COURSE CURRICULUM
&
SYLLABUS

B.Sc. (Hons.) Horticulture Degree Programme

Faculty of Agriculture
Birsa Agricultural university
Ranchi-834006
2018
www.bauranchi.org.
FOREWORD

Birsa Agricultural University, Ranchi since establishment in 1981, is striving hard to achieve excellence in Horticulture education, research and extension. As per our mandate, we provide scientifically trained quality manpower to the state and the country for catering the needs of public and private sectors.

College of Horticulture (Faculty of Agriculture) with its eight Departments admits students on the basis of joint Competitive Entrance Examination conducted by Jharkhand Combined Entrance Competitive Examination Board. The course curriculum for under-graduate programme has been updated as per the recommendations of the Vth Dean’s Committee constituted by the Indian Council of Agricultural Research. The syllabus has been re-oriented and subjected to approval by the University Academic Council to meet the presents need and future challenges of Human Resource Development.

Important changes include introduction of B.Sc. (Hon’s) Horticulture as a separate degree programme having intake capacity of 50, establishment of experiential learning units, entrepreneurship development, I congratulate Dr. Raghava Thakur, Dean of the Faculty and his team for their sincere and dedicated efforts in developing Course Curriculum and Syllabus. I also place on record, the contribution of Chairmen of the Departments of Horticulture and all the Faculty and supporting staff members.

I am sure that this publication would be of immense use to students and teachers.

(P. Kaushal)

Vice-Chancellor, BAU, Ranchi
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<td>Floriculture &amp; Landscape Architecture</td>
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<td>Name of the Department</td>
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<tr>
<td>--------</td>
<td>---------------------------------------------</td>
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</tr>
<tr>
<td>I</td>
<td>Fruit Science</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Vegetable Science</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Post Harvest Technology</td>
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<td>IV</td>
<td>Floriculture &amp; Landscape Architecture</td>
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<td>V</td>
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<td>VI</td>
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<tr>
<td>VII</td>
<td>Basic Sciences</td>
<td></td>
</tr>
<tr>
<td>VIII</td>
<td>Social Science</td>
<td></td>
</tr>
</tbody>
</table>
A. Examination and Evaluation System

(i) 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.
(ii) Evaluation

<table>
<thead>
<tr>
<th>Degree</th>
<th>Percentage of Marks Obtained</th>
<th>Conversion into Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>100</td>
<td>10 Points</td>
</tr>
<tr>
<td>90 to &lt;100</td>
<td></td>
<td>9 to &lt;10</td>
</tr>
<tr>
<td>80 to &lt;90</td>
<td></td>
<td>8 to &lt;9</td>
</tr>
<tr>
<td>70 to &lt;80</td>
<td></td>
<td>7 to &lt;8</td>
</tr>
<tr>
<td>60 to &lt;70</td>
<td></td>
<td>6 to &lt;7</td>
</tr>
<tr>
<td>50 to &lt;60</td>
<td></td>
<td>5 to &lt;6</td>
</tr>
<tr>
<td>&lt;50 (Fail)</td>
<td></td>
<td>&lt;5</td>
</tr>
<tr>
<td>Eg. 80.76</td>
<td></td>
<td>8.076</td>
</tr>
<tr>
<td>43.60</td>
<td></td>
<td>4.360</td>
</tr>
<tr>
<td>72.50 (but shortage in attendance)</td>
<td>Fail (1 point)</td>
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<table>
<thead>
<tr>
<th>OGPA</th>
<th>Division</th>
</tr>
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<tbody>
<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>
</tr>
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</table>

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

CGPA = \[\sum \text{Total points scored} / \text{Course credits}\]

OGPA = \[\sum \text{Total points scored (after excluding failure points)} / \text{Course credits}\]

% of Marks = OGPA x 100/10
HORTICULTURE

TERM OF REFERENCE 1. Defining UG degree for general market needs & for specialized jobs and uniformity in UG nomenclature

Degree Nomenclature

UG degree : B.Sc. (Hons.) Horticulture

TERM OF REFERENCE

Restructuring of UG programmes for B.Sc. Hon’s Horticulture practical and practice contents

Abstract

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Suggested</th>
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<tbody>
<tr>
<td>Total No. of courses</td>
<td>26 (Hort.)+32 (Allied) = 58 courses</td>
</tr>
<tr>
<td>Total credit hours</td>
<td>82+58=140</td>
</tr>
<tr>
<td>Non-credit courses</td>
<td>03</td>
</tr>
<tr>
<td>Non-credit courses (credit hour)</td>
<td>04(1+3)</td>
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<tr>
<td>Total credit hours of theory</td>
<td>82</td>
</tr>
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<td>Total credit hours for practical</td>
<td>58</td>
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<tr>
<td>Experiential learning (Professional Package)</td>
<td>0+20</td>
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<tr>
<td>RHWE&amp; Placement in Industries</td>
<td>0+20</td>
</tr>
<tr>
<td>Educational Tour</td>
<td>0+2</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>182 (82+[58+42])</strong></td>
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</tbody>
</table>
# Department/Discipline Wise Courses

<table>
<thead>
<tr>
<th>I</th>
<th>Fruit Science</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fundamentals of Horticulture</td>
<td>FSC-111</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Plant Propagation and Nursery Management</td>
<td>FSC-123</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Tropical and Subtropical Fruits</td>
<td>FSC-121</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Orchard and Estate Management</td>
<td>PP-311</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Plantation Crops</td>
<td>FSC-221</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Temperate Fruit crops</td>
<td>FSC-211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>7.</td>
<td>Weed Management in Horticultural Crops</td>
<td>FSC-212</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>8.</td>
<td>Principles of Plant Breeding</td>
<td>FSC-122</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>9.</td>
<td>Principles of Genetics and Cytogenetics</td>
<td>FSC-112</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>10.</td>
<td>Breeding of Fruit and Plantation Crops</td>
<td>FSC-222</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>11.</td>
<td>Dryland Horticulture</td>
<td>FSC-223</td>
<td>2(1+1)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>28(17+ 11)</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>II</th>
<th>Vegetable Science</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tropical and Subtropical Vegetable crops</td>
<td>VSC-121</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Spices and Condiments</td>
<td>VSC-221</td>
<td>3(2+1)</td>
</tr>
<tr>
<td></td>
<td>Course Description</td>
<td>Code</td>
<td>Credits</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>3.</td>
<td>Breeding of Vegetable Tuber and Spice Crops</td>
<td>VSC-311</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Seed Production of Vegetable Tuber and Spice Crops</td>
<td>VSC-321</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Temperate Vegetable crops</td>
<td>VSC-211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Potato and Tuber Crops</td>
<td>VSC-312</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>7.</td>
<td>Precision Farming and Protected Cultivation</td>
<td>VSC-222</td>
<td>3(2+1)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>19(12+7)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>III Postharvest Technology</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Postharvest Management of Horticultural Crops</td>
<td>PHT-321</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Processing of Horticultural Crops</td>
<td>PHT-322</td>
<td>3(1+2)</td>
</tr>
<tr>
<td>3.</td>
<td>Fundamentals of Food Technology</td>
<td>PHT-211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>8(4+4)</strong></td>
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<tr>
<td></td>
<td><strong>IV Floriculture &amp; Landscape Architecture</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Ornamental Horticulture</td>
<td>FLA-221</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Breeding and Seed Production of Ornamental Crops</td>
<td>FLA-321</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Principles of Landscape Architecture</td>
<td>FLA-111</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Commercial Floriculture</td>
<td>FLA-211</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Medicinal and Aromatic Crops</td>
<td>FLA-311</td>
<td>3(2+1)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>13(8+5)</strong></td>
</tr>
<tr>
<td></td>
<td><strong>V Plant Protection</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Course</td>
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<td></td>
</tr>
<tr>
<td>No.</td>
<td>Course Title</td>
<td>Course No.</td>
<td>Credits</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>---------</td>
</tr>
<tr>
<td>1.</td>
<td>Fundamentals of Plant Pathology</td>
<td>PPR-211</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Diseases of Fruit, Plantation and Medicinal and Aromatic Crops</td>
<td>PPR-214</td>
<td>3(2+1)</td>
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<tr>
<td>3.</td>
<td>Diseases of Vegetable, Ornamental and Spice Crops</td>
<td>PPR-311</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Fundamentals of Entomology</td>
<td>PPR-212</td>
<td>3(2+1)</td>
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<tr>
<td>5.</td>
<td>Nematode Pests of Horticultural Crops and their Management</td>
<td>PPR-213</td>
<td>2(1+1)</td>
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<tr>
<td>6.</td>
<td>Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops</td>
<td>PPR-221</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>7.</td>
<td>Apiculture, Sericulture and Lac Culture</td>
<td>PPR-321</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>8.</td>
<td>Insect Pests of Vegetable, Ornamental and Spice Crops</td>
<td>PPR-322</td>
<td>3(2+1)</td>
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<td><strong>Total</strong></td>
<td><strong>22(14+8)</strong></td>
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**VI** Natural Resource Management

<table>
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<tr>
<th>No.</th>
<th>Course Title</th>
<th>Course No.</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>Fundamentals of Soil Science</td>
<td>NRM-111</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Soil Fertility and Nutrient Management</td>
<td>NRM-121</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Environmental Studies and Disaster Management</td>
<td>NRM-123</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Soil, Water and Plant Analysis</td>
<td>NRM-221</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Farm Power and Machinery</td>
<td>NRM-222</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Water Management in Horticultural Crops</td>
<td>NRM-122</td>
<td>2(1+1)</td>
</tr>
<tr>
<td></td>
<td>Course Title</td>
<td>Code</td>
<td>Credits</td>
</tr>
<tr>
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</tr>
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<td>7</td>
<td>Organic Farming</td>
<td>NRM-311</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>8</td>
<td>Agro-meteorology and Climate Change</td>
<td>NRM-314</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>9</td>
<td>Introductory Agro-forestry</td>
<td>NRM-313</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>10</td>
<td>Introduction to Major Field Crops</td>
<td>NRM-312</td>
<td>2(1+1)</td>
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<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>22(12+10)</strong></td>
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<tr>
<td>VII</td>
<td>Basic Sciences</td>
<td>Course No.</td>
<td>Credit Hours</td>
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</tr>
<tr>
<td>1.</td>
<td>Elementary Statistics and Computer Application</td>
<td>BS-111</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Elementary Plant Biochemistry</td>
<td>BS-112</td>
<td>2(1+1)</td>
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<td>3.</td>
<td>Elementary Plant Biotechnology</td>
<td>BS-211</td>
<td>2(1+1)</td>
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<tr>
<td>Sl. No.</td>
<td>Activity</td>
<td>Course No.</td>
<td>Credits</td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------------------------------------------</td>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td>1.</td>
<td>Experiential learning (Professional Package)</td>
<td>BS-113</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>2.</td>
<td>RHWE&amp; Placement in Industries</td>
<td>SR-411,SR-412</td>
<td>0+20</td>
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<tr>
<td>3.</td>
<td>Educational Tour</td>
<td>ET-411</td>
<td>0+2</td>
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<td><strong>0+42</strong></td>
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<th>Sl. No.</th>
<th>Activity</th>
<th>Course No.</th>
<th>Duration</th>
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<tbody>
<tr>
<td>1.</td>
<td>Orientation Programme</td>
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<td>2 weeks</td>
</tr>
<tr>
<td>2.</td>
<td>Village stay at RSK/Hobli level</td>
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<td>12 weeks</td>
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<tr>
<td>3.</td>
<td>All India Study Tour</td>
<td></td>
<td>3 weeks</td>
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<tr>
<td>4.</td>
<td>Placement Programme</td>
<td></td>
<td>4 weeks</td>
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</table>
5. Report writing & Final Examination | 3 weeks
Total | 24 Weeks

**STUDENT READY:**

Professional Packages Hands on Training /Experimental Learning Modules: Final year B.Sc. (Hort.) students can select two modules under STUDENT READY- Experiential Learning programme depending on the facilities available at the college.

1. Commercial Horticulture
2. Protected cultivation of high value Horticulture crops
3. Processing of fruits and vegetables for value addition
4. Floriculture and landscape architecture
5. Bio-inputs: Bio-fertilizers and bio-pesticides
6. Mass multiplication of plant and molecules through tissue culture
7. Mushroom culture
8. Bee keeping

**Batch of student can select two modules under STUDENT READY- Experiential Learning Programme depending on the facilities available at the college.**

**II. Rural Horticultural Work Experience Programme (0+20)**

1. STUDENT READY - Placement in Industries (0+10)
2. STUDENT READY - Placement in Villages (0+10)

**Semester wise courses**

**Semester – I**

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
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<tr>
<td>1.</td>
<td>Elementary Statistics and Computer Application</td>
<td>BS-111</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Fundamental of Soil Science</td>
<td>NRM-111</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Economics and Marketing</td>
<td>SS-111</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Elementary Plant Biochemistry</td>
<td>BS-112</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Introductory Crop Physiology</td>
<td>BS-113</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Fundamentals of Horticulture</td>
<td>FSC-111</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>7.</td>
<td>Principles of Landscape Architecture</td>
<td>FLA-111</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>8.</td>
<td>Principles of Genetics and Cytogenetics</td>
<td>FSC-112</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>9.</td>
<td>Introductory Microbiology</td>
<td>BS-114</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>10.</td>
<td>Communication Skills and Personality Development</td>
<td>SS-112</td>
<td>2(1+1)</td>
</tr>
</tbody>
</table>
### National Service Scheme/National Cadet Corp

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>National Service Scheme/National Cadet Corp</td>
<td>NS-111</td>
<td>1(0+1)(NC)*</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>25(14+11)</strong></td>
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</tbody>
</table>

### Semester – II

<table>
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<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Tropical and Subtropical Fruits</td>
<td>FSC-121</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Tropical and Subtropical Vegetables</td>
<td>VSC-121</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Principles of Plant Breeding</td>
<td>FSC-122</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Soil Fertility and Nutrient Management</td>
<td>NRM-121</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Water Management in Horticultural Crops</td>
<td>NRM-122</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Plant Propagation and Nursery Management</td>
<td>FSC-123</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>7.</td>
<td>Environmental Studies and Disaster Management#</td>
<td>NRM-123</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>8.</td>
<td>Growth and Development of Horticultural Crops</td>
<td>BS-121</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>9.</td>
<td>Physical and Health Education*</td>
<td>SS-121</td>
<td>1(0+1) (NC)*</td>
</tr>
<tr>
<td>10.</td>
<td>Information and communication technology*</td>
<td>SS-122</td>
<td>2(1+1) (NC)*</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>23(13+10)</strong></td>
</tr>
</tbody>
</table>

### Semester – III

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fundamentals of Plant Pathology</td>
<td>PPR-211</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Fundamentals of Entomology</td>
<td>PPR-212</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Temperate Vegetable Crops</td>
<td>VSC-211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Nematode pests of horticultural crops and their Management</td>
<td>PPR-213</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Diseases of fruit, Plantation, Medicinal and Aromatic Crops</td>
<td>PPR-214</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Fundamentals of Food Technology</td>
<td>PHT-211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>S.N</td>
<td>Title of the Course</td>
<td>Course No.</td>
<td>Credit Hours</td>
</tr>
<tr>
<td>-----</td>
<td>---------------------------------------------------</td>
<td>------------</td>
<td>--------------</td>
</tr>
<tr>
<td>7.</td>
<td>Temperate Fruit Crops</td>
<td>FSC- 211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>8.</td>
<td>Weed Management in Horticultural Crops</td>
<td>FSC- 212</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>9.</td>
<td>Commercial Floriculture</td>
<td>FLA- 211</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>10.</td>
<td>Elementary Plant Biotechnology</td>
<td>BS- 211</td>
<td>2(1+1)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>24 (14+10)</strong></td>
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**Semester – IV**

<table>
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<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Soil, Water and Plant Analysis</td>
<td>NRM-221</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Spices and Condiments</td>
<td>VSC-221</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Ornamental Horticulture</td>
<td>FLA-221</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Plantation Crops</td>
<td>FSC-221</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Breeding of Fruit and Plantation Crops</td>
<td>FSC-222</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Farm Power and Machinery</td>
<td>NRM-222</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>7.</td>
<td>Insect Pests of Fruit, Plantation, Medicinal &amp; Aromatic Crops</td>
<td>PP-221</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>8.</td>
<td>Precision Farming and Protected Cultivation</td>
<td>VSC-222</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>9.</td>
<td>Dry land Horticulture</td>
<td>FSC-223</td>
<td>2(1+1)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>23(14+9)</strong></td>
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</tbody>
</table>

**Semester – V**

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Organic Farming</td>
<td>NRM-311</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Introduction to Major Field Crops</td>
<td>NRM-312</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Medicinal and Aromatic crops</td>
<td>FLA-311</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Introductory Agroforestry</td>
<td>NRM-313</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Breeding of Vegetable, Tuber and Spice Crops</td>
<td>VSC-311</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Courses</td>
<td>Credits</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>6</td>
<td>Diseases of Vegetables, Ornamentals and Spice Crops</td>
<td>PPR-311</td>
<td>3 (2+1)</td>
</tr>
<tr>
<td>7</td>
<td>Orchard and Estate Management</td>
<td>FSC-311</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td>8</td>
<td>Agro-meteorology and Climate Change</td>
<td>NRM-314</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td>9</td>
<td>Potato and tuber crops</td>
<td>VSC-312</td>
<td>2 (1+1)</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>22(13+9)</strong></td>
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</table>
### Semester – VI

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Apiculture, Sericulture and Lac culture</td>
<td>PPR-321</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>2.</td>
<td>Insect Pests of Vegetable, Ornamental and Spice Crops</td>
<td>PP-322</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>3.</td>
<td>Postharvest Management of Horticultural Crops</td>
<td>PHT-321</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>4.</td>
<td>Seed production of Vegetable, Tuber and Spice Crops</td>
<td>VSC-321</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>5.</td>
<td>Breeding and Seed Production of Flower and Ornamental Plants</td>
<td>FLA-321</td>
<td>3(2+1)</td>
</tr>
<tr>
<td>6.</td>
<td>Processing of Horticultural Crops</td>
<td>PHT-322</td>
<td>3(1+2)</td>
</tr>
<tr>
<td>7.</td>
<td>Horti-Business Management</td>
<td>SS-321</td>
<td>2(2+0)</td>
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<tr>
<td>8.</td>
<td>Entrepreneurship Development and Business Management</td>
<td>SS-322</td>
<td>2(1+1)</td>
</tr>
<tr>
<td>9.</td>
<td>Fundamentals of Extension Education</td>
<td>SS-323</td>
<td>2 (1+1)</td>
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<td>Total</td>
<td></td>
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### Semester – VII

**Rural Horticultural Work Experience Programme**

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course- RHWE</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>STUDENT READY - Placement in Industries</td>
<td>SR-411</td>
<td>0+10</td>
</tr>
<tr>
<td>2.</td>
<td>STUDENT READY- Placement in Villages</td>
<td>RHWE-412</td>
<td>0+10</td>
</tr>
<tr>
<td>3.</td>
<td>Educational Tour</td>
<td>ET-411</td>
<td>0+2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>22 (0+22)</strong></td>
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</tbody>
</table>

### Semester – VIII

<table>
<thead>
<tr>
<th>S.N</th>
<th>Title of the Course</th>
<th>ELP</th>
<th>Course No.</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STUDENT READY: Experimental Learning programme</td>
<td></td>
<td>20(0+20)</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Commercial Horticulture</td>
<td>No change</td>
<td></td>
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</tr>
<tr>
<td>2.</td>
<td>Protective Cultivation of High Value Horticulture Crops</td>
<td>No change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Processing of Fruits and Vegetables for Value Addition</td>
<td>No change</td>
<td></td>
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</tr>
<tr>
<td>4.</td>
<td>Floriculture and Landscape Architecture</td>
<td>New Module</td>
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</tr>
<tr>
<td>6.</td>
<td>Mass Multiplication of Plant And Molecules through Tissue Culture</td>
<td>New Module</td>
<td></td>
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</tr>
<tr>
<td>7.</td>
<td>Mushroom culture</td>
<td>New Module</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Bee keeping</td>
<td>New Module</td>
<td></td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td>20 (0+20)</td>
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</tr>
</tbody>
</table>

The student undergoing ELP may be allowed to register for a maximum two courses in which they have failed but completed requisite percentage of attendance.

**SYLLABUS**

**I. FRUIT SCIENCE**

1. Fundamentals of Horticulture 3(2+1)

**Theory**

Scope and importance, classification of horticultural crops and nutritive value, area and production, exports and imports, fruit and vegetable zones of India and of different states, nursery techniques and their management, soil and climate, vegetable gardens, nutrition and kitchen garden and other types of gardens – principles, planning and layout, management of orchards, planting systems and planting densities. Production and practices for fruit, vegetable and floriculture crops. Principles objectives, types and methods of pruning and training of fruit crops, types and use of growth regulators in horticulture, water management – irrigation methods, merits and demerits, weed management, fertility management in horticultural crops, manures and fertilizers, different methods of application, cropping systems, intercropping, multi-tier cropping, mulching – objectives, types, merits and demerits. Classification of bearing habits of fruit trees factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working, principles of organic farming, market chain management.

**Practical:** Features of orchard, planning and layout of orchard, tools and implements, identification of various horticultural crops, layout of nutrition garden, preparation of nursery beds for sowing of vegetable seeds, digging of pits for fruit plants, planting systems, training and pruning of orchard trees, preparation of fertilizer mixtures and field application, preparation and application of growth regulators, layout of different irrigation systems, identification and management of nutritional disorder in fruits, assessment of bearing habits, maturity standards, harvesting, grading, packaging and storage.
Suggested Reading:

2. Plant Propagation and Nursery Management 2(1+1)

Theory


Practical

Suggested Reading:


3. Tropical and Sub-Tropical Fruits 3(2+1)

Theory

Horticultural classification of fruits including genome classification. Horticultural zones of India, detailed study of area, production and export potential, varieties, climate and soil requirements, propagation techniques, planting density and systems, after care, training and pruning. Management of water, nutrient and weeds, special horticultural techniques including plant growth regulators, their solution preparation and use in commercial orchards. Physiological disorders. Post-harvest technology, harvest indices, harvesting methods, grading, packaging and storage of the following crops. Mango, banana, grapes, citrus, papaya, sapota, guava, pomegranate, bael, ber, amla, anona, fig, pineapple, jackfruit, avocado, mangosteen, litchi, carambola, durian, rambutan, bilimbi, loquat, rose apple breadfruit and passion fruit. Bearing in mango and citrus, causes and control measures of special production problems, alternate and irregular bearing overcome, control measures. Seediness and kokkan disease in banana, citrus decline and casual factors and their management. Bud forecasting in grapes, sex expression and seed production in papaya, latex extraction and crude papain production, economic of production.

Practical

Description and identification of varieties based on flower and fruit morphology in above crops. Training and pruning of grapes, mango, guava and citrus. Selection of site and planting system, pre-treatment of banana suckers, desuckering in banana, sex forms in papaya. Use of plastics in fruit production. Visit to commercial orchards and diagnosis of maladies. Manure and fertilizer application including bio-fertilizer in fruit crops, preparation and application of growth regulators in banana, grapes and mango. Seed production in papaya, latex extraction and preparation of crude papain. Ripening of fruits, grading and packaging, production economics for tropical and subtropical fruits. Mapping of arid and semi-arid zones of India. Botanical description and identification of ber, fig, jamun, pomegranate, carissa, phalsa, wood apple, West Indian cherry, tamarind, aonla, bael and annona.
Suggested Reading:


4. Temperate Fruit Crops 2(1+1)

Theory

Classification of temperate fruits, detailed study of areas, production, varieties, climate and soil requirements, propagation, planting density, cropping systems, after care training and pruning, self-incompatibility and pollinisers, use of growth regulators, nutrient and weed management, harvesting, post-harvest handling and storage of apple, pear, peach, apricot, plum, cherry, persimmon, strawberry, kiwi, Queensland nut (Mecademia nut), almond, walnut, pecan nut, hazel nut and chest nut. Re-plant problem, rejuvenation and special production problems like pre-mature leaf fall, physiological disorders, important insect – pests and diseases and their control measures. Special production problems like alternate bearing problem and their remedies.
Practical

Nursery management practices, description and identification of varieties of above crops, manuring and fertilization, planting systems, preparation and use of growth regulators, training and pruning in apple, pear, plum, peach and nut crops. Visit to private orchards to diagnose maladies. Working out economics for apple, pear, plum and peach.

Suggested Reading:


- David Jackson & N E Laone, 1999 Subtropical and Temperate Fruit Production. CABI, Publications.
5. Orchard and Estate Management 2(1+1)

Theory

Orchard & estate management, importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches. Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems. Biological efficiency of cropping systems in horticulture, systems of irrigation. Soil management in relation to nutrient and water uptake and their effect on soil environment, moisture, organisms and soil properties. Factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working, Integrated nutrient and pest management. Utilization of resources constraints in existing systems. Crop model and crop regulation in relation to cropping systems. Climate aberrations and mitigation measures of Horticultural crops.

Practical

Layout of different systems of orchard and estate, soil management, clean, inter, cover and mixed cropping, fillers. Use of mulch materials, organic and inorganic, moisture conservation, weed control. Layout of various irrigation systems.

Suggested Reading:

6. Plantation Crops 3(2+1)

Theory

History and development, scope and importance, area and production, export and import potential, role in national and state economy, uses, industrial importance, by products utilization, soil and climate, varieties, propagation: principles and practices of seed, vegetative and micro-propagation, planting systems and method, gap filling, systems of cultivation, mulching, shade regulation, weed and water management, training, pruning and handling, nutrition, foliar feeding, role of growth regulators, soil management, liming practices, tipping practices, top working, physiological disorders, harvesting, post-harvest handling and processing, packaging and marketing, yield and economics of coconut, arecanut, oil palm, palmyrah palm, cacao, cashew nut, coffee, tea, Date palm and rubber.

Practical

Description and identification of coconut varieties, selection of coconut and arecanut mother palm and seed nut, planting of seed nuts in nursery, layout and planting of coconut, arecanut, oil palm, cashew nut, cacao gardens, manuring, irrigation; mulching, raising masonry nursery for palm, nursery management in cacao. Description and identification of species and varieties in coffee, harvesting, grading, pulping, fermenting, washing, drying and packing of coffee, seed berry collection, seed extraction, treatment and sowing of coffee, epicotyl, softwood, grafting and top working in cashew, working out the economics and project preparation for coconut, arecanut, oil palm, cashew nut, cacao, etc. Mother plant selection, preparation of cuttings and rooting of tea under specialized structure, training, centering, pruning, tipping and harvesting of tea.

Suggested Reading:

- Nair 1979. Cashew. CPCRI, Kerala
7. Weed Management in Horticultural Crops 2(1+1)

Theory

Weeds: Introduction, harmful and beneficial effects, classification, propagation and dissemination; Weed biology and ecology, crop weed association, crop weed competition and allelopathy Concepts of weed prevention, control and eradication; Methods of weed control: physical, cultural, chemical and biological methods. Integrated weed management; Herbicides: advantages and limitation of herbicide usage in India, Herbicide classification, formulations, methods of application; Introduction to Adjuvants and their use in herbicides; Introduction to selectivity of herbicides; Compatibility of herbicides with other agro chemicals; Weed management in major field and horticultural crops, shift of weed flora in cropping systems, aquatic and problematic weeds and their control.

Practical

Identification of weeds; Survey of weeds in crop fields and other habitats; Preparation of herbarium of weeds; Calculations on weed control efficiency and weed index; Herbicide label information; Computation of herbicide doses; Study of herbicide application equipment and calibration; Demonstration of methods of herbicide application; Preparation of list of commonly available herbicides; Study of phytotoxicity symptoms of herbicides in different crops; Biology of nut sedge, bermuda grass, parthenium and celosia; Economics of weed control practices; Tours and visits of problem areas.

Suggested reading:
- Ramamooorthy, K. and Subbian, P., Predominant Weed flora in hill ecosystems. Agrobios (India), Jodhpur
8. Principles of Genetics and Cytogenetics 3(2+1)

Theory


Practical


Suggested Reading:

• Swanson & Webster. *The Cell (V edn).* Prentice Hall of India Pvt. Ltd, New Delhi
• Griffiths, Miller, Suzuki Lewontin & Gelbart. *An introduction to Genetic Analysis (V Ed).* W.H.Freeman & Company, Newyork
• Swanson, Merz & Young. *Cytogenetics* (II ed.). Prentice Hall of India Pvt. Ltd. New Delhi.
• Singh B D.*Fundamentals of Genetics.* Kalyani Publishers, New Delhi

• Shukla.*Cell Biology*(2001). Dominant publishers, New Delhi
• George Acquaah.*Principles of Plant Genetics and Breeding.* Blackwell
• B.D. Singh.*Fundamental of Genetics.* Kalyani. India
• Gupta, P.K. 1985.*Cytology, genetics and cytogenetics.* Rastogi Publication, India.

9. **Principles of Plant Breeding 3(2+1)**

**Theory**

Plant breeding as a dynamic science, genetic basis of Plant Breeding – classical, quantitative and molecular, Plant Breeding in India – limitations, major

**Practical**

Breeding objectives and techniques in important horticultural crops. Floral biology – its measurement, emasculation, crossing and selfing techniques in major crops. Determination of mode of reproduction in crop plants, handling of breeding material, segregating generations (pedigree, bulk and back cross methods), Field layout, and maintenance of experimental records in self and cross pollinated crops. Demonstration of hybrid variation and production techniques. Hardy Weinberg Law and calculation, male sterility and incompatibility studies in horticultural crops calculation of inbreeding depression, heterosis, heterobeltioses, GCA, SCA, GA, heritability.

**Suggested Reading:**

- R.C. Chaudhary. Plant Breeding
10. Breeding of Fruit and Plantation Crops 3(2+1)

Theory

Fruit breeding - History, importance in fruit production, distribution, domestication and adaptation of commercially important fruits, variability for economic traits, breeding strategies, clonal selection, bud mutations, mutagenesis and its application in crop improvement – policy manipulations – in vitro breeding tools (important fruit and plantation crops).

Practical

Exercises on floral biology, pollen viability; emasculation and pollination procedures; hybrid seed germination; raising and evaluation of segregating populations; use of mutagens to induce mutations and polyploidy in major crops like Mango, Banana, Citrus, Grapes, Guava, Sapota, Papaya, Custard apple, Aonla, Ber, Litchi, Pomegranate, Jamun, Areca nut, Coconut, Pistachnut, Apple, Pear, Plum, Peach, Apricuit and Strawberry.

Suggested Reading:

11. Dryland Horticulture 2(1+1)

**Theory**

Definition, importance and limitation of dry land horticulture, present status and future scope. Constraints encounter in dry lands. Agro-climatic features in rain shadow areas, scarce water resources, high temperature, soil erosion, run-off losses etc.

Techniques and management of dry land horticulture. watershed development, soil and water conservation methods-terraces, contour bunds,etc. Methods of control and impounding of run-off water-farm ponds, trenches, macro catch pits, etc., in-situ water harvesting methods, micro catchment, different types of tree basins etc. Methods of reducing evapotranspiration, use of shelter belts, mulches, antitranspirants, growth regulators, etc. water use efficiency-need based, economic and conjunctive use of water, micro systems of irrigation etc.

Selection of plants having drought resistance. Special techniques, planting and after care-use of seedling races, root stocks, in-situ grafting, deep pitting/planting, canopy management etc.

Characters and special adaptation of crops: ber, aonla, annona, jamun, wood apple, bael, pomegranate, carissa, date palm, phalsa, fig, west Indian cherry and tamarind.

**Practical**


**Suggested reading:**

II. VEGETABLE SCIENCE

1. Tropical and Sub-tropical Vegetable Crops 3(2+1)

Theory

Area, production, economic importance and export potential of tropical and sub-tropical vegetable crops. Description of varieties and hybrid, climate and soil requirements, seed rate, preparation of field, nursery practices; transplanting of vegetable crops and planting for directly sown/transplanted vegetable crops. Spacing, planting systems, water and weed management; nutrient management and deficiencies, use of chemicals and growth regulators. Cropping systems, harvest, yield, post-harvest handling, economics and marketing of tropical and sub-tropical vegetable crops such as tomato, brinjal, chillies, capsicum, okra, amaranthus, cluster beans, cowpea, lab-lab, snap bean, cucurbits, moringa, curry leaf, portulaca, basella, sorrel and roselle.

Practical

Identification and description of tropical and sub-tropical vegetable crops; nursery practices and transplanting, preparation of field and sowing/planting for direct sown and planted vegetable crops. Herbicide use in vegetable culture; top dressing of fertilizers and intercultural; use of growth regulators; identification of nutrient deficiencies. Physiological disorder. Harvest indices and maturity standards, post-harvest handling and storage, marketing, seed extraction (cost of cultivation for tropical and sub-tropical vegetable crops), project preparation for commercial cultivation.

Suggested Reading:

2. Spices and Condiments 3(2+1)

**Theory**

History, scope and importance, Present status, area and production, uses, export potential and role in national economy. Classification, soil and climate, propagation-seed, vegetative and micropropagation systems and methods of planting. Nutritional management, irrigation practices, weed control, mulching and cover cropping. Training and pruning practices, role of growth regulators, shade crops and shade regulation. Harvesting, post-harvest technology, packaging, storage, value added products, methods of extraction of essential oil and oleoresins. Economics of cultivation, role of Spice Board and Pepper. Export Promotion Council, institutions and research centers in R&D. Crops: Cardamom, pepper, betel vine ginger, turmeric, clove, nutmeg, cinnamon, all spice, curry leaf, coriander, fenugreek, fennel, cumin, dill, celery, bishops weed, saffron, vanilla, thyme and rosemary.
Practical

Identification of varieties: propagation, seed treatment – sowing; layout, planting; hoeing and earthing up; manuring and use of weedicides, training and pruning; fixing maturity standards, harvesting, curing, processing, grading and extraction of essential oils and oleoresins. Visit to commercial plantations.

Suggested Reading:

- Shanmugavelu, K.G. Kumar, N and Peter, K.V., 2005. Production technology of spices and plantation crops. Agrosis, Jodhpur

3. Breeding of Vegetable, Tuber and Spice Crops 3(2+1)

Theory

Practical

Floral biology and pollination mechanism in self and cross pollinated vegetables, tuber crops and spices. Working out phenotypic and genotypic heritability, genetic advance. GCA, SCA, combining ability, heterosis, heterobeltosis, standard heterosis, GxE interactions (stability analysis) Preparation and uses of chemical and physical mutagens. Polyploidy breeding and chromosomal studies. Techniques of F1 hybrid seed production. Maintenance of breeding records.

Suggested Reading:


4. Seed Production of Vegetable, Tuber and Spice Crops 3(2+1)

Theory

Introduction and history of seed industry in India. Definition of seed, classes- types of seed. Differences between grain and seed. Importance and scope of vegetable seed production in India. Principles of vegetable seed production. Role of temperature, humidity and light in vegetable seed production, land requirements, climate, season, planting time, nursery management, seed rate, rouging, seed extraction and storage of cole crops, root vegetables, solanaceous vegetables, cucurbits, okra, leafy vegetables, bulb crops, leguminous vegetables and exotic vegetables. Seed germination and purity analysis. Field and seed standards. Seed drying and extraction. Seed legislation.
Practical


Suggested Reading:

5. Temperate Vegetable Crops 2(1+1)

Theory

Importance of cool season vegetable crops in nutrition and national economy. Area, production, export potential, description of varieties and hybrids, origin, climate and soil, production technologies, post-harvest technology and Marketing of cabbage, cauliflower, knol-khol, sprouting broccoli, Brussels’ sprout, lettuce, palak, Chinese cabbage, spinach, garlic, onion, leek, radish, carrot, turnip, beet root, peas, broad beans, rhubarb, asparagus, globe artichoke, Vegetable kale.

Practical

Identification and description of varieties/hybrids; propagation methods, nursery management; preparation of field, sowing/transplanting; identification of physiological and nutritional disorders and their corrections; post-harvest handling; cost of cultivation and field visits to commercial farms.

Suggested Reading:

6. Potato and Tuber Crops 2(1+1)

**Theory**

Origin, area, production, economic importance and export potential of potato and tropical, sub-tropical and temperate tuber crops; description of varieties and hybrids. Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of cultivation. Post- harvest handling and storage, field and seed standards, marketing. Crops to be covered – potato, sweet potato, arrow root, cassava, colocasia, xanthosoma, amorphophallus, dioscorea, Jerusalem artichoke, horse radish and other under exploited tuber crops.

**Practical**

Identification and description of potato and tropical, sub-tropical and temperate tuber crops; planting systems and practices; field preparation and sowing/planting. Top dressing of fertilizers and interculture and use of herbicides and growth regulators; identification of nutrient deficiencies, physiological disorders; harvest indices and maturity standards, post-harvest handling and storage, marketing. Seed collection, working out cost of cultivation, project preparation of commercial cultivation.
Suggested Reading:

7. Precision Farming & Protected Cultivation 3 (2+1)

Theory

Precision farming – laser leveling, mechanized direct seed sowing; seedling and sapling transplanting, mapping of soils and plant attributes, site specific input application, weed management, insect pests and disease management, yield mapping in horticultural crops. Green house technology, Introduction, Types of Green Houses; Plant response to Greenhouse environment, Planning and design of greenhouses, Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, Typical applications, passive solar greenhouse, hot air greenhouse heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics.

Practical

Study of different types of greenhouses based on shape, construction and cladding materials; Calculation of air rate exchange in an active summer winter cooling system; Calculation of rate of air exchange in an active winter cooling system; Estimation of drying rate of agricultural products inside green house; Testing of soil and water to study its suitability for growing crops in greenhouses; The study of fertigation requirements for greenhouses crops and estimation of E.C. in the fertigation solution; The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization; Visit to commercial green houses; Economics of protected cultivation.

Suggested Reading:

III. POST HARVEST TECHNOLOGY

1. Postharvest Management of Horticultural Crops 3(2+1)

Theory

Importance of Postharvest Technology in horticultural crops. Maturity indices, harvesting, handling, grading of fruits, vegetables, cut flowers, plantation crops, spices, medicinal and aromatic plants. Pre-harvest factors affecting quality, factors responsible for deterioration of horticultural produce, physiological and bio-chemical changes, hardening and delaying ripening process. Postharvest treatments of horticultural crops. Quality parameters and specifications. Structure of fruits, vegetables and cut flowers related to physiological changes after harvest. Methods of storage for local market and export. Pre-harvest treatment and pre-cooling, pre-storage treatments. Different systems of storage, packaging methods and types of packages, recent advances in packaging. Types of containers and cushioning materials, vacuum packaging, cold storage, poly shrink packaging, grape guard packing treatments. Modes of transport.

Practical

Practice in judging the maturity of various horticultural produce, determination of physiological loss in weight and quality. Grading of horticultural produce, post-harvest treatment of horticultural crops, physical and chemical methods. Packaging studies in fruits, vegetables, plantation crops, spices and cut flowers by using different packaging materials, methods of storage, post-harvest disorders in...
horticultural produce. Identification of storage pests and diseases in spices. Visit to markets, packing houses and cold storage units.

**Suggested Reading:**

- www.postharvest.ucdavis.edu
2. Processing of Horticultural Crops 3(1+2)

Theory

Importance and scope of fruit and vegetable preservation industry in India, food pipeline, losses in post-harvest operations, unit operations in food processing. Principles and guidelines for the location of processing units. Principles and methods of preservation by heat-pasteurization, canning, bottling. Methods of preparation of juices, squashes, syrups, cordials and fermented beverages. Jam, jelly and marmalade. Preservation by sugar and chemicals, candies, crystallized fruits, preserves chemical preservatives, preservation with salt and vinegar, pickling, chutneys and sauces, tomato and mushrooms, freezing preservation. Processing of plantation crops, products, spoilage in processed foods, quality control of processed products, Govt. policy on import and export of processed fruits. Food laws.

Practical

Equipments used in food processing units. Physico-chemical analysis of fruits and vegetables. Canning of fruits and vegetables, preparation of squash, RTS, cordial, syrup, jam, jelly, marmalade, candies, preserves, chutneys, sauces, pickles (hot and sweet). Dehydration of fruits and vegetables—tomato product dehydration, refrigeration and freezing, cut out analysis of processed foods. Processing of plantation crops. Visit to processing units.

Suggested Reading:

3. Fundamentals of Food Technology 2(1+1)

Theory

Practical

Methods of measuring food ingredients, effect of cooking on volume and weight, determination of percentage of edible portion. Browning reactions of fruits and vegetables. Microscopic examination of starches, estimation of energy, value proteins and fats of foods. Planning diet for various age groups.

Suggested Reading:

- Dr. Swaminathan, M. 1985. Essential of Food and Nutrition Vol. II. BAPPCO, Bangalore.
IV. FLORICULTURE & LANDSCAPE ARCHITECTURE

1. Ornamental Horticulture 2(1+1)

Theory

History, definitions, scope of ornamental horticulture, aesthetic values, floriculture industry, Importance, area and production, industrial importance of ornamental plants and flowers. Importance, classification, design values and general cultivation aspects for ornamental plants viz. Annuals, biennales herbaceous perennials, grasses and bulbous ornamentals. shrubs, climbers, trees, indoor plants, palms and cycads, ferns and sellagenellas, cacti and succulents, Importance, design and establishment of garden features/components viz. hedge, edge, borders, flower beds, bridges, paths, drives, fences, garden walls, gates, carpet bed, arbour, Patio, decking, retaining walls, shade garden, sunken garden, roof garden, terrace garden, pebble garden, rockery, pools, waterfalls, fountains, bog garden, avenue planting and children garden. Lawn types, establishment and maintenance. Importance of Garden adornments viz. floral clock, bird bath, statues, sculptures, lanterns, water basins, garden benches etc.. Importance of flower arrangement, Ikebana, techniques, types, suitable flowers and cut foliage, uses of vertical garden, bottle garden, terrariums, art of making bonsai, culture of bonsai and maintenance.

Practical

Identification and description of annuals, biennials, herbaceous perennials, climbers, shrubs, trees, indoor plants, ferns and sellagenellas, Palms and cycads and Cacti and succulents. Planning and designing and establishment of garden features viz. lawn, hedge and edge, rockery, water garden, carpet bedding, shade garden, roof garden, Study and creation of terrariums, vertical garden, study and practice of different types of flower arrangements, preparation of floral bouquets, preparation of floral rangoli, veni etc., Study of Bonsai techniques, Bonsai practicing and training. Visit to nurseries and floriculture units.
Suggested Reading:


2. Breeding and Seed Production of Flower and Ornamental Crops 3(2+1)

Theory

Practical

Study of floral biology and pollination in important species and cultivars. Techniques of inducing polyploidy and mutation. Production of pure and hybrid seeds. Harvesting, conditioning and testing of seeds. Practice in seed production methods.

Suggested Reading:


3. Principles of Landscape Architecture 2(1 +1)

Theory

Historical Importance of Indian gardens, Gardens of ancient world, Definitions, Famous gardens of India and abroad, formal, informal, free style and wild gardens, basic themes of gardens viz. circular, rectangular and diagonal themes, Steps in preparation of garden design. Use of Auto CAD and Arch CAD in designing gardens. Factors affecting landscape design viz. intial approach, view, human choice,
simplicity, topography etc., Principles of Landscape gardens viz. Axis, rhythm, balance, time and light, space, texture, form, mass effect, focal point, mobility, emphasis, unity and harmony etc.. Elements of landscape gardens viz. tangible and intangible elements. Bio-aesthetic planning, definition, objectives, Planning and designing of home gardens, colonies, country planning, urban landscape, Development of institutional gardens, planning and planting of avenues, beautifying schools, railway lines, railway stations, factories, bus stands, air ports corporate buildings, dams, hydro electric stations, river banks, play grounds, Gardens for places of religious importance viz. temples, churches, mosques, tombs etc, Importance, features and establishment of English garden, Japanese gardens, Mughal, gardens, French and Persian garden, Italian gardens, Hindu gardens and Buddhist gardens, Xeriscaping, definition, principles and practice.

**Practical**


**Suggested Reading:**

- H.S.Grewal and Parminder Singh. 2014. *Landscape designing and ornamental plants*
4. Commercial Floriculture 3(2+1)

Theory

Scope and importance of commercial floriculture in India, production techniques of commercial flower crops like rose, marigold, chrysanthemum, orchid, carnation, gladiolus, jasmine, crossandra, anthurium, dahlia, tuberose, bird of paradise, china aster and gerbera for domestic and export market, production techniques of flowers and foliage filler materials growing of flowers under protected environments such as glass house, plastic house etc., postharvest technology of cut flowers in respect of commercial flower crops, dehydration technique for drying of flowers, production techniques for bulbous.

Practical


Suggested Reading:

5. Medicinal and Aromatic Crops 3(2+1)

Theory

History, scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants. Study of chemical composition of a few important medicinal and aromatic plants, extraction, use and economics of drugs and essential oils in medicinal and aromatic plants. Therapeutic and pharmaceutical uses of important species. Storage techniques of essential oils. Medicinal Plants: Withania, periwinkle, Rauwolfia, Dioscorea, Isabgol, opium poppy Ammi majus, Belladonna, Cinchona, Pyrethrum and other species relevant to local conditions. Aromatic Plants: Citronella grass, khus grass, flag (baje), lavender, geranium, patchouli, bursera, menthe, musk, occimum and other species relevant to the local conditions. Marketing.

Practical

Collection of medicinal and aromatic plants from their natural habitat and study their morphological description, nursery techniques, harvesting, curing and processing techniques and extraction of essential oils.
Suggested Reading:


V. PLANT PROTECTION

1. Fundamentals of Plant Pathology 3(2+1)

Theory

Practical


Suggested Readings:

- N.G. Ravichandra, 2013. Fundamentals of Plant Pathology. PHI Hall of India, New Delhi
- R.S. Mehrohtra, Ashok Agarwal. Fundamental of Plant Pathology
- Sambamurthy A textbook of Plant Pathology
- R.S. Singh Introduction to principles of plant pathology

2. Diseases of Fruit, Plantation, Medicinal and Aromatic Crops 3(2+1)

Theory

Etiology, symptoms, mode of spread, epidemiology and integrated management of the diseases of fruits, plantation, medicinal and aromatic crops viz mango, banana, grape, citrus, guava, sapota, papaya, jack fruit, pineapple, pomegranate, ber, apple, pear, peach, plum, almond, walnut, strawberry, areca nut, coconut, oil palm, coffee, tea, cocoa, cashew, rubber, betel vine senna, neem, hemp, belladonna, pyrethrum, camphor, costus, crotalaria, datura, dioscorea, mint, opium, Solanum khasianum and Tephrosia. Important post-harvest diseases of fruit, plantation and medicinal and aromatic crops and their management.
Practical

Observations of disease symptoms, identification of casual organisms and host parasite relationship of important diseases. Examination of scrapings and cultures of important pathogens of fruits, plantation, medicinal and aromatic crops.

Suggested Reading:

- Anna L A *colour atlas of Post Harvest Diseases and Disorders of fruits and vegetables*. Snowdon, CRC Press.
- Anna L. Snowdon *A colour atlas of Post Harvest Diseases and Disorders of fruits and vegetables*. CRC Press, New Delhi.
3. Diseases of Vegetable, Ornamental and Spice Crops 3(2+1)

Theory

Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following vegetables, ornamental and spice crops: tomato, brinjal, chilli, bhindi, cabbage, cauliflower, radish, knol-khol, pea, beans, beet root, onion, garlic, fenugreek, ginger, potato, turmeric, pepper, cumin, cardamom, nutmeg, coriander, clove, cinnamon, jasmine, rose, crossandra, tuberose, gerbera, anthurium, geranium. Important post-harvest diseases of vegetables and ornamental crops and their management.

Practical

Observations of symptoms, causal organisms and host parasitic relationship of important diseases, examination of cultures of important pathogens of vegetables, ornamental and spice crops in field as well as in protected cultivation.

Suggested Reading:

- Srikant Kulkarni, Yashoda R. Hedge. *Diseases of Plantation crops and their management*-., Agrotech publication Academy
4. Nematode Pests of Horticultural Crops and their Management 2(1+1)

Theory

History and development of nematology - definition, economic importance. General characters of plant parasitic nematodes, their morphology, taxonomy, classification, biology, symptomatology and control of important plant parasitic nematodes of fruits – (tropical, sub-tropical and temperate) vegetables, tuber, ornamental, spice and plantation crops. Role of nematodes in plant disease complex. Integrated nematode management.

Practical

Methods of sampling and extraction of nematodes from soil and plant parts, killing, fixing and preparation of temporary and permanent nematode mounts. Nematicides and their use. Collection and preservation of 20 plant species-parts damaged by plant parasitic nematodes.
Suggested Reading:

- Nair, M.R.G.K. 1975. Insects and Mites of Crops in India. ICAR, New Delhi

5. Fundamentals of Entomology 3(2+1)

Theory


Practical

Insect collection and preservation. Identification of important insects. General body organization of insects. Study on morphology of grasshopper or cockroach. Preparation of permanent mounts of mouth parts, antennae, legs and wings.

Suggested Reading:

6. Insect Pests of Fruit, Plantation, Medicinal and Aromatic Crops 3(2+1)

Theory

General – economic classification of insects; Bio-ecology and insect-pest management with reference to fruit, plantation, medicinal and aromatic crops; pest surveillance. Distribution, host range, bio-ecology, injury, integrated management of important insect pests affecting tropical, sub-tropical and temperate fruits, plantation, medicinal and aromatic crops like coconut, areca nut, oil palm, cashew, cacao, tea, coffee, cinchona, rubber, betel vine senna, neem, belladonna, pyrethrum, costus, crotalaria, datura, dioscorea, mint, opium, Solanum khasianum and. Storage insects – distribution, host range, bio-ecology, injury, integrated management of important insect pests attacking stored fruits, plantation, medicinal and aromatic crops and their processed products. Insecticide residue problems in fruit, plantation, medicinal and aromatic crops and their maximum residue limits (MRLs).

Practical

Study of symptoms of damage, collection, identification, preservation, assessment of damage and population of important insect – pests affecting fruits, plantation, medicinal and aromatic crops in field and storage.

Suggested Reading:

• Nair M R G K, 1995, Insect and Mites of Crops in India, ICAR, New Delhi.
• Rachna and Benna kumari. Pest management and residual analysis in horticultural crop K. P. Srivastav and Y. S. Ahawat. Pest management in citrus
• Ramnivas Sharma. Identification and management of horticulture pest.
• Fryer. Insect pest of fruit crops
• S. Atwal. Agricultural pests of South Asia and their management Mark Vernon Slingerland and C. R. Crosby. Manual of fruit insects

7. Apiculture, Sericulture and Lac Culture 2(1+1)

Theory


Practical


Suggested Reading:

- YA Shinde and BR Patel. Sericulture in India
8. Insect Pests of Vegetable, Ornamental and Spice Crops 3(2+1)

**Theory**

Economic importance of insects in vegetable, ornamental and spice crops - ecology and pest management with reference to these crops. Pest surveillance in important vegetable, ornamental and spice crops. Distribution, host range, bio-ecology, injury, integrated management of important insect-pests affecting vegetable, ornamental and spice crops. Important storage insect-pests of vegetable, ornamental and spice crops, their host range, bio-ecology, injury and integrated management. Insect –pests of processed vegetables and ornamental crops, their host range, bio-ecology, injury and integrated management. Insecticidal residue problems in vegetables and ornamental crops, tolerance limits etc.

**Practical**

Study of symptoms, damage, collection, identification, preservation, assessment of damage/ population of important insect-pests affecting vegetable, ornamental and spice crops in field and during storage.
Suggested reading:

- S. Atwal. Agricultural pests of south Asia and their management
- Approaches
VI. NATURAL RESOURCE MANAGEMENT

1. Fundamentals of Soil Science 2(1+1)

Theory

Composition of earth’s crust, soil as a natural body – major components. Eluviations and alleviations formation of various soils. Physical parameters; texture – definition, methods of textural analysis, stock’s law, assumption, limitations, textural classes, use of textural triangle; absolute specific gravity/particle density, definition, apparent specific gravity/bulk density – factors influencing, field bulk density. Relation between BD (bulk density), AD – practical problems. Pore space – definition, factors affecting capillary and non-capillary porosity, soil colour – definition, its significance, colour variable, value hue and chroma. Munsell colour chart, factors influencing, parent material, soil moisture, organic matter, soil structure, definition, classification, clay prism like structure, factors influencing genesis of soil structure, soil consistency, plasticity, Atterberg’s constants. Soil air, air capacity, composition, factors influencing, amount of air space, soil air renewal, soil temperature, sources and distribution of heat, factors influencing, measurement, chemical properties, soil colloids, organic, humus, inorganic, secondary silicate, clay, hydrous oxides. Ion exchange, cation-anion importance, soil water, forms, hygroscopic, capillary and gravitational, soil moisture constants, hygroscopic coefficient, wilting point, field capacity, moisture equivalent, maximum water holding capacity, energy concepts, PF scale, measurement, gravimetric – electric and tensiometer methods – pressure plate and pressure membrane apparatus – Neutron probe – soil water movement – classification – aerial photography – satellite of soil features – their interpretation; soil orders; land capability classification; soil of different eco-systems and their properties, Rock & Minerals classification, Pedogenic process. Objectives of soil science research institute in India (NBSS&LUP, ISSS, LTFE& NSSTL). Management of Soil Crusting, Soil Compaction and Soil Compression. Soil Biology benefits and harmful effects. Methods and objective of soil survey, Remote sensing application in soil and plant Studies, Soil degradation.
Practical


Suggested Reading:


2. Soil Fertility and Nutrient Management 2(1+1)

Theory


Practical


**Suggested Reading:**

- The fertilizer Association of India, Shaheed Jit singh marg, New Delhi, 1985. Fertilizer control order
3. Environmental Studies and Disaster Management  

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
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**

Visit to local areas - river/forest/ grassland/catchment etc. to document components of ecosystem. Study of common plants, insects, birds and animals. Visit to industries to study pollution abatement techniques and case studies - solid waste management, Human population and the Environment.

**Suggested Reading:**

- Krishnamurthy. *An Advanced Textbook on Biodiversity.*
- S. Deshwal A. Deshwal. *A Basic Course in Environmental Science.*
• Spencer R. Weart. The discovery of global warming.
• Richard T. Wright and Bernard J. Nebel Environmental science: toward a sustainable agriculture.
• Linfield C.Brown. Pollution prevention and control.

4. Soil, Water and Plant Analysis 2(1+1)

Theory


Practical

Suggested Reading:


5. Farm Power and Machinery 2(1+1)

Theory

Basic concepts of various forms of energy, unit and dimensions of force energy and power, calculations with realistic examples. IC Engines: Basic principles of operation of compression, ignition and spark ignition engines, two stroke and four stroke engines, cooling and lubrication system, power transmission system, broad understanding of performance and efficiency, tractors, power tillers and their types and uses. Electric motors: types, construction and performance comparison. Tillage: objectives, method of ploughing. Primary tillage implements: construction and function of indigenous ploughs, improved indigenous ploughs, mould board ploughs, disc and rotary ploughs. Secondary tillage implements: construction and function of tillers, harrows, levelers, ridgers and bund formers. Sowing and transplanting equipment: seed drills, potato planters, seedling transplanter. Grafting, pruning and training tools and equipment. Inter-culture equipment: sweep. Junior hoe, weeders,
long handle weeders. Crop harvesting equipments: potato diggers, fruit pluckers, tapioca puller and hoists.

**Practical**

Calculation on force, power and energy. IC engines – showing the components of dismantled engines and motors. Primary and secondary tillage implements, hitching, adjustments and operations. Spraying equipment, calibration and operation. Plant protection equipment, calculation of dilution ratio and operation.

**Suggested Reading:**

6. Water Management in Horticultural Crops 2(1+1)

Theory


Practical

Measurements of irrigation water by using water measuring devices, use of common formula in irrigation practices, practicing of land leveling and land shaping implements, layout for different methods of irrigation. Estimation of soil moisture constants and soil moisture by using different, methods and instruments, scheduling of irrigation, different approaches, practicing use of instruments, estimation of irrigation efficiency and water requirements of horticultural crops, irrigation planning and scheduling, soil moisture conservation practices.

Suggested Reading:

7. Organic Farming 3(2+1)

Theory

Introduction, concept, relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Soil improvement and amendments; Integrated diseases and pest management – use of biocontrol agents, biopesticides pheromones, trap crops, bird perches; Weed management; Quality considerations, certification, labeling and accreditation processors, marketing, exports.

Practical

Raising of vegetable crops organically through nutrient, diseases and pest management; vermicomposting; vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, postharvest management.

Suggested Reading:

8. Agro-meteorology and Climate Change 2(1+1)

Theory

Practical

Site selection for Agromet observatory; Measurement of temperature; Measurement of rainfall; Measurement of evaporation (atmospheric/soil); Measurement of atmospheric pressure; Measurement of sunshine duration and solar radiation; Measurement of wind direction and speed and relative humidity; Study of weather forecasting and synoptic charts. Visit to Meteorological observatory, Visit to IMD meteorological observatory-Lay out plan of standard meteorological observatory. Recording of air and soil temperature. Measurement of radiation and components, Measurement of rainfall-different types of raingauges, Measurement of wind speed and direction and atmospheric humidity, Recording of evaporation. Synoptic charts and weather reports, symbols, etc.

Suggested Reading:

9. Introductory Agro-forestry 2(1+1)

Theory

Agroforestry – definition, objectives and potential. Distinction between agroforestry and social forestry. Status of Indian forests and role in India farming systems. Agroforestry system, sub-system and practice: agri-silviculture, silvipastoral, horti-silviculture, horti-silvipastoral, shifting cultivation, taungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations. Planning for agroforestry – constraints, diagnosis and design methodology, selection of tree crop species for agro-forestry. Agroforestry projects – national, overseas, MPTS – their management practices, economics of cultivation – nursery and planting (Acacia catechu, Dalbergiasissoo, Tectona, Populus, Morus, Grewia, Eucalyptus, Quercus spp. and bamboo, tamarind, neem etc.).

Practical

Identification and seeds and seedlings of multipurpose tree species. Nursery practices for poplar, Grewia optiva, Morus alba, Acacia catechu, Dalbergiasissoo, robinia, leucaena etc. Visit to agro-forestry fields to study the compatibility of MPTS with agricultural crops: silvipastoral, alley cropping, horti-silviculture, agro-silvipasture, fuel and fodder blocks. Visit to social forestry plantations – railway line plantations, canal plantations, roadside plantations, industrial plantations and shelterbelts. Rapid assessment of farmers needs for green manure, fodder, fuel wood in selected villages. Economics and marketing of products raised in agro-forestry systems.

Suggested Readings:

10. Introduction to Major Field Crops 2(1+1)

Theory

Classification and distribution of field crops, definitions and concept of multiple cropping, mixed cropping, intercropping, relay and alley cropping, cultural practices for raising major cereals, pulses, oil seeds and fodder crops, green manuring, crop rotation.

Practical

Identification of crop plants, seeds and weeds. Preparation of cropping scheme. Application of herbicides in field crops.
Suggested Reading:


VII. BASIC SCIENCES

1. Elementary Statistics and Computer Application 3(2+1)

Theory

Introduction to statistics, limitations of statistics. Basic concepts: Variable statistics, types and sources of data, classification and tabulation of data, construction of frequency distribution, tables, graphic representation of data, simple, multiple component and percentage, bar diagram, pie diagram, histogram, frequency polygon and frequency curve average and measures of location, mean, mode, median, geometric mean, harmonic mean, percentiles and quadrilles, for raw and grouped data. Dispersion: Range, standard deviation, variance, coefficient of variation for raw
and grouped data. Probability: Basic concept, additive and multiplicative laws. Theoretical distributions, binominal, poison and normal distributions, sampling, basic concepts, sampling vs. complete enumeration parameter and statistic, sampling methods, simple random sampling and stratified random sampling. Tests of Significance: Basic concepts, tests for equality of means, and independent and paired t-tests, chi-square test for application of attributes and test for goodness of fit of Mendalian ratios. Correlation: Scatter diagram, correlation co-efficient and its properties, regression, fitting of simple linear regression, test of significance of correlation and regression coefficient. Experimental designs: Basic concepts, completely randomized design, randomized block design, latin square designs, factorial experiments, basic concepts, analysis of factorial experiments up to 3 factors – split plot design, strip plot design, long term experiments, plot size, guard rows. Computer application: Introduction to computers and personal computers, basic concepts, operating system, DOS and Windows, MS Word- Features of word processing, creating document and tables and printing of document, MS Excel- Concept of electronic spreadsheet, creating, editing and saving of spreadsheet, inbuilt statistical functions and formula bar, MS Power point-preparation, presentation of slides and slide show. Introduction to programming languages, BASIC language, concepts, basic and programming techniques, MS Office, Win Word, Excel, Power point, introduction to multi-media and its application. Visual basic-concepts, basic and programming techniques, introduction to internet.

Practical

Construction of frequency distribution table and its graphical representation, histogram, frequency polygon, frequency curve, bar chart, simple, multiple, component and percentage bar charts, pie chart, mean, mode for row and grouped data, percentiles, quadrille, and median for row and grouped data, coefficient of variation, ‘t’ test for independent, will equal and unequal variants, paired ‘t’ test, chi-square test for contingency tables and theoretical ratios, correlation and linear regression. Studies on computer components – Basic language, visual basic, programming techniques, MS Office, Excel, power point.

Suggested Reading:

2. Elementary Plant Biochemistry 2(1+1)

Theory

Carbohydrates: Occurrence, classification and structure, physical and chemical properties of carbohydrates, isomerism, optical activity, reducing property, reaction with acids and alkalis, ozone formation. Lipids: Classification, important fatty acids and triglycerides, essential fatty acids. Physical and chemical control of oils, their rancidity, phospholipids, types and importance. Plant pigments – structure and function of chlorophyll and carotenoids, sterols, basic structure, role of brassino sterols in plants. Proteins: Classification, function and solubility, amino acids – classification and structure, essential amino acids, properties of amino acids, colour reactions, amphoteric nature and isomerism; structure of proteins –primary, secondary tertiary and quaternary properties and reaction of proteins. Enzymes: Classification and mechanism of action; factors affecting enzyme action, co-factors and coenzymes. Vitamins and minerals as co-enzymes/ co-factors. Carbohydrate metabolism – glycolysis and TCA-cycle; metabolism of lipids, fatty acid oxidation, biosynthesis of fatty acids, electron transport chain, bioenergetics of glucose and fatty acids, structure and function of nucleic acid replication, transcription and translation.

Practical

Preparation of standard solutions and reagents; Carbohydrates: Qualitative reactions; Estimation of starch; Estimation of reducing and non reducing sugars from fruits; Amino acids: Reactions of amino acids; Proteins: Estimation of proteins by Lowry’s method; Fatty acids: Estimation of free fatty acids; Determination of iodine number of vegetable oils; Vitamins: Estimation of Ascorbic acid; Techniques: Paper chromatography, Thin layer chromatography; Electrophoresis of pigments extracted from flowers, Extraction of oil from oil seeds; Enzymes: Enzyme assay, Enzyme Immobilization.
Suggested Reading:


3. Elementary Plant Biotechnology 2(1+1)

Theory

Practical

Requirements for Plant Tissue Culture Laboratory; Techniques in Plant Tissue Culture; Media components and preparations; Sterilization techniques and Inoculation of various explants; Aseptic manipulation of various explants; Callus induction and Plant Regeneration; Micro propagation of important crops; Anther, Embryo and Endosperm culture; Hardening / Acclimatization of regenerated plants; Somatic embryogenesis and synthetic seed production; Isolation of protoplast; Demonstration of Culturing of protoplast; Demonstration of Isolation of DNA; Demonstration of Gene transfer techniques, direct methods; Demonstration of Gene transfer techniques, indirect methods; Demonstration of Confirmation of Genetic transformation; Demonstration of gel-electrophoricsis techniques. Green synthesis of nano particles and their size characterization.

Suggested Reading:

4. Introductory Crop Physiology 2(1+1)

Theory


Practical

Measurement of water potential, osmosis, root pressure, structure of the stomata, distribution, opening and closing of the stomata, measurement, transpiration and calculation of transpirational pull demonstration. Importance of light and chlorophyll in photosynthesis, pigment identification in horticultural crops, measurement of relative water content (RWC), studying plant movements.

Suggested Reading:

5. Growth and Development of Horticultural Crops 2(1+1)

Theory

Growth and development— definitions, components, photosynthetic productivity. Canopy photosynthesis and productivity, leaf area index (LAI) - optimum LAI in horticultural crops, canopy development; different stages of growth, growth curves. Crop development and dynamics (Case studies of annual/perennial horticultural crops), growth analysis in horticultural crops. Plant bio-regulators— auxin, gibberellin, cytokinin, ethylene inhibitors and retardants, basic functions, biosynthesis, role in crop growth and development, propagation, flowering, fruit setting, fruit thinning, fruit development, fruit drop, and fruit ripening. Flowering— factors affecting flowering, physiology of flowering, photoperiodism— long day, short day and day neutral plants, vernalisation and its application in horticulture, pruning and training physiological basis of training and pruning—source and sink relationship, translocation of assimilates. Physiology of seed development and maturation, seed dormancy and bud dormancy, causes and breaking methods in horticultural crops. Physiology of fruit growth and development, fruit setting, factors affecting fruit set and development, physiology of ripening of fruits—climatic and non-climacteric fruits. Physiology of fruits under post-harvest storage.

Practical

Estimation of photosynthetic potential of horticultural crops, leaf area index, growth analysis parameters including harvest index, bioassay of plant hormones, identification of synthetic plant hormones and growth retardants, preparations of
hormonal solution and induction of rooting in cuttings, ripening of fruits and control of flower and fruit drop. Important physiological disorders and their remedial measures in fruits and vegetables, seed dormancy, seed germination and breaking seed dormancy with chemicals and growth regulators.

**Suggested Reading:**

- Pandey and Sinha. *Plant Physiology.*
- JKA Bleasdale, *Plant Physiology in relation to Horticulture*
- Amarjit Basra, *Plant Growth Regulators in Agriculture and Horticulture: Their role & Commercial Uses*
6. Introductory Microbiology 2(1+1)

Theory


Practical

Examination of natural infusion and living bacteria; examination of stained cells by simple staining and Gram staining. Methods for sterilization and nutrient agar preparation. Broth culture, agar slopes, streak plates and pour plats, turbid metric estimation of microbial growth, mushroom culture- Spawn production, Culture and production techniques, harvesting, packing and storage.

Suggested Reading:

VIII. SOCIAL SCIENCES

1. Economics and Marketing 3(2+1)

Theory


Practical

Suggested Reading

2. Horti-Business Management 2(2+0)

Theory


Suggested Reading

- Kalyani Publishers, New Delhi
- Karan Singh and Kahlon A S. Economics of Farm Management in India. Theory and Practice. New Delhi. Allied
3. Fundamentals of Extension Education 2(1+1)

Theory


Practical

Visits to study structure, functions, linkages and extension programmes of ICFRE institutes/ voluntary organizations/Mahila Mandal, Village Panchayat, State Dept. of Horticulture /All India Radio (AIR). Exercises on distortion of message, script writing for farm broadcasts and telecasts, planning, preparation & use of NPVA like poster, chart, flash cards, folders etc. and AVA like OHP & 35 mm slide projector transparencies. Identification of local leaders to study their role in extension work.
Evaluation of some selected case studies of forestry extension programmes. 
Preparation of Village Agricultural productions plan.

Suggested Reading:


4. Entrepreneurship Development and Business Management 2(1+1)

Theory

Entrepreneurship Development: Assessing overall business environment in the Indian economy. Overview of Indian social, political and economic systems and their implications for decision making by individual entrepreneurs. Globalization and the emerging business / entrepreneurial environment. Concept of entrepreneurship; entrepreneurial and managerial characteristics; managing an enterprise; motivation and entrepreneurship development; importance of planning, monitoring, evaluation and follow up; managing competition; entrepreneurship development programs; SWOT analysis, Generation, incubation and commercialization of ideas and innovations. Government schemes and incentives for promotion of entrepreneurship. Government policy on Small and Medium Enterprises (SMEs) / SSIs. Export and

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, précis writing, summarizing, abstracting; Conducting market survey to the demand for product, preparing advertisements for popularization of product, news writing, preparing project proposals, individual, group presentation, features of oral presentation, presentation, evaluation of presentation and evaluation of sheet, dyadic communication-face to face conversation, telephone conversation, rate of speech and clarity of voice, speaking and listening politeness, telephone etiquettes, organising general and group meeting, salient features of participation in seminars and conferences, conducting and participating in mock interviews.

Suggested Reading:

- Pandey U. K., *An Introduction to Agricultural Finance*.
5. Communication Skills and Personality Development 2(1+1)

Theory

Structural Grammar: Introduction of Word Classes; Structure of Verb in English; Uses of Tenses; Study of Voice; Study of Conjunctions and Prepositions; Sentence Patterns in English. Spoken English: Conversations of different situations in everyday life; the concept of stress; stress shift in words and sentences; silent letters in words and pronunciation of words with silent letters, the basic intonation patterns. Reading and comprehension of general and technical articles, précis writing, summarizing, abstracting; individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

Structural Grammar: Exercises in word classes, identification and study of verbs in sentences, application of tenses and voice, exercises in conjunctions and prepositions, other structural grammar exercises, report writing, letter writing (different types of letters). Spoken English: Conversations of everyday life, the concept of stress; stress shift. Silent letters in words, basic intonation patterns, preparing and address.

Suggested Reading:


Wren and Martin, S. Key to High School English Grammar and Composition- Chand and Company Ltd., New Delhi

Wren and Martin, S. High School English Grammar and Composition- Chand and Company Ltd., New Delhi

Raymond Murphy, English Grammar in Use. Cambridge University Press


6. Information and Communication Technology 2(1+1)

Theory

IT and its importance. IT tools, IT-enabled services and their impact on society; computer fundamentals; hardware and software; input and output devices; word and character representation; features of machine language, assembly language, high-level language and their advantages and disadvantages; principles of programming-algorithms and flowcharts; Operating systems (OS)

(ii) definition, basic concepts, introduction to WINDOWS and LINUX Operating Systems; Local area network (LAN), Wide area network(WAN), Internet and World Wide Web, HTML and IP; Introduction to MS Office - Word, Excel, Power Point. Audio visual aids - definition, advantages, classification and choice of A.V aids; cone of experience and criteria for selection and evaluation of AV aids; video conferencing. Communication process, Berlo’s model, feedback and barriers to communication.

Practical

Exercises on binary number system, algorithm and flow chart; MS Word; MS Excel; MS Power Point; Internet applications: Web Browsing, Creation and operation of Email account; Analysis of fisheries data using MS Excel. Handling of audio visual equipments. Planning, preparation, presentation of posters, charts, overhead transparencies and slides. Organization of an audio visual programme.

Suggested Readings

7. Physical and Health Education (NC) 1(0+1)

Practical

Physical Education: Introduction to physical education. Posture, exercise for good posture, physical fitness exercises for agility, strength, coordination, endurance and speed. Rules are regulations of important games, skill development in any one of the games – football, hockey, cricket, volleyball, ball badminton, throw ball, tennikoit. Participation in one of the indoor games – shuttle badminton, chess and table tennis. Rules and regulations of athletic events, participation in any one of the athletic events – broad jump, high jump, triple jump, javelin throw, discuss throw, shot put, short and long distance running, Safety education, movement education, effective way of doing day-today activities. First-aid training, coaching for major games and indoor games. Asans and indigenous ways for physical fitness and curative exercises. Exercises and games for leisure time, use and experience. Importance of Asanas and Surya namaskar. Free hand exercises and Yoga. Recreation: definition, agencies promoting recreation, camping and recreation. Note: Warming up and conditioning exercises are compulsory before the commencement of each class.

Suggested Reading:

- O.P. Aneja. Encyclopaedia of Physical education, sports and exercise science (4 volumes).
- Anil Sharma. Encyclopaedia of Health and Physical Education (7 Volumes).
- Pintu Modak, O P Sharma, Deepak Jain. Encyclopaedia of Sports and Games with latest rules and regulations (8 volumes).
- Edwin F Bryant. Yoga sutrap of Patanjali.
8. National Service Scheme/National Cadet Corps (NC) 1(0+1)

Practical

NSS: Orientation of students in national problems, study of philosophy of NSS, fundamentals rights, directive principles of state policy, socio-economic structure of Indian society, population problems, brief of five year plan. Functional literacy, non-formal education of rural youth, eradication of social evils, awareness programmes, consumer awareness, highlights of consumer act. Environment enrichment and conservation, health, family welfare and nutrition. NCC: Introduction to NCC, defense services, system of NCC training, foot drill, sizing, forming up in three ranks, open and close order march, dressing, getting on parade, dismissing and falling out, saluting, marching, arms drill, shoulder arm, order arm, present arm, guard of honour, ceremonial drill, weapon training – rifle bayonet, light machine gun, sten machine carbine, introduction and characteristic stripping, assembling and cleaning, loading, unloading and firing. Field craft, visual training, targets, judging distance, fire discipline and fire control orders, battle craft, field signals, description of ground, section formation, section battle drill, scouts and patrols, ambush, field engineering, map reading, conventional signs, grid systems, use of service protractor, prismatic compass and its use, self-defense, general principles, precautions and training, attacks and counter attacks, marching and searching, first aid, hygiene and sanitation, civil defense, leadership and NCC song.

IX. STUDENT READY-PROGRAMME (ELP+RHWE) 40(0+40)

Practical

Students will practically gain hands on expertise for a semester in any two options out of commercial horticulture, protective cultivation of high value horticulture crops, processing of fruits and vegetables for value addition, floriculture and landscape gardening, production of bioinputs-biofertilizers and biopesticides, mass multiplication of plants and bio-molecules throughtissue culture, mushroom culture and bee keeping. In one semester students will be working with horticulture farmers/horticulture based industries in collaboration with developmental
departments, extension functionaries, input suppliers, marketing and procurement functionaries, processing industries.
1) EXPERIENTIAL LEARNING PROGRAMME (ELP) 20(0+20)

(iii) Module-I. Commercial Horticulture: Nursery production of fruit crops: Raising of rootstocks, grafting and budding of rootstocks, management of grafted plants, plant certification, packaging and marketing, quality control. Nursery production of ornamentals: Production of plantlets, production of potted plants, management and maintenance, sale and marketing. Protected cultivation of vegetables and flowers: Nursery raising/procurement and transplanting, management and maintenance of the crop, postharvest handling, quality control and marketing.

(iv) Module-II. Protective cultivation of high value horticulture crops: Visit to commercial polyhouses, Project preparation and planning. Specialised lectures by commercial export house. Study of designs of green- house structures for cultivation of crops. Land preparation and soil treatment. Planting and production: Visit to export houses; Market intelligence; Marketing of produce; cost analysis; Visit to export houses; Market intelligence; Marketing of produce; cost analysis; institutional management. Report writing and viva-voce.

(v) Module-III. Processing of fruits and vegetables for value addition: Planning and execution of a market survey, preparation of processing schedule, preparation of project module based on market information, calculation of capital costs, source of finance, assessment of working capital requirements and other financial aspects, identification of sources for procurement of raw material, production and quality analysis of fruits and vegetables products at commercial scale, packaging, labelling, pricing and marketing of product.


RURAL HORTICULTURAL WORK EXPERIENCE PROGRAMME 20(0+20)

1. Placement in Industries 10 (0+10)
   2. Placement in Village 10 (0+10)
   3. Educational Tour 2 (0+2)

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