) use for spray in the field.
4.	Differentiate between weeds, weedicide and weed control methods.

Unit	**Content**	**Teaching hours**
I	IntroductionandimportanceofweedsCharacteristicsofweedsHarmfuland beneficial effects of weeds on ecosystem. Classification of weeds, Shift of weedflora	7
II	Reproduction and dissemination of weeds Classification of herbicides Concept of adjuvant and surfactants Herbicide formulation and their use	7
III	Introduction to mode of action of herbicides Introduction to herbicide selectivity Allelopathy and its application in weed management Bio herbicidesandtheirapplicationinAgricultureConceptofherbicidemixture and its utility inAgriculture	7
IV	Herbicide compatibility with Agrochemicals Herbicide compatibility with fertilizers Integration of herbicides with non-chemical methods of weed Management Herbicide resistance and its management.	7
	Total	28

Practical

Experiment	**Topic**

1)	Identification of weeds
2)	Techniques of weed preservation
3)	Study of lossesca used byweeds
4)	Biology of important weeds
5)	Study of herbicide formulation and herbicide mixtures
6)	Study of herbicide in relation to Agrochemicals
7)	Phyto-toxicity symptoms on crops and its measurement
8)	Methods of herbicide application
9)	Herbicides application equipments and their calibration
10)	Calculation of herbicide dose
11)	Computation of different weed indices
12)	Visit to weed management experiments

S. No.	Course Outcomes (CO)
CO 1	Acquaint about weed, its harmful and useful effect on agricultural crops , weedicide use in agriculture for weed control.
CO 2	Develop ability to identify the different agricultural crop weeds and their growing habit for their control.
CO 3	Operate the weedicide sprayer (knap sap sprayer, foot sprayer, hand sprayer) use for spray in the field.
CO 4	Develop ability to differentiate between weeds, weedicide and weed control methods.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Aldrich, R. J. and Kramer R.J. Principles in Weed Management.	1997
2)	Gupta O.P.Weed management Principles and Practices.	2007
3)	Gupta, O.P.Modern Weed Management	2008
4)	Gupta,O.P. Scientific Weed Management Today and Tomorrows.	1984
5)	Jayakumar, R.and Jagannathan, R.Weed Science Principles.	2007
6)	Mandal R.C.Weed, Weedicides and Weed control Principles and Practices.	1999
7)	RaoV.S.Principles of Weed Science.	2006

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	-	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	-	1	1	-	-	1	2	2	1	1
CO-3	2	2	1	-	1	-	1	-	1	2	-	1	-
CO-4	2	1	2	-	-	1	-	-	1	1	1	1	1
Average	2.3	1.8	1.8	-	1.0	1.0	1.0	-	1.0	1.8	1.5	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-611	Weed Management	2	0	2	30	5	15	50	100	3(2+1)

12. BSAG-612 System Simulation and Agro-advisory* 3(2+1)

S. No.	Course Objectives
1.	To understand soil-plant-atmospheric continuum. Crop responses to weather elements and role of Agro advisory.
2.	To analyze potential and achievable crop production- concept and modelling techniques for their estimation.
3.	To implement Weather forecasting, types, methods, tools & techniques, forecast verification.
4.	To schedule agro-advisory bulletin based on weather forecast its effective dissemination.

Unit	Content	Teaching hours
I	System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.	7
II	Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis.	6
III	Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance.	7
IV	Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity. Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agroadvisory and its effective dissemination.	8

	Total	28

Practical

Experiment	Topic
1)	Preparation of crop weather calendars.
2)	Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts.
3)	Working with statistical and simulation models for crop growth.
4)	Potential & achievable production; yield forecasting, insect & disease forecasting models.
5)	Simulation with limitations of water and nutrient management options.
6)	Sensitivity analysis of varying weather and crop management practices.
7)	Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast.
8)	Feedback from farmers about the agroadvisory.

S. No.	Course Outcomes (CO)
CO 1	Acquaint about Crop models, concepts & techniques, types of crop models, weather elements and role of Agro advisory.
CO 2	Develop ability to identify and relate the crop responses to weather elements, potential and achievable crop production- concept and modeling techniques for their estimation.
CO 3	Apply Weather forecasting, types, methods, tools & techniques, forecast verification.
CO 4	Preparation ofCrop-Weather Calendars and agro-advisory bulletin based on weather forecast and its effective dissemination.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Applied Agroclimatology By O.P.Bishnoi	2010
2)	Working With Dynamic Crop Models, Evaluation, Analysis, Parametrization And Applications By D. Wallach, D. Makowshi, J. W. Jones, Elsevier.	2006
3)	Remote Sensing Techniques In Agriculture By D.D.Sahoo, R.M.Solanki, Agrobios.	2008 .
4)	Database Management Systems By R. Ramkrishnan, Johannes Gehrke, M.C.Grawhill Education (India) Pvt.Ltd, New Delhi.	2014 .
5)	Ntroduction To Agrometeorology (Second Edition) By H.S.Mavi, Oxford And IBH Publishing Co. Pvt.Ltd., New Delhi.	1994
6)	Text Book Of Agril. Meteorology By M.C. Varshneya, P. Balakrishna Pillai, ICAR New Delhi.	2003

7)	Basic Principles OfAgril. Meteoorology By V.Radhakrishna Murthy, BS Publication, Hyderabad.	2002

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	3	2	2	1	-	-	-	1	1	-	1	1
CO-2	3	3	2	2	3	-	-	-	2	1	-	1	1
CO-3	2	2	2	2	3	1	-	-	2	-	-	-	-
CO-4	3	3	2	2	3	-	-	-	2	-	-	-	-
Average	2.8	2.8	2.0	2.0	2.5	1.0	-	-	1.8	1.0	-	-	1.0

Course Code	**Course Title**	**Periods per week**			**Evaluation Scheme**					**Credit (Theory + Practical)**
					Midterm Theory Exam	**Internal Exam**		**External Theory Exam**	**Subject Total**	
		L	**T**	**P**		**Assignment**	**Practical**			
BSAG-612	System Simulation and Agro advisory	2	0	2	30	5	15	50	100	3(2+1)

13. BSAG-613 Agricultural Journalism* 3(2+1)

S. No.	**Course Objectives**
1.	To understand nature and scope of agricultural journalism characteristics and training
2.	To identify and describe the different communication media such as magazines, and newspapers.
3.	To analyze communication methods, Gathering agricultural information and scientific materials to create strategic communication initiatives.
4.	To apply excellent written, verbal, listening and visual communication and skills of agricultural journalism.

Unit	**Content**	**Teaching hours**
I	**Journalism:** Meaning, definition, importance **Agricultural Journalism:** Meaning, definition,agriculturaljournalisminruralareas,problemandprospectusofagricultural journalism Agricultural **Journalism:** The nature and scope of agricultural journalism, characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.	7
II	**Newspapers and magazines as communication media**: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. **Form and content of newspapers and magazines:** Style and language of newspapers and magazines, parts of newspapers and magazines.	7

III	**Theagriculturalstory:** Typesofagriculturalstories, subjectmatteroftheagricultural story, And structure of the agricultural story.**Gathering agricultural information:** Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural newssources.	7
IV	**Writing the story:** Organizing the material, treatment of the story, writing the news lead and the body, readability measures. **Illustrating agricultural stories:** Use of photographs,useofartwork(graphs,charts,maps,etc.),writingthecaptions.**Editorial mechanics:** Copy reading, headline and title writing, proofreading, layouting.	7
	Total	28

Practical

Experiment	Topic
1)	Practice in interviewing.
2)	Covering agricultural events
3)	Abstracting stories from research and scientific materials and from wire services.
4)	Writing news story
5)	Writing magazine story
6)	Writing success story
7)	Preparation of leaflet
8)	Preparation of folder
9)	Script writing for radio and television
10)	Selecting pictures and artwork for the agricultural story
11)	Practice in editing, copy reading, headline and title writing
12)	Use of proofreading symbols
13)	Preparing layout of farm publication
14)	Preparing cover design of farm publication
15)	Testing copy with a readability formula.
16)	Visit to press to understand the process of publication of newspaper

S. No.	Course Outcomes (CO)
CO 1	Comprehend the nature and scope of agricultural journalism characteristics and training.
CO 2	Develop ability to recognize and utilize the different agricultural communication media such as

	magazines, and newspapers.
CO 3	Implement communication methods, Gathering agricultural information and scientific materials to create strategic communication initiatives.
CO 4	Able to demonstrate and applyeditorial mechanics, excellent written, verbal, listening and visual communication and skills of agricultural journalism.

S. No.	Name of Authors/ Books / Publishers	Year of Publication/ Reprint
1)	Arvind Kumar (1999). The Electronic Media. Anmol Publications, New Delhi.	1999
2)	Bhatt, S.C. (1993) Broadcast Journalism. Basic Principles Har Anand Publications, Delhi	1993
3)	Bhatnagar, R. (2001). Print Media and Broadcast Journalism. Indian Publisher Distributors, Delhi	2001
4)	Katyal,V.P(2007).FundamentalsofMediaEthics.CyberTechPublishers, New Delhi	2007
5)	Yadava, J.S and Mathur, P. (1998). Issues in Mass Communication: the basicconcepts.Volumes1and2.IndianInstituteofMassCommunication, New Delhi.	1998

Articulated Attainment

COs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PSO-1	PSO-2	PSO-3	PSO-4
CO-1	3	2	2	1	1	-	1	-	1	2	-	1	1
CO-2	2	2	2	1	1	1	-	-	1	2	2	1	1
CO-3	2	2	1	2	1	-	1	1	1	2	-	1	-
CO-4	2	1	2	1	-	1	-	-	1	1	1	1	1
Average	2.3	1.8	1.8	1.3	1.0	1.0	1.0	1.0	1.0	1.8	1.5	1.0	1.0

Course Code	Course Title	Periods per week			Evaluation Scheme					Credit (Theory + Practical)
					Midterm Theory Exam	Internal Exam		External Theory Exam	Subject Total	
		L	T	P		Assignment	Practical			
BSAG-613	Agricultural Journalism	2	0	2	30	5	15	50	100	3(2+1)