B.Sc. (Hons.) Agriculture

OUTCOME BASED EDUCATION

Programme outcome (POs)

PO1	In depth understanding of operational aspects, principles and objectives of Agriculture and Allied Sciences.
PO2	Demonstrate the professional agricultural solutions in societal and environmental contexts, with the knowledge and need for sustainable development.
PO3	Critical thinking and problem solving skills to understand the importance of crop production and animal husbandry.
PO4	Use of research based knowledge in collection, presentation of data, analysis of results of experiments in laboratories and fields for their validation
PO5	Creation and selection of different technologies for agricultural purposes
PO6	Application of contextual knowledge of agricultural farming for societal purposes
PO7	Understand and evaluate ethical environment issues related to agricultural farming.
PO8	Follow professional ethics and responsibilities and norms of agricultural subjects while practicing.
PO9	Demonstrate and ability to engage in analyzing situations and constructing viable solutions to work effectively with each other.
PO10	Develop an understanding of communication methods, resources utilization, cultivation, management of crops, and value addition of agricultural produces
PO11	Motivate for entrepreneurship, start-up through project planning and execution, research and training during field visits etc.
PO12	Generate a culture of life-long learning in an inclined environment to achieve personal and enhance their employability for jobs in different sectors

B.Sc. (HONS.) AGRICULTURE

'ACADEMIC RULES AND REGULATIONS'
(Effective from 2021-22)

01. Regulations

The Regulations provided herein shall apply to B.Sc.(Hons.)Agriculture Degree Programme offered by the Shri Guru Ram Rai University**.**

02. Short Title and Commencement

These regulations shall be called "**B.Sc. (Hons.) Agriculture Degree Programme Academic Rules and Regulations 2017**". They shall be continue from the academic year 2021-22.

03. Definitions & Abbreviations

3.1'University' means the Shri Guru Ram Rai University,Patel Nagar, Dehradun

3.2 'Curriculum' is a group of courses and other specified requirements for the fulfilment of the Degree Programme.

3.3 'Curricula and syllabi' It includes a list of approved courses for the Degree Programme wherein each course is identified by course code, outline of syllabus, credit assigned and semester wise distribution.

3.4 'Semester' means a period consisting of 90 working days inclusive of the mid-semester and practical examinations but excluding the study holidays and final theory examinations in each semester.

3.5 'Academic Year 'means a period consisting of two consecutive semesters including the inter-semester break as announced by the University. The first year of study shall be the first and second semesters following students admission. The second year of study shall be the third and fourth semesters, the third year, the fifth and sixth semesters and the fourth year, the seventh and eighth semesters.

3.6 'Course' is a teaching unit of a discipline to be covered within a semester as detailed in the Curricula and Syllabi issued by the University.

3.7 Core Course: Core course means the list of courses specified by the University in the curricula and syllabi to be registered compulsorily by the students of B.Sc.(Hons.)Agriculture degree programme.

3.8 Elective Course: Elective course means the list of courses specified by the University in the curricula and syllabi to be registered optionally by the students of B.Sc.(Hons.) Agriculture degree programme.

3.9 Remedial Course: Remedial course is part of the core course for the student to get acquainted with basic knowledge of the main subject.

3.10 Non credit course: means a course which is compulsorily registered by the student for the completion of B.Sc. (Hons.) Agriculture degree programme. The non-credit course will be evaluated as Satisfactory or Not-satisfactory. The marks obtained by the student in a non-credit course will not be taken into account for calculating the final percentage.

3.11 'Experiential Learning Programme (ELP)' means the list of specified courses in the syllabus from which the students can have the option of selecting the courses to complete the credit requirements for the degree programme.

3.12 RAWE and AIA: Rural Agricultural Work Experience (RAWE) means a programme in which the students will be placed in villages for a fixed period of time to study the agro-eco and socio-economic scenario of the villages and farmers and to study the functioning of various agricultural and allied institutions.

Agro Industrial Attachment (AIA) means a programme in which the students will be placed in Agro and cottage industries for a fixed period of time to get acquainted with structure and functioning of various agricultural industries and allied institutions.

3.13 'A credit' in theory means one hour of class room lecture and a credit in practical means two and half hours of laboratory or field work per week. Only for Experiential learning courses, a credit means 2 hours of practical per week

Explanation:

A 1+1 course (2 credits) means 1 hour theory and 3 hours practical per week.

A 0+1 course (1 credit) means 3 hours practical per week

A 1+0 course (1 credit) means 1 hour theory per week

3.14 READY: means Rural and Entrepreneurship Awareness Development Yojana. The Student READY programme was launched by the Hon'ble Prime Minister of India on 25th July, 2015 for students of Agriculture and allied desciplines.

3.15'C' is abbreviated for Core course

'R' for remedial course

'NC' for Non gradial or non credit course

'E' for Elective course

'T' for Theory class or lecture

'P' for Practical or Lab work or Field work

04. Eligibility for admission to B.Sc. (Hons.) Agriculture Degree Programme

A candidate passed in the Higher Secondary Course (10+2) or any other examination recognized asequivalent with Physics, Chemistry, Biology/ Physics, Chemistry, Mathematics/ Physics, Chemistry, Mathematics and Biology/Agriculture/Horticulture/Forestry group with minimum 45% of marks.

05. Admission Procedure: As per the University Norms and policies.

06. System of Education

6.1 The system of education for B.Sc. (Hons.) Agriculture Degree programme is Semester Systemwith a duration of four academic years (8 Semesters). The maximum duration permissible for a student shall be 14 consecutive semesters (7 years).If a student at any stage of his/her course is found unable to complete it within the said time, he/she shall not be allowed to continue the studies further.

6.2 The date of commencement and closure of semesters as well as inter-semester break and schedule of final theory examinations shall be announced by the University.

6.3 Credits are assigned to each course in B.Sc.(Hons.) Agriculture on the basis of the number of theory classes or lectures and Practical classes or laboratory work or field work as well as other form of learning required to complete course content in a scheduled period as decided by the University.

6.4 Core courses prescribed for B.Sc.(Hons.) Agriculture are mandatory for all the students registered in B.Sc.(Hons.) Agriculture programme.

6.5 The elective courses shall be one each in fourth, fifth and sixth Semester. A student has to register a total of three elective courses compulsorily.

6.6 There are two compulsory Remedial courses in First Semester, namely Introductory Biology/ Elementary Mathematics and Agricultural Heritage.

6.7 Student has to register in semester first two non credit courses namely Human Values and Ethics and NSS/NCC/Physical Education and Yoga practices.

NSS and NCC shall be offered as per the University Norms and according to link-ups with government and guidelines issued thereby.

Physical Education & Yoga shall be offered during First semester with continuation of the course in semester II also, thus with a total duration of one year. Evaluation of the course shall be done at the end of semester II with satisfactory or unsatisfactory grade.

6.8 The student READY programme shall be offered during seventh and eighth Semesters as per the following distribution of the course content:

(a) Rural Agriculture Work Experience (RAWE) & Agro-Industrial Attachment (AIA) shall be offered during seventh Semester.

(b) Experiential Learning Programme (ELP) shall be offered during eighth Semester. A student has to register for two modules of ELP from the list given in syllabus.

6.9 An academic calendar shall be prepared by the University for every semester indicating the date of commencement and closure of semesters, date of mid semester examinations, final practical and theory examinations, inter semester break and holidays.

6.10 Summary of Credits in B.Sc. (Hons.) Agriculture

Semester	CREDITS IN DIFFERENT CATEGORIES OF COURSES						Total Credits
	Core courses	Remedial courses	Non Gredial courses	Elective courses	RAWE & AIA	ELP	
I	18	03	03	-	-	-	24
II	24	-	-	-	-	-	24
III	23	-	-	-	-	-	23
IV	19	-	-	03	-	-	22
V	21	-	-	03	-	-	24
VI	21	-	-	03	-	-	24
VII	-	-	-	-	20	-	20
VIII	-	-	-	-	-	20	20
						Grand total	**181**

6.11 A student must successfully complete a total of 181 credits which include 126 for core courses + 03 for remedial courses + 03 for Non credit + 09 for Elective courses + 20 for RAWE & AIA + 20 for ELP as per the Curriculum requirement of B.Sc.(Hons.) Agriculture programme.

6.12 A course shall be offered only once in an academic year during the semester as listed in the course curricula and syllabi.

07. The Medium of Instruction: The medium of instruction will be both Hindi and English.

08. Reservation: The reservation will be as per the State Government rules followed by University and as per University Norms and Policies.

09. Total Seats: The total seats in B.Sc.(Hons.) Agriculture programme will be as per the provision of the University.

10. Fee structure: As decided by the University.

11. Attendance: As per University Norms.

12. Examination and Evaluation: As per University Norms and following guidelines:

12.1 The medium of Examination:

The medium of Examination will be either Hindi or English or both.

12.2Duration of Examination: The examinations shall be conducted according to the

Description given below:

Examination	Courses with theory and practical	Courses with only theory	Courses with only practical
Mid-semester Examination (internal)	1.0 hour	1.0 hours	--
Final Theory Examination	3 hours	3 hours	--
Final Practical Examination	3.0 hours	--	3.0 hours

12.3 Distribution of marks in External and Internal Exams:

(a) Courses with Theory and Practical

- External Theory Exam (50%)
- Internal theory + Practical (50%)
  - Mid-term Exam (30%) + Practical (20%)

(b) Courses with only Theory:

- External Theory Exam (50%)
- Internal Exam (50%)
  - Mid-term Exam (40%) + Assignment (10%)

(c) Courses with only Practical:

- (100%) Internal

12.4 Assessment Norms: As per University Norms

12.5 Question paper pattern:

(a) External theory Examinationsfor courses with theory and practical:

The question paper pattern for External theory Examination (Maximum Marks: 50) for courses with theory and practical is given below:

SECTION	Type of question	Number of questions	Number of questions to be answered	Mark per question	Total Marks
A	Objectives	10	10	01	10
B	Short answer type	06	04	05	20
C	Long answers type	04	02	10	20
Total					**50**

(b) External theory Examinationsfor courses with theory only:

The question paper pattern for External theory Examinations (Maximum marks: 50) for courses with only theory shall be as per given in section 12.5 (a).

(c) **Mid-term Exam**:

Courses with theory and practical both shall contain two Mid-term Exams of 15 marks each. Courses with only theory shall contain two mid-term Exams of 20 marks each plus an assignment of 10 marks. Question paper for Mid-term Exams can be designed by

Examiner as per the requirement of course content including objective and short answer type questions.

(d) Practical Exam :

Courses with theory and practical shall contain one practical Exam of 20 marks including Written (5 marks) + Spotting (2.5 marks) + Viva (5 marks) + Lab record (2.5 marks) + assignment (5 marks).

(e) Practical Examinationsfor courses with practical only:

Courses with practical only shall contain one practical Exam of 100 marks including Written (30 marks) + Spotting (10 marks) +Viva (15 marks) + Lab record (15 marks) + Attendance (15 marks) + Assignment (15 marks).

12.6 Evaluation pattern & distribution of marks for RAWE & AIA:

Evaluationpattern&distributionofmarksforRAWE&AIA:

Type ofattachment	ailyobservation notes(200)	ReportWriting (200)	Presentation/ Viva (200)	Written Test (200)	Regularity (200)	Maximum Marks
Village	100	100	100	100	100	500
Agro-Industry	100	100	100	100	100	500
GrandTotal						**1000**

- **Evaluation of RAWE &AIA shall be Internal.**

12.7 Evaluation pattern for ELP:

Type of attachment	Daily observation notes (20)	Report Writing (20)	Presentation/ Viva (20)	Written Test (20)	Attendance (20)	Maximum Marks (100)
Module I	100	100	100	100	100	500
Module II	100	100	100	100	100	500
Grand Total						**1000**

- **Evaluation of ELP shall be internal.**

13. Submission of Dissertation/Project reports: Before the commencement of final theory examination.

14. Promotion of students to next semester: Following cases of students' promotion to next semester will be as per the University Norms and policies:

(i) Back papers
(ii) Carry over system
(iii) Ex – Studentship
(iv) Special examination
(v) Grace marks

(vi) Candidate leaving the semester

15. Approval of Final Results, Award of Degree and Issue of Provisional Certificates and Transcripts or Mark sheet: As per University Norms

16. Removal of Difficulties:

16.1 If any difficulty arises in giving effect to the Provisions of aforesaid regulations, the University may issue necessary orders which appear to be necessary or expedient for removing the difficulty.

16.2 Every order issued by the University under this provision shall be laid before the Academic Council of the University after the issuance for ratification.

16.3 Not-withstanding anything contained in the rules and regulations, the Board of Studies Or, Academic Council shall make changes whenever necessary.

17. Reference: Course 'Curriculum' & 'Syllabus' of B.Sc.(Hons.) Agriculture for Shri Guru Ram Rai University has been designed as per the recent recommendations of Fifth Deans Committee of Indian Council for Agricultural Research (ICAR).

STUDY & EVALUATION SCHEME

B.Sc. (Hons) Agriculture

First Semester

S. No.	Course Category	Couse Code	Course Name	Periods			Credit hrs	Evaluation scheme		Subject Total
				L	T	P		Sessional (Internal)	External (ESE)	
Theory+ Practical										
1	Core	BSAC-101	Fundamentals of Horticulture	1		1	2	50	50	100
2	Core	BSAC-102	Fundamentals of Plant Biochemistry and Biotechnology	2		1	3	50	50	100
3	Core	BSAC-103	Fundamentals of Soil Science	2		1	3	50	50	100
4	Core	BSAC-104	Introduction to Forestry	1		1	2	50	50	100
5	Core	BSAC-105	Comprehension & Communication Skills in English	1		1	2	50	50	100
6	Core	BSAC-106	Fundamentals of Agronomy	3		1	4	50	50	100
7.	Remedial	BSAR-107	Introductory Biology	1		1	2	50	50	100
8.	Remedial	BSAR-108	Elementary Mathematics*	2		0	2	50	50	100
9.	Remedial	BSAR-109	Agricultural Heritage*	1		0	1	50	50	100
10.	Core	BSAC-110	Rural Sociology & Educational Psychology	2		0	2	50	50	100
11.	Non gradial	BSAN-111	Human Values &Ethics**	1		0	1	50	50	100

12.	Non gradial	BSAN112/BSAN113/BSAN114	NSS/ NCC/Physical Education &Yoga Practices**	0		2	2	-	-	100
Totalnumberof courses C: Core Course (07)*R: Remedial course (02); **N: Non-gradial course(02)				**Course wise Total credits: C:18,R:03,N:03=24**						

Second Semester

S. No.	Course Category	Course Code	Course Name	Periods			Credit hrs	Evaluation scheme		Subject Total
				L	T	P		Sessional (Internal)	External (ESE)	
Theory+ Practical										
1	Core	BSAC-201	Fundamentals of Genetics	2		1	3	50	50	100
2	Core	BSAC-202	Agricultural Microbiology	1		1	2	50	50	100
3	Core	BSAC-203	Soil and Water Conservation Engineering	1		1	2	50	50	100
4	Core	BSAC-204	Fundamentals of Crop Physiology	1		1	2	50	50	100
5	Core	BSAC-205	Fundamentals of Agricultural Economics	2		0	2	50	50	100
6	Core	BSAC-206	Fundamentals of Plant Pathology	3		1	4	50	50	100
7	Core	BSAC-207	Fundamentals of Entomology	3		1	4	50	50	100
8	Core	BSAC-208	Fundamentals of Agricultural Extension Education	2		1	3	50	50	100
9	Core	BSAC-209	Communication Skills and Personality Development	1		1	2	50	50	100
Total number of courses C: Core Course (09)*R: Remedial course (Nil); **N: Non-gradial course(Nil)				**Course wise Total credits: C:24,R:Nil,N:Nil=24**						

L – Lecture, T – Tutorial, P – Practical, C – Credit

Third Semester:

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	Credit hrs	Sessional (Internal)	External (ESE)	
Theory+ Practical										
1	Core	BSAC-301	Crop Production Technology – I *(Kharif Crops)*	1		1	2	50	50	100
2	Core	BSAC-302	Fundamentals of Plant Breeding	2		1	3	50	50	100
3	Core	BSAC-303	Agricultural Finance and Cooperation	2		1	3	50	50	100

4	Core	BSAC-304	Agri-Informatics	1		1	2	50	50	100
5	Core	BSAC-305	Farm Machinery and Power	1		1	2	50	50	100
6	Core	BSAC-306	Production Technology for Vegetables and Spices	1		1	2	50	50	100
7.	Core	BSAC-307	Environmental Studies and Disaster Management	2		1	3	50	50	100
8.	Core	BSAC-308	Statistical Methods	1		1	2	50	50	100
9.	Core	BSAC-309	Livestock and Poultry Management	3		1	4	50	50	100
Total number of courses C: Core Course (09)*R: Remedial course (Nil); **N: Non-gradial course(Nil)				**CoursewiseTotalcreditsC:23,R:Nil ,N:Nil**						

Fourth Semester:

S. No.	Course Category	Couse Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	Credit hrs	Sessional (Internal)	External (ESE)	
Theory+ Practical										
1	Core	BSAC-401	Crop Production Technology –II *(Rabi Crops)*	1		1	2	50	50	100
2	Core	BSAC-402	Production Technology for Ornamental Crops, MAP and Landscaping	1		1	2	50	50	100
3	Core	BSAC-403	Renewable Energy and Green Technology	1		1	2	50	50	100
4	Core	BSAC-404	Problematic Soils and their Management	2		0	2	50	50	100
5	Core	BSAC-405	Production Technology for Fruit and Plantation Crops	1		1	2	50	50	100
6	Core	BSAC-406	Principles of Seed Technology	2		1	3	50	50	100
7	Core	BSAC-407	Farming System & Sustainable Agriculture	1		0	1	50	50	100
8	Core	BSAC-408	Agricultural Marketing Trade& Prices	2		1	3	50	50	100
9	Core	BSAC-409	Introductory Agro-meteorology &Climate Change	1		1	2	50	50	100
10	Elective	Given in the list	Elective Course (One course can be selected from the	2		1	3	50	50	100

			list of Elective courses)							
Total number of courses **C: Core Course (09)*R: Remedial course (Nil); **N: Non-gradial course(Nil); Electivecourse:01**				**Course wise Total credits C: 19 ,R: Nil , N: Nil ,E:03 =22**						

Fifth Semester

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	Credit hrs	Sessional (Internal)	External (ESE)	
Theory+ Practical										
1	Core	BSAC-501	Principles of Integrated Pest and Disease Management	2		1	3	50	50	100
2	Core	BSAC-502	Manures, Fertilizers and Soil Fertility Management	2		1	3	50	50	100
3	Core	BSAC-503	Pests of Crops and Stored Grain and their Management	2		1	3	50	50	100
4	Core	BSAC-504	Diseases of Field and Horticultural Crops and their Management–I	2		1	3	50	50	100
5	Core	BSAC-505	Crop Improvement-I(*Kharif Crops)*	1		1	2	50	50	100
6	Core	BSAC-506	Entrepreneurship Development and Business Communication	1		1	2	50	50	100
7	Core	BSAC-507	Geo informatics and Nano-technology and Precision Farming	1		1	2	50	50	100
8	Core	BSAC-508	Practical Crop Production–I(*Kharif* crops)	0		2	2	50	50	100
9	Core	BSAC-509	Intellectual Property Rights	1		0	1	50	50	100
10	Elective	Given in the list	Elective Course (One course can be selected from the list of Elective courses)	2		1	3	50	50	100
Total number of courses C: Core Course (09)*R: Remedial course (Nil); **N: Non-gradial course(Nil) ; Elective course :01				**CoursewiseTotalcreditsC:21 ,R:Nil, N:Nil, E:03 = 24**						

Sixth Semester:

S. No.	Course Category	Course Code	Course Name	Periods				Evaluation scheme		Subject Total
				L	T	P	Credit hrs	Sessional (Internal)	External (ESE)	
Theory+ Practical										
1	Core	BSAC-601	Rainfed Agriculture & Watershed Management	1		1	2	50	50	100
2	Core	BSAC-602	Protected Cultivation and Secondary Agriculture	1		1	2	50	50	100
3	Core	BSAC-603	Diseases of Field and Horticultural Crops and their Management-II	2		1	3	50	50	100
4	Core	BSAC-604	Post-harvest Management and Value Addition of Fruits and Vegetables	1		1	2	50	50	100
5	Core	BSAC-605	Management of Beneficial Insects	1		1	2	50	50	100
6	Core	BSAC-606	Crop Improvement-II*(Rabi crops)*	1		1	2	50	50	100
7	Core	BSAC-607	Practical Crop Production–II(*Rabi* crops)	0		2	2	50	50	100
8	Core	BSAC-608	Principles of Organic Farming	1		1	2	50	50	100
9	Core	BSAC-609	Farm Management, Production & Resource Economics	1		1	2	50	50	100
10	Core	BSAC-610	Principles of Food Science and Nutrition	2		0	2	50	50	100
11.	Elective	Given in the list	Elective Course (One course can be selected from the list of Elective courses)	2		1	3	50	50	100
Total number of courses C: Core Course (10)*R: Remedial course (Nil); **N: Non-gradial course(Nil);Electivecourse:01				**CoursewiseTotalcreditsC:21 ,R:Nil,N: Nil,E:03 =24**						

Seventh Semester:

COURSE CODE: BSAW-701

Course Name: Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE&AIA)

SN.	Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE&AIA)		
	Activities	No. of weeks	Total Credits

1	General orientation & On campus training by different faculties	1	20
2	Village attachment	4	
3	Unit attachment in University/ College/KVK/ Research Station Attachment	1	
4	Plant clinic	4	
5	Agro-Industrial Attachment	3	
6	Field visit	5	
7	Project Report Preparation ,Presentation and Evaluation	2	
Total weeks for RAWE& AIA		**20**	

RAWE Component-I
Village Attachment Training Programme

Sl. No.	Activity	Duration
1	Orientation and Survey of Village	2 week
2	Agronomical Interventions	
3	Plant Protection Interventions	
4	Soil Improvement Interventions (Soil sampling and testing)	
5	Fruit and Vegetable production interventions	2 week
6	Food Processing and Storage interventions	
7	Animal Production Interventions	
8	Extension and Transfer of Technology activities	

RAWE Component –II
Agro- Industrial Attachment

- StudentsshallbeplacedinAgroandCottageindustriesandCommoditiesBoardsfor03 weeks.
- IndustriesincludeSeed/Saplingproduction, Pesticides-insecticides, Postharvest-processing-valueaddition, Agri-finance in situations, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- StudyofvariousprocessingUnitsandhands-

ontrainingsundersupervisionofindustrystaff

- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

Semester-VIII

COURSE CODE: BSAL-801Experiential Learning Programme (ELP)

Modules for Experiential Learning Programme (ELP) 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 ELP modules in the VIII semester from the list provided below:

Sr.	Title of the ELP module	Credits
1.	Production Technology for Bioagents and Biofertilizer	0+10
2.	Seed Production and Technology	0+10
3.	Mushroom Cultivation Technology	0+10
4.	Soil, Plant, Water and Seed Testing	0+10
5.	Commercial Beekeeping	0+10
6.	Poultry Production Technology	0+10
7.	Commercial Horticulture	0+10
8.	Floriculture and Landscaping	0+10
9.	Food Processing	0+10
10.	Agriculture Waste Management	0+10
11.	Organic Production Technology	0+10
12.	Commercial Sericulture	0+10

NOTE: In addition to above ELP modules other important modules may be given to the students by the University

ELECTIVE COURSES

A student can select three elective courses out of the following one in each 4th, 5th and 6thSemester:

S.N.	Course Code	Courses	Credit Hours
1.	BSAE-410	Agribusiness Management	3(2+1)
2.	BSAE-411	Agrochemicals	3(2+1)
3.	BSAE-412	Commercial Plant Breeding	3(2+1)
4.	BSAE-413	Landscaping	3(2+1)
5.	BSAE-510	Food Safety and Standards	3(2+1)
6.	BSAE-511	Biopesticides & Biofertilizers	3(2+1)
7.	BSAE-512	Protected Cultivation	3(2+1)
8.	BSAE-513	Micro propagation Technologies	3(2+1)
9.	BSAE-611	Hi-tech. Horticulture	3(2+1)
10.	BSAE-612	Weed Management	3(2+1)
11.	BSAE-613	System Simulation and Agro-advisory	3(2+1)
12.	BSAE-614	Agricultural Journalism	3(2+1)

Course code : BSAC-101				
Course Name : Fundamentals of Horticulture				
Semester /Year : 1/ 1 year				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on concept of horticulture along with different branches of horticulture,
2. Gain Knowledge about classification of horticultural crops, propagation, management and harvest, correlate of horticulture to the economy and environment.

Course Contents:

Theory:

Unit1: Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops.

Unit 2: Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness.

Unit 3: Pollination pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants.

Unit 4: Importance of plant bio-regulators in horticulture.Irrigation–methods, Fertilizer application in horticultural crops.

Practical:

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.

Suggested reading:

1. Prasad and Kumar, 2014.Principles of Horticulture2nd Edn.Agrobios India.
2. Neeraj Pratap Singh, 2005. Basic concepts of Fruit Science 1st Edn. IBDC Publishers.
3. Kumar,N.,1990.Introduction to Horticulture.Rajya lakshmi publications,Nagarcoil,

Tamilnadu

4. Jitendra S.2002.Basic Horticulture.Kalyani Publishers,Hyderabad.
5. Denisen,E.L.,1957. Principles of Horticulture. Macmillan Publishing Co., New York.
6. Chadha, K. L.(ICAR),2002.Hand book of Horticulture, ICAR,NewDelhi
7. K. S. Kirad, Swati Barche and N. K. Gupta (2019). Fundamentals of Horticulture, Brillion Publishing House.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize the concept of horticulture, classification and its scope.
CO2	Understands basic principles, processes and plant propagation methods.
CO3	Determine techniques to propagate, manage and harvest plants
CO4	Assess and correlate knowledge of horticulture to the economy and environment
CO5	Evaluate importance of growth regulators
CO6	Prepare nursery beds

CO-PO Mapping:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	-	1	-	-	-	-	1	-	-
CO2	2	2	2	1	2	1	-	-	-	2	1	-
CO3	2	2	2	1	2	1	-	1	-	2	1	1
CO4	1	2	1	2	-	2	2	1	1	1	2	2
CO5	-	-	-	-	1	-	2	-	2	-	-	-
CO6	-	-	-	-	-	-	-	2		-	-	-
Average	**1.75**	**2**	**1.5**	**1.3**	**1.5**	**1.3**	**2**	**1.3**	**1.5**	**1.5**	**1.3**	**1.5**

Course code	**: BSAC-102**			
Course Name	**: Fundamentals of Plant Biochemistry and Biotechnology**			
Semester /Year	**: 1/ 1 year**			
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on terminology of biochemistry, structure and functions of Biomolecules and their metabolic processes.
2. Students are expected to know about the instruments, techniques required for work in biotechnological and biochemistry laboratories and its application in Agriculture.

Course Content:

Theory:

Unit 1: 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 Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.

Unit2: Proteins:Importance of proteins and classification;Structures,titration and zwitterions natureofaminoacids;Structural organization of proteins.Enzymes:Generalproperties;Classification;Mechanismof action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to all ostericenzymes.Nucleicacids:Importance and classification;Structure of Nucleotides,A,B&ZDNA;RNA:Types and Secondary&Tertiary structure.Metabolism of carbohydrates:Glycolysis,TCAcycle,Glyoxylatecycle,Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Unit 3: Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture,cell suspension culture, callus culture, anther culture, pollen culture and ovule cultureand their applications ;Micro-propagation methods; organogenesis and embryogenesis ,Synthetic seeds and the irsignificance;Embryorescueandits significance;somatichybridization and cybrids;Somaclonal variation and its use in crop improvement; cryopreservation;

Unit4: Introduction to recombinant DNA methods :physical (Gene gun method),chemical(PEGmediated)andAgrobacteriumme diatedgene transfermethods;Transgenics and its importance in crop improvement;PCR techniques and its applications;RFLP,RAPD,SSR;Marker Assisted Breeding in crop improvement;Biotechnology regulations.

Practical:

1. Preparation of solution, pH&buffers.
2. Qualitative tests of carbohydrates and amino acids.
3. Quantitative estimation of glucose/proteins.

4. Titration methods for estimation of amino acids/lipids,
5. Effect of pH, temperature and substrate concentration on enzyme action,
6. Paper chromatography/ TLC demonstration for separation of amino acids/Monosaccharides.
7. Sterilization techniques, Composition of various tissue culture media
8. Preparation of stock solutions for MS nutrient medium.
9. Callus induction from various explants.Micro-propagation, hardening and acclimatization.
10. Demonstration on isolation of DNA.
11. Demonstration of gel electrophoresis techniques and DNA fingerprinting.

Suggested Reading:

1. Rastogi, S.D.2010, Biochemistry,3rdedn, TataMcGraw-Hill, Delhi.
2. Voet, D.; Voet, J.G. and Pratt, C.W. 2002. Biochemistry,John Wiley & Sons, Inc,Singapore
3. Thayumanavan,B.;Krishnaveni,SandParvathi, K.2004.BiochemistryforAgriculturalScience,GalgotiaPublications Pvt Ltd., NewDelhi
4. Gupta, P.K.2005.Elements of Biotechnology.RastogiPublication, India.
5. Malacinski, M. and D. Friefelder. 2003. Essentials of molecular biology. IV Ed. Jones and Bartlett publishers, Boston
6. Singh, B.D. 2004. Frontier areas in Biotechnology. Kalyani Publications, New Delhi.
7. Chawla, H.S. 2005.Introductionto Plant Biotechnology, India. Science Publishers
8. Satyanarayana U. and Chakrapani U. Biochemistry, Elsevier India.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize basic terminology of biochemistry.
CO2	Understand the structure and functions of Biomolecules and their metabolic processes.
CO3	Apply the instruments, techniques required for work in biotechnological and biochemistry laboratories.
CO4	Enhance the skill of plant tissue culture and basics of genetic engineering and its application in Agriculture.
CO5	Analyse importance of crop improvement
CO6	Prepare stock solution of media

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	-	-	-	-	-	-	-
CO2	2	-	-	2	-	-	-	-	-	1	-	-
CO3	2	2	1	2	3	1	-	2	-	-	-	-
CO4	2	-	1	-	-	-	1	1	1	1	1	2
CO5	-	-	-	-	-	-		-	2	-	-	-
CO6	-	-	-	-	-	-	1	-	1	2	1	1
Average	**2**	**1.5**	**1**	**1.67**	**3**	**1**	**1**	**1.5**	**1.3**	**1.3**	**1**	**1.5**

Course code : BSAC-103				
Course Name : Fundamentals of Soil Science				
Semester /Year : 1/ 1 year				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives:The objectives of this course are

1. To gain knowledge on basic concept of soil forming process and factors in various climatic conditions.
2. To understand the physical properties and chemical properties of soil and to examine the soil condition, moisture, and soil quality and soil health in relation to plant growth.

Course Contents:

Theory:

Unit 1: Soil as a natural body, Pedological and edaphological concepts of soil;Soil genesis:soil forming rocks and minerals;weathering,processes and factors of soil formation;Soil Profile,components of soil.

Unit2: Soilphysical properties:soil texture,structure,density and porosity,soil colour,consistence and plasticity;Elementary knowledge of soil taxonomy classification and soils of India;Soil water retention,movement and availability; Soil air, composition, gaseous exchange, problem and plantgrowth, Soil temperature; source, amount and flow of heat in soil; effect on plant growth.

Unit3: Soil reaction pH,soil acidity and alkalinity,buffering,effect of pH onnutrienta vailability;soilcolloids-inorganic and organic;silicate clays:constitution and properties; sources of charge; ion exchange, cation exchange capacity, base saturation.

Unit 4: Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and micro organisms, their beneficial and harmful effects; Soil pollution - behavior of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

1. Study of soil profile in field.
2. Study of soil sampling tools, collection of representative soilsample,its processingandstorage.
3. Studyofsoilformingrocksandminerals.
4. Determinationofsoildensity, moisture content and rosity.
5. Determinationofsoiltexture by feel and Bouyoucos Methods.
6. Studies of capillary rise phenomenon of water insoilcolumnandwatermovementinsoil.
7. DeterminationofsoilpHandelectricalconductivity.
8. Determinationofcationexchangecapacityofsoil.
9. Studyofsoilmap.

10. Determination of soil colour.
11. Demonstration of heat transfer in soil.
12. Estimation of organic matter content soil.

Suggested reading:

1. Brady, N.C.2002.The Nature and Properties of Soils(13thEdition)Mc Millan Co., NewYork.Indian Publisher–Eurasia Publishing House (P)Ltd.,Ramnagar, NewDelhi
2. Dilip, K.D. 2004. Introductory Soil Science, Kalyani Publishers, NewDelhi
3. Daji, A.J.1970.AText Book of Soil Science-Asia Publishing House, Madras.
4. Biswas T. D. and Mukherjee S. K. 1994. Textbook of Soil Science, Mc Graw Hill Education, Chennai.
5. Kolay A.K. 2000. Basic Concepts of Soil Science 2nd ed., New Age International, New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorizing the basic concept of soil forming process and factors in various climatic conditions.
CO2	Categorising the physical and chemical properties that affect both plant growth and biological activity
CO3	Examine the soil condition, moisture, and soil quality and soil health in relation to plant growth.
CO4	Analyse physical and chemical properties of soil.
CO5	Assess soil moisture content
CO6	Solve the on farm problems.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	2	1	-	-	-	-	1
CO2	-	1	-	2	1	2	-	-	-	2	-	-
CO3	-	2	2	2	1		2	1	1	2	-	-
CO4	-	-	-	2	-	-	-	-	-	2	2	-
CO5	-	-	-	-	-	-	-	-	-	-	-	2
CO6	2	-	-	-	-	-	-	2	2	-	-	-
Average	**2.5**	**1.5**	**2**	**2**	**1**	**2**	**1.5**	**1.5**	**1.5**	**2**	**2**	**1.5**

Course code : BSAC-104				
Course Name : Fundamentals of Forestry				
Semester /Year : 1/1 year				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To gain knowledge on silviculture, classification and various techniques used in the management of forest resources and production of forest products
2. To understand the development and evaluation of management plans with multiple objectives and constraints

Course Contents:

Theory:

UnitI: Introduction definitions of basic termsrelated to forestry,objective sofsilvi culture,forest classification,and salient features of Indian Forest Policies.

Unit 2: Forestre generation, Natural regeneration - natural regeneration from seed and vegetative parts,coppicing, pollarding, root suckers; 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.

Unit3: Forest men suration objectives,diameter measurement,instruments used indiameter measurement;Non instrumental method of height measurements had owand single pole method;Instrumental method so fheight measurement geometric and trigonometric principles,instruments use dinheight measurement; tree stem form, form factor, form quotient, measurement of volume offelled and standingtrees,agedetermination of trees

Unit4: Agroforestry–definitions, importance, criteria of selection of trees inagro forestry, different agro forest rysystems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing treespecies of the region.

Practical

1. Identification of tree-species.
2. Diameter measurements using calipers and tape, diameter measurement sofforked, buttressed, flutedand leaning trees.
3. Heightmeasurement of standing trees by shadow method, single pole method and hypsometer.
4. Volume measurement oflogs using various formulae.
5. Nursery lay out, seed sowing,vegetative propagation techniques.
6. Forest plantations and their management.
7. Visits of near by forest based industries.

Suggested Readings:

1. K. Patra, 2013. Agroforestry – Principles and Practices. New India publishing agency.
2. Dadhwal et al., 2014. Practical Manual on Agroforestry. Jaya publishing house, Delhi.

3. Jha,L. K.2015.Advances inAgroforestry. APHPublishingcorporation,NewDelhi.
4. A. P. Dwivedi, 2006.A Textbook of Silviculture.International Book Distributers, Dehradun.
5. A. P. Dwivedi, 1992. Agroforestry: Principles and Practices. Oxford and IBH Pub., New Delhi 1992.
6. S.R. Reddy and C. Nagamani, 2017. Introduction to forestry. Kalyani publication.
7. A. P. Dwivedi, 2006. A textbook of Silviculture. International Book Distributors, Dehradun.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize and retrieving silviculture terminology, classification and various techniques used in the management of forest resources and production of forest products
CO2	Understand to develop and evaluate management plans with multiple objectives and constraints
CO3	Develop and apply silvicultural prescriptions appropriate to management objectives
CO4	Analyze and design forest inventory information and project for future forest, stand, and tree conditions.
CO5	Judge growth habit of trees
CO6	Prepare tree nursery layout

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO4	3	2	-	-	-	1	-	-	-	-	-	-
CO4	2	-	2	-	-	2	3	-	-	1	-	2
CO4	2	-	-	-	3	2	2	2	2	1	-	2
CO4	2	-	-	3	-	3	2	2	2	2	2	1
CO5	-	1	-	1	-	-	-	-	-	-	1	1
CO6	--	-	-	-	-	-	-	-	-	-	-	-
Average	**2.25**	**1.5**	**2**	**2**	**3**	**2**	**2.33**	**2**	**2**	**1.33**	**1.5**	**1.5**

Course code	**:**	**BSAC-105**

Course Name : Comprehension & Communication Skills in English				
Semester /Year : 1/1				
	L	T	P	Credit hrs
	1	-	1	2

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge aims and objectives of communication, misconceptions about communication and the reasons, people use language.
2. To know about the action, interaction and transaction models of communication process, basic communication skills, intercultural communication skills, interpersonal communication skills and public- speaking skills.

Course Contents:

Theory:

Unit 1: War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at scienceRaymond B. Fosdick. You and Your English – Spoken English and broken English G.B.Shaw.

Unit2: Reading Comprehension,Vocabulary-Antonym,Synonym,Homophones,Homonyms, often confused words. Exercises to help the students in the enrichment ofvocabulary based on TOEFL and other competitive examinations.

Unit 3: Functional grammar:Articles, Prepositions, verb, Subject verb Agreement, Transformation, Synthesis, Directand Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writingandProposalwriting.

Unit 4: TheStyle:Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importanceandprocess.

Practical

1. Listening Comprehension: Listening to short talk's lectures, speeches (scientific, commercial land generalin nature).
2. OralCommunication: Phonetics, stress and intonation, Conversation practice.
3. Conversation: rate of speech, clarity of voice, speakingand Listening, politeness &Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills.
4. MockInterviews: testinginitiative, teamspirit, leadership, intellectualability.
5. Group Discussions.

Suggested Reading:

1. Peter, R.2009. EnglishPhoneticsand Phonology.APractical Course: (4th edition),CUP, U.K.
2. Kory, F.2008. Interpersonal Communication: TheWhole Story, Tata Mc Graw Hill Publishers.
3. Hariharan,S.2003.English for Agriculture and Allied Sciences: Orient Longman, Hyderabad
4. Interactive Software on Effective Communication. Learning to

Communicate. TOEFL Books published by Orient Longman and Cambridge University Press

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify and explain their aims and objectives of communication, misconceptions about communication and the reasons, people use language.
CO2	Differentiate the action, interaction and transaction models of communication process, importance of listening effectively and can identify strategies for communicating the cultural awareness.
CO3	Analyze basic communication skills, intercultural communication skills, interpersonal communication skills and public- speaking skills.
CO4	Demonstrate critical and innovative thinking. Display competence in oral, written and visual communication.
CO5	Edit the script
CO6	Write articles, synopsis and presentations

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO4	2	2	-	3	2	-	1	1	2	1	-	3
CO4	1	2	-	-	1	2	2	-	-	2	-	-
CO4	2	-	-	-	-	2	-	2	-	3	-	-
CO4	-	-	3	-	-	-	-	-	2	-	2	-
CO5	-	-	-	-	-	-	-	-	-	-	1	1
CO6	-	-	-	-	-	-	-	-	-	-	-	-
Average	**1.67**	**2**	**3**	**3**	**1.5**	**2**	**1.5**	**1.5**	**2**	**2**	**1.5**	**2**

Course code : BSAC-106

Course Name : Fundamentals of Agronomy				
Semester /Year : 1/1				
	L	**T**	**P**	**Credit hrs**
	3	**-**	**1**	**4**

Course Objectives: The objectives of this course are

1. Main objective of this subject is to introduce the students to fundamentals of Agronomy.
2. To give basic concept of Crop nutrition, soil-plant-water relationship, crop water requirement, water logging, irrigation scheduling and method of irrigation and to assess about Growth and development of crops and their management, harvesting and threshing technologies of crops.

Course Contents

Theory:

Unit 1: Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry.

Unit2: Cropnutrition, manures and fertilizers, nutrient use efficiency,water resources, soil-plant-water relationship, crop water requirement, water use efficiency,irrigation-scheduling criteria and methods,quality of irrigation water, water logging.

Unit3: Weeds-importance, classification, and crop weed competition, concepts of weed management-principles and methods,herbicides-classification,selectivity and esistance, allelopathy.

Unit4: Growth and development of crops, factors affecting growth and development,plantideo types,crop rotation and its principles,adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical:

1. Identification of crops, seeds, fertilizers, pesticides and tillage implements,
2. Studyof agro-climatic zones of India
3. Identification of weeds in crops, Methods of herbicideand fertilizer application,
4. Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plantpopulation, herbicides and water requirement
5. Use oftill age implements-reversible plough, one way plough, harrow, leveler, seed drill
6. Study of soil moisture measuring devices
7. Measurement of field capacity, bulk density and infiltration rate.
8. Measurementof irrigation water.

SuggestedReading:

1. BAL subramaniyan, P. and Palaniappan, S.P.2001.Principles and Practices of Agronomy.Agrobios, Jodhpur.
2. Panda, S.C.2005.Agronomy.AgrobiosIndia, Jodhpur.
3. ICAR.2006.HandbookofAgriculture.IndianCouncilofAgriculturalResearch,NewDelhi.
4. Reddy,S.R.1999.PrinciplesofAgronomy.KalyaniPublishers,NewDelhiYellamananda
5. Reddy,T.and G.H. Sankara Reddi.2016.Principles of Agronomy.Kalyani Publishers, NewDelhi.
6. B. Chandrasekaran, K. Annadurai, E. Somasundaram, 2010. A Textbook of Agronomy. New Age International Pub.
7. Singh, S S. 2015 Principles& Practices of Agronomy Kalyani Publishers

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Recall about basic aspects of Agronomy from sowing up to harvest including various tools and implements used for field operations.
CO2	Understand the concept of Crop nutrition, soil-plant-water relationship, crop water requirement
CO3	Aware about the principles and methods of irrigation and its application in field crops, weeds and its management, herbicides, allelopathy.
CO4	Assess about Growth and development of crops and their management , harvesting and threshing technologies of crops
CO5	Detect weed infestation
CO6	Solve Numerical exercises on fertilizer requirement, plant population ,herbicides and water requirement

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	1	1	1	-	-	-	-	-
CO2	2	2	2	2	-	-	-		1	-	-	-
CO3	2	1	2	2	2	-	-	2	-	2	-	-
CO4	2	1	2	-	-	2	1	-	1	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	1	-
CO6	-	-	-	-	-	-	2	--	2	-	-	-
Average	**2**	**1.2**	**2**	**1.6**	**1.5**	**1.5**	**1.3**	**2**	**1.3**	**2**	**1.5**	**2**

Course code : BSAR-107

Course Name : Introductory Biology				
Semester /Year : 1/1				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1.The students are expected to gain knowledge on primary biological functions, basic structure, biological principles of angiosperm

2. Gain knowledge on the basic biological techniques.

Course Contents:

Theory

Unit1: Introduction to the living world, diversity and characteristics of life,origin of life,Evolution and Eugenics.

Unit 2: Binomial nomenclature and classification Cell and cell division.

Unit 3: Morphologyofflowingplants.Seedandseedgermination.

Unit4: Plant systematic-viz;Brassica ceae,Faba ceae and Poaceae.Role of animals inagriculture.

Practical:

1. Study of morphology of flowering plants – root, stem
2. Study of leaf and their modifications.
3. Study of Inflorescence, flower and fruits.
4. Study of Cell, tissues
5. Study of cell division.
6. Study of Internal structure of root, stem and leaf.
7. Studyofspecimensandslides.
8. DescriptionofBrassicaceae
9. DescriptionofFabaceae
10. Description of Poaceae.

Suggested Reading:

1. Poonam, Bachheti and Aruna Singh .2012. Introduction to Biology. Vayu Education of India.
2. JaneB.Reece,LisaA.Urry,MichaelL.Cain .2011.Campbell Biology: GlobalEdition.
3. Singh, Pandey and Jain, 2017.Text book of Botany, Rastogi Publishers, fifth edition
4. Saxena and Saxena, 2017. Plant Taxonomy 10th edi. Pragati Prakashan.

Course outcomes (COs)

Upon successful completion of the course a student will be able to

CO1	Memorize the livingworld,diversityandcharacteristicsoflife,originoflife and its evolution
CO2	Summarize the biological principles like binomial nomenclature and classification of cell.
CO3	Apply the basic biological techniques like slide preparation, floral morphology, and can categorize the root, shoot and leafs anatomy.
CO4	Categorization of families of angiosperm by understanding of difference between the families, role of animals in agriculture
CO5	Judge morphological maturity in plants
CO6	Prepare specimens slides,herbarium

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	-	3	2	2	-	-	2	-	-	-
CO4	-	-	-	-	2	-	-	-	2	1	1	-
CO5	-	-	-	-	-	-	1	2	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	3	2	1
Average	**2**	**2**	**-**	**3**	**2**	**2**	1	2	**2**	**2**	**1.5**	1.5

Course code	**: BSAR-108**
Course Name	**: Elementary Mathematics**

Semester /Year : 1/1				
	L	T	P	Credit hrs
	2	-	0	2

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on concept of core of the mathematics major and to understand and write mathematical proofs.
2. To understand technologies to solve mathematical problems and construct appropriate mathematical models to solve a variety of practical problems

Course Contents

Theory

Unit 1: Straight lines : Distance formula, section formula (internal and external division),Change of axes (only origin changed), Equation of co-ordinate axes, Equation of linesparallel to axes, Slope-intercept form of equation of line, Slope-point form of equation ofline, Two point form of equation of line, Intercept form of equation of line, Normal formof equation of line, General form of equation of line, Point of intersection of two st. lines,Anglesbetweentwost.lines,Parallellines,Perpendicularlines,Angleofbisectorsbetween two lines, Area of triangle and quadrilateral.

Unit 2: Circle: Equation of circle whose center and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points(x_1, y_1) & (x_2,y_2), Tangent and Normal to a given circle at given point (Simple problems),Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.

Unit 3: DifferentialCalculus : Definition of function, limit and continuity, Simple problems on limit, Simpleproblems 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 (Simple problem based on it), Logarithmic differentiation (Simpleproblem based on it), Differentiation by substitution method and simple problems basedon it, Differentiation of Inverse Trigonometric functions.

Unit 4: Maxima and Minima of thefunctionsof theformy=f (x) (Simple problems basedon it). IntegralCalculus:Integration of simple functions,Integration of Product of two functions,Integration by substitution method, Definite Integral (simple problems basedonit), Areaunder simple well-known curves (simple problems basedon it). Matrices and Determinants: Definition of Matrices,Addition,Subtraction,Multiplication,Transpose and Inverseup to 3rdorder,Properties of determinants upto 3^{rd} order and theirevaluation.

Suggested Reading:

1. Duraipandian, 2007, Calculus and AnalyticalGeometry,Emerald Publishers,Chennai.

2. Mehta, B. C. and Madnani, G. M. K.1982. Mathematics for Economists, Sultan Chand&Sons, New Delhi.
3. Veerarajan, T.2004. Engineering Mathematics, Tata McGraw-Hill PublishingCompanyLimited, NewDelhi.
4. Gupta, S.C. and Kapoor, V.K. 2009. Fundamentals of Mathematical Statistics, SultanChand&Sons, NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Recall the areas that comprise the core of the mathematics major
CO2	Demonstrate the ability to understand and write mathematical proofs
CO3	Use appropriate technologies to solve mathematical problems
CO4	Calculate **Simple problems on limit, Simple problems on continuity, Differentiation**
CO5	Assess Equation of circle
CO6	Construct appropriate mathematical models to solve a variety of practical problems

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	-	2	1			2			1
CO2	2	-	-		2	2		2	2	3		2
CO3	2			3	3	2		2	3	2		2
CO4	1	2			3	1		3	2	2	3	2
CO5							1				1	
CO6												
Average	**1.75**	**1.5**	**2**	**3**	**2.5**	**1.5**	**1**	**1.75**	**2.25**	**2.33**	**2**	**1.75**

Course code : BSAC-109				
Course Name : Agricultural Heritage				
Semester /Year : I/I				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**0**	**1**

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on various agricultural crops and agricultural heritage in India
2. To know about traditional crop production and protection techniques in present scenario of Indian agriculture

Course Contents:

Theory:

Unit 1: Introduction of Indian agricultural heritage; Ancient agricultural practices, Relevance ofheritage to present day agriculture; Past and present status of agriculture and farmers insociety.

Unit 2: Journey of Indian agriculture and its development from past to modern era; Plantproductionandprotectionthroughindigenoustraditionalknowledge;CropvoyageinIndia and world.

Unit 3: Agriculture scope;Importance of agriculture and agricultural resourcesavailable in India; Crop significance and classifications; National agriculture setup inIndia.

Unit 4: Currentscenario of Indian agriculture; Indian agricultural concerns and futureprospects.

Suggested Reading:

1. ICAR.2006.Hand book of Agriculture.Indian Council of Agricultural Research,NewDelhi.
2. D. Kumari and Veeral ,M. 2012.A Text Book On Agricultural Heritage of India.ISBN-10: 8183212700
3. Choudhary, S.L., Sharma, G.S. and Nene, Y.L.Ancient and Medieval History of Indian Agriculture Rajasthan College of Agriculture, Udaipur

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Label get the basic knowledge of various agricultural crops
CO2	Understand the knowledge of agricultural heritage in India
CO3	Explain traditional crop production and protection techniques
CO4	Appraise the present scenario of Indian agriculture
CO5	Judge problems and prospects of Indian Agriculture based on agroclimatic condition
CO6	Solve the on farm problems of farmers

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	3	2	-	-	1	1	-	2
CO2	3	2	2	-	1	2	2	2	-	2	1	-
CO3	2	2	3	2	1	3	2	3	-	3	1	1
CO4	3	2	2	1	-	-	-	-	-	2	1	1
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	2	-	-	-
Average	**2.5**	**2**	**2.25**	**1.67**	**1.66**	**2.33**	**2**	**2.5**	**1.5**	**2**	**1**	**1.33**

Course code : BSAC-110				
Course Name : Rural Sociology & Educational Psychology				
Semester /Year : I/I				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**0**	**2**

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on sociology and rural sociology, its importance in agricultural extension, characteristics of Indian rural society.
2. To gain knowledge of social groups, social stratification, culture, social values, social control and attitudes, leadership and training and concept of educational psychology and behaviour

Course Contents

Theory:

Unit 1: Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.

Unit2: Social Ecology, Rural society, Social Groups, Social Stratification,Culture concept,Social Institution,Social Change & Development.

Unit 3: Educationalpsychology: Meaning & its importance in agriculture extension.

Unit4: Behavior:Cognitive,affective,psychomotordomain,Personality,Learning,Motivation,Theoriesof Motivation,Intelligence.

Suggested Reading

1. Chitambar, J.B. 1997. Introductory Rural Sociology, Wiley Eastern Ltd., New Delhi.
2. Kundu,C.L and Tutoo,D.N.2001.Education Psychology. Sterling Publishers Pvt.Ltd, NewDelhi

Course outcomes (COs):

Upon successful completion of the course a student will be able t

CO1	Describe the concept of sociology and rural sociology, its importance in agricultural extension, characteristics of Indian rural society.
CO2	Explain social groups, social stratification, culture, social values, social control and attitudes, leadership and training.
CO3	Analyse the concept of educational psychology and behaviour.
CO4	Acquaint with characteristics of rural society, village institutions and social organizations.
CO5	Judge Cognitive, affective ,Personality behaviour
CO6	Discuss about socioeconomic condition of rural and urban area

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**-**	**3**	**2**	**-**	**2**	**1**	**1**	**2**	**1**	**-**	**-**
CO2	**2**	**1**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**-**	**-**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**--**	**-**
CO4	**1**	**2**	**1**	**1**	**-**	**-**	**2**	**1**	**2**	**1**	**-**	**2**
CO5											**2**	
CO6											**1**	
Average	**1.66**	**1.5**	**2**	**2**	**1.5**	**2**	**1.5**	**1**	**2**	**1**	**1.5**	**2**

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on concept and importance of values and ethics and begin to apply them in their daily lives, personal and professional life and in careers for overall personality development.
2. To know about principles of philosophy, the acquisition of physical assets and decision making.

Course Contents

Theory:

Unit 1: Values and Ethics-An Introduction. Goal and Mission of Life.

Unit 2: Vision of Life.Principles and Philosophy. Self Exploration. Self Awareness.

Self Satisfaction. Decision Making. Motivation. Sensitivity. Success. Selfless Service.

Unit 3: Case Study of Ethical Lives.Positive Spirit. Body, Mind and Soul.
Unit 4: Attachment and Detachment. Spirituality Quotient.Examination.

Suggested Books

1. Chakraborty,S.K.&Chakraborty,D.2014.HumanValues AndEthics Himalayapublishinghouse.
2. Govindarajan, M.2013.Professional Ethics and Human Values. Himalayapublishinghouse.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Understand the concept and importance of values and ethics and begin to apply them in their daily lives, personal and professional life and in careers for overall personality development
CO 2	Acquaint with principles of philosophy, the acquisition of physical assets and decision making.
CO 3	Explain the personal and professional lives, self- satisfaction, self -motivation and respect.
CO 4	Apply the knowledge of positive spirit, soul, Spirituality Quotient and Examination.
CO5	Evaluate Attachment and Detachment theory
CO6	Solve Case Study of Ethical Lives

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	1	1	2	2	3	2	2	2
CO2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	1	1	1	-	2	2	2	2	2	2	2	2
CO5												
CO6												
Average	**2**	**1.75**	**1.66**	**2**	**1.75**	**1.75**	**2**	**2**	**2.25**	**2**	**2**	**2**

Course code	**: BSAN-112**
Course Name	**: NSS**
Semester /Year	**: I /I**

	L	T	P	Credit hrs
	0	**-**	**2**	**2**

Course Objectives: The objectives of this course are

1. To impart knowledge for students on cooperation, developing leadership among them and inculcating knowledge on helping others
2. To know about importance of youth leadership and activities of NSS and skill development.

Couse Contents

Theory

Course aimsatevokingsocialconsciousnessamong studentsthroughvariousactivities viz., working together, constructive and creative social work, to be skilful inexecuting democratic leadership, developing skill in programme development to be ableforselfemployment,reducing gap between educated and uneducated,increasing awareness and desireto help sections of society.

Followingactivities areto betaken upunder thenss course:

- Introductionandbasic componentsofnss:Orientation
- Nssprogrammes andactivities
- Understandingyouth
- Communitymobilisation
- Socialharmonyandnationalintegration
- Volunteerismandshramdan
- Citizenship,constitutionandhumanrights
- Familyand society
- Importanceandroleofyouthleadership
- Lifecompetencies
- Youthdevelopmentprogrammes
- Health,hygieneandsanitation
- Youthhealth,lifestyle,hivaidsandfirstaid
- Youthandyoga
- Vocationalskilldevelopment
- Issuesrelated environment
- Disastermanagement
- Entrepreneurshipdevelopment
- Formulationofproductionorientedproject
- Documentationanddata reporting
- Resourcemobilization
- Additionallifeskills
- Activitiesdirected bythecentraland stategovernment

All the activities related to the National Service Scheme course is distributed underfour semestersviz., National Service Scheme I, National Service Scheme II, nationalservice Scheme III and National Service Scheme IV. The entire four courses should beoffered continuously for two years.A student enrolled in NSS course should put in atleast 60 hours of social work in different activities in a semester other than five regularone day camp in a year and one special camp for duration of 7 days at any semester breakperiod in the two year. Different activities will include orientation lectures and practicalworks.Activities directed by the Central and State Government has to be performed byallthe volunteers ofnssas per direction.

Semester icourse Title: National Service Scheme: introduction and basic components of nss:

Orientation: history, objectives, principles, symbol, badge; regular programmes undernss, organizational structure of NSS,

code of conduct for NSS volunteers, points to beconsidered by nss volunteers awareness about health

Nss programs and activities

Concept of regular activities, special camping, day camps, basis of adoption ofvillage/slums,conductingsurvey,analyzingguidingfinancialpatternsofscheme,youthprogramme/ schemes of GOI, coordination with different agencies and maintenance ofdiary

Understanding youth

Definition, profile, profile, categories, issues and challenges of youth; and opportunities for youth who is agent ofthe social change

Community mobilisation

Mapping of community stake holders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership

Social harmony and nation alintegration

Indian history and culture, role of youth in nation building, conflict resolution and peace-building

Volunteerism and shramdan

Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdanas part ofvolunteerism

Citizenship, constitution and human rights

Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information

Familyandsociety

Concept of family, community (PRIs and other community based organisations) and society

Semester II Course Title: National Service Scheme III mportance and

role of youth leadership

Meaning, types and traits of leadership, qualities of good leaders;importance and roles of youth leadership

Lifecompetencies

Definition and importance of life competencies, problem-solving and decision-making, interpersonal communication

Youth development programmes

Development of youth programmes and policy at the national level,state level and voluntary sector; youth-focused and youth-led organstions

Health,hygiene and sanitation

Definition needs and scope of health education; role of food, nutrition, safe drinkingwater, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; nationalhealthprogrammesand reproductivehealth.

Youth health, lifestyle, HIV AIDS and firstaid

Healthylifestyles, HIV AIDS, drugs andsubstanceabuse, home nursing and firstaid

Youth and yoga

History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method

Semester III Course Title: National Service Scheme IIIVocational

skill development

To enhance the employment potential and to set up small business enterprises skills ofvolunteers, a list of 12 to 15 vocational skills will be drawn up based on the localconditions and opportunities. Each volunteer will have the option to select two skill-areasout of this list

Issues related environment

Environmental conservation, enrichment and sustainability, climatic change, naturalresource management (rain water harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management

Disaster management

Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management.

Entrepreneurshipdevelopment

Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and Role of financial and support service institution.

Formulationofproductionorientedproject

Planning, implementation, management and impactassessment of project

Documentationanddatareporting

Collection and analysis of data, documentation and dissemination of projectreports

Semester IVCourse Title: National Service Scheme IV

Youthand crime

Sociological and psychological factors influencing youth crime, cyber crime, pearment oringin preventing crime and awareness for juvenile justice

Civil/self defence

Civil defence services, aims and objectives of civil defence; needs and training of self defence

Resource mobilisation

Writing a project proposal of selffund Units (SFUs) andits establishment

Additional life skills

Positive thinking, self confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO1	Memorize importance of youth leadership and activities of NSS
CO 2	Understand the constitution, citizenship and human right/health care
CO 3	Explain the activities related to skill development
CO 4	Collection, analysis, documentation and data reporting of NSS
CO 5	Evaluate Resource mobilisation
CO 6	Write a project proposal of self fund Units(SFUs) and its establishment

Course code	**:BSAN-113**			
Course Name	**: NCC**			
Semester /Year	**: I /1**			
	L	**T**	**P**	**Credit hrs**
	1		**1**	**2**

L - Lecture T – Tutorial P – Practical C – Credit

Course Objectives:The objectives of this course are

1. To impart knowledge for students on cooperation, developing leadership among them and inculcating knowledge on helping others
2. To gain knowledge on types of communication, media, latest trends and developments.

.National Cadet Corps Credit hours: 2(0+2)

Semester I: National Cadet Corps

1. Aims, objectives, organization of NCC and NCC song.DG'scardinals of discipline.
2. Drill-aim, general words of command, attention, stand satease, stand easy and turning.
3. Sizing, numbering, forming in three ranks,open and close order marchand dressing.
4. Salutin gatthehalt, getting onparade, dismissing and falling out.
5. Marching, lengthof pace, and time of marching in quick/slow time and halt.Sidepace, pace forward and to the rear.
6. Turning on the March and wheeling.Saluting on the march.
7. Markingtime, forward marchand halt.
8. Changing step, formation of squad and squad drill.
9. Command and control,organization,badgesofrank,honours and awards
10. Nation Building- cultural heritage, religions, traditions and customs of India. National integration.
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadershiptraits, type so fleadership.Character/personalitydevelopment.
13. Civildefenseorganization,typesof emergencies,firefighting,protection,

14. Maintenance of essential services, disaster management, aid during development projects.

15. Basics of social service, weaker sections of society and their needs, NGO'sand their contribution, contribution of youth towards social welfare and family planning.
16. Structure and function of human body, dietand exercise, hygiene and sanitation.

17. Preventable diseases including AIDS, safe blood donation, first aid, physical andmentalhealth.
18. Adventureactivities

19. Basicprinciplesofecology, environmental conservation, pollution and its control.

20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerableparts ofthe body, self defence.

SemesterII: National Cadet Corps

1. Arms Drill-Attention, standatease, stands easy.Getting on parade.Dismissing and falling out. Ground/takeup arms, examinearms.
2. Shoulder from the order and vice-versa, present from the order and vice-versa.

3. Saluting at the shoulder at the halt and on the march. Short/long trail from the order and vice-versa.
4. Guard mounting, guard of honour, Platoon/Coy Drill.

5. Characteristic sofrifle (.22/.303/SLR), ammunition, firepower, stripping, assembling, care,cleaningand sight setting.
6. Loading, cocking and unloading.The lying position and holding.

7. Trigger control and firing shot. Range Procedure and safety precautions.Aiming and alteration of sight.
8. Theoryof groups and snap shooting.Firing atmoving targets.Miniaturerange firing.

9. Characteristics of Carbine and LMG.

10. Introduction tomap, scales and conventional signs.Top ographical forms and technical terms.
11. The grid system.Relief, contours and gradients.Cardinal points and finding north.Types of bearings and use of service protractor.
12. Prismatic compass and its use. Setting a map, finding north and own position. Map toground andgroundto map.
13. Knots and lashings, Camouflage and concealment, Explosives and IEDs.

14. Field defences obstacles,mines and minelying.Bridging,watermanship

15. Field water supplies, tracks and their construction.

16. Nuclear,Chemical and Biological Warfare(NCBW)

17. Judgingdistance.Description of ground and indication of land marks.

18. Recognition and description of target.Observation and concealment.Field signals.Sectionformations.
19. Fire control orders. Fire and movement. Movement with/without arms. Section battledrill.
20. Types of communication, media, latest trends and developments.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize aims, objectives, organization of NCC and NCC song
CO 2	Judging distance, description of ground and indication of landmarks
CO 3	Categorise Types of communication, media, latest trends and developments.
CO 4	Explain Nuclear, Chemical and Biological Warfare (NCBW)
CO 5	Judging distance.Description of ground and indication of landmarks.
CO 6	Develop communication, media, and latest trends.

	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge scope and importance of Physical Education and yoga asana
2. Understand the value of Physical Fitness and Health Education

Course code	**: BSAN-114**
Course Name	**: Physical Education & Yoga Practices**
Semester /Year	**: 1/1**

SemesterI

PhysicalEducationandYogaPracticesCredithours:2(0+2)(0+2)

1. Teaching of skills of Football – demonstration, practice of the skills, correction,involvementin game situation(Forgirls teachingofTennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills,correction,involvementingamesituation(For girlsteachingofTennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situationwithteachingof rules ofthe game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction ofskills,involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement ingamesituation
6. Teaching of skills of Basketball – involvement of all the skills in game situation withteachingof ruleof the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction ofskills,involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction ofskills,involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situationwithteachingof rule of thegame
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills,correctionofskills, involvement in gamesituation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situationwithteachingof rule of thegame
12. Teachingofsomeof Asanas–demonstration, practice, correctionandpractice
13. TeachingofsomemoreofAsanas –demonstration,practice,correctionandpractice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction andpractice and involvementin game situation
15. Teachingofskillsof TableTennis–demonstration,practiceofskills,correctionandpractice and involvementin game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situationwithteachingof rule of thegame
17. Teaching–Meaning,Scopeandimportanceof PhysicalEducation
18. Teaching–Definition,Typeof Tournaments
19. Teaching–Physical FitnessandHealthEducation
20. Construction and laying out of the track and field (*The girls will have Tennikoit

and Throw Ball).

SemesterII

Physical Education and Yoga Practices

1. Teachingofskills of Hockey– demonstrationpracticeoftheskills andcorrection.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. Andinvolvementofskills in games situation
3. Teaching of advance skills of Hockey – demonstration practice of the skills andcorrection. Involvement of all the skills in games situation with teaching of rules of thegame
4. TeachingofskillsofKho-Kho–demonstrationpracticeof theskillsandcorrection.
5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.Involvementof the skills in games situation
6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills andcorrection. Involvementofalltheskillsingamessituationwithteachingof rulesofthegame
7. Teachingofdifferenttrackevents –demonstrationpracticeoftheskillsandcorrection.
8. Teachingofdifferenttrackevents–demonstrationpracticeoftheskillsandcorrection.
9. Teaching of different track events – demonstration practice of the skills and correctionwithcompetition among them.
10. Teaching of different field events – demonstration practice of the skills andcorrection.
11. Teaching of different field events – demonstration practice of the skills andcorrection.
12. Teaching of different field events – demonstration practice of the skills andcorrection.
13. Teaching of different field events – demonstration practice of the skills and correctionwithcompetition among them.
14. Teachingofdifferentasanas –demonstrationpracticeandcorrection.
15. Teachingofdifferentasanas–demonstrationpracticeandcorrection.
16. Teachingofdifferentasanas –demonstrationpracticeandcorrection.
17. Teachingofdifferentasanas –demonstrationpracticeandcorrection.
18. Teachingof weighttraining–demonstrationpractice andcorrection.
19. Teachingof circuittraining–demonstrationpractice andcorrection.
20. Teachingof calisthenics –demonstrationpracticeandcorrection.

Note: 1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white

(Girlswill have white Tee Shirt and Track pants) 2) The games mentioned in the practical maybeinter changed dependingon the season andfacilities.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Remember Meaning, Scope and importance of Physical Education
CO2	Summarise Physical Fitness and Health Education
CO3	Categorise yoga asana.
CO4	Classify types of yoga asana
CO 5	Demonstrate practice of the skills and correction
CO 6	Construct and laying out of the track and field

Course code : BSAC-201				
Course Name : Fundamentals of Genetics				
Semester /Year : II/I				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. The students are expected to comprehensive and detailed knowledge of the chemical basis of heredity and variability especially in crop plants to improve and develop the new varieties of plants.

2. To understand the role of genetic technologies in industries related to Agriculture, biotechnology, pharmaceuticals, and other fields.

Course Contents

Theory

Unit 1: Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity.Architecture of chromo some;chromo nemata,chromo some matrix,chromo meres,centromere,secondary constriction and telomere;special types of chromo somes.

Unit 2: Chromosomal theory of inheritance- cell cycle and cell division- mitosis and meiosis.Probability and Chi-square. Dominance relationships, Epistatic interactions with example.Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sexlimitedandsexinfluencedtraits,Bloodgroupgenetics,Linkageanditsestimation,crossing over mechanisms, chromosome mapping.

Unit 3: Structural and numerical variations inchromosome and their implications, Use of haploids, dihaploids and doubled haploids inGenetics.Mutation, classification, Methods of inducing mutations & CIB technique,mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenesand continuous variations, multiple factor hypothesis, Cytoplasmic inheritance.

Unit4: Genetic disorders.Nature, structure & replication of enetic material.Protein synthesis, Transcription and ranslational mechanism of genetic material,Gene concept:Gene tructure,function and regulation,Lacand Trpo perons.

Practical

1. Studyofmicroscope and cellstructure.
2. MitosisandMeiosiscelldivision.
3. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross
4. Experimentson epistatic interactionsincluding test cross and back cross,
5. Practice on mitotic andmeiotic cell division,
6. Experiments on probability and Chi-square test.
7. Determination oflinkage and cross-over analysis (through two point test cross and three point test crossdata).
8. Study on sex linked inheritance in Drosophila.
9. Study of models on DNA and RNAstructures.

Suggested reading:

1. Gupta,P.K.,1997. Cytogenetics.Rastogi Publications, Meerut.
2. Singh, B.D.2009.Funda mental sofgenetics,Kalyani Publishers,Chennai.
3. Verma,P.S.andAgarwal,V.K.2007.Genetics.S.ChandandCompanyLtd./NewDelhi.
4. Gardner E J and Snustad D P.1991.*Principles of Genetics*. JohnWiley and Sons. 8th ed. 2006
5. Strickberger MW. 2005. Genetics (III Ed). Prentice Hall, New Delhi, India; 3rd ed., 2015

6. Snustad DP and Simmons MJ. 2006. Genetics. 4th Ed. John Wiley and Sons. 6th Edition International Student Version edition

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe comprehensive and detailed knowledge of the chemical basis of heredity and variability especially in crop plants to improve and develop the new varieties of plants.
CO2	Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.
CO3	Correlate mutation and their interaction with biotic and abiotic factors
CO4	Analyze the role of genetic technologies in industries related to Agriculture, biotechnology, pharmaceuticals, and other fields.
CO5	Judge Methods of inducing mutations & CIB technique,mutagenic agents
CO6	Design and execute the results of genetic experimentation in plant systems

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	2	2	2	1	2	2	2	2
CO2	2	2	2	-	1	2	2	2	2	2	-	-
CO3	-	-	-	3	2	2	-	1			2	-
CO4	-	2	2	2		2	2	2	1	2	2	3
CO5	-	-	-	-	2	-	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	-	2	-	1	-
Average	**2.5**	**2**	**2**	**2**	**1.75**	**2**	**2**	**2.5**	**1.75**	**2**	**1.7**	**2.5**

Course code : BSAC-202				
Course Name : Agricultural Microbiology				
Semester /Year : II/I				
L	**T**	**P**	**Credit hrs**	
1	**-**	**1**	**2**	

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on identification of the basic microbial structure, function and study the comparative characteristics of prokaryotes and eukaryotes

2. To understand the growth requirements of bacteria and applications of microbes in human welfare

Course Contents

Theory

Unit 1: Introduction.Microbial world: Prokaryotic and eukaryotic microbes.

Unit 2: Bacteria: cell structure,chemo autotrophy,photo autotrophy,growth.Bacterial genetics:Geneticrecombination-transformation, conjugation and transduction, plasmids, transposon.

Unit 3: Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles.Biological nitrogen fixation-symbiotic,associative and a symbiotic.

Unit 4: Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes' inhuman welfare: silage production, biofertilizers, biopesticides, biofuel production andbiodegradationofagro-waste.

Practical

1. Introduction to microbiology laboratory and its equipments
2. Microscope- parts, principles of microscopy,resolving power and numerical aperture.
3. Method sofsterilization.
4. Nutritional media and their preparations.
5. Enumeration of microbial population in soil-bacteria, fungi, actinomycetes.
6. Methodsofisolationandpurificationofmicrobialcultures.
7. Isolation of *Rhizobium* from legume root nodule.
8. Isolation of *Azotobacter* fromsoil.
9. Isolation of *Azospirillum* from roots.
10. Isolation of BGA.
11. Staining and microscopicexaminationofmicrobes.

Suggested reading:

1. Black, J.G. 2005. Microbiology: Principles and Explorations, John Wiley, USA.Prescott,
2. M.J., Harley,J.P.andKlein,D.A.2002. Microbiology.5thEdition, WCBMc GrawHill, NewYork.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify the basic microbial structure, function and study the comparative

	characteristics of prokaryotes and eukaryotes
CO2	Understand the various Physical and Chemical growth requirements of bacteria
CO3	Apply knowledge about production of beneficial bacteria
CO4	Explain applications of microbes in human welfare
CO5	Detect the ubiquitous nature of microbes inhabiting wide range of ecological habitats
CO6	Use microbes in enriching specific plant nutrients

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	1	-	-	-	1	-	-	-	-	-
CO2	-	2	-	2	-	-	-	-	-	-	1	-
CO3	2	1	1	2	3	-	-	-	1	-	-	-
CO4	2	2	1	3	1	-	-	-	1	1	1	1
CO5	-	-	-	-	-	2	-	-	-	2	-	-
CO6	-	-	-	-	-	-	-	1	-	-	2	2
Average	2	1.66	1	2.33	2	2	1	1	1	1.5	1.3	1.5

Course code : BSAC-203				
Course Name : Soil and Water Conservation Engineering				
Semester /Year : I /1				
L	**T**	**P**	**Credit hrs**	
1	**-**	**1**	**2**	

Course Objectives: The objectives of this course are

1. The students are expected to gain knowledge on soil and water conservation and its importance.

2. To understand soil erosion and its types, and its measurement techniques and methods of erosion control

Course Contents

Theory

Unit 1: Introduction to Soil and Water Conservation, causes of soilerosion.Definition and agents of soil erosion, water erosion: Forms of water erosion.

Unit2: Gully classification and control measures.Soil losses timation by universal Loss Soil Equation.Soil loss measure menttechniques.

Unit 3: Principles oferosion control:Introduction tocontouring,strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and theirdesign. Water harvesting and its techniques.

Unit4: Winderosion:mechanics of winderosion,types of soil movement.Principles of wind erosion control and its control measures.

Practical

1. General status of soil conservation in India.
2. Calculation of erosion index.
3. Estimation ofsoil loss.
4. Measurement of soil loss.
5. Preparation of contour maps.
6. Design of grassed waterways.
7. Designof contour bunds.
8. Designofgraded bunds.
9. Design of bench terracingsystem.
10. Problem on winderosion.

Suggested Reading:

1. Suresh, R. 2005. Soil and Water Conservation Engineering, Standard Publishers &Distributors, New Delhi.
2. Gunshyam, D. 2005.Hydrology and soil conservation engineering, Prentice-Hall ofIndiaPvt.Ltd., New Delhi
3. Suresh, R. 2008. Land and water management principles, Standard Publishers &Distributors,New Delhi.
4. Michael, A.M. and Ojha, T.P. 2006. Principles of Agricultural Engineering. Vol. II. JainBrothers, New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorizes the soil and water conservation and its importance.
CO2	Understand about soil erosion and its types, and its measurement techniques.
CO3	Illustrates about different principles and methods of erosion control
CO4	Evaluate about wind erosion, mechanics and principles of wind erosion and its control measures
CO5	Interpret case studies related to soil and water conservation
CO6	Design of graded bunds,contur bunds, grasses bunds

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	1	1	1	2	3	1	1
CO2	2	3	2	1	-	2	2	-	-	-	-	1
CO3	-	-	3	2	2	2	1	3	3	2	1	1
CO4	1	1	3	2	1	-	-	2	1	3	-	-
CO5												
CO6							1				1	1
Average	**2**	**2**	**2.75**	**1.75**	**1.7**	**1.6**	**1.3**	**2**	**2**	**2.6**	**1**	**1**

Course code : BSAC-204				
Course Name : Fundamentals of Crop Physiology				
Semester /Year : II/I				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1. The students are expected to gain knowledge physiological phenomena in plant cell and basic mechanism of various metabolic processes in plants.

2. To develop skills in preparation of temporary slides, estimation of physiological processes, understand the importance and application of growth regulators in Agriculture

Course Contents

Theory

Unit 1: Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview, Diffusion and osmosis;Absorption of water,transpiration and Stomatal Physiology.

Unit 2: Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants.

Unit3: Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown; Plant growth regulators: Physiological roles and agricultural uses.

Unit4: Physiological aspect sofgrowth and evelopment of major crops:Growth analysis,Role of Physiological growth parameters in crop productivity

Practical

1. Study of plant cells, structure and distribution of stomata, imbibitions, osmosis,plasmolysis, measuremen to froot pressure,rate of transpiration
2. Separation of photosynthetic pigments through paper chromatography,
3. Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content
4. Measurement of photosynthetic CO_2 assimilation by Infra Red Gas Analyser (IRGA).

Books

1. Taiz,L.andZeiger,E.,2010.PlantPhysiology.Publishers:SinauerAssociates,Inc.,Massa chusetts,USA
2. Pandey, S.N. and Sinha,B.K. 2006.Plant Physiology.Vikas Publishing House Pvt. Ltd.,New Delhi.
3. Jain,J.K.2007.Fundamentals of Plant Physiology.S.Chand&CompanyLtd.,NewDelhi
4. Hopkins and Huner Norman P. A., 2014. Introduction to Plant Physiology 4th edi. Wiley India Pvt. Ltd., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Describe the knowledge of physiological phenomena in plant cell.

CO2	Summarize the basic mechanism of various metabolic processes in plants
CO3	Develop skills in preparation of temporary slides for morphological study of plant cell, measurement and distribution of stomata, estimation of physiological processes.
CO4	Envelope the ability to categorize the C3, C4, and CAM plants and to understand the importance and application of growth regulators in Agriculture.
CO5	Explanin nutrient deficiencies and physiological requirements of the plants.
CO6	Design experiments based on growth regulators

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	3	1		1	1	2	2	1	1
CO2	1	1	3	2	1	1	1	-	2	1	1	-
CO3	2	2	3	2	1	2	-	-	-	3	2	2
CO4	2	2	1	2	1	1	-	-	1			-
CO5												
CO6										2	1	
Average	**1.5**	**1.5**	**2.25**	**2.25**	**1**	**1.3**	**1**	**1**	**1.7**	**2**	**1.25**	**1.5**

Course code : BSAC-205				
Course Name : Fundamentals of Agricultural Economics				
Semester /Year : II/I				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1. Main objective of this subject is to familiarize the students about the crop and economics

2. To understand the concept of finance, banking, taxation, economic systems and its role in agricultural economic development.

Course Contents

Theory

Unit 1: *Economics:* Meaning, scope and subject matter, definitions, activities, approaches to economicanalysis;micro and macro economics,positive and normative analysis.Nature of economic theory; rationality assumption, concept of equilibrium, economiclaws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare.

Unit2: Agriculturaleconomics: meaning, definition, characteristics of agriculture, importance and its role ineconomic development.Agricultural planning and development in the country. *Demand:* meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer'sequilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production: process, creation of utility, factors of production, input output relationship. *Laws of returns*: Law of variable proportions and law of returns to scale.*Cost:* Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law ofsupply, supply schedule, supply curve, determinant sofsupply, and elasticity of supply.Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets.

Unit 3: Price determination under perfect competition; short run and longrun equilibrium of firm and industry, shut down and break even points. Distributiontheory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, and interestandprofit.Nationalincome: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement.Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control.

Unit 4: Money: Barter system of exchange and its problems, evolution, meaning andfunctions of money, classification of money, money supply, general price index, inflationanddeflation.Banking: Role in modern economy, type sofbanks, functionsofcommercial and central bank, credit creation policy. Agricultural and public finance: meaning, microv/smacrofinance, needfor agriculturalfinance, publicrevenueandpublic expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT.*Economicsystems:* Concept sofeconomy and its functions,important feature sofcapitalistic,socialistic and mixed economies, elements f economic planning.

Suggested Reading

1. Dewett, K.K. 2002. Modern Economic Theory, Syamlal Charitable Trust, New Delhi.
2. Varian, H.R.1987.Intermediate Micro economics, WW Norton&Company, New Delhi.
3. Seth, M.L. 2000. Principles of Economics, Lakshmi Narain Agarwal Co., Agra. NewDelhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Retrieve different aspects of agricultural economics, laws and theory of economics in relation to agricultural economics.
CO 2	Understand about drought, its types and effect of water deficit on physio-morphological characteristics of the plants.
CO 3	Analyze peer-reviewed journal articles, literature, and practices that reflect other policies and uplifting approaches for developments of agricultural economics in India.
CO 4	Explain concept of finance, banking, taxation, economic systems and its role in agricultural economic development.
CO5	Interpret market structures responsible for creating national income
Co6	Plan Agroeconomic growth and develop policies

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	1	1	-	-	-	-	-	1	2	2
CO2	2	2	3	2	2	2	3	-	2	3	2	1
CO3	3	3	2	3	-	2	-	2	3	-	2	1
CO4	2	3	3	2	1	2	-	3	3	3	-	-
CO5	-	-	-	-	-	-	2	1	2	-	-	-
CO6	-	-	-	-	-	-		-	-	2	2	3
Average	**2**	**2.5**	**2.25**	**2**	**1.5**	**2**	**2.5**	**2**	**2.5**	**2.25**	**2**	**1.75**

Course code	**:**	**BSAC-206**
Course Name	**:**	**Fundamentals of Plant Pathology**
Semester /Year	**:**	**II/I**

L	T	P	Credit hrs
3	**-**	**1**	**4**

Course Objectives:The objectives of this course are

1. Main objective of this subject is to familiarize the students about the crops and plant disease
2. To facilitate the students to learn and understand the plant disease causing agents, their properties and management practices of crop plants

Course Contents

Theory

Unit 1: *Introduction*: Importance of plant diseases, scope and objective sofPlant Pathology.History of Plant Pathology with special reference to Indian works. Terms and concepts in Plant Pathology. Pathogenesis. Causes / factors affecting disease development: diseasetriangle and tetrahedron and classification of plant diseases. Importantplantpathogenicorganisms,differentgroups:fungi,bacteria, fastidiousvesicularbacteria,phytoplasmas,spiroplasmas,viruses,viroids,algae,protozoa, phanerogamicparasites and nematodeswithexamplesofdiseasescausedbythem. Diseases and symptomsdueto abioticcauses.

Unit 2:*Fungi*: general characters, definition of fungus, somatic structures, types of fungal thalli,fungal tissues, modification softhallus, reproduction (asexualandsexual).Nomenclature, Binomialsystem of nomenclature, rules of nomenclature,classification of fungi. Key to divisions, sub-divisions, orders and classes. *Bacteria and mollicutes*: general morphological characters.Basic method sofclassification 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.)

Unit 3: Growth and reproduction of plant pathogens. Liberation / dispersal and survival of plant pathogens. Types of parasitism and variability in plant pathogens. Pathogenesis. Role ofenzymes, toxins and growth regulators in disease development.

Unit 4: Defense mechanism inplants. Epidemiology: Factors affecting disease development. Principles and methods of plant disease management.Nature, chemical combination, classification, mode of action and formulations of fungicides and anti biotics.

Practical

1. Acquaintancewithvariouslaboratoryequipmentandmicroscopy.
2. Collectionandpreservation of disease specimen.
3. Preparation of media, isolation and Koch's postulates.
4. Generalstudyofdifferentstructuresoffungi.
5. Studyofsymptomsofvariousplantdiseases.
6. Study of representative fungal genera.
7. Staining and identification of plant pathogenicbacteria.
8. Transmission of plant viruses.
9. Studyof phanerogamicplantparasites.
10. Study of morphological features and identification of plant parasitic nematodes.
11. Sampling and extraction of nematodes froms oil and plant material, preparation of nematode mounting.
12. Study of fungicides andtheir formulations. Methods of pesticideapplication and theirsafeuse. Calculation of fungicidesprays concentrations**.**

Suggested Reading:

1. Agrios, G.N. 2005.Plant Pathology.AcademicPress, NewYork.
2. Dube, H.C.2009. A textbookofFungi, Bacteria and Viruses, Vikas Publishing House P.Ltd, New Delhi.
3. Mehrotra, R.S. and Agarwal, A.2006. Plant Pathology , Tata McGraw

HillPublishingCompanyLtd., New Delhi,India

Course outcomes (COs):

Upon successful completion of the course a student will be able to

Co1	Introduce plant pathology (definitions, objective, concept, scope and importance) and role the microorganism to cause disease in plant, pathogenesis and epidemiology.
CO2	Discuss the general characters, somatic structures, reproduction, nomenclature, classification of fungi and bacteria.
CO3	Identify the disease based on symptoms and applied the management strategies for the control of plant disease.
CO4	Acquaint with various laboratory equipment and their uses in plant pathology
CO5	Evaluate disease cycle, physiology of pathogen and plant defence
CO6	Develop strategies for disease management and controlling pathogens

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	3		-	-				3
CO2	2	3	2	3	1	2	1	-	2	1	2	
CO3	3	3	3	3	2	1	2	1	2	2	1	2
CO4	2	2	-	-	-	-	-	-	1	1	-	-
CO5	-	-	-	-	-	2	-	2	-	-	-	-
CO6	-	-	-	-	-	-	-	-	1	2	3	1
Average	**2.25**	**2.5**	**2.7**	**2.7**	**2**	**1.7**	**1.5**	**1.5**	**1.5**	**1.5**	**2**	**2**

Course code	**:**	**BSAC-207**			
Course Name	**:**	**Fundamentals of Entomology**			
Semester /Year	**:**	**II/I**			
	L	**T**	**P**	**Credit hrs**	
	3	**-**	**1**	**4**	

Course Objectives:The objectives of this course are

1. To acquaint the students with external morphology of the insect, basic aspects of anatomy of different systems and identification of insects up to family level with hands-on experience.
2. To familiarize the students with concept of IPM, insecticide classification and their formulations and recent methods of pest control.

Course Contents

Unit 1: History of Entomology in India. Major points related to dominance of Insecta inAnimal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insectcuticle and molting.Body segmentation.Structure of Head, thorax and abdomen.Structure and modification sofinsectantennae,mouth parts,legs,Wingvenation,modifications and wing coupling apparatus. Structure of male and female genital organ.Metamorphosis and diapauses in insects.Type soflarvae 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.

Unit 2: Insect Ecology: Introduction, Environment and its components. Effect of abiotic Factors–temperature, moisture, humidity, rainfall, light, atmospheric pressure and aircurrents.Effect of bioticfactors –foodcompetition, natural and environmental resistance.

Unit 3: Categorie sofpests.ConceptofIPM,Practices, scope and limitation sofIPM.Classification of insecticides, toxicity of insecticides and formulations of insect cides.Chemical control-importance, hazards and limitations. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation. InsecticidesAct 1968-Importantprovisions.Applicationtechniquesof spray fluids.Symptomsof poisoning, firstaid and antidotes.

Unit 4: Systematics:Taxonomy–importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family andOrder.Classification of class Insecta upto Orders, basic groups of present day insects with pecial emphasis to orders and families of Agricultural importance like Orthoptera:Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae;Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pen tatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae,Coccidae,Lophophidae,Aleurodidae,Pseudococcidae;Neuroptera:Chrysopida e;Lepidoptera:Pieridae,Papiloinidae,Noctuidae,Sphingidae,Pyralidae,Gelechiidae,Arctii dae,Saturnidae,Bombycidae;Coleoptera:Coccinellidae,Chrysomelidae,Cerambycidae, Curculionidae,Bruchidae,Scarabaeidae;Hymenoptera:Tenthridinidae,Apidae.Trichogra mmatidae,lchneumonidae,Braconidae,Chalcididae;Diptera:Cecidomyiidae,Tachinidae,A gromyziidae,Culicidae,Muscidae,Tephritidae.

Practical

1. Methodsofcollectionandpreservationofinsectsincludingimmaturestages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts andlegs; Wing venation, types of wings and wing coupling apparatus.
2. Types of insect larvaeand pupae; Dissection of digestive system in insects (Grasshopper); Dissection of maleand female reproductive systems in insects (Grasshopper);
3. Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera,Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance.
4. Insecticides and their formulations.Pesticide appliances and their maintenance.
5. Sampling techniques forestimation of insect population and damage.

Suggested Reading:

1. Nayar. K.K., Ananthakrishnan, T.N. and David, B.V. 1976. General and

AppliedEntomology. TataMc-GrawHillpublishingCompanyLtd, NewDelhi.
2. Richards, O.W. and Davies, R.G.1977. Imm's General Text Book of Entomology Vol.IandII. ChapmanandHallPublication, London.
3. Upadhyay, K.D and Dwivedi, K. 2014. A text book of Entomology. Amman PublishingHouseAman publishing house, Meerut.
4. Mathur Y. K. and Upadhyay K. D. A Textbook of Entomology. Aman Publ. house, Meerut.
5. Dhaliwal G. S. 2016. An Outline of Entomology, 3rd Ed., Kalyani Publ., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Understand external morphology of insects
CO 2	Compare the effects of biotic and abiotic factors on life cycle and population dynamics of insects
CO 3	Demonstrate the concept of pest and IPM
CO 4	Acquaint with modern methods of pest management and categories the main orders of insects
CO5	Evaluate strategies of IPM and controlling pathogens
CO6	Solve actual insect-pest management problems

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	3	-	1	2	-	2		1	-
CO2	2	3	3	3	-	1	1	-	2	2		1
CO3	3	3	3	3	2		1	-	3	3	2	2
CO4	2	2	3	2	1	2	3	-	1	2	2	2
CO5	-	-	-	-	-	-	-	2	-	2	-	-
CO6	-	-	-	-	-	1	-	2	-	-	3	1
Average	**2.25**	**2.5**	**2.75**	**2.75**	**1.5**	**1.25**	**1.75**	**2**	**2**	**2.25**	**2**	**1.5**

Course code : BSAC-208				
Course Name : Fundamentals of Agricultural Extension Education				
Semester /Year : II/I				
L	**T**	**P**	**Credit hrs**	
2	**-**	**1**	**3**	

Course Objectives: The objectives of this course are

1. To impart students on knowledge about extension education and extension efforts, rural development, leadership and transfer of technology in India
2. To impart students on knowledge about various ICT applications in TOT, communication strategies, innovation and adapter categories.

Course Contents

Theory

Unit1: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:extensi on efforts inpre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independenceera(Etawah Pilot Project,Nilokheri Experiment,etc.);various extension/agriculture development programmes launched by ICAR/Govt.of India(IADP,IAAP,HYVP,KVK,IVLP,ORP,ND,NATP,NAIP,etc.).New trendsin agriculture extension: privatization extension, cyber extension/e-extension, market-ledextension,farmer-ledextension, expert systems, etc.

Unit 2: 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;extensionad ministration:meanin gand concept, principles and functions.

Unit 3: 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; Principles and Functions of Communication, models and barriers to communication

Unit 4: Agriculture journalism; diffusion and adoption of innovation: conceptand meaning, process and stages of adoption, adopter categories.

Practical

1. To get acquainted with university extension system.
2. Group discussion- exercise;handling and use of audio visual equipment and digital camera and LCD projector; preparation and use of AV aids,
3. Preparation of extension literature – leaflet, booklet,folder, pamphlet newsstories and success stories; Presentation skills exercise; microteaching exercise
4. A visit to village to understand the problems being encountered by thevillagers/farmers;to study organization and functioning of DRDA and other development department satdistrict level
5. Visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application invillage development planning; exposure to mass media
6. Visit to community radio and television studio for understanding the process of programme production
7. Script writing, writing for print and electronic media, developing script for radio and television.

SuggestedReading:

1. Adivi,R. A.2001. Extension Education. Sree Laxmi Press, Bapatla, A.P.

2. Muthiah, M.P. and Arunachalam, R.2003. Agricultural Extension. Himalaya Publishing House, Mumbai.
3. Singh, A.K. 2000. Agricultural Extension. Impact and Assessment, Agri-bios (India), NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Develop the concept of Extension Education, scope and process; objectives and its principles.
CO2	Familiarized with Extension systems in India: pre-independence, post-independence era, various extension/ agriculture development programs launched by ICAR/ Govt. of India
CO3	Explain Rural Development and Community Development, various development programs launched by Government of India.
CO4	Acquaint with ICT Applications in TOT, media mix strategies, Agriculture journalism.
CO5	Assess various aids of communication
CO6	Prepare viable bankable projects

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	1	2	1		2			1	-
CO2	2	3	1	2	1	2	1	1	3	2	2	-
CO3	2	2	2	3	-	1		3	2	3	2	2
CO4	3	2	3	2	1	-	2		3	2	2	-
CO5	-	-	-	-	-	-	-	1	-	-	-	2
CO6	-	-	-	-	-	-	-	-	3	2	-	-
Average	**2**	**2**	**2**	**2**	**1.33**	**1.33**	**1.5**	**1.75**	**2.75**	**2.25**	**1.75**	**2**

Course code : BSAC-209				
Course Name : Communication Skills and Personality Development				
Semester /Year : II/I				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1. To develop inter-personal skills and be an effective communicator.
2. To develop professionals with idealistic practical and problem-solving skills and understand its influence on behaviour.

Course Contents

Theory

Unit 1: Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication

Unit 2: Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote andbibliographic procedures.

Unit 3: Reading and comprehension of general and technical articles, precise writing, summarizing abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion.

Unit 4: Organizing seminars and conferences.

Practical

1. Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, foot note and biblio graphic procedures.
2. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

SuggestedReading:

1. Richard, E.2009.Communication Skills; Step ladders to success for professionals. Intellect Books, Chicago, USA.

2. Peter, R.2009. English Phonetics and Phonology. A Practical Course: (4thedition, CUP, U.K.

3. Interactive Software on Effective Communication. Learning to Communicate. TOEFL Books published by Orient Longman and Cambridge University Press

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO1	Learn about structural and functional grammar; meaning and process of communication, verbal and nonverbal communication
CO2	Make use of knowledge about listening and note taking, writing skills, oral presentation skills
CO3	Describe field diary and lab record; indexing, footnote and biblio graphic procedures

CO4	Organizes reading and comprehension of general and technical articles, precise writing, summarizing and abstracting
CO5	Evaluate opportunities to enter into a process that leads to a passion for innovation and development
CO6	Become a entrepreneur, on the basis of self qualities and competencies

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	1	1	2	2		1	1
CO2	1	2	1	2	2	1	2	3	2	1	2	-
CO3	-	1	1	2	2	1	1	1	2	1		1
CO4	-	2	1			2	2	1	-	1	2	2
CO5	-	-	-	2	2	-	-	-	-	-	2	-
CO6	-	-	-	-	-	-	-	-	2	2	-	3
Average	**1.5**	**1.75**	**1.25**	**2**	**2**	**1.25**	**1.5**	**1.75**	**2**	**1.25**	**1.75**	**1.75**

Course code : BSAC-301				
Course Name : Crop Production Technology – I (Kharif Crops)				
Semester /Year : III/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of thi scourse are

1. The aim of this course is to know about the importance and cultivation aspects of Cereals, millets, pulses, oilseeds and fodder crops raised under Kharif season
2. To know about the soil and climatic requirements, varieties and yield of Kharif crops

Course Contents

Theory

Unit 1: Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops.

Unit 2: Cereals – rice, maize, sorghum, pearl millet and finger millet, pulses-pigeonpea, mung bean and urdbean

Unit 3: Oilseeds- groundnut, and soybean; fibre crops- cotton & Jute

Unit 4: Forage crops-sorghum,cowpea,cluster bean andnapier.

Practical

1. Rice nursery preparation, transplanting of Rice, sowing of soybean, pigeonpea andmungbean. maize, groundnut and cotton,
2. Effect of seed size on germination and seedlingvigour of kharif season crops,
3. Effect of sowing depth on germination of kharif crops,
4. Identification of weeds in kharif season crops, top dressing and foliar feeding of nutrients,
5. Study of yield contributing characters andyield calculation of kharif season crops,
6. Study of crop varieties and important agronomic experiments at experimental farm.
7. Study offorage experiments, morphological description of kharif season crops,
8. Visit to research centres of related crops.

Suggested Reading:

1. Ahlawat, I.P.S.,OmPrakash and Saini,G.S.1998.Scientific Crop Production in India. Rama publishing House, Meerut
2. Chidda, S.1997.Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd,New Delhi
3. Singh. S.S. 1997. Crop management under irrigated and rainfed conditions. Kalyani Publishers, New Delhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Impart knowledge on various cultivation practices of different Kharif crops
CO2	Explain the origin, geographical distribution, economic importance of Kharif crops
CO3	Interpret the soil and climatic requirements, varieties of Kharif crops
CO4	Correlate crop production and factors affecting it
CO5	Evaluate the skills on the cultural practices, yield and weeds of Kharif crops
CO6	Solve on farm problems and their management

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12

CO1	2	1	1	2	2	2	1	1	1		1	
CO2	1	1	2	1	1	1	1	1	1	1	-	1
CO3	1	1	1	1	1	2	1	1	-	1	1	1
CO4	2	2	2	2	2	2				2	1	1
CO5							2		1	3		
CO6								2			2	2
Average	**1.5**	**1.25**	**1.5**	**1.5**	**1.5**	**1.75**	**1.25**	**1.25**	**1**	**1.75**	**1.25**	**1.25**

Course code : BSAC-302				
Course Name : Fundamentals of Plant Breeding				
Semester /Year : III/ II				
L	**T**	**P**	**Credit hrs**	
2	**-**	**1**	**3**	

Course Objectives: The objectives of this course are

1. To provide the knowledge of basic and applied principles of plant breeding.
2. To know about mode of reproduction, breeding methodologies and applications employed for self, cross and vegetatively propagated crops.

Course Contents

Theory

Unit 1: 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. Domestication, Acclimatization and Introduction; Centres of origin/diversity

Unit 2: Components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods inself-pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection;

Unit 3: 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; Breeding methods in asexually propagated crops, clonal selection and hybridization; Maintenance of breeding records and data collection;

Unit 4: 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'sRights.

Practical

1. Plant Breeder's kit, Study of germplasm of various crops.
2. Study of floral structureofself-pollinatedandcrosspollinatedcrops.
3. Emasculation and hybridization techniquesin self & cross pollinated crops.
4. Consequences of inbreeding on genetic structure of resulting populations.
5. Study of malesterility 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.

Suggested Reading:

1. Singh, B.D. 2005. Plant breeding - Principles and methods. Kalyani Publishers, NewDelhi.
2. Phundhan, S. 2001. Essentials of plant breeding, Kalyani publishers, New Delhi.Chopra,V.L.,1994.Plantbreeding theory and practice. Oxfordand IBH Publishing Co.Pvt.Ltd.
3. Sharma, J. R. 1994. Principles and practice of plant breeding Tata McGraw-Hillpublishing Co., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Acquire knowledge of principles and objectives of plant breeding.
CO2	Demonstrate the ability to know methodologies and applications of the plant breeding employed for self, cross and vegetative propagated crops.
CO3	Apply knowledge for social, economic, environmental ethical, health and safety issues and sustainability with due ethical responsibility.
CO4	Summarizes academic environment and make them aware of excellence, develop the urge of creativity, inventiveness, leadership, and the life-long learning
CO5	Realize the necessity of protecting farmers and breeder's right
CO6	Designs used in plant breeding experiments, analysis of Randomized Block Design

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	1	1	1	1	1		1
CO2	2	2	2	2	2	2	1	1	1	1	1	1
CO3	1	1	1	1	1	1	2	1	1	1	1	2
CO4	1	1	1	1	1	1	1		1		2	-
CO5	-	-	-	-	-	-	-	1	2	-	-	-
CO6	-	-	-	-	-	-	-	-	-	1	1	2
Average	**1.5**	**1.5**	**1.5**	**1.5**	**1.25**	**1.25**	**1.25**	**1**	**1.5**	**1**	**1.25**	**1.5**

Course code : BSAC-303				
Course Name : Agricultural Finance and cooperation				
Semester /Year : III/II				
L	**T**	**P**	**Credit hrs**	
2	**-**	**1**	**3**	

Course Objectives:The objectives of this course are

1. To teach about agricultural finance, credits and banking
2. To teach about cooperation and credit need

Course Contents

Theory

Unit 1: Agricultural Finance- meaning, scope and significance, credit needs and its role inIndian agriculture. Agricultural credit: meaning, definition, need, classification. Creditanalysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social

control and nationalization of commercialbanks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance andUnit cost.

Unit 2: An introduction to higher financing institutions – RBI, NABARD, ADB, IMF,world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recentdevelopment in agricultural credit. Preparation and analysis of financial statements–Balance Sheet and Income Statement. Basic guidelines for preparation of project reports-Banknorms – SWOTanalysis.

Unit3: Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Unit4: Agricultural Cooperation in India-credit, marketing, consumerandmulti-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA,NCUI,NCDC, NAFED.

Practical

1. Determination of most profitable level of capitaluse.
2. Optimumal location 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 RRB susing published data.
5. Visit to acommercial bank, cooperative bank and cooperative society to acquire first hand knowledge of their management,schemes and procedures.
6. Estimation of credit requirement of farmbusiness-– A case study. Preparation and analysis of balance sheet – A case study. Preparation and analysis of income statement – A case study. Appraisal of a loan proposal – A case study.
7. Techno-economic parameters for preparation of projects.
8. Preparation of Bank able projects for various agricultural products and its value added products.
9. Seminar on selected topics

Suggested Reading:

1. Muniraj, R. 1987. Farm Finance for Development, Oxford & IBH, New Delhi.
2. SubbaReddy, S.and P.Raghu Ram2000. Agricultural Financeand Management, Oxford &IBH, NewDelhi.W.F. Lee.
3. M.D. Boehlje, A.G. Nelson and W.G. Murray. 1998. AgriculturalFinance, Kalyani Publishers, NewDelhi.
4. Patnaik, V.E. and Roy, A.K.1988.Cooperation and Cooperative Management, KalyaniPublishers, Ludhiana.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify the different credit needs and its role in Indian agriculture, credit analysis,

	sources of agricultural finance.
CO2	Understand how the commercial banks are working, functioning the RRB's, KCC and lead bank scheme, preparing the income statements, balance sheets and project proposal
CO3	Build knowledge about higher financing institutions, world bank, Insurance and Credit Guarantee Corporation of India and recent development in agricultural credit.
CO4	Familiarize the different cooperatives development in India and its role in rural development
CO5	Evaluate significance of cooperatives in Indian agriculture.
CO6	Preparation and analysis of financial statements–Balance Sheet and Income Statement.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	-	1	-	1	1	1
CO2	1	1	1	1	1	1	-	1	1	1	1	1
CO3	2	1	1	1	1	1	-	1	1	1	1	1
CO4	2	2	1	1	1	1	-	1	1	-	-	-
CO5	-	-	-	-	-	-	-	-	-	1	1	-
CO6	-	-	-	-	-	-	-	-	-	-	-	1
Average	**1.5**	**1.25**	**1**	**1**	**1**	**1**	**-**	**1**	**1**	**1**	**1**	**1**

Course code : BSAC-304				
Course Name : Agri- Informatics				
Semester /Year : III/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To introduce the students to uses of information technology in agriculture sciences.
2. To provide knowledge about Database, concepts and types, uses of DBMS in Agriculture, preparation of contingent crop-planning using IT tools

Course Contents

Theory

Unit1: Introduction to Computers, Operating Systems, definition and types, Applications

of MS-Office for document creation & Editing, Data presentation, interpretation and graph creation, statistic alanalysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture, World Wide Web(WWW):Concepts and components. Introduction to computer programming languages, concepts and standard in put/out put operations.

Unit2: e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Modelsfor understanding plant processes. IT application for computation of water and nutrientrequirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smart phone Apps in Agriculture for farm advises, market price, post harvest management etc;

Unit3: Geospatial technology for generating valuable agri-information.Decision support systems,concepts,components and applications in Agriculture,

Unit4: Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions.Preparation of contingent crop-planning using IT tools.

Practical

1. Study of Computer Components, accessories, practice of important DOS Commands.
2. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files& Folders, File Management.
3. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document.
4. MS-EXCEL-Creating a spread sheet,use of statistical tools, writing expressions, creating graphs, analysis of scientific data.
5. MS-ACCESS: Creating Data base, preparing queries and reports, demonstration of Agri-information system.
6. Introduction to World Wide Web (WWW).Introduction of programming languages.Handson Crop Simulation Models(CSM) such as DSSAT/Crop-Info/CropSyst/ Wofost;
7. Computation of water and nutrient requirements ofcrop using CSM and IT tools.
8. Introduction of Geospatial Technology for generating valuable information for Agriculture.
9. Hands on Decision Support System. Preparation of conting entcrop planning.

Suggested Reading:

1. Balagurusamy E. 2009. Fundamentals of Computers, McGraw Hill Education.

2. JohnPaulMueller.2012.Windows 8 For Dummies Quick Reference, Wiley.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Get to know about basics of agricultural informatics software and applications

CO2	Demonstrate MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions
CO3	Describe knowledge about Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW)
CO4	Explain about computer models for understanding plant processes, Preparation of contingent crop-planning using IT tools
CO5	Assess IT application for computation of water and nutrient requirement of crops
CO6	Preparation of contingent crop planning

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	2	1	1	1	1	-	-	-	1
CO2	1	1	1	2	1	1	1	1	1	1	-	1
CO3	1	1	1	2	1	1	1	1	1	1	1	1
CO4	1	1	1	2	1	1	1	1	1	1	1	
CO5	-	-	-	-	-	-	-	-	1	-	1	1
CO6	-	-	-	-	-	-	-	-	-	1	1	1
Average	1	1	1	2	1	1	1	1	1	1	1	1

Course code : BSAC-305				
Course Name : Farm Machinery and Power				
Semester /Year : III/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To understand about sources of farm power and its uses.
2. To identify suitable implements for tillage, sowing, plant protection operations for different crop and soil conditions.

Course Contents

Theory

Unit 1: Status of Farm Power in India, Sources of Farm Power, I.C. engines,

working principles of I C engines, comparison of two stroke and four stroke cycle engines

Unit 2: Study of different components of I.C. engine, I.C. engine terminology and solved problems, Familiarization with different systems of I.C.engines: Aircleaning, cooling, lubrication, fuel supply and hydraulic control system of a tractor,

Unit 3: Familiarization with Powertrans mission system : clutch, gear box, differential and final drive of a tractor , Tractor types,Costanalysis of tractor power and attached implement,Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement forintercultural operations,

Unit 4: Familiarization with sowing and planting equipment, calibrationof a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvestingand threshing equipment.

Practical

1. Study of different components of I.C. engine.
2. To study air cleaning and cooling system ofengine,
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: mouldplough, disc plough and disc harrow.
8. Familiarization with seed-cum-fertilizer drills theirseed metering mechanism and calibration, planters and transplanter
9. Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivationequipment,
10. Familiarization with harvestingand threshing machinery.

Suggested Reading:

1. Jagadishwar, S.1992.Elements of agricultural engineering.Agro book agency, Patna-20.
2. Nakra, C.P .1970. Farm Machineryand equipment,:DhanpatRai &Son
3. Bindra, O.S.and Harcharan Singh, 1971.Pesticide application equipment.Oxfordand IBH pubCo. NewDelhi.
4. Srivastava, A.C., 1990.Elements of farm machinery. Oxford

IBHpubCo. NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Learn about Various sources of farm power and their uses
CO2	Understand working of IC Engines and their uses in modern equipment.
CO3	Familiarize with Power transmission system, about various parts of tractors and their mechanism
CO4	Explain about primary and secondary tillage implement and Implement used in hill agriculture, agriculture farm for various purposes.
CO5	Inspect clutch, transmission, differential and final drive of a tractor,
CO6	Use different types of sprayer

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	-	-	-	-	-
CO2	1	1	1	1	1	2	1	1	1	1	-	-
CO3	1	1	1	1	-	2	1	1	1	1	1	1
CO4	1	1	1	1	1	-	1	1	1	1	1	1
CO5	-	-	-	-	1	2	-	-	-	-	1	1
CO6	-	-	-	-	-	-	-	1	1	1	1	1
Average	**1**	**1**	**1**	**1**	**1**	**1.75**	**1**	**1**	**1**	**1**	**1**	**1**

Course code : BSAC-306				
Course Name : Production Technology for Vegetables and Spices				
Semester /Year : III/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To learn about the nursery practices, planting , maturity indices, harvesting techniques, grading, packaging, storage and seed production techniques of vegetable crops.
2. To learn about the production technology of spice crops, challenges and opport Unities facing the vegetable industry

Course Contents

Theory

Unit 1: Importance of vegetables & spices in human nutrition and national economy, kitchen gardening, brief about origin, area, climate, soil, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance,fertilizer requirements, irrigation, weed management, harvesting and yield.

Unit 2: Physiologicaldis orders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum, Cucumber, Melons, Gourds, Pumpkin, French bean, Peas

Unit 3: Cole crops such asCabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic

Unit4: Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as Potato;Leafy vegetables such asAmaranth,Palak. Perennial vegetables).

Practical

1. Identification of vegetables & spice crops and their seeds.
2. Nursery rising. Direct seedsowing and transplanting.
3. Study of morphological characters of different vegetables &spices.
4. Fertilizersapplications.
5. Harvesting&preparationformarket.
6. Economics of vegetables and spices cultivation.

Suggested Readings:

1. Gopalakrishnan, T.R. 2007. Vegetable Crops. Horticultural Science Series (Series Editor K.V.Peter). New India Publishing Agency.
2. Thamburaj, S. and Narendra Singh. 2001. Vegetables, Tuber crops and Spices,Director ate of information and publication so fagriculture, ICAR,NewDelhi.
3. Chadha, K.L. 1994. Advances in Horticulture, Vol.10. Malhotra Publishing house, New Delhi.
4. Chadha, K.L. 1994. Advances in Horticulture, Vol.11. Malhotra Publishing house, New Delhi.
5. Kumar, N.Introduction to Spices, Plantation, Medicinaland Aromatic crops.1995. Oxfordand IBH Publications, NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define practical knowledge on specialized production techniques of vegetables and spices.
CO2	Understand will Importance of vegetables & spices in human nutrition improved and national economy

CO3	Assess cultural practices, quality requirement, and techniques used in the production of vegetable crops and spices
CO4	Modify managing skill for the challenges and opportunities facing the vegetable industry
CO5	Recommend propagation techniques to fruit crops
CO6	Design nursery layout,orchard establishment

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-
Average	**1.25**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Course code : BSAC 307

Course Name : Environmental Studies and Disaster Management

Semester /Year : III/II

	L	T	P	Credit hrs
	2	-	1	3

Course Objectives: The objectives of this course are

1. To teach the basics of environmental studies, environmental pollution and its effects.
2. To teach about disasters and management.

Course Contents

Theory

Unit1: Multi disciplinary 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, casestudies.Timberextraction, mining, damsand 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, casestudies.e) Energy resources:Growing energy needs,renewable and non-renewable energy sources, use of alternate energy sources.Casestudies. f) Land resources: Land as a resource, land degradation, man induced landslides, soiler osion and desertification.Role of nindividual in conservation of natural resources.Equitable use of resources for sustainable life styles.

Unit2: Ecosystems:Concept of anecosystem, Structure and function of aneco system, Producers, consumers and decomposers, Energy flow in the eco system. 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: consumptiveuse, 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 wild life, man-wild life conflicts.End angered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situconservation ofbiodiversity.

Unit3: Environmental Pollution: definition, cause, effects and control measures of: a.Airpollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f.Thermal pollution g. nuclear hazards. Solid Waste Management: causes, effects andcontrol measures of urban and industrial wastes. Role of an individual in prevention of pollution. Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acidrain, ozonelayer depletion, nuclear accidents and holocaustdies.Wasteland reclamation. Consumerism and waste products. Environment Protection Act.Air (Preventionand Control of Pollution) Act.Wate

(Prevention and control of Pollution) Act.Wildlife Protection Act. Forest Conservation Act. Issues involvedinen forcement of environmental legislation. Public awareness. Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS.Womenand Child Welfare.RoleofInformationTechnologyin Environment and human health.

Unit 4:*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, Climaticchange:global warming,Sealevel rise,ozonedepletion. Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, buildingfire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrialwastewater pollution,road accidents,rail accidents,air accidents,seaaccidents. Disaster Management- Effect to migrate natural disaster at national and global levels.Internationals trategy for disaster reduction.Concep tofdisaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armedforcesin disaster response;Disaster response; Policeand other organizations

Practical

1. Pollution case studies.
2. Case Studies- Field work: Visit to a local area to documentenvironmental assets river/ forest/ grassland/ hill/ mountain,
3. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural,
4. Study of common plants, insects, birds and study ofsimpleecosystems-pond, river, hill slopes, etc.

Suggested Reading

1. Balakrishnamoorty 2005. Environmental Management .Prentice- Hall of India PrivateLtd.New Delhi.

2. Sharma, P.D. 2009, Ecology and Environment, Rastogi Publications, Meerat, India William P. Cunninghamand Mary Ann Cunningham, 2007.Principles of Environmental Sciences,Tata Mc Grawhill Publishing company, New Delhi.

3. SharmaP.D.2006.Environmental Microbiology.Narosa Publishers, New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorizes about environmental studies and ecosystems
CO2	Illustrate biodiversity and its conservation
CO3	Acquaint with basic structure of atmosphere and their functions, Current problems, related issues context in solving environmental issues and their management

CO4	Appraise with meaning and nature of natural disasters, their types and effects and management.
CO5	Evaluate relationship between environment and farming system
CO6	Work out case studies in polluted areas

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1	1	1	1
CO3	1	1	1	1	1	1	1	1	1	1	1	1
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-
Average	**1.25**	**1**	**1**	**1.25**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Course code : BSAC-308				
Course Name : Statistical Methods				
Semester /Year : III/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1. To enable students to understand basic concepts and terms and uses of Statistics in agricultural data analysis.
2. To develop skills among the students to analyze data using appropriate Statistical tools.

Course Contents

1. **Theory**

Unit 1: Introductionto Statistics and its Applications in Agriculture, Graphical

Representation of Data, Measures of Central Tendency&Dispersion, DefinitionofProbability, Addition and Multiplication Theorem (withoutproof).Simple Problems Based on Probability.

Unit 2: Binomial &Poisson Distributions, Definition of Correlation, Scatter Diagram.Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Unit 3: Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 □2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.

Unit 4: Introduction to SamplingMethods, Sampling versus Complete Enumeration, Simple Random Sampling with andwithout replacement, Use of Random Number Tables for selection of Simple RandomSample.

Practical

1. Graphical Representation of Data. Measures of Central Tendency (Ungroupeddata) with Calculation of Quartiles, Deciles & Percentiles.
2. Measures of Central Tendency (Groupeddata) with Calculation of Quartiles, Deciles & Percentiles.
3. Measures of Dispersion (Ungrouped Data).Measures of Dispersion (GroupedData).
4. Moments, Measures of Skewness & Kurtosis (Ungrouped Data).
5. Moments, Measures of Skewness & Kurtosis (Grouped Data).
6. Correlation & Regression Analysis.
7. Application of OneSample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 □2 contingency table.
8. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification.
9. Selection ofr and om sample using Simple Random Sampling.

Suggested reading:

1. Nageswara Rao, G. 2007. Statistics for Agricultural Science.BS Publications, Hyderabad.
2. Gupta, S.C. and V.K. Kapoor. 2006. Fundamentals of Applied Statistics,Sultan Chand and Sons, New Delhi.
3. Chandel, S.R.S., 1999, A hand book of Agricultural Statistics, Achal PrakashanMandhir, Kanpur.
4. Gomez,K.A. and Gomez, A.A.,1984.Statistical Procedures for Agricultural Research, John Wileyand Sons, New York.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Acquaintance with some basic concepts in statistics and its use in agriculture
CO2	Familiar with some elementary statistical methods of analysis of data and to interpret them.
CO3	Represent the graphical data of their analysis
CO4	Analysis of data pertaining to attributes and to interpret the results.
CO5	Test hypothesis in agricultural experiments
CO6	Prepare various statistical Design in agricultural experiments

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	2	1	1	1	1	1	1	1	1
CO2	1	1	1	2	1	1	1	1	1	1	1	1
CO3	1	1	1	2	1	1	1	1	1	1	1	1
CO4	1	1	1	2	1	1	1	1	1	1	1	1
CO5	-	-	-	-	--	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-
Average	**1.25**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Course code	**: BSAC-309**				
Course Name	**: Livestock and Poultry Management**				
Semester /Year	**: III/II**				
		L	**T**	**P**	**Credit hrs**
		3	**-**	**1**	**4**

Course Objectives:**The objectives of this course are**

1. The General objective of this course is to establish basic knowledge of how to manage and operate livestock and poultry farms.
2. This course is designed to impart basic technical knowledge and skills required to successfully run livestock farm enterprise by developing competencies concerning the selection and breeding of livestock, management of animals of different physiological status, feeding, housing and health care.

Course Contents

Theory

Unit 1: Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of live stock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Unit 2: Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry.Improvementoffarm animals and poultry.

Unit 3: Digestion in livestock and poultry. Classification of feed stuffs. Proximate principles offeed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry.Feedsupplements and feed additives.Feedingof livestock andpoultry.

Unit 4: Introduction of live stock and poultry diseases.Prevention(including vaccination schedule)and control ofimportant diseases of live stockand poultry.

Practical

1. External body parts of cattle, buffalo,sheep,goat,swineandpoultry.
2. Handlingand restraining of livestock.
3. Identification methods of farm animals and poultry.
4. Visit toIDF andIPF to study breeds of livestock and poultry and daily routine farm operationsand 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. Computation of rations forlivestock.
9. Formulation of concentrate mixtures.
10. Clean milk production, milking methods.
11. Hatcheryoperations, incubation and hatching equipment.
12. Managementofchicks, growers and layers.
13. Debeaking, dusting and vaccination.
14. Economics of cattle, buffalo, sheep, goat, swineand poultryproduction.

Suggested Reading

1. Banerjee, G.C.2010.TheTextBookofAnimalHusbandry.OxfordBookCompany,Calcutta.
2. ICAR, 2013. A Hand Book of Animal HusbandryJull,M.A.2003.Successful PoultryManagement
3. Kadirvel, R., and Balakrishnan, V., 1998. Hand Book of Poultry Nutrition. MadrasVeterinaryCollege, TANUVAS. Chennai.
4. Prabakaran,R.,1998.CommercialChickenProduction.PublisherP.Saranya,5/2,RamalingamStreet, Seven Wells, Chennai
5. Sastry, N.S.R., Thomas, C.K. 2005. Livestock Production Management. KalyaniPublishers, Ludhiana

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Gain knowledge about the types, classification, production of live stocks and poultry and the importance of animals to the health and well-being of society.
CO2	Acquire knowledge on management of live stocks and poultry.
CO3	Develop and evaluate animal production and applying scientific and quantitative reasoning to solve real-world challenges.
CO4	Explain about types, prevention (including vaccination schedule) and control of important diseases of livestock and poultry
CO5	Judging of cattle, buffalo and poultry
CO6	Formulate of concentrate mixtures

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	2	1	1	1	1	1	1	-	-
CO2	1	1	2	1	1	1	1	1	1	1	1	-
CO3	1	1	2	1	1	1	1	1	1		1	1
CO4	1	1	2	1	1	1	1	1	-	1	-	1
CO5	-	-	-	-	-	-	-	-	1	-	1	1
CO6	-	-	-	-	-	-	-	-	-	1	-	1
Average	**1**	**1**	**2**	**1.25**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

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Course code	**: BSAC-401**				
Course Name	**: Crop Production Technology-II *(Rabi Crops)***				
Semester /Year	**: IV/II**				
		L	**T**	**P**	**Credit hrs**
		1		**1**	**2**

Course Objectives:The objectives of this course are

1. To familiarize the students about the Rabi crops and their management.
2. to know about the importance and cultivation aspects of Cereals, millets, pulses, oilseeds and fodder crops raised under rabi season

Course Contents

Theory

Unit 1: Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops

Unit 2: Cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard and sun flower

Unit 3: Sugar crops-sugarcane;

Unit 4: Medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, Lucerne and oat.

Practical

1. Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops
2. Study of morphological characteristics of *rabi* crops
3. Study of yield contributing charactersof *Rabi* season crops, yield and juice quality analysis of sugarcane
4. Study of important agronomic experiments of *Rabi* crop sat experimental farms.
5. Studyof*rabi*forageexperiments
6. Oilextractionofmedicinalcrops
7. Visittoresearchstationsofrelatedcrops.

Suggested Reading:

1. Ahlawat, I.P.S., Om Prakash and G.S.Saini.1998. Scientific Crop Production in India. Rama publishing House, Meerut
2. Chidda Singh.1997.Modern techniques ofraising field crops.Oxford and IBH Publishing Co. Pvt. Ltd,New Delhi
3. Massod Ali, S.K.Chaturvedi and S.N.Gurha.2001. Pulses for sustainable agriculture and nutritional security.Indian Institute of Pulses Research, Kanpur, India.
4. Hand Book of Agriculture. 2006. Indian Council of Agrl. Research, New Delhi.Crop Production Guide.2005.Directorate of Agriculture, Chennaiand TamilNadu Agricultural University, Coimbatore.
5. Rajendra Prasad.2004 Text Book on Field Crop Production, Indian Council of Agrl. Research, New Delhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define the Origin, geographical distribution, economic importance, cultural practices and yield of Rabi crops.
CO2	To know the cultivation practices of cereals, pulses, oil seeds of Rabi crops
CO3	Apply the knowledge about the economic importance of forage, Medicinal and Aromatic crops in present sphere.

CO4	Familiarize with basic characteristics, economic importance and yield of Rabi crops
CO5	Judge different growth stages of crops and their physiological maturity
CO6	Prepare seed bed and layout the experiments

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	1	1	1	-	-	-	-	-	1
CO2	2	1	2	1	2	2	-	-	-	-	-	1
CO3	2	1	2	1	2	2	2	1	1	2	-	
CO4	2	2	1	2	1		2	1	1	2	1	
CO5	-	-	-	-	-	2	3	1	1	1	-	1
CO6	-	-	-	-	-	-	2	1	1	2	-	1
Average	**2**	**1.25**	**1.75**	**1.25**	**1.5**	**1.75**	**2.25**	**1**	**1**	**1.75**	**1**	**1**

Course code : BSAC-402				
Course Name : Production Technology for Ornamental Crops, MAP and Landscaping				
Semester /Year : II/IV				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To impart knowledge on the advances made in the production technology of ornamental crops in India.
2. To impart comprehensive knowledge about the production technology of Medicinal and Aromatic crops.
3. To learn the basic aspects of successful Landscape Design.

Course Contents

Theory

Unit 1: Importance and scope of or namental crops, medicinal and aromatic plants and land

scaping. Principles of land scaping. Land scape uses of trees, shrubs and climbers.

Unit 2: Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under openconditions.

Unit 3: Package of practices for loose flowers like marigold and jasmine under open conditions.Production technology of important medicinal plants like ashwagandha, asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint,lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

Unit 4: Processing and value addition in ornamental crops and MAPs produce.

Practical

1. Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants.
2. Nursery bed preparation and seed sowing.
3. Training and pruning of Ornamental plants.
4. Planning and layout of garden.
5. Bed reparation and planting of MAP.
6. Protected structures – care and maintenance.
7. Intercultural operations in flowers and MAP.
8. Harvesting and post harvest handling of cut and loose flowers.
9. Processing of MAP.
10. Visit to commercial flower/MAP Unit.

Suggested Reading:

1. Bhattacharjee, S.K and De L.C. 2005. Medicinal Herbs & Flowers, Aarishkar, Jaipur.Bhattacharjee, S.K.2004. Hand book of medicinal plants, Pointer publications, Jaipur.
2. Ravindra sharma. 2004. Agro techniques of Medicinal plants. Daya publishing, New Delhi.
3. Trivedi, P.C. 2004. Medicinal Plants: Utilization and Conservation, Aavishkar Publisher, Distributors, Jaipur.
4. Farooqi, M., M. M. Khan and M. Vasundhara. 2004. Production technology of medicinal and aromatic crops.Natural Remedies Pvt. Ltd., Bangalore–561229.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Understand meaning, scope and importance of ornamental, MAPs plants and landscaping.
CO2	Articulate different methods of packaging, value addition and processing of ornamental crops and MAPs produce.
CO3	Design landscaping in executing planned methodology for gardening
CO4	Instruct the students regarding production technology of important flowering and medicinal plants.
CO5	Processing and value additionin ornamental crops and MAP
CO6	Planning and layoutof garden.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	1	2	-	-	-	-
CO2	2	2	2	2	2	2	-	-	-	-	-	-
CO3	2	2	2	2	2	2	2	3	2	1	-	1
CO4	3	2	3	3	3	2	2	2	2	3	2	-
CO5	-	-	-	-	2	-	2	-	1	2	3	1
CO6	-	-	-	-	-	-	-	2	1	3	-	2
Average	**2.5**	**2**	**2.25**	**2.25**	**2.25**	**2**	**1.75**	**2.33**	**1.5**	**2.25**	**2.5**	**1.33**

Course code : BSAC-403				
Course Name : Renewable Energy and Green Technology				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To acquaint the student about renewable Energy and Green Technology
2. To apply renewable energy in the agricultural sector

Course Contents

Theory

Unit 1: Classification of energy sources, contribution of these of sourcesin

agricultural

sector,

Familiarization

With

Biomassutilization

Or

Bio

Fuel production and their application, Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource,

Unit 2: Introduction ofsolar energy, collection and their application, Familiarization with solar energy gadgets: solar cooker, solar water heater

Unit 3: Applicationof solar energy: solar drying, solar pond, solar distillation, solar photovoltaic system and their application,

Unit 4: Introduction of wind energy and their application.

Practical

1. Familiarization with renewable energy gadgets.
2. To study biogas plants
3. To studygasifier
4. To study the production process of biodiesel
5. To study briquetting machine
6. Tostudy the production process of bio-fuels.
7. Familiarization with different solar energy gadgets.
8. To study solar photovoltaic system: solar light, solar pumping, and solar fencing.
9. Tostudy solar cooker
10. To study solar drying system.
11. To study solar distillation and solarpond.

Suggested Reading:

1. Renewable Energy, Godfrey Boyle (Editor) ISBN: 0199261784 / ISBN-13:9780199261789.
2. RaiG.D. 1984.Solar Energy Utilization.Khanna Publishers, New Delhi
3. Sukhatme SP1985.Solar Energy.Tata Mc Graw Hill publishing Co. Ltd., NewDelhi.
4. Rao, S. and B.B.Parulekar, 2002. Energy technology- Non conventional, renewable and conventional, Khanna Publishers, New Delhi,I ndia.

5. JohnTwidell and TonyWeir-(Paperback-24Nov2005).Renewable Energy Resources

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Remember and understand different energy sources and their contribution in the agriculture sector
CO2	Understand the bio fuel production and their applications in today's world.
CO3	Implementing the application of solar energy products as bioenergy resources.
CO4	Familiarize with different solar energy gadgets and their utilization in different sectors
CO5	Evaluate application of solar energy
CO6	Device solar energy gadgets.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	2	1	1	-	-	-	-	-
CO2	2	2	2	2		2	2	-	2	2	-	-
CO3	2	2	1	2	3	2		2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	3
CO5	-	-	-	-	3	-	-	-	2	-	2	2
CO6	-	-	-	-	-	-	2	-	-	3	2	2
Average	**2**	**2**	**1.6**	**2**	**2.5**	**1.75**	**1.75**	**2**	**2**	**2.25**	**2**	**2.25**

Course code	**:**	**BSAC-404**			
Course Name	**:**	**Problematic Soils and their Management**			
Semester /Year	**:**	**IV/II**			
		L	**T**	**P**	**Credit hrs**
		2	**-**	**0**	**2**

Course Objectives:The objectives of this course are

1. To teach the matters pertaining to the problematic soils, their reclamation and crop suitability to those soils
2. To understand different factors responsible for saline, sodic and acidic soils and their properties.

Course Contents

Theory

Unit 1: Soil quality and health, Distribution of Waste land and problem soils in India.Their categorization based on properties.

Unit 2: Reclamation and management of Saline andsodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils,Polluted soils.

Unit 3: Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosisand management of problem .

Unit 4: Multipurpose tree species, bio remediation through MPTs of soils, land capabilityandclassification, land suitability classification.Problematic soils under different Agro-ecosystems

Suggested Reading:

1. Bear FE. 1964. Chemistry of the Soil. Oxford and IBH.Jurinak JJ. 1978. Salt-affected Soils. Department of Soil Science and Biometeorology. Utah State Univ. 949OxfordandIBH.
2. Baver LD, Gardner WH and Gardner WR. 1972. Soil Physics. John Wiley and Sons.Hanksand Ascheroft.1980. Applied Soil Physics.Springer Verlag.

Course outcomes (COs):

Upon successful completion of thecourse a student will be able to

CO1	Recall fundamental knowledge to identify problematic soils and associated problems
CO2	Demonstrate waste land and problematic soils in India and management of the soils.
CO3	Apply the fundamentals of soil science disciplines for the reclamation and management of degraded soils
CO4	Evaluate different factors responsible for saline, sodic and acidic soils and their properties.
CO4	Judge quality of irrigation water
CO5	Remote sensing and GIS in diagnosis and management of problem soils.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	3	2	-	-	-	-	-
CO2	2	3	3	2	2	2		1	2	2	-	2

CO3	2	3	2	2	2	2	2	2	1	3	-	1
CO4	2	3	2	2	2	2	2	2	2	2	1	-
CO5	-	-	-	-	-	-	-	2	2	2	-	-
CO6	-	-	-	-	-	-	3	-	-	-	1	2
Average	**2**	**2.75**	**2.25**	**2**	**2**	**2.25**	**2.25**	**1.75**	**1.75**	**2.25**	**1**	**1.6**

Course code	**:**	**BSAC-405**			
Course Name	**:**	**Production Technology for Fruit and Plantation Crops**			
Semester /Year	**:**	**IV/II**			
	L	**T**	**P**	**Credit hrs**	
	1	**-**	**1**	**2**	

Course Objectives: The objectives of this course are

1.To learn about the production technology of Tropical, Subtropical, Humid zone, Arid and Temperate fruit crops.

2. To learn about the production technology of Plantation crops

Course Contents

Theory

Unit 1: Importance and scope of fruit and plantation crop industry in India;

Unit 2: Importance of root stocks;

Unit 3: Production technologiesfor the cultivation of major fruits-mango, banana,citrus, grape, guava, litchi, papaya, sapota, apple, pear, peach, walnut, almond and;

Unit 4: Minor fruits- date, ber, pineapple, pomegranate, jackfruit, strawberry, plantation crops-coconut, arecanut, cashew, tea, coffee&rubber.

Practical

1. Seed propagation.
2. Scarification and stratification of seeds.
3. Propagation methods for fruitand plantation crops.
4. Description and identificationof fruit.
5. Preparation of plant bioregulators

Suggested Reading:

1. Bose, T.K., S.K. Mitra and D. Sanyal. 2001. Fruits: Tropical and Subtropical (2Volumes) Naya Udyog, Calcutta.
2. Chadha, K.L.2001.Hand book of Horticulture, ICAR.Delhi.
3. Mitra, S.K., T.K. Bose and D.S. Rathore. 1991. Temperate fruits. Horticulture andAllied Publishers, Calcutta.
4. Pal, J.S.1997.Fruit Growing.Kalyani Publishers, NewDelhi.
5. Kumar, N.J.B.M.Md.Abdul Khaddar, Ranga Swamy, P. and Irrulappan, I.1997.Introduction to spices, Plantation crops and Aromatic plants. Oxford & IBH, New Delhi.
6. Thampan, P.K. 1981.Hand Book of Coconut Palm. Oxford IBH, New Delhi.Nair1979.Cashew. CPCRI, Kerala
7. Ranganadhan, V. 1979. Hand Book of Tea Cultivation. UPASI Tea Research Station, Cinchona.
8. Thompson, P.K.1980.Coconut.Oxford&IBHPublishingCo. Ltd., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Recall importance of different fruit crops and plantation crops.

CO2	Assess the utilization of different production technologies for the cultivation of major fruits
CO3	Apply production technologies of minor fruits -date, ber, pine apple, pomegranate, jack fruit and strawberry
CO4	Describe and interpret wide range of plantation crops
CO5	Judge physiological maturity and ripening period of fruit crops
CO6	Design and layout fruit crop nursery beds

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	1			2	-	2	-	-
CO2	2	2	3	3	3	2	2	2	2	3	-	-
CO3	3	2	3	2	2	2	2	1	-	-	2	-
CO4	3	3	2	2	2	2	-	-	1	2	1	1
CO5	-	-	-	-	-	2	2	-	-	-	1	1
CO6	-	-	-	-	-	-	-	-	-	3	--	-
Average	**2.5**	**2.25**	**2.5**	**2.33**	**2**	**2**	**2**	**1.6**	**1.5**	**2.5**	**2**	**1**

Course code	**:**	**BSAC-406**			
Course Name	**:**	**Principles of Seed Technology**			
Semester /Year	**:**	**IV/II**			
		L	**T**	**P**	**Credit hrs**
		3	**-**	**1**	**4**

Course Objectives: The objectives of this course are

1.To understand the importance of seed quality and principles involved in seed production

2. To know about procedure and importance of seed certification and acquire the knowledge of seed processing and storage principles and technique

Course Contents

Theory

Unit 1: Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

Unit 2: Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow out Testand Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organicseed production.

Unit 3: Seed drying,processing and their steps,seed testing for quality assessment, seed treatment, its importance, method of application and seed packing.Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pestand disease control during storage.

Unit 4: Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and ECD in seed marketing.Private and public sectors and their production and marketing strategies.

Practical

1. Seed production in major cereals: Wheat, Rice, Maize, Sorghum, Bajra and Ragi.
2. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Field bean, pea.
3. Seed roduction in major oil seeds: Soybean, Sunflower, Rapeseed, Groundnutand Mustard.
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination, viability, etc.
6. Seed and seedling vigour test.
7. Genetic puritytest: Grow out test and electrophoresis.
8. Seed certification: Procedure, Field inspection, Preparation of field inspection report.
9. Visit to seed production farms, seed testing laboratories and seed processing plant.

Suggested Reading:

1. Agrawal, R.L. 2003. Seed Technology. Oxford & IBH Publishing Co. Pvt. Ltd. NewDelhi.
2. Copeland, L. O.andMcDonald, M.2001.PrinciplesofSeedScienceand Technology. 4thed.2001, XIV.
3. Joshi, A.K. and B.D. Singh. 2004. Seed Science and Technology. Kalyani Publishers, Ludhiana.
4. Khare, D. and Bhale, M. S. 2005. Seed Technology. Scientific Publishers (India), Jodhpur.
5. Singhal, N.C. 2003. Hybrid seed production in field crops. Kalyani Publishers, Ludhiana.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Knowledge about meaning and significance of seeds and their quality
CO2	Categorize seed production principles and techniques
CO3	Aware about field and seed standards for quality seed production and get the skills of seed quality testing
CO4	Assume about procedure and importance of seed certification and acquire the knowledge of seed processing and storage principles and technique
CO5	Evaluate seed quality
CO6	Design agricultural experiments for seed production

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	3	1	-	-	-	-	-	-
CO2	3	2	2	3	3	1	1	2	1	-	2	1
CO3	3	3	3	3	2	1	1	1	2	2	2	1
CO4	3	2	2	3	3	2	1	1	-	-	1	1
CO5	-	-	-	-	-	-	2	1	-	-	-	-
CO6	-	-	-	-	-	-	-	-	2	1	1	1
Average	3	2.25	2	2.5	2.75	1.25	1.25	1.25	1.66	1.5	1.5	1

Course code : BSAC-407				
Course Name : Farming System & Sustainable Agriculture				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**0**	**1**

Course Objectives:The objectives of this course are

1. To know agricultural methods and traditions around the world.
2. To Aware about the cross-cultural contacts and to demonstrate how agricultural experts are working in maintaining enough food supply for the world's population

Course Contents

Theory

Unit 1: Farming System-scope, importance, and concept, Types and systems of farmingsystem and factors affecting types of farming, Farming system components and theirmaintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance,Tools for determining production and efficiencies in cropping and farming system;

Unit2: Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptationand mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability,

Unit3: Integrated farmings ystem-historical back ground, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques,

Unit4: Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IF Smodelin different agro-climaticzones of near by states University/ institutes and farmers field.

Suggested Reading:

1. Jayanthi, C.Devasenapathy, PandC.Vennila.2007.Farming Systems.Principles and practices.Satish Serial Publishing House.Delhi.
2. Devasenapathy, P., T. Ramesh and B. Gangwar 2007.Efficiency indices for agriculture management research. New India Publishing agency, Delhi.
3. Jayanthi, C., N. Sakthivel, N. Sankaran and T.M. Thiyagarajan. 2003. Integrated Farmingsystem –APathto Sustainable Agriculture.TNAU Publication.
4. S.C.Panda.2003.Croppingand Farming Systems.Agrobios Publishers.Jodhpur.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define the scope, concept and importance of farming system
CO2	Aware about the cross-cultural contacts and exchanges that brought the world's people together and aided agricultural progress is anticipated
CO3	Analyze the practices that reflect civilizations', agricultural traditions and utilizing resources.
CO4	Compare and categorize types of cropping systems
CO5	Recommend system model according to agroclimatic condition
CO6	Demonstrate how agricultural experts are working in maintaining enough food supply for the world's population

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	1	2	2	-		-	-
CO2	2	2	1	2	1	1	1	-	2	-	-	1
CO3	1	1	-	-	-	-	-	1	1	1	-	-
CO4	2	2	3	2	1	1	1	-	-	1	1	1
CO5	-	-	-	-	-	-	-	-	-	1	1	1
CO6	-	-	-	-	-	-	-	-	-	-	1	1
Average	**1.75**	**1.75**	**2**	**2**	**1.33**	**0.75**	**133**	**1.5**	**1.5**	**1**	**1**	**1**

Course code : BSAC-408				
Course Name : Agricultural Marketing Trade & Prices				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To acquaint the student about the agriculture marketing, trades and prices.
2. To impart the students on knowledge about the Marketing process their functions, Hurdles and the Trade concepts.

Course Contents

Theory

Unit 1: Agricultural Marketing:Concepts and definitions of market, marketing, agricultural marketing, market structure,marketing mix and market segmentation, classification and characteristics of agricultural markets; demand, supply and producer'ssurplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus,factors affecting marketable surplus of agri-commodities;

Unit 2: Product life cycle (PLC) and competitive strategies: Meaning and stages in PLC; characteristics of PLC; strategies indifferent stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits;marketing process and functions:Marketing process-concentration, dispersion and equalization;exchangefunctions–buying and selling;physical functions–storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark)

Unit 3: Market functionaries and marketing channels: Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel;number of channel levels;marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types ofmarketintegration;marketing efficiency;marketing costs,margins andprice spread;factor saffecting cost of marketing;reasons for higher marketing costs of farm commodities; ways of reducing marketing costs

Unit 4: Role of Govt. in agricultural marketing:Public sector institutions-CWC,SWC,FCI,CACP&DMI–their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing;speculation & hedging; an overview of futures trading; Agricultural prices and policy:Meaning and functions of price; administered prices; need for agricultural price policy;Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATTand WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical

1. Plotting and study of demand and supply curves and calculation of elasticities**;**
2. Study of relationship between market arrivals and prices of some selected commodities;
3. Computation of marketable and marketed surplus of important commodities;
4. Study of price behaviourover time for some selected commodities;
5. Construction of in dexnumbers
6. Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report
7. Visit to market institutions– NAFED, SWC, CWC, cooperative marketing society,etc.to study their organization and functioning;
8. Application of principles of comparative advantage of international trade.

Suggested Reading:

1. Acharya S. S. and N. L. Agarwal, 2002. Agricultural Marketing in India, Oxford andIBHPublishingCo. Pvt. Ltd., New Delhi.

2. Acharya S.S. and N.L. Agarwal, 1994 Agricultural Prices - analysis and policy, Oxford and IBH PublishingCo. Pvt. Ltd., NewDelhi.
3. Kahlon A.S. and S.D.Tyagi, 2000. Agricultural Price Policy in India – Allied PublishersPvt. Ltd., Bombay.
4. SakOnk visit.JohnJ.Shaw.1999 International Marketing Analysis and Strategy, Prentice Hall of India, New Delhi.
5. Sivarama Prasad A., 1999. Agricultural Marketing in India - Mittal Publications, New Delhi.
6. Kohls R.L. and N. Uhl. Joseph, 1980. Marketing of Agricultural Products, CollierMacmillan, New York.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define the optimization of resource use, output in agriculture marketing, trades and prices
CO2	Understand marketing process, functions and increase in farm income
CO3	Recognizes role of Government in agricultural marketing such as Public sector institutions, their objectives and functions
CO4	Appraise how employer characteristics and decision-making at various levels enhance the success of an agricultural enterprise for better living
CO5	Application of principles of comparative advantage of international trade
CO6	Computation of marketable and marketed surplus of important commodities

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1	2	2	-	1	-	-	-	-	-
CO2	2	2	1	-	2	2	-	-	-	-	-	1
CO3	1	1	1	-	-	1	1	-	2	1	2	-
CO4	2	1	1	-	-	1	1	-	2	1	2	3
CO5	-	-	-	2	-	-	-	2	1	2	2	1
CO6	-	-	-	-	-	-	-	-	1		2	3
Average	**2**	**1.25**	**1**	**2**	**2**	**2**	**1**	**2**	**1.5**	**1.33**	**2**	**2**

Course code : BSAC-409				
Course Name : Introductory Agro-meteorology & Climate Change				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1. Main objective of this subject is to familiarize the students about agro - meteorology and climate change and their impact to the crops.
2. Acquaint with recent developments in agrometeorology with historical development of climate change to sustain crop production

Course Contents

Theory

Unit 1: Meaning and scope of agricultural meteorology;Earth atmosphere-its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anti cyclone, land breeze and sea breeze;

Unit 2: Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance ofearth;Atmospherichumidity, concept of saturation,vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud;

Unit 3: Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, andhail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weatherhazards-drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave. Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production.

Unit 4: Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional andnational Agriculture.

Practical

1. Visit of Agrometeorological Observatory, site selection of observatory, exposure of instruments and weather data recording.
2. Measurement of total, shortwave and long waveradiation, and its estimation using Planck'sintensity law.
3. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS.
4. Measurement of maximum and minimum air temperatures, itstabulation, trend and variation analysis.
5. Measurement of soil temperature and computation of soil heat flux.
6. Determination of vapor pressure and relative humidity.
7. Determinationof dew point temperature.
8. Measurement of atmospheric pressure and analysis of atmospheric conditions.
9. Measurement of wind speed and wind direction, preparation of windrose.
10. Measurement, tabulation and analysis of rain.
11. Measurement of open pan evaporation and evapo transpiration.
12. Computation of PET and AET.

Suggested Reading:

1. Gopalaswamy, N. 1994. Agricultural Meteorology, Rawat publications, Jaipur.Kakde, J.R.1985.Agricultural climatology, Metropolitan Book Co.Pvt. Ltd., New Delhi.
2. Lenka, D.2000.Climate, Weatherand Crops in India, Kalyani Publishers, Ludhiana.
3. Mavi, H.S.1996. Introduction to Agrometeorology, Oxford and IBH Publishing

Co., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Introduce agrometeorology (definitions, aims, scope and importance)
CO2	Understand roles of agrometeorology in agriculture and its relation to other areas of agriculture
CO3	Acquaint with recent developments in agrometeorology with historical development of climate change.
CO4	Explain weather based agro advisories to sustain crop production utilizing various methods
CO5	Interpret Climate change, climatic variability, global warming, causes of climate change.
CO6	Measurement, tabulation and analysis of rain

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	1	1	1	-	-	-	-	-
CO2	3	2	1	2	1	-	1	2	-	2	-	-
CO3	1	1	1	1	-	-	3	-	2	-	2	1
CO4	3	2	2	2	2	2	-	1	1	1	1	1
CO5	-	-	-	-	-	-	3	-	2	-	-	1
CO6	-	-	-	-	-	-	-	2	1	-	2	1
Average	**2.25**	**1.75**	**1.5**	**1.75**	**1.33**	**1.5**	**2**	**1.66**	**1.5**	**1.5**	**1.66**	**1**

Course code : BSAC-501				
Course Name : Principles of Integrated Pest and Disease Management				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. Main objective of this course is to familiarize the students about the pest and disease and their prevention in the crop
2. To know about Integrate pest managements in cereal and millet, major oil crops, legumes and other miscellaneous crop, political, social and legal implication of IPM.

Course Contents

Theory

Unit1: Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM.

Unit2: Economic importance of insect pests, diseases and pestrisk analysis.Methods of detection and diagnosis of insectpest and diseases.Calculation and dynamics of economic injury evel and importance of Economic threshold level. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.

Unit3: Ecological management of crop environment.Introduction to conventional pesticides for the insect pestsand disease management.Survey surveillance and forecasting of Insectpest and diseases.Development and validation of IPM module. Implementation and impact of IPM (IPM module for Insectpest and disease.

Unit 4: Safety issues in pesticide uses. Political, social and legal implication of IPM.Case histories of important IPM programmes.Case histories of important IPM programmes.

Practical

1. Methods of diagnosis and detection of various insect pests, and plant diseases,Methods of insect pests and plant disease measurement,
2. Assessment of crop yield losses, calculations based on economics of IPM,
3. Identification of biocontrol agents, different predators and natural enemies.
4. Mass multiplication of *Trichoderma*, *Pseudomona*s, *Trichogramma*, NPVetc.
5. Identification and nature of damage of important insectpests and diseases and their management.
6. Crop (agro-ecosystem) dynamics of a selected insectpest 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'sfields.

Suggested Reading

1. Dhaliwal, G.S. and Arora, R. 2001. Integrated Pest Management – Concepts andApproachesKalyani publishers, New Delhi.
2. Dhaliwal. G. S. and Heinnchs, E. A. 1998. Critical Issues in Integrated PestManagement.Common wealthpublishes, New Delhi.
3. Gupta, V.K. and Sharma, R.C. 1995. Integrated Disease Management and PlantHealth(Eds). ScientificPublisher, Jodhpur.
4. SharmaRC&SharmaJN. (Eds).1995.IntegratedPlantDiseaseManagement. ScientificPublisher,Jodhpur

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize categories of insect pests and diseases
CO2	Discuss types of symptoms during infection by various types of pathogens and the role of weather and disease forecasting before the spread of epidemics.
CO3	Illustrate the prevention and control measures during the disease spread, disease cycle

CO4	Integrate pest managements in cereal and millet, major oil crops, legumes and other miscellaneous crop, political, social and legal implication of IPM.
CO5	Evaluate Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control.
CO6	Plan & assess preventive strategies (IPM module) and decision making

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	2	2	-	2	2	2	-	-	-	-
CO3	2	-	2	2	2	2	2	2	2	-	-	-
CO4	1	1	1	1	2	2	2	2	2	2	2	2
CO5	-	-	-	-	-	-	-	2	2	2	-	-
CO6	-	-	-	-	-	-	2	-	2	2	2	2
Average	**1.75**	**1.5**	**1.6**	**1.6**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Course code : BSAC-502				
Course Name : Manures, Fertilizers and Soil Fertility Management				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To introduce basic postulates of soil fertility and nutrient management.
2. Introduction to basic fundamentals of soil fertility and nutrient management

Course Contents

Theory

Unit 1: Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures.Green/leafmanuring.Fertilizer recommendation approaches.Integrated nutrient management.

Unit 2: Chemical fertilizers:classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complexfertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

Unit3: History of soil fertility and plant nutrition. Criteria of essentiality.role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micro nutrients.Soil fertility evaluation, Soil testing. Critical levels of different nutrients insoil. Forms of nutrientsin soil, plant analysis, rapid plant tissue tests

Unit 4: Indicator plants.Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application underrainfedand irrigatedconditions

Practical

1. Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry.
2. Estimation of soil organic carbon
3. Estimation of alkaline hydrolysable N in soils.
4. Estimation of soil extractable P in soils.
5. Estimation of exchangeable K, Ca and Mg in soils.
6. Estimation of soil extractable S insoils.
7. Estimation of DTPA extractable Zn in soils.
8. Estimation ofN, P, K, S in plants.

Suggested Reading

1. John Havlin, James Beaten, Samuel Tisdale, Werner Nelson, 2005.Soil Fertility andFertilizers - An Introduction to Nutrient Management. 7th Edition, Prentice Hall.Upper Saddle River, NJ.

2. Mengel, K. and E.A. Kirkby. 1987. Principles of Plant Nutrition, 4th ed. International Potash Institute, Worblaufen-Bern, Switzerland.

3. Yawalkar, K.S., J.P. Agarwal and S.Bokde.1972. Manures and Fertilizers Third revised edition Agri Horticultural Publishing House, Nagpur.

4. Cooke G.W.1972.Fertilizers formaximizing yield, Grenada Publishing Ltd, London.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Remember the criteria of essentiality and available forms of nutrients in soils and factors affecting transformation of nutrients in soils and their availability.
CO2	Estimate knowledge regarding types of fertilizers and classification in terms of nutrient

	source.
CO3	Acquaint with methods of soil analysis for nutrient contents and fertilizer recommendations, application methods and nutrient use efficiency.
CO4	Make decisions on nutrient dose, choice of fertilizers/manures and method of application etc.
CO5	Judge deficiency and toxicity symptoms of essential plant nutrients
CO6	Prepare bulky and concentrated manures.Green/leaf manuring.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**2**	**-**	**-**	**-**
CO2	**2**	**-**	**2**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**-**	**-**
CO4	**-**	**-**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO5	**-**	**-**	**-**	**-**	**-**	**-**	**--**	**2**	**-**	**2**	**-**	**-**
CO6	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**2**
Average	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Course code : BSAC-503				
Course Name : Pests of Crops and Stored Grain and their Management				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To study the scientific name, Order, Family, Host range, distribution, nature of damage by major pests
2. To understand important management practices of insect pest and non insect pests

Course Contents

Theory

Unit 1: General account on nature and type of damage by different arthropods pests.

Unit 2: Scientific name, order, family, host range, distribution, biology and bionomics, nature ofdamage, and management of majorpests and scientific name, order, family, host range,distribution, nature of damage and control practice other important arthropod pests ofvarious field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, spicesand condiments.

Unit 3: Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain. Insect pests, mites, rodents, birds and micro organisms associated with stored grain and their management.

Unit4: Storage structure and method sofgrainst orage andf undamental principle sofgrain store management.

Practical

1. Identification of different types of damage.
2. Identification and study of life cycleand seasonal history of various insect pests attacking crops and their produce: (a) FieldCrops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments.
3. Identification of insectpests and Mites associated with stored grain.Determination of insect infestation by different methods. Assessment of losses due toinsects. Calculations on the doses of insecticides application technique. Fumigation ofgrain store / godown.
4. Identification of rodents and rodent control operations in godowns.
5. Identification of birds and bird control operations in godowns.
6. Determination of moisturecontent of grain.
7. Methods of grain sampling under storage condition.
8. Visit to IndianStorage Management and Research Institute, Hapur and Quality Laboratory, DepartmentofFood, Delhi.
9. Visit tonearestFCIgodowns.

Suggested Reading:

1. Ayyar, T.V.R. 1963. Hand Book of Economic Entomology for South India. Govt. Press, Madras.
2. David, B.V.2006. Elements of Economic Entomology. Popular Book Depot, Chennai.Dhaliwal, G.S. and Ramesh Arora.1998.Principles of Insect Pest Management. Kalyani Publishers, New Delhi.
3. Metcalf. C.K. and W.P. Flint. 1970. Destructive and Useful Insects - Their Habits andControl.Tata McGraw Hill Pub. Co., New Delhi
4. Nayar, K.K., T.N.Ananthakristman and B.V.David 1985. General and AppliedEntomology. Tata McGraw Hill Publishing Company Ltd, New Delhi
5. Srivastava, K.P.2003.A textbook of Applied Entomology.Vol. I&II. Kalyani Publishers.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify nature and type of damage done by different arthropods pests
CO2	Explain life stages of major crop pests
CO3	Discuss life cycles of different agricultural insect pests
CO4	Recommend different pest management techniques to farmers and to manage pests of stored grains
CO5	Judge Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain
CO6	Determine moisture content of grain

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	2	-	-	2	2	-	-	-	-
CO2	2	2	2	2	-	2	2	1	2	-	-	-
CO3	2	2	2	2	2	2	2	-	-	-	-	2
CO4	-	2	-	2	2	3	2	2	2	2	2	2
CO5	-	-	-	-	-	-	-	-	2	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2**	**2**	**2**	**2**	**2**	**2.3**	**2**	**1.6**	**2**	**2**	**2**	**2**

Course code : BSAC-504				
Course Name : Diseases of Field and Horticultural crops and their Management-I				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To facilitate the students to learn and understand the Field and Horticultural crops plant disease symptoms and control measures
2. Design the prevention and control measures during the disease spread, disease cycle and integrated pest management of horticultural crops

Course Contents

Theory

Unit 1: Symptoms, etiology, disease cycle and management of major diseases of following Crops:

Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khairaand tungro; Maize: stalk rots, downy mildew, leaf spots; Sorghum: smuts, grain mold andanthracnose, Bajra: downymilde wander got; Ground nut: early and late leaf spots, wilt

Unit 2: Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Finger millet: Blast and leaf spot; black &green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; Castor: Phytophthorab light

Unit 3: To bacco: black shank,black rootrot and mosaic.Horticultural Crops: Guava: wilt and anthrac nose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: footrot, leafcurl and mosaic, Pomegranate: bacterial light;

Unit 4: Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight andfruit rot and Sclerotinia blight; Tomato: damping off, wilt, early and late blight, buck eye rotand leafcur land mosaic; Okra: Yellow Vein Mosaic; Beans: anthrac nose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and budrot;Tea: blister blight; Coffee: rust.

Practical

1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
2. Field visit for the diagnosis of field problems.
3. Collection andpreservation of plant diseased specimens for Herbarium;

Note: Students should submit 50pressed and well-mounted specimens.

Suggested Reading

1. Singh, R.S. 2013. Introduction to Principles of Plant Pathology (4th edition), Oxford and IBH Publishing Co. Pvt.Ltd., New Delhi
2. Mehrotra, R.S. and Agarwal, A.2006.Plant Pathology (6th edition), Tata McGraw Hill Publishing Company Ltd., New Delhi, India
3. Singh, R.S.2001.Plant Disease Management. Oxford and IBH Publishing Co.Pvt.Ltd. New Delhi 246 pp.
4. Sharma, R.C.and Sharma J.N.1995. Integrated Plant Disease Management (Eds), Scientific Publisher, Jodhpur.
5. Chaube H.S and Pandhir 2005.Crop diseases and their management. Prentice hall ofIndiaPvt.Ltd.New Delhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize causal organism, symptomatology, etiology and epidemiology of the important diseases of field and horticultural crops and their management.
CO2	Identification and histo-pathological studies of diseases of field and horticultural crops
CO3	Differentiate diseases of cereals and horticultural crops and able to diagnosis the

	diseases.
CO 4	Correlate effect of factors affecting disesas
CO5	Judge types of diseses in cereals and horticultural crops
CO6	Design the prevention and control measures during the disease spread, disease cycle and integrated pest management of horticultural crops

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	2	-	-	1	2	-	-
CO2	-	2	2	2	2	-	2	2	-	-	-	-
CO3	2	2	3	2	1	2	3	3	2	2	1	3
CO4	-	-	2	2	2	2	2	3	2	1	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	-	-	-
Average	**2**	**2**	**2.25**	**2**	**1.66**	**2**	**2.33**	**2.66**	**1.66**	**1.66**	**1.5**	**2.5**

Course code : BSAC-505				
Course Name : Crop Improvement-I(Kharif Crops)				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. Main objective of this subject is to familiarize the student about the improvement of the Kharif crop
2. Explain breeding methods for the improvement of sexually and asexually propagated crop species and modern advances

Course Contents

Theory

Unit 1: Centers of origin, distribution of species, wild relatives in different cereals; pulses;oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops; Plant geneticresources, its utilization and conservation,

Unit2: study of genetics of qualitative and quantitative characters; important concepts of breeding self pollinated, cross pollinated and vegetative lypropagated crops.

Unit3: Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varietiesfor yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

Unit4: Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideo type conceptand climatere silient crop varieties for future.

Practical

1. Floral biology,emas culation and hybridization techniques in different crop species; viz., Rice, Jute, Maize Sorghum, Pearlmillet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops.
2. Maintenance breeding of different *kharif* crops.
3. Handlingof germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods
4. Study of field techniques for seed production and hybridseeds production in*Kharif* crops
5. Estimation of heterosis, inbreeding depression and heritability
6. Layout of field experiments
7. Study of quality characters, donor parents fordifferent characters;
8. Visit to seed production plots
9. Visit to AICRP plots of different fieldcrops.

Suggested Books:

1. Singh, B.D. 2007. Plant breeding - Principles and methods. Kalyani Publishers, NewDelhi.
2. Phoelman, J.N. and Borthakur, 1969. Breeding Asian field crops Oxford & IBH PublishingCo., New Delhi.
3. Harihar Ram and Hari Govind Singh, 1994. Crop breeding and Genetics. Kalyani Publishers, New Delhi.
4. Chopra, V.L. 1994. Plant Breeding. Theory and Practice. Oxford and IBH PublishingCo.,NewDelhi
5. Sharma, J.R. 1994. Principles and practice of Plant Breeding. Tata McGraw –Hill Publishing Co. Ltd., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Recognize the concept of Centre of Origin of different species of agriculture and

	horticultural crops and their wild relatives.
CO2	Understand the concept of plant genetic resources their conservation strategies and their utilization in improving genotypes
CO3	Explain different breeding methods for the improvement of sexually and asexually propagated crop species and modern advances for the development of superior hybrids for yield, quality parameter and for more tolerant to abiotic and biotic condition.
CO4	Construct the concept of ideal plant type and their utilization in development of climate resilient crops.
CO5	Evaluate Hybrid seed production technology in cereals
CO6	Prepare Design and Layout of field experiments

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	-	-	2	2	2	-	-	-	-	-	-
CO3	-	-	2	2	2	2	-	-	2	2	2	-
CO4	-	-	-	2	2	2	2	2	2	2	2	3
CO5	-	-	-	-	-	-	1	1	-	2	2	-
CO6	-	-	-	-	-	-	-	-	2	-	2	3
Average	**2**	**2**	**2**	**2**	**2**	**2**	**1.5**	**1.5**	**2**	**2**	**2**	**3**

Course code	**: BSAC-506**			
Course Name	**: Entrepreneurship Development and Business Communication**			
Semester /Year	**: V/III**			
L	**T**	**P**	**Credit hrs**	
1	**-**	**1**	**2**	

Course Objectives:The objectives of this course are

1. To provide the knowledge on basic concept of Entrepreneur, Entrepreneurship Development.
2. To analyse the business environment in order to identify agro-entrepreneurship and rural development.

Course Contents

Theory

Unit1: Concept of Entrepreneur, Entrepreneurship Development, Characteristic sofentrepreneurs

Unit2: SWOT Analysis & achievement motivation, Government policy and programs and institutions for entrepreneurship development, Impact of economic reforms on Agribusiness/Agrienterprises.

Unit3: Entrepreneurial Development Process; Business Leadership Skills; Developing organizational skill (controlling, supervising, problemsolving, monitoring & evaluation), Developing Managerial skills, Business Leadership Skills (Communication, direction and motivation Skills), Problemsolving skill, Supply chainmanagemen tand Total quality management,

Unit4: Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for agri-entrepreneurship and rural enterprise.

Practical

1. Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation,
2. Exercise in creativity, time audit through planning, monitoring and supervision,
3. Identification and selection of business idea, preparation of business plan and proposal writing,
4. Visit to entrepreneurship development institute and entrepreneurs.

Suggested Reading:

1. Gupta, C.B. 2001. Management: Theory and Practice. Sultan Chand and Sons, NewDelhi.
2. Khanka, S.S.1999. Entrepreneurial Development. S. Chand and Co., New Delhi.Sagar Mondal and G.L.Ray. 2009. Text Book of Entrepreneurship and Rural Development, Kalyani Publishers, Ludhiana.
3. Vasant Desai. 1997. Small Scale Industries and Entrepreneurship. Himalaya Publishing House, NewDelhi.
4. Vasant Desai. 2000. Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define basic concept of Entrepreneur, Entrepreneurship Development and analyze the business environment in order to identify business opportUnities
CO2	Choose the parameters to assess opportunities for new business ideas
CO3	Design strategies for successful implementation of ideas
CO4	Create possibility of entrepreneurship development and opportunities for agro-entrepreneurship and rural development.
CO5	Assess entrepreneurial traits,problem solving skills,managerial skills and achievement motivation,
CO6	Prepare Project Planning Formulation and reports

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	2	2	-	-	-	-	-
CO2	2	2	-	-	2	1	-	-	-	-	-	-
CO3	2	-	2	2	2	-		2	2	2	2	3
CO4	2	-	2	-	2	2	2	2	2	2	2	3
CO5	-	-	-	-	-	-	-	-	-	-	2	2
CO6	-	-	-	-	-	-	-	2	2	2	-	3
Average	2	2	2	2	2	1.7	2	2	2	2	2	2.75

Course code	**: BSAC-507**				
Course Name	**: Geo informatics and Nanotechnology and Precision Farming**				
Semester /Year	**: V/III**				
	L	**T**	**P**	**Credit hrs**	
	1	**-**	**1**	**2**	

Course Objectives: The objectives of this course are

1. To provide the knowledge about Precision agriculture, its concepts, techniques and Geo-informatics and their use in Precision Agriculture.
2. To understand nanotechnology, concepts and techniques applied in agriculture

Course Contents

Theory

Unit 1: Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

Unit 2: Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remotesensing concepts and application in agriculture; Image processing and interpretation;

Unit 3: Global positioning system(GPS), components and its functions; Introduction to crop Simulation Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture;

Unit 4: Nanotechnology, definition, concepts and techniques, brief introduction about nano scale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nano technology in seed, water, fertilizer,plant protection for scaling-upfarm productivity.

Practical

1. Introduction to GIS software, spatial data creation and editing.
2. Introduction toimage processing software.
3. Visual and digital interpretation of remote sensing images.
4. Generation of spectral profiles of different objects.Supervised and unsupervised classification and acreageestimation.
5. Multispectral remote sensing forsoilmapping.Creation of thematic layers of soil fertility based on GIS.
6. Creation of productivity and management zones.Fertilizers recommendations based of VRT and STCR techniques.Cropstress (biotic/abiotic) monitoring using geospatial technology.
7. Use of GPS for agricultural survey.
8. Formulation, characterization and applications of nano particles in agriculture.
9. Projects formulation and execution related to precision farming.

Suggested Reading:

1. Jitendra Singh, 2015.*Precision Farming in Horticulture*.New India Publishing Agency.New Delhi.
2. A.M.Chandra.2016.Geo informatics Paper back.New Age International Publishers.
3. Sulabha K.Kulkarni.2014. Nano technology: Principles and Practices Hardcover Springer.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define the Precision agriculture, its concepts, techniques and Geo-informatics and their use in Precision Agriculture.
CO2	Learn about crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies and application in agriculture
CO3	Organize the image processing and interpretation; Global positioning system (GPS), components and its functions

CO4	Summarize nanotechnology, concepts and techniques applied in agriculture
CO5	Visual and digital interpretation of remote sensing images
CO6	Projects formulation and execution related to precision farming.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	-	-		-	2	-	-	-
CO2	-	-	2	2	2	2	2	-	-	-	-	-
CO3	2	-	-	-	3	2	2	2	3	2	2	2
CO4	2	1	-	2	2	2	2	2	2	2	2	2
CO5	-	-	-	-	-	-	2	2	-	-	-	2
CO6	-	-	-	-	-	-	-	-	1	2	2	-
Average	**2**	**1.5**	**2**	**2**	**2.3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Course code	**: BSAC-508**				
Course Name	**: Practical Crop Production – I (*Kharif* crops)**				
Semester /Year	**: V/III**				
	L	**T**	**P**	**Credit hrs**	
	0	**-**	**2**	**2**	

Course Objectives: The objectives of this course are

1. To provide knowledge of profitable crop production technology.
2. To know about adoption diversified farming system according to available farming situation and to assist to encourage the profitable and sustainable agriculture system

Practical

1. Cropplanning, raising field crops in multiple cropping systems:Field preparation, seed, treatment, nurseryraising, sowing, nutrient, water and weed management and managemen to finsect-pests diseases of crops, harvesting,threshing, drying winnowing, storage and marketing of produce.
2. The emphasis will begiven to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
3. Preparation of balance sheet including cost of cultivation, net returns per studentas well as per team of 8-10 students.

Suggested Reading:

1. Ahlawat, I.P.S., Om Prakash and G.S.Saini.1998. Scientific Crop Production in India. Rama Publishing House, Meerut.
2. Chidda Singh.1997.Modern technique so fraising field crops.Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. ICAR 2006. Hand book of Agriculture. Indian Council of Agriculture, New Delhi.Crop Production Guide.2005.Directorate of Agriculture, Chennaiand Tamil Nadu
   Agricultural University, Coimbatore.
4. Rajendra Prasad.2004.Text Book on Field Crop Production, Indian Council of Agrl. Research, New Delhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Acquaint with the knowledge of profitable crop production technology
CO2	Understand ruminative crop production techniques and management of insect pests and diseases of crops
CO3	Adopt diversified farming system according to available farming situation
CO4	Assist to encourage the profitable and sustainable agriculture system
CO5	Evaluate modern techniques of crop production
CO6	Prepare and design layout of field experiments

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	-	-	-
CO2	-	-	2	2	-	2	2	2	-	2	-	-
CO3	-	-	-	-	3	-	-	2	2	2	-	2

CO4	-	-	-	-	-	2	-	2	2	2	2	2
CO5	-	-	-	-	1	-	2	-	2	2	-	-
CO6	-	-	-	2	-	-	-	-	-	-	2	2
Average	2	2	2	2	2	2	2	2	2	2	2	2

Course code	**: BSAC-509**				
Course Name	**: Intellectual Property Rights**				
Semester /Year	**: V/III**				
	L	**T**	**P**	**Credit hrs**	
	1	**-**	**0**	**1**	

Course Objectives: The objectives of this course are

1. To provide knowledge on concept of intellectual property rights.
2. To know about protection of plant varieties, Farmer's Rights Act and biodiversity conservation and biodiversity Act and their importance

Course Contents

Theory

Unit 1: Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIP sand WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

Unit 2: Type sofIntellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets.Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent data base.

Unit 3: Origin and history including abrief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act2001, breeders, researcher and farmers rights.Traditional knowledge-meaning and right sofTK holders.

Unit 4: Convention on Biological Diversity, International treaty on plant genetic resources forfood and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salientfeatures, access and benefit sharing

Suggested Reading

1. Goeland Parashar.2013.IPR, Bio safety and Bioethics.Pearson.
2. N.S. Rathore.2013.IPR: Drafting,Interpretation of Patent Specifications and Claims Hardcover–Import, 15 Jan 2013

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Recall the concept of intellectual property rights.
CO2	Outline the knowledge of various international organizations related to IP and their importance
CO3	Aware about various Intellectual Property Rights in India and basic knowledge of patent and their significance
CO4	Explain about Protection of Plant varieties, Farmer's Rights Act and biodiversity conservation and Biodiversity Act and their importance
CO5	Interpret Compulsory licensing, Patent Cooperation Treaty, Patent search and patentdatabase.
CO6	Prepare projects,manuscripts and research articles based on intellectual property rights

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-		-	-	-	-	-
CO2	-	2	2	-	-	-	2	-	-	2	-	-
CO3	-	2	-	2	2	2	2	2	-	2	2	-
CO4	-	-	-	2	-	-	2	2	2	-	-	3
CO5	-	-	-	-	1	-	2	-	-	2	2	-
CO6	-	-	-	-	-	-	-	2	2	-	-	2
Average	2	2	2	2	1.5	2	2	2	2	2	2	2.5

Course code	**: BSAC-601**			
Course Name	**: Rainfed Agriculture & WatershedManagement**			
Semester /Year	**: VI/IV**			
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1. To teach the students about the basic aspects and concept of rainfed agriculture
2. To learn about soil and water conservation techniques and drought management in different crops and Watershed management

Course Contents

Theory

Unit 1: Rainfeda griculture:Introduction, types, History of rainfed agricul ture and watershed in India; Problems and prospects of rainfed agriculture in India ; Soil andclimatic conditions

prevalent in rainfed areas; Soil and water conservation techniques,

Unit 2: Drought: types, effect of water deficit on physio- morphological characteristics of theplants, Cropadaptation and mitigation to drought.

Unit3: Water harvesting: importance, its techniques, Efficientutilization of water through soil and crop management practices, Management of crops in rainfed areas,

Unit4: Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

1. Studies on climate classification, studies on rainfall pattern in rainfed areas of thecountry and pattern of onset and withdrawal of monsoons.
2. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India.
3. Interpretation of meteorological data and scheduling of supplemental irrigation on thebasis of evapo-transpiration demand of crops.
4. Critical analysis of rainfall and possibledrought period in the country, effective rainfall and its calculation.
5. Studies on cultural practices for mitigating moisture stress.
6. Characterization and delineation of model water shed.
7. Field demonstration ons oil & moisture conservation measures.
8. Field demonstration on construction of water harvesting structures.
9. Visit to rainfed researchstation/watershed**.**

Suggested Reading:

1. Singh. S.S. 1997. Crop management under irrigated and rainfed conditions. Kalyani Publishers,New Delhi
2. Suresh, R. 2005. Soil and Water Conservation Engineering, Standard Publishers &Distributors, New Delhi.
3. Gunshyam Das 2005, Hydrology and soil conservation engineering, Prentice-Hall ofIndiaPvt.Ltd., New Delhi
4. Suresh, R. 2008. Land and water management principles, Standard Publishers & Distributors, New Delhi.
5. Murthy, V.V.N. 2005, Land and water management, Kalyani publishing, New Delhi.
6. Michael, A.M. and Ojha, T.P.2006.Principles of Agricultural Engineering.Vol.II. Jain Brothers, NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define Rainfed Agriculture and its problems and prospects in India.
CO2	Classify the Soil and climatic conditions prevalent in rainfed areas and knowledge about drought, its types and effect of water deficit on physio-morphological characteristics of the plants.

CO3	Acquaint with Water harvesting systems and its importance, its techniques, efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.
CO4	Determine how agricultural experts are working in the field of watershed Management to increase agricultural production in rainfed areas while maintaining enough food supply.
CO5	Interpretation of meteorological data and scheduling of supplemental irrigation
CO6	Construction of water harvesting structures.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	2	3	2	2	2	-	-	-	-
CO2	2	-	1	3	3	2	-	-	-	2	-	-
CO3	2	1	1	-	3	2	3	1	-	3	1	1
CO4	2	-	1	2	2	2	2	-	1	2	2	1
CO5	-	-	-	-	-	-	-	1	2	-	2	-
CO6	-	-	-	-	-	-	-	1	-	2	-	2
Average	**2**	**1**	**1**	**1.75**	**2.7**	**2**	**2.33**	**1.25**	**1.5**	**2.25**	**1.6**	**1.3**

Course code : BSAC-602				
Course Name : Protected Cultivation and Secondary Agriculture				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To teach the students about the basic aspects and concept of rainfed agriculture
2. To learn about soil and water conservation techniques and drought management in different crops and Watershed management

Course Contents

Theory

Unit 1: Green house technology: Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of green housefor cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses.

Unit 2: Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying.Cost estimation and economic analysis.

Unit 3: Important Engineering properties such as physical, thermal and aero & hydro dynamic properties of cereals, pulses and oilseed, their application in PHT equipment design andoperation.

Unit 4: Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial graindryer(deepbeddryer, flatbeddryer, traydryer, fluidized bed dryer, recirculatory dryer and solar dryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

1. Studyofdifferenttypeofgreenhousesbasedonshape.
2. Determinetherateofairexchange in an active summer winter cooling system.
3. Determination of drying rate ofagriculturalproductsinsidegreenhouse.
4. Studyofgreenhouseequipment.
5. Visittovarious Post HarvestLaboratories.
6. Determination of Moisture contentof variousgrainsby oven drying & infrared moisture methods.
7. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials).
8. Determination of Moisture content of various grains by moisture meter.
9. Field visit toseed processingplant.

Suggested Reading:

1. Nelson, P.V.1991. Green house operation and management, Bali Publication.
2. Chandra, SandSo,. V2000.Cultivating vegetables in green house.India horticulture 45:17-18
3. Prasad, Sand Kumar, U. 2003.Green housetechnology for controlled environment. Narosa Publication House

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Knowledge about greenhouse technology, types of green houses and construction of green houses.
CO 2	Identify Greenhouse equipment, materials of construction for traditional and low cost green houses.
CO3	Explain to learn about Irrigation systems used in greenhouses, shade net house in protected cultivation.
CO 4	Generate to understand the Material handling equipment, principle and working.
CO5	Cost estimation and economic analysis.

CO6	Prapre designs and layout experiments under protected areas

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	3	2	3	-	-	-	-
CO2	3	1		3	3	2	1	-	2	1	-	-
CO3	3	2	1	1	3	2	-	-	1	3	2	1
CO4	2	2	3	3	2	1	-	2	3	3	2	3
CO5	-	-	-	-	-	-	-	-	-	-	3	1
CO6	-	-	-	-	-	-	-	-	-	3	3	-
Average	**2.7**	**1.7**	**1.7**	**2.25**	**2.7**	**2**	**1.5**	**2.5**	**2**	**2.25**	**2.7**	**1.6**

Course code : BSAC-603				
Course Name : Diseases of Field and Horticultural Crops and their Management-II				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives:The objectives of this course are

1. To study the importance and design principle of Green House
2. To learn about Irrigation systems used in greenhouses, shade net house in protected cultivation, material handling equipment, principle and working.

Course Contents

Theory

Symptoms, etiology, disease cycle and management of following diseases:

Unit 1:*Field Crops:*Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle; Sugarcane:redrot, smut, wilt, grassyshoot, ratoonstunting and Pokkah Boeng.

Unit 2: Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, whiterust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould andAscochyta blight; Lentil: rust and wilt; Cotton: anthracnose, vascular wilt, andblack arm; Pea: downymildew, powderymildewand rust.

Unit 3: *Horticultural Crops:* Mango: anthracnose, malformation, bacterial blight and powdery

Mildew; Citrus: canker and gummosis; Grapevine: downy mildew, Powdery mildew and

Anthracnose; Apple: scab, powdery mildew, fire blight and crown gall; Peach: leafcurl.

Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic

Unit 4: Cucurbits: downy mildew, powderymildew, wilt; Onionandgarlic: purpleblotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, wilt and leaf curl; Turmeric: leaf spot Coriander: Stemgall Marigold: Botrytisb light; Rose: dieback, powdery mildew and black leaf spot.

Practical

1. Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory.
2. Field visit for the diagnosis of field problems.
3. Collection and preservation of plant diseased specimens for herbarium.

Note: Students should submit 50pressed and well-mounted specimens.

Suggested Books:

1. Singh, R.S. 2013. Introduction to Principles of Plant Pathology (4th edition), Oxford and IBH Publishing Co. Pvt.Ltd., New Delhi
2. Mehrotra, R.S. and Agarwal, A.2006.Plant Pathology (6th edition), Tata McGraw Hill Publishing Company Ltd., New Delhi, India
3. Singh, R.S.2001.Plant Disease Management. Oxford and IBH Publishing Co.Pvt.Ltd., NewDelhi 246 pp.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	List the causal organism, etiology and epidemiology and importance of studying the disease cycles
CO2	Explain different types of symptoms during infection by various types of pathogens and the role of weather and disease forecasting before the spread of epidemics
CO3	Describe prevention and control measures during the disease spread, disease cycle

	and integrated pest management of horticultural crops
CO4	Recognize the diseases through symptoms in field, their proper management as well as identification of causal agents and helpful for setting up agri-clinics, farmer oriented service centers and other agri-enterprises.
CO5	Evaluate the methods of site specific disease management
CO6	Collection and preservation of plant diseased specimens for herbarium

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	2	-	2	-	-	2	-	-	-
CO2	2	3	2	2	1	1	2	-	1	-	-	1
CO3	3	3	2	2	2	1	-	-	1	3	1	1
CO4	2	-	3	3	3	2	1	-	3	3	2	3
CO5	-	-	-	-	-	-	-	2	-	3	1	-
CO6	-	-	-	-	-	-	-	-	-	2	2	1
Average	2.25	3	2.3	2.25	2	1.5	1.5	2	1.7	2.7	1.65	1.5

Course code : BSAC-604				
Course Name : Post-harvest Management and Value Addition of Fruits and Vegetables				
Semester /Year : VI/III				
L	**T**	**P**	**Credit hrs**	
1		**1**	**2**	

Course Objectives: The objectives of this course are

1. To understand the basics and principles of postharvest technology and recent innovations in packaging, storage and value addition of horticultural crops
2. To know about the physiological disorders of horticultural crops and perform post - harvest practices

Course Contents

Theory

Unit 1: Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses; Pre-harvest factors affecting post harvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate;

Unit 2: Harvesting and field handling; Storage (ZECC, cold storage, CA, MA,an dhypobaric);

Unit3: Value addition concept; Principles and methods of preservation; Intermediate moisture food-Jam,jelly,marmalade, preserve, candy–Concepts and Standards; Fermentedand non-fermented beverages.

Unit 4: Tomato products-Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying.Canning-– Concepts and Standards, packaging of products.

Practical

1. Applications of different types of packaging, containers for shelf life extension.
2. Effect of temperature on shelf life and quality of produce.
3. Demonstration of chilling andfreezing injury in vegetables and fruits.
4. Extraction and preservation of pulps and juices.
5. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar andcandy and tomato products, canned products.
6. Quality evaluation of products -- physico-chemicaland sensory.
7. Visit to processingUnit/industry.

Suggested Reading:

1. Henderson, S.M. and R.L.Perry. 1995. Agricultural process engineering, John WilleyandSons, New York. p.234.

2. Multon, J.L., A.M.Reimbert, D.Marsh andA.J.Eydt.1989.Preservation and storage of grains, seeds and their by products.CBS Publishers and Distributors, Delhi.

3. Sahay. K.M.andSingh, K.K.1994.Unitoperations of Agricultural Processing.Vikas Publishing House Pvt.Ltd. New Delhi.

4. Chakraverty, A. 2000. Third Edition. Post Harvest Technology of cereals, pulses andoilseeds.Oxford & IBH publishing & Co.Pvt.Ltd., New Delhi.

5. Srivastava, U.K. and Patel, N.K. 1994. Managing Food Processing Industries. Oxford and IBH PublishingCo., Pvt. Ltd., New Delhi.

6. Verma, L.R and V.K.Joshi.2000 Post Harvest Technology of Fruits and Vegetables VolI &II, Published by Indus Publishing Company, New Delhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Memorize importance and use of processing of fruits and vegetables
CO2	Understand the value addition of horticulture crops.
CO3	Construct work space, tool and equipment design for post- harvest technology and value addition.
CO 4	Illustrate the physiological disorders of horticultural crops and perform post - harvest practices
CO5	Quality evaluation of products
CO6	Value addition of fruits and vegetable crops

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2		1		3	1	-	-	-	-	-	-
CO2	3	1	1	2	3	-	-	-	-	3	3	-
CO3	3	2		-	1	-	-	2	-	3	3	3
CO4	2	1	1	-	2	-	-	-	2	2	2	1
CO5	-	-	-	-	-	-	1	-	-	-	-	2
CO6	-	-	-	-	-	-	-	-	-	3	1	3
Average	**2.5**	**1.3**	**1**	**2**	**2.5**	**1**	**1**	**2**	**2**	**2.7**	**2.5**	**2.25**

Course code : BSAC-605				
Course Name : Management of Beneficial Insects				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	1		**1**	**2**

Course Objectives: The objectives of this course are

1. To study the importance of beneficial insects
2. To study the techniques in rearing honey bees, silkworm and lac insects

Course Contents

Theory

Unit 1: Importance of beneficial Insects, Beekeeping and pollinators, beebiology,

commercial methods of rearing, equipment used, seasonal management, bee enemies anddisease. Bee pasturage, bee foraging and communication. Insect pests and diseases ofhoneybee. Role of pollinators in cross pollinated plants.

Unit 2: Types of silk worm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silk worm, management, rearing appliances of mulberry silk worm and methods of disinfection.

Unit 3: Species of lac insect, morphology, biology, host plant, lac production – seed lac, buttonlac, shellac, lac- products. Identification of major parasitoids and predators comm. only beingused in biologicalcontrol.

Unit4: Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

Practical

1. Honey bees pecies, caste sofbees.Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication.
2. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves.
3. Species of lac insect, host plant identification.
4. Identification of other important pollinators, weed killers and scavengers.
5. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.
6. Identification and techniques for mass multiplication of natural enemies

Suggested Reading:

1. Singh,S.,1975.Beekeeping in India –ICAR,NewDelhi.,214p.
2. Sunita, N.D, Guled ,M.B, Mulla S.R and Jagginavar,2003, Beekeeping, UAS, Dharwad
3. Mishra, R.C. and Rajesh Gar. 2002. Prospective in Indian Apiculture. Agrobios, Jodhpur.
4. Singh, Dand Singh, D.P. 2006.A handbook of Beekeeping, Agrobios (India).
5. Paul DeBach and Devid, Rosen. 1991. Biological control by natural enemies. Cambridge UniversityPress; 2 edition (27 June1991)
6. Shinde, Y.A. and Patel, B.R..Sericulturein India.
7. Ganga, G. and Sulochana Chetty, J. 1997. An introduction to Sericulture (2nd Edn.). Oxford & IBH publishing Co. Pvt.Ltd., New Delhi.
8. Krishnaswamy, S.(Ed).1978. Sericulture Manual-Silk worm Rearing. FAO Agrl. Services bulletin, Rome..
9. Singh, S.1975.Beekeepingin India. ICAR, New Delhi.
10. Glover, P.M.1937. LaccultivationinIndia.IndianLacResearchInstitute, Ranchi.
11. Jolly, M.S.1987."Appropriateseri culture techniques" International centre for training and Researchin Tropical Sericulture, Mysore, 209.
12. Srivastava, K.P.2012.AText Bookon Applied Entomology Vol.I & II., Kalyani Publishers, Ludhiyana

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Identify different species of honey bee
CO2	Explain scientifically manage a bee keeping Unit
CO3	Demonstrate different silk worms and understand their hosts and life cycle
CO4	Analyze mulberry silk worm scientifically and manage lac insect
CO5	Judge Insect orders bearing predators and parasitoids used in pest control
CO6	Establish bee keeping unit

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	1	1	-	-	-	-	-	-
CO2	2	2	1	1	2	2	1	1	1	-	-	-
CO3	1	2	1	2	1	-	-	2	1	1	-	1
CO4	2	2	1	2	1	-	-	-	1	2	2	2
CO5	-	-	-	-	-	-	1	1	-	-	2	2
CO6	-	-	-	-	-	-	-	-	1	-	2	2
Average	**2**	**2**	**1**	**1.7**	**1.25**	**1.5**	**1**	**1.6**	**1**	**1.5**	**2**	**1.75**

Course code : BSAC-606				
Course Name : Crop Improvement-II*(Rabicrops)*				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives:The objectives of this course are

1.To impart knowledge to the students on the botanical description, origin, distribution and various breeding approaches used for the development of varieties / hybrids in various rabi crops.

2. To learn new genetic approaches to achieve a definite ideotype of Rabi crop.

Course Contents

Theory

Unit 1: Centers of origin, distribution of species, wild relatives in different cereals; pulses;oil seeds; fodder cropsand cash crops; vegetable and horticultural crops.

Unit 2: Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters

Unit 3: Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional)

Unit 4: Hybrid seed production technology of *rabi*crops. Ideo type concept and climate resilient crop varieties for future.

Practical

1. Floral biology, emasculation and hybridization techniques in different crops pecies namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem.
2. Sugarcane, Tomato, Chilli,Onion; Handling of germ plasm and segregating populations by different methods like pedigree, bulk and single seed decent methods;
3. Study of field techniques for seed production and hybrid seeds production in *Rabi* crops
4. Estimation of heterosis, inbreeding depression and heritability
5. Layout of field experiments
6. Study of quality characters
7. Study of donor parents for different characters
8. Visit to seed production plots
9. Visit toAICRP plots of different field crops

Suggested Books:

1. Singh, B.D. 2007. Plant breeding - Principles and methods. Kalyani Publishers, NewDelhi.

2. Phoelman, J.N. and Borthakur, 1969. Breeding Asian field crops Oxford & IBHPublishingCo., New Delhi.

3. Harihar Ram and Hari Govind Singh, 1994. Crop breeding and Genetics. KalyaniPublishers, New Delhi.

4. Chopra, V.L. 1994. Plant Breeding. Theory and Practice. Oxford and IBH Publishing Co.,NewDelhi

5. Sharma, J.R. 1994. Principles and practice of Plant Breeding. Tata McGraw – Hill Publishing Co.Ltd., NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Memorize centers of origin, distribution of species, wild relatives in different crops
CO 2	Understand Major breeding objectives and procedures
CO 3	Apply plant genetic resources, its utilization and conservation
CO 4	Analyze new genetic approaches to achieve a definite ideotype of Rabi crop.
CO5	Evaluate about major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties
CO6	Prepare Layout of field experiments seed production plots

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	1	1	1	-	-			-	-
CO2	1	1	2	2	-	-	-	-	1	3	1	-
CO3	2	1	2	3	3	1	-	-	2	2	2	1
CO4	2	1	2	3	3	-	-	-	2	2	2	2
CO5	-	-	-	-	-	-	-	1	1	2	2	
CO6	-	-	-	-	-	-	2	-	-	-	-	1
Average	**2**	**1.25**	**2.25**	**2.25**	**2.3**	**1**	2	1	**1.65**	**2.25**	**1.7**	**1.3**

Course code : BSAC-607				
Course Name : Practical Crop Production–II(*Rabi* crops)				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	0	**-**	**2**	**2**

Course Objectives: The objectives of this course are

1. To expose the students on hands on training in cultivation of crops from land preparation up to harvest including economics of cultivation
2. To explain profitable based farming system can be adopted with the help of course content

Couse Contents

Practical

1. Cropplanning, raising field crops in multiple cropping systems:Field preparation, seed, treatment, nurseryraising, sowing, nutrient, waterand weed management and management of insect-pests disease sofcrops, harvesting, threshing, drying winnowing, storage and marketing of produce.
2. The emphasis wills begiven to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies.
3. Preparation of balance sheet includingcostof cultivation, net returns per studentas well as per team of 8-10 students.

Suggested Reading:

1. Ahlawat, I.P.S., Om Prakash andG.S.Saini.1998.Scientific Crop Production in India. Rama Publishing House, Meerut.
2. Chidda Singh.1997.Modern techniques of raising field crops.Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
3. ICAR 2006. Hand book of Agriculture. Indian Council of Agriculture, New Delhi.Crop Production Guide.2005.Directorate of Agriculture, Chennai and Tamil Nadu Agricultural University, Coimbatore.
4. Rajendra Prasad.2004.Text Book on Field Crop Production, Indian Council of Agrl. Research, NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Acquainted with the knowledge of profitable crop production technology.
CO 2	Understand the management of insect pests and diseases of crops and helps to adopt diversified farming system according to available farming situation.
CO 3	Illustrate about preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students
CO 4	Explain profitable based farming system can we adopted with the help of course content
CO5	Judge growth stages of crops with their physiological maturity
CO6	Prepare Layout of field experiments of rabi crops .

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	3	2	1	1	-	-	-	-	-	1
CO2	1	2	2	3	1	1	1	-	-	-		-
CO3	1	2	2	3	-	1	-	1	1	2	1	1

CO4	1	2	1	2	-	2	2	-	1	2	1	-
CO5	-	-	-	-	-	-	-	1	1	3	2	-
CO6	-	-	-	-	-	-	-	-	1	3	1	1
Average	**1.25**	**2**	**2**	**2.5**	**1**	**1.25**	**1.5**	**1**	**1**	**2.5**	**1.25**	**1**

Course code	**: BSAC-608**				
Course Name	**: Principles of Organic Farming**				
Semester /Year	**: VI/III**				
	L	**T**	**P**	**Credit hrs**	
	1	**-**	**1**	**2**	

Course Objectives: The objectives of this course are

1. To learn about principles and practices of organic farming
2. To create the socio-economic status of farmers and environmental quality due to adoption of organic production practices

Course Contents

Theory

Unit 1: Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture.

Unit 2: Organic ecosystem and their concepts; Organic nutrient resources and itsfortification; Restrictions to nutrient use in organic farming; Choice of crops and varietiesin organic farming

Unit 3: Fundamentals of insect, pest, disease and weed management underorganic mode of production; Operational structure of NPOP; Certification process and standards of organic farming

Unit 4: Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

1. Visit of organic farms to study the various components and their utilization
2. Preparation of enrich compost,vermin compost,bio-fertilizers/bio-inoculants and their quality analysis
3. Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management
4. Cost of organic production system
5. Post harvest management
6. Qualityaspect, grading, packagingand handling.

Suggested Reading:

1. Nicholas lampkin 1994. Organic farming. Farming press London.Arun kumar Sharma 2008. A Hand book of organic farming.Agrobios Publishers.
2. Dahama, A.K.2009. Organic farming for sustainable agriculture, Agrobros publishers.Veeresh, G.K. 2010. Organic farming, Cambridge university press.
3. SP.Palaniappan and K Annadurai.2008.Organic Farming: Theory and Practice.2008. Scientific Publishers.
4. Stockdale, E *et al.,* 2000. Agronomic and environmental implications of organic farming systems. Advances in Agronomy, 70, 261-327

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Remember principles and practices of organic farming
CO 2	Explain efficient nutrient use through various source of organic manures, insect, pest, disease and weed management under organic mode of production.
CO 3	Analyze the harmony within an agro-ecosystem by organic mode of farming. Familiarize with organic certification process and standards of organic products set by various agencies.

CO 4	Create the socio-economic status of farmers and environmental quality due to adoption of organic production practices.
CO5	Evaluate organic production system
CO6	Preparation of enrich compost,vermicompost,bio-fertilizers/bio-inoculants and their quality analysis

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2	2	3	2			-	-	-	-
CO2	3	2	1	-	2	-	1	2	3	2	2	-
CO3	3	3	2	1	2	1	2	2	3	2	3	2
CO4	3	3	2	2	3	2	3	2	1	2	3	3
CO5	-	-	-	-	-	-	-	-	-	1	2	3
CO6	-	-	-	-	-	-	3	3	2	-		-
Average	**2.7**	**2.25**	**1.7**	**1.6**	**2.5**	**1.7**	**2.5**	**2.25**	**2.25**	**1.5**	**2.5**	**2**

Course code : BSAC-609				
Course Name : Farm Management, Production & ResourceEconomics				
Semester /Year : VI/III				
L	**T**	**P**	**Credit hrs**	
1	**-**	**1**	**2**	

Course Objectives: The objectives of this course are

1. To learn the concept farm management, objectives and relationship with other sciences.
2. To know the concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies

Course Contents

Theory

Unit 1: Meaning and concept of farm management, objectives and relationship with othersciences.Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.

Unit 2: Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm, factor-product, factor-factor and product-product relationship, lawofequi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their inter relationship, importance of cost inmanaging farm business and estimation of gross farm income, net farm income, familylabor income and farm business income.

Unit 3: Farm business analysis:meaning and conceptof farm income and profitability, technical and economic efficiency measures in crop and lives tock enterprises.Importance of farm records and accounts in managing afarm,various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning gandbudgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises. Concept of riskand uncertainty occursin agriculture production, nature andsources of risksand its management strategies**,** Crop/livestock/machinery insurance–weather based crop insurance, features, determinants of compensation.

Unit 4: Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pastureand forest resources etc.

Practical

1. Preparation of farm layout.
2. Determination of cost of fencing of a farm.
3. Computation ofdepreciation cost of farm assets.
4. Application of equi-marginal returns/opportunity costprinciple in allocation of farm resources.
5. Determination of most profitable level of inputsuse in a farm production process.
6. Determination of least cost combination of inputs.
7. Selection of most profitable enterprise combination.
8. Application of cos tprinciples including CACP concepts in the estimation of cost of crop and live stock enterprises.
9. Preparation of farm plan and budget, farm records and accounts and profit & lossaccounts.
10. Collection and analysis of data onvarious resources in India.

Suggested Reading

1. Dewett, K.K. 2002. Modern Economic Theory, Syamlal Charitable Trust, New Delhi.
2. Samuelson, P. 2004. Economics, (18/e), Tata Mcgraw-Hill, New Delhi
3. Koutsoyiannis,A. 1983.Modern Microeconomics, The Macmillan Press Ltd., Hongkong

4. Varian, H. R. 1987. Intermediate Micro economics, WW Norton & Company, New Delhi.
5. Seth, M.L. 2000. Principles of Economics, Lakshmi Narain Agarwal Co., Agra. New Delhi
6. Johl SS & Kapoor TR. 2012. Fundamentals of Farm Business Management. Kalyani Publ.India
7. Panda SC. 2007. Farm Management & Agricultural Marketing. Kalyani Publ.
8. Ludhiana India

Course outcomes (COs):

Uponsuccessfulcompletionofthecourseastudentwillbeableto

CO1	Know the concept farm management, objectives and relationship with other sciences.
CO2	Identify use of production, function in decision-making on a farm, factor-product, factor-factor and product relationship
CO3	Discuss Farm business analysis: meaning and concept of farm income, profitability and importance of farm planning and budgeting
CO4	Revaluate concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies
CO5	Determine least cost combination of inputs
CO6	Preparation of farm layout.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	-	-	-	2	-	--	-	-
CO2	2	2	-	-	1	-	2	1	2	3	1	2
CO3	1	--	3	1	--	2	-	1	2	-	3	-
CO4	2	1	2	-	1	2	-	-	3	-	1	1
CO5	-	-	-	-	--	-	-	-	3	1	2	
CO6	-	-	-	-	-	-	-	-	-	-	-	2
Average	**1.7**	**2**	**2.3**	**1.5**	**1**	**2**	**2**	**1.3**	**2.5**	**2**	**1.7**	**1.6**

Course code : BSAC-610				
Course Name : Principles of Food Science and Nutrition				
Semester /Year : VI /III				
L	**T**	**P**	**Credit hrs**	
2	**-**	**0**	**2**	

Course Objectives: The objectives of this course are

1. To provide knowledge about food science, food composition and chemistry of biomolecules.
2. To know new trends in food science and nutrition in maintaining health.

Course Contents

Theory

Unit 1: Concepts of Food Science (definitions, measurements, density, phasechange, pH, osmosis, surface tension, colloidal systems etc.)

Unit2: Food composition and chemistry (water, carbohydrates, proteins, fats ,vitamins, minerals, flavours, colours, miscellaneousbioactives, important reactions); Food microbiology (bacteria, yeast, moulds, spoilage offresh & processed foods, Production of fermented foods)

Unit 3: Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, dryingetc.); Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders

Unit4: Energy metabolism (carbohydrate, fat, proteins); Balanced/modifieddiets, Menuplanning, New trends in food science and nutrition

Suggested Reading:

1. Dr.Swaminathan, M.1985.Foodand NutritionVol.I& II.BAPPCO,Bangalore.
2. Dr. Swaminathan, M. 1985. Essential of Food and Nutrition Vol. II. BAPPCO, Bangalore.
3. Manoranjan, K. and Sangita, S. 1996. Food Preservation and Processing. Kalyani Publishers 978-81-272-4262-6.
4. Srilakshmi. 2010. Food Science. New age International 978-81-224-2724-0.Srilakshmi. 2005.Dietetics. New age International 978-81-224-1611-4.
5. Shankunthala, M. 1972. Foods-Facts, Principles & Procedure. The Eastern Press, Bengaluru.
6. Devendra, K. B. and Priyanka, T. 2006. An Introduction to Food Science and technology and Quality Management. Kalyani Publishers 81-272-2521-5.
7. Monoranjam, K. and Sangita, S. 2008. Food Preservation and Processing. Kalyani Publishers978-81-272-4262-6.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Define food science, food composition and chemistry water, carbohydrates, proteins, fats, vitamins, minerals, flavors, colors, miscellaneous bioactive, important reactions.
CO 2	Classify food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods)
CO 3	Discuss food and nutrition, malnutrition (over and under nutrition), nutritional disorders
CO 4	Compile new trends in food science and nutrition in maintaining health.

CO5	Evaluate New trends in food scienceand nutrition
CO6	Plan balance diets

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	3	3	-	1	-	-	2	-	-	-
CO2	2	2	3	1	-	2	1	2	-	1	2	1
CO3	3	3	2	2	1	2	-	3	1	2	2	1
CO4	2	1	-	2	2	-	1	-	2	-	2	2
CO5	-	-	-	-	-	-	1	-	-	-	-	-
CO6	-	-	-	-	-	-	-	-	-	1	2	2
Average	**2.25**	**1.75**	**2.7**	**2**	**1.5**	**1.6**	**1**	**2.5**	**1.6**	**1.3**	**2**	**1.5**

Course code	**: BSAW-701**			
Course Name	**: Rural Agricultural Work Experience and Agro-industrial Attachment(RAWE&AIA)**			
Semester /Year	**: VII/III**			
	L	**T**	**P**	**Credit hrs**
	0	**-**	**20**	**20**

Course Objectives: The objectives of this course are

1. To provide the knowledge of various agricultural intervention during village attachment.

2. To teach about acquaintancewith agro industryand its staff and preparation, presentation and evaluation of project report

Course Contents

SN.	**Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE& AIA)**		
	Activities	**No.ofweeks**	**TotalCredits**
1	General orientation & On campus training by different faculties	1	20
2	Village attachment	4	
3	Unit attachment in University/ College/KVK/ Research StationAttachment	1	
4	Plant clinic	4	
5	Agro-Industrial Attachment	3	
6	Field visit	5	
7	Project Report Preparation, Presentation and Evaluation	2	
Total weeks for RAWE&AIA		**20**	

RAWE Component-I
VillageAttachment Training Programme

S. No.	Activity	Duration
1	Orientation and Survey of Village	2 week
2	Agronomical Interventions	
3	Plant Protection Interventions	
4	Soil Improvement Interventions (Soilsamplingandtesting)	
5	Fruit and Vegetable production interventions	2 week
6	Food Processing and Storage interventions	
7	Animal Production Interventions	
8	Extension and Transfer of Technology activities	

RAWE Component –II Agro Industrial Attachment

• Students shall be placed in Agro and Cottage industries and Commodities

Boards for 03weeks.

- Industries include Seed/Sapling production, Pesticides-insecticides, Postharvest-processing-valueaddition, Agri-finance institutions, etc.

Activities and Tasks duringAgro-IndustrialAttachmentProgramme

- Acquaintance with industry and staff
- Study of structure, functioning, objectiveand mandates ofthe industry
- Study of various processing Units and hands-ontrainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of theindustry promoting environment
- Learning business network including out lets of the industry
- Skill development inallcrucialt asks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisalan dranking of students

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Orientation and campus training of students
CO 2	Understand the various agricultural interventions during village attachment.
CO 3	Acquaintance with agro industry and its staff
CO 4	Analyze Contribution of the industry promoting environment
CO5	Evaluate Learning business network including outlets of the industry
CO6	Preparation, presentation and evaluation of project report

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	-	-	-	-	-
CO2	2	2	2	2	3	2	2	2	2	3	2	2
CO3	2	2	2	2	3	2	2	2	2	2	3	2
CO4	2	2	2	3	2	2	2	2	2	2	2	3
CO5	-	-	-	-	2	2	2	2	-	-	2	-
CO6	-	-	-	-	-	-	-	-	2	2	-	2
Average	**2**	**2**	**2**	**2.25**	**2.5**	**2**	**2**	**2**	**2**	**2.25**	**2.25**	**2.25**

Course code	**: BSAL-801**			
Course Name	**: Experiential Learning Programme(ELP)**			
Semester /Year	**: VIII/IV**			
	L	**T**	**P**	**Credit hrs**
	0	**-**	**20**	**20**

Course Objectives: The objectives of this course are

1. To provide knowledge of implementation of experiential learning during village and industrial attachment.
2. To demonstrate the modules in agricultural fields and preparation, presentation and

evaluation of project report

Course Contents

Modules for Experiential Learning Programme (ELP) for Skill Development andEntrepreneurship:A student has to register 20 credits opting for two modules of (0+10)credits each (total 20 credits) from the package of ELP modules in the VIII semester fromthelist providedbelow:

Sr.	Title of the ELP module	Credits
1.	Production Technology for Bio agents and Bio fertilizer	0+10
2.	Seed Production and Technology	0+10
3.	Mushroom Cultivation Technology	0+10
4.	Soil, Plant,Waterand SeedTesting	0+10
5.	Commercial Beekeeping	0+10
6.	Poultry Production Technology	0+10
7.	Commercial Horticulture	0+10
8.	Floriculture and Landscaping	0+10
9.	Food Processing	0+10
10.	Agriculture Waste Management	0+10
11.	Organic Production Technology	0+10
12.	Commercial Sericulture	0+10

Course outcomes (COs):

Upon successful completion of the courseastudent will be able to

CO 1	Orientation and campus training of students
CO 2	Implementation of experiential learning during village and industrial attachment.
CO 3	Execute and demonstrate the modules in agricultural fields
CO 4	Analyze the data of agricultural experiments
CO5	develop entrepreurship according to agroclimatic conditions
CO6	Preparation, presentation and evaluation of project report

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	2	-	-	-	-	-
CO2	2	2	2	2	3	2	2	2	2		2	2
CO3	2	2	2	2	3	2	2	2	2	2	3	2
CO4	2	2	2	3	2	2	2	2	2	2	2	3

CO5	-	-	-	-	-	-	-	-	-	2	2	2
CO6	-	-	-	-	-	-	-	2	2	3	-	-
Average	2	2	2	2.25	2.5	2	2	2	2	2.25	2.25	2.25

Course code : BSAE-410				
Course Name : Agribusiness Management				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives:The objectives of this course are

1. To understand & experience the importance of Agribusiness and types and importance of agro-based industries, different marketing systems.
2. To learn different marketing systems, different pricing systems and procedure for setting up a agro based industry

Course Contents

Theory

Unit 1: Transformation of agriculture into agribusiness, various stake holders and components of agri business systems.Importance of agri business in the Indian economy and New Agricultural Policy.Distinctive features of Agribusiness Management: Importance and need sofagro-based industries, Classification of industries and types of agrobased industries.Institutional arrangement, procedures to set up agrobased industries.Constraints in establishing agro-based industries.

Unit 2: Agri-valuechain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis.Management functions: Roles & activities, Organization culture.Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.

Unit 3: Components of a business plan, Steps inplanning and implementation.Organization staffing, directing and motivation. Ordering, leading, supervision, communications,

control.Capital Management and Financial management of Agribusiness.Financial statements and their importance.Marketing Management:S egmentation, targeting & positioning.Marketing mix and marketing strategies.

Unit 4: 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 and evaluation techniques.

Practical

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

Suggested Reading:

1. Prasad, L.M, 2005, 'Principles and Practices of Management', Sultan Chand and Sons Educational Publishers, New Delhi.
2. Richard, B Chase, Nicholas J., Acquilanoand F. Robert Jacobs, 2007,` Production and Operations Management - Manufacturing and service, Tata Mc Graw Hill Publishing Company Limited, New Delhi.
3. Chandra Prasanna. 2000. Financial Management - Theory and Practice. Tata Mc Graw Hill Publishing Company Ltd., New Delhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Define agribusiness management in the Indian economy, Management structure and definitions, capital management and financial management
CO 2	Understand classification, types and importance of agro-based industries, different marketing systems.
CO 3	Analyse different marketing systems, different pricing systems and procedure for setting up a agro based industry
CO 4	Explain method of making of balance sheets, profit and loss statements
CO5	Determine agri-input markets
CO6	Preparations of projects and Feasibility reports for agribusiness entrepreneur

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	-		2	1	-	-	-	-
CO2	2	2	2	2	-	2	2	-	2	1	-	-

CO3	2	-	3	2	2	2	3	2	2	2	3	3
CO4	1	2	1	2	-	2	2	2	1	3	2	3
	-	-	-	-	-	-	-	-	-	-	2	-
	-	-	-	-	--	-	-	-	-	2	-	3
Average	**1.75**	**2**	**2**	**2**	**2**	**2**	**2.25**	**1.66**	**1.66**	**2**	**2.33**	**3**

Course code : BSAE-411				
Course Name : Agrochemicals				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To know about various agrochemicals and its usage in agricultural production
2. To know about classification, importance of herbicides, fungicides, insecticides

Course Contents

Theory

Unit1:An introduction to agro chemicals, their type and role in agriculture, effecton

environment, soil, human and animal health, merits and demerit softheir uses in agriculture,management of agro chemicals for sustain able agriculture.

Herbicides-Major classes, properties and important her bicides.Fate of her bicides.

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Modeofaction-Bord eauxmixture and copperoxy chloride.

Organic fungicides- Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineband maneb.

Unit2: Systemic fungicides Benomyl, carboxin, oxycarboxin ,Metalaxyl, Carbendazim, characteristics and use. Introduction and classification of insecticides: inorganic and organic insecticides Organ ochlorine, Organ ophosphates, Carbamates, Synthetic pyrethroids Neonicotinoids, Biorationals, Insecticide Act an drules, Insecticides banned, with drawn and restricted use, Fateofin secticidesins oil & plant.IGRs Biopesticides, Reduce drisk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

Unit3: Fertilizers and their importance.Nitrogenous fertilizers:Feed stock sand Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea.Slowrelease N-fertilizers.Phosphatic fertilizers:feed stock and manufacturing of single super phosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassiumnitrate

Unit4: Mixed and complex fertilizers:Sources and compatibility–preparation ofajor,secondary and micro nutrient mixtures.Complex fertilizers:Manufacturing of ammoniumphosphates, nitrophosphates and NPK complexes.Fertilizer controlorder.Fertilizerlogistics and marketing.Plantbio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

1. Sampling of fertilizers and pesticides.
2. Pesticides application technology to study about various pesticides appliances.
3. Quicktests for identification of common fertilizers.
4. Identification of anion and cation in fertilizer.
5. Calculation of doses of insecticides to beused.
6. To study and identify various formulations of insecticide available k in market.
7. Estimation of nitrogen in Urea.
8. Estimation of water soluble P_2O_5 and citrate soluble P_2O_5in single super phosphate.
9. Estimation of potassium in Muraite of Potash/ Sulphate ofPotash by flame photometer.
10. Determination of copper content in copper oxychloride.
11. Determinationofsulphurcontentinsulphurfungicide.
12. Determination of thiram, ziramcontent.

Suggested Reading:

1. Handa.S.K.2004.PrinciplesofPesticideChemistry.Agrobios
2. Cremlyn, R.J. 1991. Agrochemicals – Preparation and mode of action. John Wiley and sons, Newyork.
3. George, W.Ware.1986. Fundamentals of Pesticides – A Self Instruction Guide – Thomas Publications, PO Box.9335, Freno, California 93791.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Define agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health and management of agro chemicals for sustainable agriculture
CO 2	Illustrate the major classes, properties and important herbicides. Fate of herbicides.
CO 3	Acquaint with organic fungicides and systemic fungicides with their mode of action
CO 4	Summarize fertilizers and their importance. Fertilizer control order and fertilizer logistics and marketing.
CO5	Sampling of fertilizers and pesticides.
CO6	Calculate of doses of insecticides to be used

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	2	-	--	-	-	-	-
CO2	2	2	2	2	2	2	2	2	2	2	-	-
CO3	2	3	2	2	2	2	2	2	3	3	3	-
CO4	-	-	2	2	2	2	2	3	2	2	2	3
CO5	-	-	-	-	-	-	-	2	2	-	-	-
CO6	-	-	-	-	-	-	2	-	-	2	-	3
Average	**2**	**2.3**	**2**	**2**	**2**	**2**	**2**	**2.25**	**2.25**	**2.25**	**2.5**	**3**

Course code : BSAE-412				
Course Name : Commercial Plant Breeding				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	1	**-**	**1**	**2**

Course Objectives: The objectives of this course are

1. To learn basic knowledge about the hybrid seed production and plant Breeding techniques
2. To know about intellectual property rights in commercial plant breeding

Course Contents

Theory

Unit1: 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.

Unit2:Genetic purity test of commercial hybrids. Advances inhybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cottonpigeon pea, Brassica etc.Quality seed production of vegetable crops under open and protected environment.

Unit3: Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issuesin commercial plant breeding: DUS testing and registration of varieties under PPV & FRAct.

Unit4: Variety testing, release and notification systems in India.Principles and techniques of seed production, typesof seeds, quality testing in self andcross pollinated Unit crops.

Practical

1. Floral biology inself and crosspollinated species, selfing and crossing techniques.
2. Techniques of seed production in self and cross pollinated cropsusing A/B/Rand twoline system.
3. Learning techniques in hybrid seed production using male-sterility in field crops.
4. Understanding the difficulties in hybrid seed production, Tools and techniques foroptimizing hybrid seed production.
5. Concept of rouging in seed production plot.
6. Conceptof line its multiplication and purification in hybrid seed production.
7. Role of pollinators' inhybrid seed production.
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 purity testing and detection of spurious seed.
10. Seeddrying and storage structure in quality seed management.
11. Screening techniques duringseed processing viz., grading and packaging.
12. Visit to public private seed production andprocessingplants.

Suggested Reading:

1. Singh, B.D. 2005. Plant breeding – Principles and methods. Kalyani Publishers, NewDelhi.
2. Phundhan Singh.2001.Essentials of plant breeding, Kalyani publishers, New Delhi.

Course outcomes (Cos):

Upon successful completion of the course a student will be able to

CO 1	Remember the aims and objectives of commercial plant breeding
CO 2	Summarizes principles and techniques of hybrid seed production and registration
CO 3	Apply Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of biotechnological tools.
CO 4	Plan intellectual property rights in commercial plant breeding
CO5	Quality seed production of vegetable crops under open andprotectedenvironment.
CO6	Sampling and analytical procedures for purity testing

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2		2	2	-	-	-			-	-
CO2	2	2	2	2	2	2	2	2	2	2	-	-
CO3	1	2	2	2	2	2	2	2	2	2	2	3
CO4	2	2	2	2	2	2	1	2	2	2	2	2
CO5	-	-	-	-	-	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	--	-	2	2	-	-
Average	**1.75**	**2**	**2**	**2**	**2**	**2**	**1.7**	**2**	**2**	**2**	**2**	**2.5**

Course code : BSAE-413				
Course Name : Landscaping				
Semester /Year : IV/II				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To learn about Importance, Principles of Landscape Horticulture and Garden components
2. To learn about the Lawn making and Landscape Designs of urban and rural areas.

Course Contents

Theory

Unit1: Importance and scope of landscaping. Principles of landscaping, gardenstyles and types,terrace gardening, vertical gardening, garden components, adornments, lawnmaking, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

Unit2 Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture.Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants:palms,ferns,grasses and cacti succulents.

Unit3: Potplants: selection, arrangement, management.Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, riverbanks, hospitals, play grounds, airports, industries, institutions.

Unit 4: Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

1. Identification of trees, shrubs, annuals, potplants;
2. Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting,
3. Identification of tools and implements used in landscape design, training and pruning of plants for special effects,
4. Lawn establishment and maintenance, layout of formal gardens, informal gardens,special type of gardens(sunkengarden, terracegarden, rockgarden) and designing of conservatory and lathehouse.
5. Useof computer software, visit to important gardens/parks/institutes.

Suggested Books:

1. Nambisan, K.M.P.1992.Design andelementsoflandscapegardening. Oxfordand IBHPublications, New Delhi.
2. Pal,B.P.1960.Beautiful climbers of India.ICAR, NewDelhi
3. Randhava, G.S. 1973. Ornamental Horticulture in India. Today and Tomarrow's Printers and Publishers. Karol Bagh,New Delhi
4. Randhava, G.S and Mukhopadhyay, A. 1986. Floriculture in India. Allied PublishersPvt.Ltd., New Delhi

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Memorize landscaping terrace gardening, vertical gardening, garden components, adornments

CO 2	Understand various planting practices of shrubs, herbaceous perennials and trees
CO 3	Differentiate climber and creepers: importance, selection, propagation, planting.
CO 4	Design Bio-aesthetic planning and different landscaping of urban and rural areas.
CO5	selection, propagation, planting schemes, architecture of ornamentals
CO6	Lawn establishment and maintenance, layout of formal gardens, informal gardens,

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	2	-	-	-	-	-
CO2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	2	2	2	2	2	2	2	2	2	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	-	-	-	-	-	-	-	2	2	2	-	-
CO6	-	-	-	-	-	-	-	-	-	-	2	2
Average	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Course code : BSAE-510				
Course Name : Food Safety and Standards				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To Understand the importance of food safety in food service institutions •
2. To know the tools used for assessment of food safety, food laws and standards ensuring food quality

Course Contents

Theory

Unit1: Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazardsand Risks, Types of hazards - Biological, Chemical, Physical hazards. Management ofhazards-Need.Control of parameters.

Unit2: Temperaturecontrol.Food storage.Product design.Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. 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.

Unit3:TQM - concept and need for quality, components of TQM, Kaizen.Risk Analysis.Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene.Foodlaws and Standards-Indian Food Regulatory Regime, FSSA. Global Scenario CAC.Other laws and standards related to food. Recent concerns- New and Emerging Pathogens.

Unit4: Packaging, Product labeling and Nutritional labeling.Genetically modified foods\transgenics.Organic foods.New erapproaches to food safety. Recent Out breaks. Indian and International Standards for food products.

Practical

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

Suggested Books:

1. M.L.Bhargava 2006.Law of Food Safety and Standards Act, 2006 Along with Rules,Regulations & Allied Laws
2. TheFood Safetyand StandardsAct, 2006 (Alongwith Rules&Regulations). 2017. Commercial Law Publisher (Author)

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO 1	Recognizes the food safety, hazards and risks, types of hazards - biological, chemical,

	physical hazards
CO 2	Demonstrate food storage, product design. hygiene and sanitation
CO 3	Describe Food Safety Measures and Food Safety Management Tools
CO 4	Examine food laws and standards Indian and International food regulatory regime
CO5	Assessment of surface sanitation by swab/rinse method.
CO6	Preparation of plans for Implementation of FSMS-HACCP, ISO: 22000.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	2	-	-	-	-	
CO2	2	2	3	2	2	2	2	2	3	2		
CO3	2	2	2	2	2	2	2	2	2	2	2	3
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	-	-	-	-	-	-	-	-	2	2	2	2
CO6	-	-	-	-	-	-	-	2			2	2
Average	**2**	**2**	**2.25**	**2**	**2**	**2**	**2**	**2**	**2.25**	**2**	**2**	**2.25**

Course code : BSAE-511				
Course Name : Biopesticides & Biofertilizers				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To know about the importance of biopesticides and biofertilizers
2. To familiarize students with the microbes used as bio fertilizers for various crop plants and their advantages in maintaining soil health.

Course Contents

Theory

Unit1: 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.

Unit 2: Mass production technology ofbio-pesticides.Virulence, pathogenicity and symptoms of entomopathogenic pathogensand nematodes.Methods of application of biopesticides.Methods of quality control and Techniques of biopesticides.Impediments and limitation in production and use of biopesticide.

Unit 3: Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers-*Azospirillum,Azotobacter,Bacillus,Pseudomonas,Rhizobium*and *Frankia*; Cynobacterial biofertilizers- *Anabaena, Nostoc*, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza.Nitrogen fixation-Free living and symbioticnitrogenfixation.Mechanism of phosphates olubilization and phosphate mobilization, Ksolubilization.

Unit 4: Production technology: Strainselection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers.Application technology for seeds, seedlings, tubers, setsetc.Biofertilizers-Storage, shelf life, quality control and marketing.Factors influencing the efficacy of biofertilizers.

Practical

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 near by area.
4. Field visit to explore naturally infected cadavers.
5. Identification of entomopath ogenic entities in field condition.
6. Quality control ofbiopesticides.
7. Isolation and purification of *Azospirillum , Azotobacter,Rhizobium*, P-solubilizers andcyanobacteria.
8. Massmultiplication and inoculums production of biofertilizers.
9. Isolationof AM fungi -Wet sieving method and sucrose gradient method.
10. Mass production of AMinoculants.

Suggested Books:

1. Burges, H. D. 1981 .Microbial control of pests and plant diseases, Academic Press, NewYork,949
2. Deshmukh, A.M.; Khobragade, R.M. and Dixit . 2007. Handbook of

Biofertilizers andBiopesticides /edited, Oxford Book Company, xviii, 308 p., tables, figs., ISBN81-89473-15-0.

3. Trivedi, P, C .2008. Biofertilizers. Pointer Publications, New Delhi. P.374. (ISBN:9788171325429)

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Acquaint with the importance of bio-pesticides in present scenario
CO 2	Educate concept and classification of bio-concepts.
CO 3	Aware about bio fertilizers, its status and scope. characteristic features of various bacterial bio fertilizers
CO 4	Explain role of bio-fertilizers in quality parameters of various agricultural products and key role of bio-fertilizer in maintain soil health.
CO5	Evaluate Quality control of biopesticides.
CO6	Mass multiplication and inoculums production of biofertilizers.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	2	2	2	-	-	-	-	-
CO2	2	2	2	2	2	2	3	3	2	2	2	2
CO3	2	2	3	2	2	2	2	2	2	3	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	-	-	-	-	-	-	-	2	2	-	-	-
CO6	-	-	-	-	-	-	-			2	1	1
Average	**2**	**2**	**2.25**	**2**	**2**	**2**	**2.25**	**2.25**	**2**	**2.25**	**1.75**	**1.75**

Course code : BSAE-512				
Course Name : Protected Cultivation				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are;

1. To understand the principles and theoretical aspects of protected cultivation.

2. Developing skills in erection of protected structures, cultivation and management of horticultural crops.

Course Contents

Theory

Unit1: Protected cultivation- importance and scope, Status of protected cultivation in India andWorld types of protected structure based on site and climate. Cladding material involveding greenhouse/poly house.

Unit2: Green house design,environment control,artificial lights,Automation.Soil preparation and management, Substrate management. Types of benchesand containers. Irrigation and fertigation management.

Unit3: Propagation and production of quality planting material of horticultural crops.Greenhouse cultivation of mportant horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium tulip, tomato, bellpepper, cucumber, strawberry, potplants, etc.

Unit4: Cultivation of economically important medicinal and aromatic plants.Off-season production of flowersandvegetables.Insect pest and diseasemanagement.

Practical

1. Raising of seedlings and saplings under protected conditions, use of protrays in qualityplanting material production,
2. Bed preparation and planting of crop for production, Intercultural operations,
3. Soil EC and pH measurement,
4. Regulation of irrigation and fertilizersthroughdrip, fogging admisting.

Books

1. Nelson, P.V.1991. Green house operation and management, Bali Publication.

2. Prasad, Sand Kumar, U. 2003.Green house technology for controlled environment. Narosa Publication House

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Define Protected cultivation- importance and scope, Status of protected cultivation in India and World.
CO 2	Demonstrate Cladding material involved in greenhouse/ poly house. Greenhouse design, environment control, Portrays lights, Automation.
CO 3	Explain Soil preparation and the irrigation and fertigation management in polyhouse.

CO 4	Analyze the concept of cultivation of economically important medicinal and aromatic plants, Insect pest and disease management
CO5	Raising of seedlings and saplings under protected conditions
CO6	Bed preparation and planting of crop for production, Intercultural operations,

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	2	-	-		2	-	-
CO2	3	3	3	2	2	2	2	-	-	2	2	2
CO3	2	2	2	2	2	2	2	2	2	1	2	2
CO4	2	2	2	2	2	2	2	2	2	2	2	2
CO5	-	-	-	-	-	-	-	2	2	-	-	-
CO6	-	-	-	-	-	-	-	-	2	-	2	2
Average	**2.5**	**2.25**	**2.25**	**2**	**2**	**2**	**2**	**2**	**2**	**1.75**	**2**	**2**

Course code : BSAE-513				
Course Name : Micropropagation Technologies				
Semester /Year : V/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To provide students with hands on training on various techniques of plant tissue culture
2. To provide the knowledge Analyze production of secondary metabolites, Somaclonal variation, Cryopreservation

Course Contents

Theory

Unit1: Introduction, History, Advantages and limitations; Types of cultures(seed, embryo, organ, callus, cell),

Unit2: Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, budculture), Organ ogenesis (callus and director ganformation), Somatic embryogenesis, cell suspension cultures,

Unit 3: Production of secondary metabolites

Unit 4: Somaclonalvariation, Cryopreservation

Practical

1. Identification and use of equipment in tissue culture Laboratory,
2. Nutrition media composition,
3. Sterilization techniques for media, containers and small instruments, sterilization techniques for explants
4. Preparation of stocks and working solution, Preparation of working medium.
5. Culturing of explants: Seeds, shoot tip and single node,Callus induction, Induction of somaticembryosregenerationofwholeplantsfromdifferentexplants, Hardeningprocedures.

Suggested Books:

1. Razdan, M. K. 2003. Introduction to Plant Tissue Culture. Enfield: Science PublishersInc.USA
2. Dixon,R.A.2003.PlantCellCulture–APracticalApproach,IRLPress.Oxford.London
3. Gamborg, O. L and Phillips, G. C. 2004. Plant Cell Tissue and Organ Culture –Fundamental methods. Narosa Publishing House, New Delhi.
4. George, E. F., Hall, M.A and DeKlerk, G. J. 2008.Plant Propagation by Tissue Culture. Volume1.The Background.3rd edition. Springer. Netherlands
5. Trigano, R. N and Gray, D. J. 2000. Plant Tissue Culture – Concepts and Laboratory exercises.Second edition. CRC press.London

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Aware about types of cultures (seed, embryo, organ, callus, cell)

CO 2	Illustrate stages of micro propagation, axillary bud proliferation
CO 3	Discuss the concept of organogenesis (callus and direct organ formation), somatic embryogenesis, cell suspension cultures
CO 4	Analyze production of secondary metabolites, Somaclonal variation, Cryopreservation and its application in agriculture
CO5	Examine Production of secondary metabolites
CO6	Preparation of working medium.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	-	-	-	1`	-	-
CO2	2	2	1	1	2	1	2	2	1	1	-	-
CO3	2	2	2	2	3	2	2	3	1	2	-	1
CO4	2	2	2	2	3	2	2	3	1	2	1	2
CO5	-	-	-	-	-	-	2	2	-	-	2	-
CO6	-	-	-	-	-	-	-	-	1	-	-	1
Average	**2.25**	**2**	**1.5**	**1.75**	**2.5**	**1.5**	**2**	**2.5**	**1**	**1.5**	**1.5**	**1.3**

Course code : BSAE-611				
Course Name : Hi-tech.Horticulture				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To impart knowledge on the protected cultivation of vegetables, fruits and Flower crops.
2. To sensitize the students on hi-tech production technology of fruits, vegetables and flower crops.

Couse Contents

Theory

Unit 1: Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods,

Unit2: Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, highdensity orcharding, Components of precision farming:

Unit3: Remotesensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),

Unit4: Application of precision farming in horticultural crops (fruits,vegetables and ornamental crops); Mechanized harvesting of produce.

Practical

1. Types of poly houses and shade net houses,
2. Intercultural operations, tools and equipments identification and application,
3. Micro propagation, Nursery-protrays, micro-irrigation, EC,pHbased fertilizers cheduling, canopy management,
4. visit tohi-tech orchard/nursery.

Suggested Books:

1. Hartmann, H.T. and Kester, D.E.2010.Plant Propagation: Principlesand Practices.John Mason. 2004. Nursery Management.
2. Ray, P.K. 2012. Plant Nursery Management: How to Start and Operate a Plant Nursery.
3. Nelson, P.V.1991. Green house operation and management, Bali Publication.Chandra, SandSo,. V2000. Cultivating vegetables in green house.India horticulture 45:17-18
4. Prasad, Sand Kumar, U. 2003.Green house technology for controlled environment. Narosa Publication House

Course outcomes (COs):
Upon successful completion of the course a student will be able to

CO 1	Recall nursery management and mechanization; micro propagation of horticultural crops
CO 2	Demonstrate basic modern field preparation and planting methods, protected cultivation

CO 3	Acquire knowledge of Micro irrigation systems and its components
CO 4	Familiarize with different methods and components of precision farming: Remote sensing, Geographical Information System (GIS)
CO5	Differentiate Remote sensing,Geographical Information System (GIS), Differential Geo-positioning System (DGPS),Variable Rate applicator (VRA),
CO6	Apply precision farming in horticultural crops

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	2	2	1	1`	-	-
CO2	2	2	1	1	2	1	2	2	1	1	-	-
CO3	2	2	2	2	3	2	2	3	1	2	2	2
CO4	2	2	2	2	3	2	2	3	1	2	1	2
CO5	-	-	-	-	-	-	-	-	1	-	-	2
CO6	-	-	-	-	-	-	2	-	-	-	2	-
Average	**2.25**	**2**	**1.5**	**1.75**	**2.5**	**1.5**	**2**	**2.5**	**1**	**1.6**	**1.5**	**2**

Course code : BSAE-612				
Course Name : Weed Management				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To learn about Importance of Weed management and Herbicides in agriculture, human life & society
2. To learn about types, methods & techniques of Weed management.

Course Contents

Theory

Unit1: Introduction to weeds, characteristics of weeds their harmful and beneficial effects onecosystem.Classification, reproduction and dissemination of weeds.

Unit2: Her bicide classification, concept of adjuvant, surfactant, herbicide formulation and theiruse. Introduction to mode of action of herbicides and selectivity.Allelopathy and its application for weed management.

Unit3: Bio-herbicides and their application inagriculture.Concept of herbicide mixture and utility in agriculture.Herbicide compatibility withagro-chemicals and their application.

Unit 4: Integration of herbicides with non chemical methods of weed management.Herbicide Resistance and its management.

Practical

1. Techniques of weed preservation.
2. Weed identification and their losses study.
3. Biology of important weeds.
4. Study of herbicide formulations and mixture of herbicide.
5. Herbicide and agro-chemicals study.
6. Shift of weed flora study in long term experiments.
7. Study of methods of herbicide application, spraying equipments.
8. Calculations of herbicide doses and weedcontrol efficiency and weed index.

Suggested Reading:

1. Gupta, O. P. 1998. Modern Weed Management. Agro Botanica Bikaner, India.
2. Rao,V.S.1983.Principles of Weed Science.Oxford and IBH Publishing Co.New Delhi.
3. Jaganathan R., and R.Jayakumar. 2003. Weed Science Principles, Kalyani Publishers, NewDelhi.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Recognize the importance to control weeds in the crop field to minimize the chances of yield loss without endangering the natural resources for future generation.
CO 2	Acquainted about different approaches of weed management.
CO 3	. Apply weed control plans and methods in prominent crops
CO 4	Analyze extent of losses due to weeds
CO5	evaluate the negative and positive consequences of weeds in agriculture, human life & society and also seeking for efficient tools to manage these unwanted plants
CO6	Calculate of herbicide doses and weed control efficiency and weed index

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	2	2	-	-	-	-
CO2	2	2	1	1	2	1	2	2	1	-	-	-
CO3	2	2	2	2	3	2	2	3	1	2	2	2
CO4	2	2	2	2	3	2	2	3	1	2	1	2
CO5	-	-	-	-	-	-	-	-	1	2	-	-
CO6	-	-	-	-	-	-	-	-		-	2	2
Average	**2.25**	**2**	**1.5**	**1.75**	**2.5**	**1.5**	**2**	**2.5**	**1**	**2**	**1.6**	**2**

Course code : BSAE-613				
Course Name : System Simulation and Agro-advisory				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To learn about Importance and Agro advisory services.
2. To learn about types, methods, tools & techniques of weather forecasting.

Course Contents

Theory

Unit 1: System Approach for representing soil-plant-atmospheric continuum, system boundaries,Crop models, concepts & techniques, types of crop models, data requirements, relationaldiagrams.

Unit 2: Evaluation of crop responses to weather elements; Elementary crop growthmodels; calibration, validation, verification and sensitivity analysis.Potential and achievable crop production- concept and modelling techniques for their estimation.

Unit 3: Cropproduction in moisture and nutrients limited conditions; components of soil water and nutrients balance.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.

Unit4: Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

1. Preparation of crop weather calendars.
2. Preparation of agro-advisories based on weather forecastusing various approaches and synoptic charts.
3. Working with statistica land 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. Feed back from farmers about the agro advisory.

Suggested Reading:

Narsingh Deo.1978.System Simulation with Digital Computer Gordon2015.System Simulation.Pearson**.**

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO 1	Know the system approach for representing soil-plant-atmospheric continuum, system boundaries
CO 2	Understand crop models, concepts & techniques, types of crop models, data requirements, relational diagrams
CO 3	Analyze potential and achievable crop production- concept and modelling techniques for their estimation.
CO 4	Explain the weather forecasting, types, methods, tools & techniques
CO5	Use of crop simulation model for preparation of Agro-advisory
CO6	Prepare crop weather calendars.

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	2	2	1	1`	-	-
CO2	2	2	1	1	2	1	2	2	1	1	2	2
CO3	2	2	3	2	3	2	2	3	1	2	2	2
CO4	2	2	2	2	3	2	2	3	1	2	1	2
CO5	-	-	-	-	-	-	-	-	1	-	-	2
CO6	-	-	-	-	-	-	2	-	-	-	-	-
Average	**2.25**	**2**	**1.75**	**1.75**	**2.5**	**1.5**	**2**	**2.5**	**1**	**1.5**	**1.67**	**2**

Course code : BSAE-614				
Course Name : Agricultural Journalism				
Semester /Year : VI/III				
	L	**T**	**P**	**Credit hrs**
	2	**-**	**1**	**3**

Course Objectives: The objectives of this course are

1. To impart knowledge on Agricultural Journalism and Characteristics and functions of Newspaper and Magazines.
2. To gain knowledge on gathering Agricultural Journalism, writing stories and Editorial Mechanics.

Course Contents

Theory

Unit 1: 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.

Unit 2: 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.

Unit 3: The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story.Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research ands cientific materials, wire services, other agricultural news sources.

Unit4: Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, read ability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading,head line and title writing, proof reading, lay outing

Practical

1. Practice in interviewing. Covering agricultural events.
2. Abstracting stories from research and scientific materials and from wire services.
3. Writing different types of agricultural stories.
4. Selecting pictures and artwork for the agricultural story.
5. Practice in editing, copy reading, headline and title writing,proof reading, layouting.
6. Testing copy with are adability formula.
7. Visit to a publishing office.

Suggested Reading:

1. Rodney Fox.2014.Agricultural and Technical Journalism Hardcover.Green wood Press, London.
2. Aggarwal, V.2012. Handbook of Journalism and MassCommunication.

Course outcomes (COs):

Upon successful completion of the course a student will be able to

CO1	Define nature and scope of agricultural journalism.
CO 2	Understand newspapers and magazines as communication media.
CO 3	Develop knowledge on types, subject matter, structure of agricultural stories, and gathering agricultural information related to it

CO 4	Generate writing the story: organizing the material, treatment of the story.
CO5	Selecting pictures and artwork for the agricultural stories
CO5	Write different types of agricultural stories

CO-PO Mapping

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	2	1	2	2		1`		
CO2	2	2	3	1	2	1	2	2	2	1	2	2
CO3	2	2	2	2	3	2	2	3	2	2	2	2
CO4	2	2	2	2	3	2	2	3	2	3	1	2
CO5	-	-	-	-	-	-	-	-	2	-	2	-
CO6	-	-	-	-	-	-	-	-	-	-	-	2
Average	**2.25**	**2**	**2.5**	**1.75**	**2.5**	**1.5**	**2**	**2.5**	**2**	**1.75**	**1.75**	**2**