College of Agriculture

Course Curriculum

B.Sc. (Hons.) Agriculture

(As per Vth Dean’s Committee Recommendation of ICAR)

2016 – 2017

Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut- 250110 (U.P.)
Patron

Prof. Gaya Prasad
Vice-Chancellor, SVP University of Agriculture & Technology, Meerut – 250110 (U.P.)

Compiled by

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Dean, College of Agriculture

Composed & Designed by

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Foreword

Agriculture Education is the most important basic public good to produce adequately trained scientific human resources capable of carrying out teaching, research and transfer of technology activities. More than 60% of the population in India lives in rural areas and engaged in diverse farm and non farm activities. Therefore, the socio-economic conditions of the farming communities, impeding climate change, challenge of sustainable agricultural production and, food and nutritional security, global competitiveness, necessity of knowledge intensive technology generation and its adoption have to be the basis for revision and up-gradation of the course curricula. The agriculture graduates passing out from various institutions do not match with the requirements of emerging global market and industry demand hence necessitates relook at the content and curriculum delivery so that the graduates would be able to meet the expectations of different stakeholders. In view of this, entire course curricula of B.Sc.(Hons.) Agriculture degree programme has been revised by the Academic Council considering the Fifth Dean’s Committee Recommendations of the ICAR. The revised programme has been implemented in the university from academic session 2016 – 17.

I hope that the syllabus booklet will serve as ready reckoner for comprehensive understanding of individual topic and the content of the courses. The information will help the students and the advisors in pursuing the B.Sc.(Hons.) Agriculture degree programme in a systematic manner. Details of these courses will also be useful to the students applying to different PG programmes in various universities/institutes. I hope that students will take full advantage of the opportunities offered by the university for their academic, intellectual and personality development. I congratulate Dean (Agriculture) and his team for bringing out this academic document which will be of immense use to both the teachers and students.

(Gaya Prasad)
Message

Agriculture is the foremost sector which needs proper attention in view of increasing population of the country. The mandate of College of Agriculture is to connect farmers to the developing technologies in various disciplines of agriculture sciences viz. Agronomy, Plant Pathology, Entomology, Agricultural Engineering, Agricultural Economics, Genetics & Plant Breeding, Soil Science & Agricultural Chemistry, Agricultural Extension & Communication, Horticulture, Animal Production, Basic Science and Agricultural Biotechnology. Our aim is to ensure the best possible learning experience to the students through excellent research-oriented teaching skills and enhanced learning opportunities. In view of this, it is essential to strengthen the course curriculum for the students at graduation level. Considering Fifth Deans Committee Recommendation Report of ICAR, the READY (Rural and Entrepreneurship Awareness Development Yojana) Programme has been included in the course curricula and syllabi besides other desired modifications to reorient graduates of B.Sc.(Hons) Agriculture degree programme for ensuring and assuring employability and developing entrepreneurial skills for emerging knowledge intensive agriculture.

It gives me immense pleasure that the revised course curricula for B.Sc.(Hons.) Agriculture is being published. It will provide a consolidated insight of the syllabi to be taught during 4 years degree programme. The booklet will be quite useful to the students and faculty members of the university. I congratulate Prof. Samsher, Dean, College of Agriculture and his team for preparing and publishing this booklet.

( R. R. Singh )
Registrar
PREFACE

The Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut was established on October 2, 2000 under THE UTTAR PRADESH (KRISHI EVAM PRODYOGIK VISHWAVIDYALAYA ADHINIYAM) 1958. The university was inaugurated on 28th March 2002 by the then Hon’ble Chief Minister of Uttar Pradesh. The College of Agriculture is the first college, established in the university having 12 departments viz Agronomy, Plant Pathology, Agricultural Engineering, Agricultural Economics, Genetics & Plant Breeding, Soil Science & Agricultural Chemistry, Agricultural Extension & Communication, Horticulture, Animal Production, Basic Science, Agricultural Biotechnology and Entomology. The College of Agriculture, being the largest college, is engaged in teaching, research and extension activities. The Indian Council of Agricultural Research has been periodically appointing Deans Committees for revision of course curriculum. In the series, Fifth Deans Committee was constituted by the ICAR, New Delhi and given terms of reference considering contemporary challenges for employability of passing out graduates and to adopt a holistic approach for quality improvement in agricultural education.

In view of above, the course curricula of B.Sc.(Hons.) Agriculture has been restructured to develop much needed skills and entrepreneurial mind-set among the graduates to take up self employment, contribute to enhanced rural livelihood and food security, sustainability of agriculture and be propeller for agricultural transformation. Considering the Fifth Dean’s Committee Recommendations, the course curricula of B.Sc.(Hons.) Agriculture degree programme has been revised by the Academic Council and implemented in the university from 1st Semester, academic session 2016 – 17. In order to reorient agriculture graduates, the introduction of READY Program is an essential prerequisite for the award of degree to ensure In-Plant-Training (IPT) / Hands-On-Training (HOT).

I am highly grateful to the Hon’ble Vice-Chancellor for his valuable suggestions and granting permission to publish this booklet for the benefits of faculty members and the students as well. The help and support rendered by Dr. R. K. Naresh, Dr. Kamal Khilari, all Heads of the Department, Registrar and Comptroller along with non teaching personnel namely Mrs. Monika Chaudhary, Mr. G. S. Bharti, Mr. Kapil Bhardwaj and Mr. Harish Chandra is thankfully acknowledged.

Meerut
March 2017

( Prof. Samsher )
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EXECUTIVE SUMMARY

The Indian Council of Agricultural Research (ICAR) an autonomous organization under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India is the largest national agricultural systems in the world. With 101 ICAR institutes and 73 agricultural universities spread across the country, ICAR is the apex body for co-ordinating, guiding and managing research and education in agriculture in the entire country in association with the Education Division.

The Education Division undertakes planning, development, coordination and quality assurance in higher agricultural education in the country and, thus, strives for maintaining and upgrading quality and relevance of higher agricultural education through partnership and efforts of the components of the ICAR-Agricultural Universities (AUs) System comprising State Agricultural Universities (SAUs), Deemed to be Universities (DUs), Central Agricultural Universities (CAU) and Central Universities (CUs) with Agriculture Faculty.

Quality assurance in higher agricultural education in the country has been achieved through policy support, accreditation, framing of minimum standards for higher agricultural education, academic regulation, personnel policies, review of course curricula and delivery systems, development support for creating/strengthening infrastructure and facilities, improvement of faculty competence and admission of students through All India competitions. As first and most important step for quality improvement of education, the Indian Council of Agricultural Research has been periodically appointing Deans Committees for revision of course curriculum. In the series, Fifth Deans Committee was constituted and given terms of reference considering contemporary challenges for employability of passing out graduates and to adopt a holistic approach for quality assurance in agricultural education.

Considering the fact that the report of the Committee needs to be widely accepted, a bottom up approach in respect of curriculum development has been undertaken. To achieve this, inputs from different stakeholders of agricultural education have been obtained at different levels. The committee first deliberated on the skills which graduates must and then reverse engineering done to design course curriculum. The Committee identified Conveners/Co-conveners and given them the responsibility to have inputs from all the Deans of all the colleges of their disciplines based on the suggestions received from their faculty after holding meetings at University/College level. The suggestions received for all the disciplines were reviewed by the Committee. The Committee has tried to make sure that the report represents a national consensus in respect of various issues that have been flagged to the Committee. The course curricula have been restructured to reorient course curricula to develop much needed skills and entrepreneurial mindset among the graduates to take up self employment, contribute to enhanced rural livelihood and food security, sustainability of agriculture and be propeller for agricultural transformation.
Student READY Programme

Student READY programme was launched by the Hon’ble Prime Minister of India on 25th July, 2015

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

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

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

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

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

➢ Experiential Learning helps the student to develop competence, capability, capacity building, acquiring skills, expertise, and confidence to start their own enterprise and turn job creators instead of job seekers. This is step forward for earning while learning concept. Experiential Learning is major step forward for High Quality Professional Competence, Practical Work Experience in Real Life Situation to Graduates, Production Oriented Courses, Production to Consumption Project working, Facilitates producing Job Providers rather than Job Seekers and Entrepreneurial Orientation.

➢ Rural Agriculture Work Experience also enable the students to gain rural experience giving them confidence and enhancing on farm problem solving abilities in real life situations especially in contact with farmers, growers etc.

➢ In-plant training for a short period of time in relevant industry to gain the knowledge and experience of the work culture. In Plant training by reputed organization either MNC’s or organised sectors provide an industrial exposure to the students as well as to develop their career in the high tech industrial requirements.

➢ Skill development component include use of Agriculture Systems & devices for enhancing functional skill. It is expected that basic infrastructure and Experiential Learning Unit available university may help in boosting livelihood ensuring opportunity.

➢ Student Project is essential for students interested in higher education. Through this component, they will know how to identify research problem, experimental set up and writing report etc.

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

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

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

I. Experiential Learning
   a) Concept
      The word ‘experiential’ essentially means that learning and development are achieved through personally determined experience and involvement, rather than on received teaching or training, typically in group, by observation, study of theory or hypothesis, bring in innovation or some other transfer of skills or knowledge. Experiential learning is a business curriculum-related endeavour which is interactive.
      EL is for building (or reinforcing) skills in Project development and execution, decision-making, individual and team coordination, approach to problem solving, accounting, marketing and resolving conflicts, etc. The programme has end to end approach. Carefully calibrated activities move participants to explore and discover their own potential. Both activities and facilitation play a critical role in enhancing team performance.
   b) Objectives
      EL provides the students an excellent opportunity to develop analytical and entrepreneurial skills, and knowledge through meaningful hands on experience, confidence in their ability to design and execute project work.
      The main objectives of EL are:
      • To promote professional skills and knowledge through meaningful hands on experience.
      • To build confidence and to work in project mode.
      • To acquire enterprise management capabilities
   c) Duration
      The experiential learning programme will be offered for 180 days (one semester) period in the final year. As the programme is enterprise oriented, students and faculty are expected to attend the activities of the enterprise even on institutional holidays with total commitment, and without any time limit or restriction of working hours for ELP. The Experiential Learning Programme shall be run for full year by making two groups and rotating activities of the final year in two groups.
   d) Attendance
      The minimum attendance required for this programme is 85%. The attendance of a student will be maintained at the EL unit. The attendance particulars shall be communicated to the Chief Executive Officer (Dean) by the Manager of the EL unit every week. The students will be eligible for the final evaluation of EL only when the attendance requirement is met with. Any student in the event of recording shortage of attendance has to re-register the EL when offered next by paying the assigned fee.
   e) Students’ Eligibility
      To get the eligibility for registering the EL programme, the students should have completed all the courses successfully. No student should be allowed to take up the EL programme with backlog/repeat courses. The assignment/allotment of the EL programme shall be based on merit of the student at the end of 5th Semester. A separate certificate should be issued to the students after successful completion of EL course. Allotment of EL programmes amongst students to different modules should be done strictly on the basis of merit at the end of fifth semester. In this work experience students will know exact problems of farming & suggest appropriate technology and finally useful in enhancing productivity and profitability at farmers end.
II. Rural Agricultural Work Experience

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

2. Objectives

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

III. In Plant Training (IPT)

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

OBJECTIVES

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

The students will be required to submit the report on various aspects and will be issued certificates upon successful completion of the student READY components. It is planned that ICAR will provide Rs. 3000/pm per student for the duration of RAWE/ In-plant Training/ Hands-on Training (HOT) / Skill Development Training subject to a maximum of 6 months.

Fifth Deans Committee after deliberations with the Conveners/Co-conveners and Subject Matter Specialists recommend the discipline-wise Student READY programs.
AGRICULTURE

Semester VII
Rural Agricultural Work Experience (RAWE) and Agro-Industrial Attachment (AIA)

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

Semester VIII
Experiential Learning Programme (ELP)/ Hands On Training (HOT)

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

- Production Technology Bio-agents and Bio-fertilizer
- Seed Production and Technology
- Mushroom Cultivation Technology
- Soil, plant, water and seed Testing
- Poultry Production Technology
- Hybrid Seed Production Technologies
- Floriculture and Landscaping
- Food Processing
- Commercial Horticulture
- Agriculture Waste Management
- Organic Production Technology
- Commercial Sericulture

In addition to these ELP modules other important modules may be given to the students by SAUs.

Indian Council of Agricultural Research has already provided financial help for establishment of two or more Experiential Learning units in different State Agricultural Universities, hence, each university is expected to plan EL program accordingly.
EXAMINATION AND EVALUATION SYSTEM

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

1. Examination
   - External theory (50%)
   - Internal Theory + Practical (50%)

   ▶ Courses with Theory and Practical
     Mid-term Exam (30%) + Assignment (5%) in practical oriented courses + Practical (15%)

   ▶ Courses with only Theory
     Mid-term Exam (40%) + Assignment (10%)

   ▶ Courses with only Practical:
     (100%) Internal

     - Paper to be set by external: HOD shall ensure the coverage of syllabus. If needed moderation can be done.
     - Evaluation to be done internally by the faculty other than the Course Instructor. Syllabus of the concerned course shall be sent to the external examiner, who shall prepare the question papers. For practical, it is recommended that examination shall be conducted by course instructor(s) and one teacher nominated by HOD.

2. Evaluation

<table>
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<th>Degree</th>
<th>Percentage of Marks Obtained</th>
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<tr>
<td>All</td>
<td>100</td>
<td>10 Points</td>
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<td>90 to &lt;100</td>
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<td>9 to &lt; 10</td>
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<tr>
<td>80 to &lt;90</td>
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<td>8 to &lt; 9</td>
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<td>6 to &lt; 7</td>
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<tr>
<td>50 to &lt;60</td>
<td></td>
<td>5 to &lt; 6</td>
</tr>
<tr>
<td>&lt;50 (Fail)</td>
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<td>&lt; 5</td>
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<tr>
<td>Ex. 80.76</td>
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<td>8.076</td>
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<tr>
<td>43.60</td>
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<td>4.360</td>
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<tr>
<td>72.50 (but shortage in attendance)</td>
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<td>Fail (1 point)</td>
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<tr>
<td>5.000 – 5.999</td>
<td>Pass</td>
</tr>
<tr>
<td>6.000 – 6.999</td>
<td>II division</td>
</tr>
<tr>
<td>7.000 – 7.999</td>
<td>I division</td>
</tr>
<tr>
<td>8.000 and above</td>
<td>I division with distinction</td>
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\[
\text{GPA} = \frac{\text{Total points scored}}{\text{Total credits (for 1 semester)}}
\]
\[
\text{CGPA} = \frac{\sum \text{Total points scored}}{\text{Course credits}}
\]
\[
\text{OGPA} = \frac{\sum \text{Total points scored (after excluding failure points)}}{\text{Course credits}}
\]
\[
\text{% of Marks} = \frac{\text{OGPA} \times 100}{10}
\]
## COLLEGE OF AGRICULTURE

### Discipline-wise Courses

(As per ICAR Vth Deans Committee Recommendation Report)

**B.Sc. (Hons) Agriculture**

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<thead>
<tr>
<th>Course Code</th>
<th>Discipline/Course title</th>
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<tr>
<td>AGR-111</td>
<td>Fundamentals of Agronomy</td>
<td>4(3+1)</td>
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<td>Principles of Animal Nutrition</td>
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<td>Physical Education &amp; Yoga Practices</td>
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<td>1(1+0)</td>
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<td>NGC - 321</td>
<td>Educational Tour</td>
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### Semester-wise distribution of courses

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<td>Fundamentals of Horticulture</td>
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<td>AGB-111</td>
<td>Fundamentals of Plant Biochemistry and Biotechnology</td>
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<tr>
<td>SAC-111</td>
<td>Fundamentals of Soil Science</td>
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<td>Introduction to Forestry</td>
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<td>BAS-111</td>
<td>Comprehension &amp; Communication Skills in English</td>
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<tr>
<td>AGR-111</td>
<td>Fundamentals of Agronomy</td>
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<tr>
<td>UGR-112</td>
<td>Introductory Biology*</td>
</tr>
<tr>
<td>UGR-113</td>
<td>Elementary Mathematics*</td>
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<td>UGR-111</td>
<td>Agricultural Heritage*</td>
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<td>Rural Sociology &amp; Educational Psychology</td>
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<td>NCC-111/ NSS-111/PEY-111</td>
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<td>Agricultural Microbiology</td>
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<td>AGE-121</td>
<td>Soil and Water Conservation Engineering</td>
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<td>AGR-121</td>
<td>Fundamentals of Crop Physiology</td>
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<td>AAE-121</td>
<td>Fundamentals of Agricultural Economics</td>
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<tr>
<td>PPA-121</td>
<td>Fundamentals of Plant Pathology</td>
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<td>ENT-121</td>
<td>Fundamentals of Entomology</td>
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<td>AEC-121</td>
<td>Fundamentals of Agricultural Extension Education</td>
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<td>AGE-122</td>
<td>Farm Machinery and Power</td>
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<td>AGR-212</td>
<td>Crop Production Technology – I (Kharif Crops)</td>
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<tr>
<td>GPB-211</td>
<td>Fundamentals of Plant Breeding</td>
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<tr>
<td>PPA-211</td>
<td>Diseases of Field and Horticultural Crops and their Management -I</td>
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<tr>
<td>AEC-211</td>
<td>Communication Skills and Personality Development</td>
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<tr>
<td>BAS-212</td>
<td>Agri- Informatics</td>
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<tr>
<td>HOR-211</td>
<td>Production Technology for Vegetables and Spices</td>
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<tr>
<td>AGE-211 / SAC-211 / AGR-211</td>
<td>Environmental Studies and Disaster Management</td>
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<tr>
<td>BAS-213</td>
<td>Statistical Methods</td>
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<tr>
<td>AAP-211</td>
<td>Livestock and Poultry Management</td>
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<tr>
<td>AAP-212</td>
<td>Principles of Animal Nutrition</td>
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<td>NCC-111/ NSS-111/PEY-111</td>
<td>NSS/NCC/Physical Education &amp; Yoga Practices**</td>
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14
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<td>Production Technology for Ornamental Crops, MAP and Landscaping</td>
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<td>AGE-222</td>
<td>Renewable Energy and Green Technology</td>
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<td>SAC-221</td>
<td>Problematic Soils and their Management</td>
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<td>HOR-222</td>
<td>Production Technology for Fruit and Plantation Crops</td>
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<td>GPB-221</td>
<td>Principles of Seed Technology</td>
<td>3(1+2)</td>
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<td>Farming System &amp; Sustainable Agriculture</td>
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<td>AAE-221</td>
<td>Agricultural Marketing Trade &amp; Prices</td>
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<td>AGR-224</td>
<td>Introductory Agro-meteorology &amp; Climate Change</td>
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<td>Breeding &amp; Improvement of Farm Animals</td>
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<td>UGE-221</td>
<td>Agribusiness Management*</td>
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<td>Agrochemicals*</td>
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<td>Commercial Plant Breeding*</td>
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<td>Pests of Crops and Stored Grain and their Management</td>
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<td>Geo informatics and Nano-technology and Precision Farming</td>
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<td>Protected Cultivation*</td>
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<td>Diseases of Field and Horticultural Crops and their Management-II</td>
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<td>Management of Beneficial Insects</td>
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<td>Hi-tech. Horticulture*</td>
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**TOTAL**  *Elective Course, **NC: Non-gradial courses*  19(9 + 10)+3*+2**

### VII Semester

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<td>ii. Agronomical Interventions</td>
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<td>iii. Plant Protection Interventions</td>
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<td>iv. Soil Improvement Interventions (Soil sampling and testing)</td>
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<td>v. Fruit and Vegetable production interventions</td>
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<td>vi. Food Processing and Storage interventions</td>
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</tr>
<tr>
<td>viii. Extension and Transfer of Technology activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Attachment in University/College/KVK/research Station</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>READY- Component –II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIA- 412 (Agro Industrial Attachment)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>• Industries include Seed/Sapling production, Pesticides-insecticides, Post harvest-processing-value addition, Agri-finance institutions, etc.</td>
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<td></td>
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<tr>
<td>Plant Clinic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Seed/Sampling production, Pesticide/insecticide, post harvest industries, processing- value addition, Agri -finance institutions etc.</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Activities and Tasks during Agro-Industrial Attachment Programme</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i. Acquaintance with industry and staff</td>
<td></td>
<td></td>
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<tr>
<td>ii. Study of structure, functioning, objective and mandates of the industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii. Study of various processing units and hands-on trainings under supervision of industry staff</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IV. Ethics of industry
V. Employment generated by the industry
VI. Contribution of the industry promoting environment
VII. Learning business network including outlets of the industry
VIII. Skill development in all crucial tasks of the industry
IX. Documentation of the activities and task performed by the students
X. Performance evaluation, appraisal and ranking of students

| Total | 20 |

**VIII Semester**

**READY - Component –III (Experiential Learning Programme)**

**Modules for Skill Development and Entrepreneurship**

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

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

**Grand Total (Credit Hours) = 185**

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

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Course Code</th>
<th>Courses</th>
<th>Department</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>IV Semester</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>1.</td>
<td>UGE-221</td>
<td>Agribusiness Management</td>
<td>Agricultural Economics</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>UGE-222</td>
<td>Agrochemicals</td>
<td>Soil Science &amp; Agricultural Chemistry</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>UGE-223</td>
<td>Commercial Plant Breeding</td>
<td>Genetics &amp; Plant Breeding</td>
<td>3(1+2)</td>
</tr>
<tr>
<td>4.</td>
<td>UGE-224</td>
<td>Landscaping</td>
<td>Horticulture</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>V Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>UGE-311</td>
<td>Food Safety and Standards</td>
<td>Agricultural Engineering</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>UGE-312</td>
<td>Bio-pesticides &amp; Bio-fertilizers</td>
<td>Soil Science &amp; Agricultural Chemistry</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>UGE-313</td>
<td>Protected Cultivation</td>
<td>Horticulture</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>UGE-314</td>
<td>Micro propagation Technologies</td>
<td>Horticulture</td>
<td>3(1+2)</td>
</tr>
<tr>
<td>VI Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>UGE-321</td>
<td>Hi-tech. Horticulture</td>
<td>Horticulture</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>UGE-322</td>
<td>Weed Management</td>
<td>Agronomy</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>UGE-323</td>
<td>System Simulation and Agro-advisory</td>
<td>Soil Science &amp; Agricultural Chemistry</td>
<td>3(2+1)</td>
</tr>
</tbody>
</table>
Syllabus of B.Sc.(Hons.) Agriculture Degree Programme

Agronomy

AGR-111 Fundamentals of Agronomy  
Theory  
4(3+1)  
Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, 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.  

Practical  
Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agro-climatic zones of India, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

AGR–112 Introduction to Forestry (New)  
Theory  
2(1+1)  
Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies. Forest regeneration, 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. Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees. Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Practical  
AGR 121 Fundamentals of Crop Physiology  

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

Practical  
Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO\textsubscript{2} assimilation by Infra Red Gas Analyser (IRGA).

AGR-212 Crop Production Technology-I (Kharif Crops)  

Theory  
Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Kharif crops. Cereals – rice, maize, sorghum, pearl millet and finger millet, pulses-pigeonpea, mungbean and urdbean; oilseeds- groundnut, and soybean; fibre crops- cotton & Jute; forage crops-sorghum, cowpea, cluster bean and napier.

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

AGR-221 Crop Production Technology-II (Rabi crops)  

Theory  
Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals –wheat and barley, pulses-chickpea, lentil, peas, oilseeds- rapeseed, mustard and sunflower; sugar crops- sugarcane; medicinal and aromatic crops-mentha, lemon grass and citronella, Forage crops-berseem, lucerne and oat.

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

AGR-223 Farming System and Sustainable Agriculture  

Theory  
Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, 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; Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation,
conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability, Integrated farming system-historical background, 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, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

**AGR- 224 Introductory Agro-meteorology & Climate Change**  
*2(1+1)*

**Theory**
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, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, longwave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth; Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon- mechanism and importance in Indian agriculture, Weather hazards - 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. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

**Practical**

**AGR- 311 Geoinformatics, Nano-technology and Precision Farming**  
*2(1+1)*

**Theory**
Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geoinformatics- definition, concepts, tool and techniques; their use in Precision Agriculture. Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS; Remote sensing concepts and application in agriculture; Image processing and interpretation; 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; Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

**Practical**

**AGR- 312 Practical Crop Production-I (Kharif Crops)**

**Practical**
Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

**AGR – 321 Rainfed Agriculture and Watershed Management – (New)**

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

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

**AGR- 322 Practical Crop Production-II (Rabi Crops)**

**Practical**
Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of 8-10 students.

**AGR- 323 Principles of Organic Farming**

**Theory**
Organic farming, principles and its scope in India; Initiatives taken by Government (central/state), NGOs and other organizations for promotion of organic agriculture; Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming; Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP; Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.
Practical
Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post harvest management; Quality aspect, grading, packaging and handling.

Genetics And Plant Breeding

GPB- 121 Fundamentals of Genetics 3(2+1)
Theory

Practical
Study of microscope. Study of cell structure. Mitosis and Meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross-over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.

GPB- 211 Fundamentals of Plant Breeding 3(2+1)
Theory
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, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; 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; 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.

Practical
Plant Breeder’s kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handling of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiments, analysis of Randomized Block Design. To work out the mode of

GPB- 221 Principles of Seed Technology 3(1+2)
Theory
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. 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 Test and Electrophoresis, Molecular and Biochemical test. History and development of Seed Industry in India; PPV & FR Act. Organic seed production- An Overview.
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 pest and disease control during storage. Seed marketing, Private and public sectors and their production and marketing strategies.

Practical
Seed production in major cereals: Wheat, Barley, Rabi Maize. Seed production in major pulses: Urd (Summer crop), Lentil, Gram, pea. Seed production in major oilseeds: Sunflower, Rapeseed, Mustard and Linseed. Seed production in important vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

GPB- 311 Crop Improvement – I (Kharif) 2(1+1)
Theory
Centers of origin, distribution of species, wild relatives in different cereals (Rice, Maize, Sorghum, Pearl millet & Ragi); pulses (Pigeonpea, Urdbean & Mungbean); oilseeds (Soybean, Groundnut, Seasame & Caster); fibres (Jute & Cotton); fodders (cowpea) and cash crops (tobacco); vegetable (Brinjal, Okra and cucurbiteaceous) and horticultural crops (Guava); Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters; Important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; 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); Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical
Floral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbiteaceous crops. Maintenance breeding of different kharif crops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Kharif crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.
GPB- 321 Crop Improvement – II (Rabi)  

Theory
Centers of origin, distribution of species, wild relatives in different cereals (Wheat, oat and barley); pulses (Chickpea, lentil, Fieldpea, Rajma & Horse gram); oilseeds (Rapeseed Mustard, Sunflower, Safflower); fodder crops (Berseem) and cash crops (Sugarcane); vegetable (Potato, Tomato, Chilli, Onion) and horticultural crops (Mango); Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters; 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); Hybrid seed production technology of rabi crops. Ideotype concept and climate resilient crop varieties for future.

Practical
Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Rabi crops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops

Agricultural Engineering

AGE – 112 Farm Machinery and Power

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

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

AGE- 121 Introductory Soil and Water Conservation Engineering

Theory

**Practical**

**AGE-211/SAC-211/AGR-211 Environmental Studies and Disaster Management** 3 (2+1)

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


**Disaster Management**
Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.
Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

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

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

AGE- 222  Renewable Energy and Green Technology  2(1+1)

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

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

AGE – 322 /HOR-322 Post-harvest Management and Value Addition of Fruits and Vegetables  2(1+1)

Theory
Importance of post-harvest processing of fruits and vegetables, extent and possible causes of post harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate; Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric); Value addition concept; Principles and methods of preservation; Intermediate moisture food- Jam, jelly, marmalade, preserve, candy – Concepts and Standards; Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning — Concepts and Standards, packaging of products.

Practical
Basic Science

BAS – 111 Comprehension and Communication Skills in English 2 (1+1)

Theory

Practical

BAS – 212 Agri-Informatics 2(1+1)

Theory
Introduction to Computers, Operating Systems, definition and types, Applications of MS-Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, 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 input/output operations.
e-Agriculture, concepts and applications, Use of ICT in Agriculture. Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

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

BAS – 213 Statistical Methods 2(1+1)

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

Practical

BAS- 312 Intellectual Property Rights

Theory

Soil Science and Agricultural Chemistry

SAC- 111 Fundamentals of Soil Science

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

Practical
SAC-121 Agricultural Microbiology 2(1+1)

Theory

Practical

SAC-221 Problematic Soils and their Management (New) 2(2+0)

Theory
Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties. Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.
Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agro-ecosystems.

SAC-311 Manures, Fertilizers and Soil Fertility Management 3(2+1)

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

Practical
Entomology

ENT- 121  Fundamentals of Entomology  4(3+1)
Theory

History of Entomology in India. Classification of phylum Arthropoda upto classes. Relationship of
class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and
molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect
antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male
and female genital organ. Metamorphosis and diapause in insects. Structure and functions of digestive,
circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system, in insects. Major
sensory organs like simple and compound eyes, chemoreceptor.

Insect Ecology: Introduction. Effect of abiotic factors—temperature, moisture, humidity, rainfall, light,
atmospheric pressure and air currents. Effect of biotic factors.

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Classification of
insecticides, formulations of insecticides. Recent methods of pest control, repellents, antifeedants,
hormones, attractants. Insecticides Act 1968-Important provisions. Symptoms of poisoning, first aid and
antidotes.

Systematics: Taxonomy –importance, history and development and binomial nomenclature.
Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto
Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural
importance like Orthoptera: Acrididae, Tettigonidae, Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera:
Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Cicadellidae, Aphididae, Coccidae,
Aleurididae, Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papilionidae, Noctuidae, Pyralidae,
Bombycidae; Coleoptera: Coccinellidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Apidae.
Trichogrammatidae, Braconidae, Chalcididae; Diptera: Agromyzidae, Muscidae, Tephritidae.

Practical

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

ENT- 311  Pests of Crops and Stored Grains and their Management  3(2+1)
Theory

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

1. Field Crops: Rice, Sorghum, Maize, Ragi, Wheat, Chickpea, Field pea, Lentil, Pigeon pea,
   Groundnut, Sunflower and Mustard.
2. Vegetable Crops: Brinjal, Okra, Tomato, Cabbage, Cauliflower, Bottle guard, Bitter guard, Potato
   and Chilies,
3. Fruit Crops: Mango, Citrus, Grapevine, Banana, Guava, Ber and Apple,
4. Plantation: Coffee and Tea,
5. Ornamental plants: Rose and Chrysanthemum
6. **Narcotics:** Tobacco
7. **Spices:** Turmeric, Onion, Coriander, Garlic, Pepper and Ginger

**Practical**

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

**ENT-321 Management of Beneficial Insects**

**Theory**

Importance of beneficial Insects, Beekeeping and pollinators, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.


**Practical**


**Agricultural Economics**

**AAE-121 Fundamentals of Agricultural Economics**

**Theory**


AAE – 221 Agricultural Marketing, Trade and Prices 3 (2+1)

Theory
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's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies; Meaning and stages in PLC; characteristics of PLC; strategies in different 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; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark); Market functionaries and marketing channels: 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 of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs; Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practical
Plotting and study of demand and supply curves and calculation of elasticities; Study of relationship between market arrivals and prices of some selected commodities; Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; Application of principles of comparative advantage of international trade.

AAE- 311 Agricultural Finance and Co-operation 3 (2+1)

Theory
Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC. Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural

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

**Practical**


**AAE- 321  Farm Management, Production and Resource Economics  

2 (1+1)**

**Theory**

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms. 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, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income. Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, 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 and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock’s enterprises. Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies, Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. 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, pasture and forest resources etc.

**Practical**

Plant Pathology

PPA-121 Fundamentals of Plant Pathology 4(3+1)
Theory


Practical


PPA-211 Diseases of Field & Horticultural Crops & their Management-I 3(2+1)
Theory

Symptoms, etiology, disease cycle and management of major diseases of following crops:
Field Crops: Rice: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; Maize: stalk rots, downy mildew; Sorghum: smuts, Bajra: downy mildew and ergot; Groundnut: early and late leaf spots, GNBN Soybean: Rhizoctonia blight, bacterial spot, and mosaic; Pigeonpea: Phytophthora blight, wilt and sterility mosaic; Cercospora leaf spot, web blight and yellow mosaic; Till: Phytophthora blight phyllody; Barley: covered smut, stripe disease; Tobacco: TMV mosaic. Horticultural Crops: Guava: wilt and anthracnose; Banana: Panama wilt, bacterial wilt, Sigatoka and bunchy top; Papaya: foot rot, leaf curl, Pomegranate: bacterial blight; Cruciferous vegetables: Alternaria leaf spot and black rot; Brinjal: Phomopsis blight and fruit rot and Sclerotinia blight; Tomato: early and late blight, buck eye rot and leaf curl and mosaic; Okra: Yellow Vein Mosaic; Beans: anthracnose and bacterial blight; Ginger: soft rot; Colocasia: Phytophthora blight; Coconut: wilt and bud rot; Tea: blister blight; Coffee: rust

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

PPA – 312 Principles of Integrated Pest and Disease Management 3(2+1)
Theory

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis. Methods of detection

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

**PPA-321 Diseases of Field & Horticultural Crops & their Management-II**

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

**Field Crops:**
Wheat: rusts, loose smut, Karnal bunt, powdery mildew, Alternaria blight, and ear cockle;
Sugarcane: red rot, smut, wilt, grasy shoot,
Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot; Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt; Cotton: vascular wilt, and black arm; Pea: downy mildew, powdery mildew and rust.

**Horticultural Crops:**
Mango: anthracnose, malformation, bacterial blight and powdery mildew; Citrus: canker and gummosis; Grape vine: downy mildew, Powdery mildew and anthracnose; Apple: scab, fire blight, Peach: leaf curl.
Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll,
Cucurbits: downy mildew, powdery mildew, wilt; Onion and garlic: purple blotch, and Stemphylium blight; Chillies: anthracnose and fruit rot, leaf curl; Turmeric: leaf spot Coriander: stem gall Marigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

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

**Horticulture**

**HOR – 111 Fundamentals of Horticulture (NEW)**

**Theory**
Horticulture - Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops; Plant propagation-methods and propagating structures; Seed dormancy, Seed germination, principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators; fertilization and parthenocarpy; medicinal and aromatic plants; importance of plant bio-regulators in horticulture. Irrigation – methods, Fertilizer application in horticultural crops.

**Practical**
Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation including micro-propagation. Layout and planting of
orchard. Training and pruning of fruit trees. Preparation of potting mixture. Fertilizer application in different
crops. Visits to commercial nurseries/orchard.

HOR – 211 Production Technology for Vegetable and Spices 2 (1+1)

Theory
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, physiological disorders, of important vegetable and spices (Tomato, Brinjal, Chilli, Capsicum,
Cucumber, Melons, Gourds, Pumpkin, French bean, Peas; Cole crops such as Cabbage, Cauliflower, Knol-
khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beetroot; Tuber crops such as
Potato; Leafy vegetables such as Amaranth, Palak. Perennial vegetables).

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

HOR – 221 Production Technology for Ornamental Crops, MAPs and Landscaping 2(1+1)

Theory
Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of
landscaping. Landscape uses of trees, shrubs and climbers. Production technology of important cut flowers
like rose, gerbera, camation, lillium and orchids under protected conditions and gladiolus, tuberose,
chrysanthermum under open conditions. Package of practices for loose flowers like marigold and jasmine
under open conditions. Production technology of important medicinal plants like ashwagandha, asparagus,
alo, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella,
palmarosa, ocimum, rose, geranium, vetiver. Processing and value addition in ornamental crops and MAPs
produce.

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

HOR – 222 Production Technology for Fruit and Plantation Crops 2 (1+1)

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

Practical
Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation
crops. Description and identification of fruit. Preparation of plant bio regulators and their uses, Important
pests, diseases and physiological disorders of above fruit and plantation crops. Visit to commercial orchards.

HOR – 321/AGE 321 Protected Cultivation and Secondary Agriculture 2(1+1)

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

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

**Practical**

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

**Agricultural Extension and Communication**

AEC – 112 Rural Sociology & Educational Psychology

**Theory**


AEC – 121 Fundamentals of Agricultural Extension Education

**Theory**

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

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

**Practical**

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

AEC-211 Communication skills and Personality Development

Theory
Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical
Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

AEC – 312/ AAE-312 Entrepreneurship Development and Business Communication

Theory

Practical
Assessing entrepreneurial traits, problem solving skills, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

AGRICULTURAL BIOTECHNOLOGY

AGB-111 Fundamentals of Plant Biochemistry and Biotechnology

Theory

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo
rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

**Practical**

**ANIMAL PRODUCTION**

**AAP- 211 Livestock & Poultry Management**

**Theory**

**Practical**

**AAP- 212 Principles of Animal Nutrition**

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

**Practical**
Understanding the nutritive value of feed stuffs. Study of forages, fodders, cereals, cereal offal's and oilcakes. Study of animals avain and marine offal's minerals and vitamins supplements and other feed
additives. Proximate analysis of feed samples for moisture, crude protein, crude fat, crude fiber, ash and nitrogen free extractive. Formulation of least cost ration for cattle, buffaloes, sheep, goat, swine and poultry.

**AAP-221 Breeding and Improvement of Farm Animals**

Qualitative and quantitative inheritance and effect of environment on them. Various qualitative and quantitative traits of livestock. Gene frequently and forces affecting them. Random mating and Hardy Weinberg law. Variation and its measures, genetic, phenotypic and environmental variances. Heritability and repeatability, qualitative and quantitative traits, selection differential, response to selection, generation interval and annual rate of gain. Genetic correlation and correlated response. Basis of selection, individual, family, progeny, pedigree and combined selection. Methods of selection for one or more trait random, independent culling level and selection index. Inbreeding-its consequence, inbred lines, line breeding, inbreeding coefficient and relationship coefficients. Out breeding- various types of out breeding and cross-breeding, species hybridization and development of new breeds.


**REMEDIAL COURSES**

**UGR-111 Agricultural Heritage**

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

**UGR-112 Introductory Biology**

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


**Practical**


**UGR-113 Elementary Mathematics**

Theory
Equations: (Linear, Quadratic). Elementary idea of Set Theory, Elementary idea of permutation and combination, Binomial theorem (positive index only) Logarithm Straight lines: Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral. Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle 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 \(x^2 + y^2 = a^2\). Differential Calculus: Definition of function, limit and continuity, Simple
problems on limit, Simple problems on continuity, Differentiation of $x^n$, $e^x$, $\sin x$ & $\cos x$ from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form $y=f(x)$ (Simple problems based on it).

Integral Calculus: Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation.

NON-GRADIAL COURSES

NSS 111/NCC 111/ PEY 111 Physical Education & Yoga Practices 2 (0+2)

Theory
Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skillful in executing democratic leadership, developing skill in programme development to be able for self employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

Following activities are to be taken up under the NSS course:
- Introduction and basic components of NSS: Orientation
- NSS programmes and activities
- Understanding youth
- Community mobilisation
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health, lifestyle, HIV AIDS and first aid
- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year. Different activities will include orientation
lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction.

NSS 111 National Service Scheme (Semester I)  1(0+1)**
Introduction and basic components of NSS:
Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health
NSS programmes and activities
Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary
Understanding youth
Definition, profile, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change
Community mobilisation
Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership
Social harmony and national integration
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; shramdan as part of volunteerism
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
Family and society
Concept of family, community (PRIs and other community based organisations) and society

NSS 111 National Service Scheme (II)
Importance and role of youth leadership
Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership
Life competencies
Definition and importance of life competencies, problem-solving and decision-making, inter personal communication
Youth development programmes
Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations
Health, hygiene and sanitation
Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.
Youth health, lifestyle, HIV AIDS and first aid
Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid
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

NSS 111 National Service Scheme (Semester III )  1(0+1)**
Vocational skill development
To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list
Issues related environment
Environmental conservation, enrichment and sustainability, climatic change, natural resource 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.

**Entrepreneurship development**
Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.

**Formulation of production oriented project**
Planning, implementation, management and impact assessment of project

**Documentation and data reporting**
Collection and analysis of data, documentation and dissemination of project reports

**NSS 111 National Service Scheme (IV)**

**Youth and crime**
Sociological and psychological factors influencing youth crime, cyber crime, peer mentoring in 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 self fund units (SFUs) and its establishment

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

**NCC 111 National Cadet Corps (Semester I)**

1. Aims, objectives, organization of NCC and NCC song. DG’s cardinals of discipline.
2. Drill- aim, general words of command, attention, stands at ease, stand easy and turning.
3. Sizing, numbering, forming in three ranks, open and close order march and dressing.
4. Saluting at the halt, getting on parade, dismissing and falling out.
5. Marching, length of pace, and time of marching in quick/slow time and halt. Side pace, pace forward and to the rear.
6. Turning on the march and wheeling. Saluting on the march.
7. Marking time, forward march and halt.
8. Changing step, formation of squad and squad drill.
9. Command and control, organization, badges of rank, honours and awards
11. Values and ethics, perception, communication, motivation, decision making, discipline and duties of good citizen.
12. Leadership traits, types of leadership. Character/personality development.
13. Civil defense organization, types of emergencies, fire fighting, 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’s and their contribution, contribution of youth towards social welfare and family planning.
17. Preventable diseases including AIDS, safe blood donation, first aid, physical and mental health.
18. Adventure activities
20. Precaution and general behaviour of girl cadets, prevention of untoward incidents, vulnerable parts of the body, self defense.
NCC 111 National Cadet Corps (Semester III) 1(0+1)**
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. Characteristics of rifle (.22/.303/SLR), ammunition, fire power, stripping, assembling, care, cleaning and sight setting.
8. Theory of groups and snap shooting. Firing at moving targets. Miniature range firing.
9. Characteristics of Carbine and LMG.
10. Introduction to map, scales and conventional signs. Topographical forms and technical terms.
12. Prismatic compass and its use. Setting a map, finding north and own position. Map to ground and ground to map.
13. Knots and lashings, Camouflage and concealment, Explosives and IEDs.
15. Nuclear, Chemical and Biological Warfare (NCBW)
20. Types of communication, media, latest trends and developments.

PEY111 Physical Education and Yoga Practices(Semester I) 1(0+1)**
1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situation with teaching of rules of the game
4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
6. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
7. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
8. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of some of Asanas – demonstration, practice, correction and practice
11. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
12. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
13. Teaching – Meaning, Scope and importance of Physical Education
14. Teaching – Definition, Type of Tournaments
15. Teaching – Physical Fitness and Health Education
16. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).
PEY111 Physical Education and Yoga Practices (Semester III) 1(0+1)**

1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game.
3. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.
4. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game.
5. Teaching of different track events – demonstration practice of the skills and correction with competition among them.
6. Teaching of different field events – demonstration practice of the skills and correction.
7. Teaching of different field events – demonstration practice of the skills and correction with competition among them.
8. Teaching of different asanas – demonstration practice and correction.
10. Teaching of circuit training – demonstration practice and correction.
11. Teaching of calisthenics – demonstration practice and correction.

Note:
1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white (Girls will have white Tee Shirt and Track pants)
2) The games mentioned in the practical may be inter changed depending on the season and facilities.

BAS-113/ AEC-113 Human Values and Ethics 1 (1+0)

Theory

NGC-321 Educational Tour 2 (0+2)

ELECTIVE COURSES

UGE-221 Agri-Business Management 3(2+1)

Theory
Practical

UGE- 222 Agrochemicals 3(2+1)

Theory

Practical

UGE- 223 Commercial Plant Breeding 3 (1+2)

Theory
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. Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment. Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools. IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical
Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.

UGE- 224 Landscaping 3 (2+1)

Theory

Practical
Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

UGE – 311 Food Safety and Standards 3 (2+1)

Theory

Practical

UGE- 312 Biopesticides & Biofertilizers 3(2+1)

Theory


Practical
Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhizium etc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides.

UGE- 313 Protected Cultivation 3 (2+1)

Theory

Practical
Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

UGE- 314 Micro propagation Technologies 3 (1+2)

Theory
Introduction, History, Advantages and limitations; Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture), Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites, Somaclonal variation, Cryopreservation

Practical
Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants :Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.

UGE- 321 Hi-tech. Horticulture 3 (2+1)
Theory
Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods, Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding. Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA), application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical
Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

UGE- 322  Weed Management  3 (2+1)
Theory

Practical

UGE- 323  System Simulation and Agro-advisory  3 (2+1)
Theory
System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams. Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production- concept and modelling techniques for their estimation. Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity; Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

UGE- 324  Agricultural Journalism  3 (2+1)
Theory
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.
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. 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 and scientific materials, wire services, other agricultural news sources. Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, layouting.

**Practical**

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.