Syllabus

For

Diploma Course

In

Sustainable Agriculture

To be implemented from Academic Year 2020-2021 Onwards

Arts, Science and Commerce College CIDCO, Nashik-422 008

Affiliated to Savitribai Phule Pune University, Pune

FOR

DIPLOMA

IN

Sustainable Agriculture

Under Scheme of

B. Voc. of UGC [NSQF]

[Effective from 2020-21]

UGC Sponsored B. Voc. Programme

1. Preamble

The Government of India to meet the goal of empowering the youth and also to make education relevant and creating 'industry fit' skilled work force, initiated the B. Voc. programs. Based upon the guidelines for B. Voc. courses issued by AICTE, UGC and also the guidelines of B. Voc. programs in colleges in NSQF (Academic council sub-committee report of SPPU, June 2019) the Board of studies has prepared the admission rules, regulations and syllabus structure common for the programs.

2. Objectives

- To provide judicious mix of skills relating to a profession and appropriate content of general education.
- To ensure that the students have adequate knowledge and skills so that they are work ready at each exit point of the program.
- To provide flexibility to the students by means of pre-defined entry and exit points.
- To integrate NSQF within the UG level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.
- To provide vertical mobility to students coming out of 10+2 vocational subjects.
- Global mobility of skilled work force from India through international equivalence of NSQF.

The focus is to formulate courses as per the regional skill gap as per the need of

i. Industry in specialized areas
ii. Design curriculum and contents in the areas of skill development.
iii. Pedagogy, assessment for skills development education and training.
iv. Trained faculty to deliver in the areas of skill development and
v. Entrepreneurship development.

3. Duration of the Diploma Programs: 1 years [Two semesters].

4. Eligibility for Admission to the Diploma Programs

i. Type A - Students who have already acquired NSQF certification level 4 in a particular trade and opted
ii. Type B - Students who have passed 10+2 or equivalent in any stream from any recognized board or university without any background of vocational training.
iii. Type C – Students passed 10+2 examination with conventional schooling without any background of vocational training.

While admitting type B and type C students' additional courses for skill intensive training and teaching during the first six months shall be mandatory for such students, who will be assessed and certified for NSQF level 4 of skill competency by concerned CSA at the end of first semester. However, students belonging to type A will not require such certification as they were already having NSQF level 4 certificates in same industry sector / job role required for specified skill credits. All students continuing to Diploma courses or further will be treated at par from second semester onwards. Student may exit after diploma or advanced diploma level courses or above. The academic progression for students in vocational stream after senior secondary level should be as per table 1 and thus the curriculum shall be framed as per these guidelines.

Table 1: Stages and Exit points and Credits

NSQF Level	Skill component credits	General Education Credits	Total credits for Award	Normal duration	Exit points / Awards
5	36	24	60	Two semesters	Diploma

5. COMMON COURSE STRUCTURE AND CREDIT DISTRIBUTION

Table 2: Typical courses and distribution of theory, practical, contact hours and credits.

Course structure of Diploma in Sustainable Agriculture

(Semester I & II)

Semester I				
Course code	**Name of Subject**	**Theory/Practical**	**Contact hours**	**Credits**
General education component				
BVDSUA111G	Personality development and Computer Fundamentals	Theory	60	04
BVDSUA112G	Fundamentals of Agronomy	Theory	60	04
BVDSUA113G	Fundamentals of Horticulture	Theory	60	04
Skill Based Component				
BVDSUA111S	Personality development	Practical	90	06
BVDSUA112S	Fundamentals of Agronomy	Practical	90	06
BVDSUA113S	Fundamentals of Horticulture	Practical	90	06
	Total		**450**	**30**
Semester II				
General education component				
BVDSUA121G	Fundamentals of organic Farming	Theory	60	04
BVDSUA122G	Fundamentals of soil and water	Theory	60	04
BVDSUA123G	Fundamentals of Plant Breeding and Seed technology	Theory	60	04
Skill Based Component				
BVDSUA121S	Fundamentals of organic Farming	Practical	90	06
BVDSUA122S	Fundamentals of soil and water	Practical	90	06
BVDSUA123S	Fundamentals of Plant Breeding and Seed technology	Practical	90	06
	Total		**450**	**30**

a. One credit would mean equivalent of 15 periods of 60 minutes each for theory lectures.
b. For lab course / workshops/ internship/ field work / project, the credit weightage for equivalent hours shall be 50% that for lectures.
c. The courses offered shall be in accordance to the rules / norms of the respective apex body (UGC/AICTE).
d. The number theory papers and practicals shall be decided by each program depending upon the knowledge domains required.

6. Examination

a. **Theory Courses** –

i. The assessment of theory subjects shall include continuous internal assessment [CIA] of 50% of total marks which can include midterm test, short quiz, assignment, extension work, project work, seminar, presentations etc. There shall be semester end examination [SEE] of 50% of the total marks.

ii. The student should get minimum 30% marks in CIA and SEE each and minimum 40% in CIA and SEE jointly.

iii. In case of failure in CIA the student shall appear only in the next academic year when the said course is offered in the regular academic session at his/her responsibility. However in case of failure in SEE in particular course(s) exam will be conducted in immediate subsequent semester.

iv. In case a student fails in certain course(S) in a particular semester and the same course(s) are modified / revised/removed from the curriculum in due course, the student will have to appear as per the newly framed curriculum and/or pattern in subsequent semester at his/her own responsibility.

b. **Practical Courses**-

i. The skill component of the course will be assessed and certified by the respective Certified Skill Assessor. The Certified skill assessor for a specific trade is made available by the respective sector skill council or a committee headed by the respective board or prescribed by the concerned regulatory body. Assessment of practical courses / on job training course shall be in equal proportion by the internal and external examiners.

ii. The semester end exam for practical courses shall be conducted at the end of each semester along with the theory exams.

iii. A student must get minimum 40% marks (jointly in internal and external) to pass in the practical courses.

7. Grading System

Table 3: Letter Grades, Points and Marks

Letter Grade	Points	Marks obtained
O: Outstanding	10	80-100
A+: Excellent	9	70-79
A: Very Good	8	60-69
B+: Good	7	55-59
B: Above Average	6	50-54
C: Average	5	45-49
P: Pass	4	40-44
F: Fail	0	0-39
Ab: Absent	0	-

Table 4: Grade point Average

Grade Point Average	Grade
9.00 – 10.00	O
8.50 – 8.99	A+
7.50 – 8.49	A
6.50 – 7.49	B+
5.50 – 6.49	B
4.25 – 5.49	C
4.00 – 4.24	P
0.00 – 3.99	F

8. Computation of SGPA and CGPA

- The semester end grade sheet will contain grades for the course along with titles and SGPA. Final grade sheet and transcript shall contain CGPA.

- SGPA: The performance of a student in a semester is indicated by a number called the semester grade point average (SGPA). The SGPA is the weighted average of grade points obtained in all the courses registered by the student during the semester.

Semester Grade Point Average (SGPA) =

$$\text{SGPA} = \frac{\sum_{i=1}^{p} CiGi}{\sum_{i=1}^{p} Ci}$$

$$= \frac{\sum Grade\ Points\ earned \times Credits\ for\ each\ course}{Total\ credits}$$

SGPA is calculated up to two decimal places by rounding off.

- **CGPA**: The CGPA is the weighted average of the grade points obtained in all the courses (theory Practical courses) of all the semesters till the respective exit point. It is calculated in the same manner as the SGPA. It is calculated based upon the SGPA of the concerned semesters.

9. **OTHER RULES**- University may frame additional rules and regulations or modify these regulations if needed and once approved by the University they would be binding on the students.

Course Code

An eight-character Course code is assigned to each course. The first two characters indicates the discipline, third and fourth character indicates the programme, fifth for year, sixth for semester, seventh characters for SUAial no of the course, eighth for general or skilled component.

Example: BVDSUA111G

BVD: Bachelor of vocation Diploma

SUA: Sustainable Agriculture

1: First year

1: First semester

1: Serial number of the course

G/S: General Component (G) / Skill Component (S)

Sustainable Agriculture

Diploma in Sustainable Agriculture

Semester – I

BVDSUA111G: Personality Development and Computer Fundamentals (General)

Total credits: 4 **Teaching Hours-60**

Aim of the course: The aim of the subject is to bring out personality development with regard to the different behavioural dimensions that have far reaching significance in the direction of organizational effectiveness. To facilitate students to study basic IT skills using application software tools in industry and teaching –learning process.

Outcome of the course: Awareness in the participants with regard to the different aspects of interpersonal relations based on the ideas envisaged in Transactional Analysis and their relative significance in the context of the functional effectiveness of organizations. Students will have command on basic IT skills to use computer and internet facilities for their academic and holistic development purpose.

Syllabus

Unit-I: Self-Analysis and Motivation **18 Hours**

SWOT Analysis, Who am I, Attributes, Importance of Self Confidence, Self Esteem. Creativity- Out of box thinking, lateral thinking. Attitude- Factors influencing attitude, Challenges and lessons from attitude, etiquette. Motivation- Factors of motivation, Self-talk, Intrinsic & Extrinsic Motivators. Goal Setting- Wish List, Smart Goals, Blue print for success, Short Term, Long Term, Life Time Goals. Time Management- Value of time, Diagnosing, Weekly Planner to do list, Prioritizing work.

Unit-II: Leadership and Interpersonal Relations **14 Hours**

Introduction to leadership, Leadership Power, Leadership Styles and Leadership in administration.

Introduction to Interpersonal Relations- Analysis of different ego states, Analysis of

Transactions, Analysis of Strokes. Introduction to Stress- Causes of Stress, Impact Stress and Managing Stress. Conflict- Introduction to Conflict and Causes of Conflict.

Unit III: Operating system- MS Office **23 Hours**

Definition & functions, Basic components of windows, types of icons, taskbar, using desktop, title bar, running applications, exploring computer, managing files and folders, copying and moving files and folders. Control panel -adding and removing software and hardware, setting date and time, screen saver and appearance.

MS-Word - Documentation - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advanced features of MS-Word-Mail Merge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.

MS-Excel- Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel-Pivot table & Pivot Chart, Linking and Consolidation. Database Management using Excel-Sorting, Filtering, Table, Validation, Goal Seek and Scenario.

MS-PowerPoint - Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds and inSUAtion, InSUAting Animated Pictures.

Unit IV: Introduction to concept of Internet **5 Hours**

Internet applications, www, Email, ftp, web browSUAs (Internet explorer, Google Chrome, Mozilla).Mobile apps related to agriculture

References

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7) Soft skills, Career Development Centre, Green Pearl Publications.

8) Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster.
9) Thomas A Harris, I am ok, You are ok , New York-Harper and Row.
10) Daniel Coleman, Emotional Intelligence, Bantam Book.
11) Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers.
12) Russell A. Stultz, Learn Microsoft Office – BPB Publication
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16) Chetan Srivastva, Fundamentals of Information Technology, Kalyani Publishers.
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18) Satish Jain, Information Technology, BPB.
19) V. Rajaraman, Fundamental of Computers – (Prentice Hall)
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21) Alexis Leon, Introduction to Information Systems.
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Reference website:

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3) https://mscit.mkcl.org/

BVDSUA111S: Personality Development and Computer Fundamentals (Skill based)

Total credits: 6

1. Stress, Anger and Time Management.
2. Communication Skills.
3. CV Writing and Interview Techniques.
4. Teamwork and Leadership.
5. Problem Solving and Conflict Resolution.
6. Presentation Skills.
7. Internet surfing.
8. MS-Windows: features.
9. Documentation Using MS-Word.
10. Electronic Spread Sheet using MS-Excel.
11. Database Management using Excel.
12. Presentation using MS-PowerPoint
13. Creating tables in MS ACCESS using different ways.
14. Import and export data from MS ACCESS.
15. Creating queries in MS ACCESS
16. Creating forms in MS ACCESS
17. Working of Internet with Different BrowSUAs (Internet Explorer, Google Chrome, Mozila).
18. Applications of Internet. (Handling Email accounts.
19. Student Have to Do Following Activities:
    i. How to create Email
    ii. How to send email?
    iii. How to Download the Data?
    iv. How to attach files with email?

BVDSUA112G: Fundamentals of Agronomy (General)

Total credits: 4 **Teaching Hours-60**

Aim of the course:

To develop methods that will improve the use of soil and increase the production of food and fiber crops. To conduct research in crop rotation, irrigation and drainage, plant breeding, soil classification, soil fertility, weed control, and other areas.

Outcome of the course : Students conquer the deep knowledge in this field are concerned with enhancing grain and seed nutrition, as well as increasing the amount and quality of food

Syllabus

20hrs.

Unit I: Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency, water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation-scheduling criteria and methods, Weeds- importance, classification, crop weed competition, concepts of weed management- principles and methods, herbicides- classification, selectivity and resistance, allelopathy. Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, harvesting and threshing of crops.

Unit II: Crop Production Technology-I (Kharif Crops) **15 hrs.**

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

Unit III: Crop Production Technology-II (Rabi crops) **15 hrs.**

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of Rabi crops; cereals -wheat, barley and oat, pulses-chickpea, lentil, peas, oilseeds-rapeseed, mustard, linseed and sunflower; sugar crops-sugarcane; other crop-Potato. Forage crops-berseem, lucerne and oat.

Unit IV: Farming System, Precision Fanning and Sustainable Agriculture 10 hrs.

Theory Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Sustainable agriculture-problems and its impact on agriculture, conservation agriculture strategies, HEIA, LELA and LE1SA and its techniques for sustainability, Integrated farming system components of IFS and its advantages, farming system and environment.

References

1) Chhidda Singh, Modern techniques of raising field corps. Oxford and IBH Publishing Co. Ltd., Bangalore.

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3) Hand book of Agriculture, ICAR Publication.

4) Palaniappan, S.P., Cropping Systems in the tropics – Principles and Practices.Willey Eastern Ltd., New Delhi.

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8) Vaidya, V.G., Sahasrabuddhe, K.R. and Khuspe, V.S. Crop production and field experimentation. Continental Prakashan, Vijaynagar, Pune.

9) Rao V.S. (2006), Principles of Weed Science. Oxford and IBH Publishing Co., New Delhi, India.

10) Gupta, O.P. (2008), Modern Weed Management Agribios India Publication.

BVDSUA112S: Fundamentals of Agronomy (Skill based)

Total credits: 6

List of Practicals-

1. Identification of crops, seeds, fertilizers, pesticides.
2. Identification of weeds in crops.
3. Agro climatic zones of Maharashtra and India
4. Rice nursery preparation
5. Practice of seed treatments in different field crops.
6. Calculation of Plant Population
7. Application of manures and fertilizer in important field crops.
8. Application of herbicides in different field crops
9. Fertilizer and herbicide dose for different field crops
10. Methods of seed germination and viability test
11. Laboratory Note Book
12. Internal Assessment.

BVDSUA113G: Fundamentals of Horticulture (General)

Total credits: 4 **Teaching Hours -60**

Aim of the course: To increase the area, production and productivity of fruits, vegetable, spices, Medicinal and floriculture crops. Introduction of high yielding, disease free and true to type varieties of fruits, vegetable and spices crops through layout of demonstration and minikits in the selected areas

Outcome of the course:

Students developed their skills of plant propagation and cultivation with the aim of improving plant growth, yields, quality, nutritional value, and resistance to insects, diseases, and environmental stresses.

Syllabus

Introduction and Principles of Horticulture: **30 hrs.**

Unit - I 1.1 Definition of Horticulture. 1.2 Importance of horticulture in terms of economy, production, employment. Generation, environmental protection and human resource development. 1.3 Scope for horticulture in India. Nutritive value of horticultural crops. 1.4 Divisions of horticulture with suitable examples and their importance. 1.5 Classification of horticulture crops based on soil and climatic requirements. Fruit and Vegetable zones of India and Andhra Pradesh.

Unit – II 2.1 Definition of a nursery. 2.2 Different types of nursery beds – flat beds, raised beds and sunken beds, their merits and demerits. 2.3 Different nursery techniques and their management. 2.4 Vegetable gardens, nutrition and kitchen garden, truck garden, Vegetable forcing, market gardens and roof gardens. 2.5 Different steps in planning and layout establishment and management of orchards. 2.6 Different s systems of planting orchards - square, rectangle, quincunx, hexagonal and contour systems of planting – their merits and demerits. 2.7 Calculation of planting densities in different systems of planting.

Unit – III 3.1 Pruning: Definition, objectives. 3.2 Principles and methods of pruning of fruit crops. 3.3 Training: Definition, objectives. 3.4 Principles and methods of training of fruit crops: Open centre, closed centre and Modified leader systems, their merits and demerits. 3.5

Bearing habits in horticultural crops. 3.6 Irrigation: definition, different methods of irrigation followed in horticultural crops, their merits and demerits. 3.7 Manures and fertilizers: Definition, different methods of application of manures and fertilizers to horticultural crops.

Preharvesting and Propagation of Horticultural Plants: 30 hrs.

Unit – IV 4.1 Cropping systems: Inter cropping and multi – tier cropping, their merits and demerits with suitable examples. 4.2 Practical uses of growth regulators in horticulture. 4.3 Fruitfulness and unfruitfulness: Definitions, Factors influencing the fruitfulness and unfruitfulness with suitable examples. 4.4 Rejuvenation of old orchards, Importance of rejuvenation: Top working and Frame working. 4.5 Maturity: Definition, Different methods to judge maturity in horticultural crops.

Unit- V 5.1 Propagation: Definition, Methods, Sexual and asexual, advantages and disadvantages of each method, asexual method of propagation, propagation by division and separation. 5.2 Propagation by cuttings: Definition of cutting, Different methods of cuttings, semi hard wood, soft wood and herbaceous stem cuttings, examples for each type; Leaf cuttings. 5.3 Plant propagation by layering: Definition of layering and layer; Types of layering : Ground layering – Tip layering, Simple layering, Trench layering, Mound or Stool layering and Compound or Serpentine layering, examples for each type; Air layering examples. 5.4 Plant propagation by grafting: Definition; methods of grafting: Attached scion methods of grafting, Simple inarching or approach grafting; Detached scion methods of grafting: Pre-curing of scion, Side grafting methods: Veneer grafting, Apical grafting methods, Epicotyle grafting, soft wood grafting, double working, Top working. 5.5 Plant propagation by budding: Definition of budding; Methods of budding: T- budding and Inverted T- budding, patch budding and ring budding.

References:

1 Fundamentals of Horticulture, Edmond, J.B., Sen., T.L., Andrews, F.S and Halfacre R.G, 1963. Tata McGraw Hill Publishing Co., New Delhi.

2 Introduction to Horticulture, Kumar, N. 1990. Rajyalakshmi Publications, Nagarcoil, Tamilnadu.

3 Basic Horticulture, Jitendra Sing, 2002. Kalyani Publishers, Hyderabad.

4 Fundamentals of Fruit Production, Garner V R, Bradford F C and Hooker Jr. H D, 1957. McGraw Hill Book Co., New York.

5 Plant Propagation. Principles and Practices, Hartman, HT and Kester, D.E.1976, Prentice

Hall of India Pvt. Ltd. Bombay.
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7 Propagation of Fruit Crops, Mukherjee, S.K. and Majumdar, P.K.1973. ICAR, New Delhi.
8 Propagation of Tropical Fruit Trees, Ganner, R.J. and Choudari, S.A. 1972. Oxford & IBH Publishing Co., New Delhi. 9 Propagation of Horticultural Crops: Principles and Practices, Sarma, R.R. 2002. Kalyani Publishers, New Delhi.

BVDSUA113S: Fundamentals of Horticulture (Skill based)

Total credits: 6

List of Practicals:

1. Identification of garden tools
2. Identification of horticultural crops
3. Preparation of seed bed/nursery bed.
4. Polyhouse preparation.
5. Identification of vegetables & spice crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizers applications raising of nursery of vegetable & spices, vegetable and spices seed extraction. Harvesting & preparation for market. Economics of vegetables and spices cultivation.
6. Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures - care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post-harvest handling of cut and loose flowers extraction of essentials oils.
7. Layout and planting of orchard plants
8. Training and pruning of fruit trees.
9. Preparation of potting mixture, potting and repotting
10. Practice of sexual and asexual methods of propagation
11. Practice of sexual and asexual methods of propagation
12. Laboratory Note Book and Internal Assessment

Diploma in Sustainable Agriculture

Semester II

BVDSUA121G: Fundamentals of organic Farming (General)

Total credits: 4 **Teaching Hours -60**

Aim of the course: To study productivity, profitability, sustainability, quality and input-use-efficiencies of different crops and cropping systems under organic farming in different agro-ecological regions. To develop efficient crop and soil management options for organic farming. To develop need-based cost-effective new techniques for farm-waste recycling.

Outcome of the course: Students learn evaluation of organic, inorganic and integrated production systems for crops and cropping systems, Evaluation of response of different varieties of major crops for organic farming. Evaluation of bio-intensive complimentary cropping systems under organic production systems. Development of Integrated Organic Farming System models

Syllabus

Unit – I: Concept of organic farming **12 Hours**

1. Introduction: Farming, organic farming, concept and development of organic farming. 2. Principles of organic farming 3. Types of organic farming 4. Biodynamic farming 5. Benefits of organic farming. 6. Need for organic farming Page 4 of 8 7. Conventional farming v/s organic farming 8. Scope of organic farming; Kerala, national and international status 9. Agencies and institutions related to organic agriculture 10. Requirements for organic farming 11. Farm components for an organic farming

Unit - II: **Organic plant nutrient management** **12 Hours**

1. Organic farming systems 2. Soil tillage 3. Land preparation and mulching 4. Choice of varieties 5. Propagation-seed, planting materials and seed treatments. 6. Water management 7. Green manuring 8. Composting- principles, stages, types and factors 9. Composting methods 10. Vermicomposting 11. Bulky organic manures 12. Concentrated organic manures 13. Organic preparations 14. Organic amendments and sludges, biogas 15. Bio-fertilizers-

types 16. Bio-fertilizers-methods of application, advantages and disadvantages 17. Standards for organic inputs- fertilizers

Unit - III: Organic plant protection **12 Hours**

1. Plant protection- cultural 2. Plant protection - mechanical 3. Plant protection- botanical pesticides I 4. Plant protection- botanical pesticides II 5. Plant protection- botanical pesticides III 6. Plant protection- bio pesticide 7. Plant protection- bio control agents 8. Plant protection- bio control agents 9. Weed management 10. Weed management 11. Standards for organic inputs- plant protection.

Unit - IV: Organic crop production practices **12 Hours**

1. Organic crop production methods- rice 2. Organic crop production methods- rice 3. Organic crop production methods- coconut 4. Organic crop production methods- coconut 5. Organic crop production methods- arecanut 6. Organic crop production methods - cashew 7. Organic crop production methods- vegetables- okra 8. Organic crop production methods- vegetables- cowpea 9. Organic crop production methods- vegetables- amaranthus 10. Organic crop production methods- vegetables- solanaceous 11. Organic crop production methods- vegetables- cucurbits 12. Organic crop production methods- mango 13. Organic crop production methods- banana 14. Organic crop production methods- tuber crops 15. Organic crop production methods- spices- pepper 16. Organic crop production methods- spices- ginger, turmeric 17. Organic crop production methods- spices- cardamom 18. Organic crop production methods- medicinal and aromatics 19. Organic crop production methods- ornamental crops 20. Livestock component in organic farming- I 21. Livestock component in organic farming-

Unit - V: Organic Certification **12 Hours**

1. Farm economy: Basic concept of economics- Demand, supply 2. Economic Viability of a farm. 3. Basic production principles 4. Reducing expenses, ways to increase returns, 5. Cost of production system. Benefit/ cost ratio. 6. Marketing, Imports and exports 7. Policies and incentives of organic production. 8. Farm inspection and certification: I 9. Farm inspection and certification: II 10. Conversion to organic farming, Process 11. Income generation activities: Apiculture, Mushroom production, Terrace farming

References:

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7.Organic Farming Web Sites Organisation IRL address Scottish Agricultural College (SAC) http://www.sac.ac.uk/organic-farming Scottish Organic Producers Association http://www.sopa.org.uk/index.php Soil Association http://www.soilassociation.org Organic Farmers & Growers http://www.organicfarmers.uk.com/ DEFRA (ACOS) http://www.defra.gov.uk/farm/organic/default Organic Centre Wales http://www.organic.aber.ac.uk/index/shtml Elm Farm Research Centre http://www.efrc.com/education_main.htm Henry Doubleday Research Association (HDRA) http://www.hdra.org.uk International Federation of Organic Agriculture Movements (IFOAM) http://www.ifoam.org/index.html Food and Agriculture Organisation (FAO) http://www.fao.org/organicag/default.htm Danish Research Centre for Organic Farming (DARCOF) http://www.darcof.dk/ Swiss Federal Research Institute for Organic Farming (FiBL) http://www.fibl.org/english/index.php German Federal Institute for Organic Farming http://www.oel.fal.de/e

BVDSUA121S: Fundamentals of organic Farming (Skill based)

Total credits: 6

List of practicals:

1. Preparation of enrich compost
2. Vermicompost Preparation
3. Bio-fertilizers/bio-inoculants and their quality analysis
4. Indigenous technology knowledge (ITK) for nutrient
5. Insect, pest disease and weed management
6. Cost of organic production system
7. Post-harvest management
8. Quality aspect, grading, packaging and handling.
9. Visit to organic farms to study the various components and their utilization
10. Laboratory Note Book
11. Internal Assessment

BVDSUA122G: Fundamentals of soil and water (General)

Total credits: 4 **Teaching Hours -60**

BVSA218 S: Fundamentals of soil and water science (Skill Development)

Aim: Imparting the knowledge on soil properties, soil water plant relationship and its importance, stating the various aspects of soil science and substantiating through laboratory experiments.

Outcome of the course: On successful completion of the programme, student will be able to

1. Acquire knowledge on the importance of soil to agriculture
2. Value the physical properties of soil
3. Classify soil type, soil texture and soil structure required for an agricultural field
4. Analyze soil, water and nutrients related to crop growth

5. State techniques to mitigate soil pollution
6. Identify soil related problems in agricultural fields and provide suitable solutions

Syllabus

Unit I: Soil Chemistry **12 Hours**

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

Unit II: Problematic Soils and Soil Testing **12 Hours**

Introduction, Acid Soil, Alkali Soil, Introduction to soil testing, Composition and properties of Soil major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order. History of soil fertility and plant nutrition, criteria of essentiality, role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients. Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil. Methods of fertilizer recommendations to crops.

Unit III: Quality of irrigation Water **12 Hours**

Sources of water, Composition of irrigation water; Suitability of water for irrigation, Analysis Of irrigation water, Water quality standards, Nutrients in irrigation water, Waste water treatment and re-use for irrigation, Nutrients in irrigation water, Farm-pond preparation

Unit IV: Plant Nutrients **12 Hours**

Need of plant nutrients, Forms of nutrient uptake, theories of nutrient uptake, Classification of essential nutrients, Effect of environmental conditions on nutrient uptake.

Unit V: Protection of plants **12 Hours**

Definition and classification of pesticides, Mode of action of pesticide, Insecticides, Fungicides, Herbicides, Plant analysis, and rapid plant tissue tests

References:

1. Sabry Gobran Elias, Lawrence O. Copeland, Miller B McDonald and Riad Z. Baalbak. 2012. Seed Testing: Principles and Practices. Michigan State University Press, USA.
2. George Estefan, Rolf Sommer, and John Ryan. 2013. Methods of Soil, Plant, and Water Analysis: A manual for the West Asia and North Africa Region: Third Edition. International Center for Agricultural Research in the Dry Areas, Beirut, Lebanon. ICARDA@cgiar.org www.icarda.org
3. Dhyan Singh, P.K. Chhonkar and B.S. Dwivedi. 2015. Manual On Soil, Plant And Water Analysis. Westville Publishing House. India.
4. Henry D. Foth. 1990. Fundamentals of Soil Science. 8th Edition. John Wiley& Sons. USA.
5. Soil Science-An Introduction. 2015. Indian Society of Soil Science. India.
6. Martin Alexander. 1991. Introduction to Soil Microbiology. 2nd Edition, Krieger pub.Co. USA.
7. Biswas. T.D and S.K. Mukherjee. 2017. Text book of Soil Science, 2nd edition. McGraw-Hill Education. USA.
8. Das, D.K. 2015. Introductory soil science. 4th Edition. Kalyani Publisher, India.
9. Mehra, R.K. 2006. Textbook of Soil Science. ICAR, New Delhi, India.

BVDSUA122S: Fundamentals of soil and water science (Skill based)

Total credits: 6

1. Study of soil profile
2. Study of soil sampling tools, collection of representative soil sample, its processing and storage.
3. Determination of soil density, moisture content and porosity.
4. Determination of soil pH, electrical conductivity and cation exchange capacity of soil.
5. Determination of soil colour and estimation of organic matter content of soil
6. Sampling and monitoring of irrigation water, Laboratory analysis for irrigation water
7. Plant sampling and sample preparation for analysis-digestion of plant material. Sampling stages and plant part to be sampled. Estimation of N, P, K, S and micro nutrients: Fe, Mn, Zn, Cu and B from plant sample. Rapid plant tissue test for N, P, and K. Quantitative rating of plant analysis data and interpretation of results. Critical nutrient concentration and critical nutrient ranges.
8. Farm-pond preparation
9. Visit to soil and water testing laboratories
10 Laboratory Note Book
11. Internal Assessment

BVDSUA123G: Fundamentals of Plant Breeding and Seed technology (General)

Total credits: 4 **Teaching Hours - 60**

Aim of the course:

1. To describe concepts of breeding crops
2. To demonstrate the fundamentals of seed technology
3. Extending the practical knowledge on seed production
4. Imparting knowledge on seed certification, processing, storage and marketing
5. Apply practical knowledge gained to commercially produce seeds and practice seed testing
6. Demonstrate the concepts of seed certification, Seed Act and seed testing processes

Outcome of the course:

1. Understand seed processing and seed storage techniques
2. State the norms of seed marketing in India.
3. Infer the importance of plant genetic resources and utilize it in crop improvement
4. Design crop specific breeding methodology

Syllabus

Unit 1: **30 Hours**

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self-incompatibility and male sterility genetic consequences. Domestication, Acclimatization and Introduction; Centres of origin/diversity, components of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self- pollinated crops - mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept. Concepts of population genetics and Hardy-Weinberg Law; Genetic basis and methods of breeding cross pollinated crops, modes of selection; Population improvement Schemes-Ear to row method, Modified Ear to Row, recurrent selection. Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and

hybridization; Maintenance of breeding records and data collection; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses; Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Honeybee farming

Unit 2: **30 Hours**

Theory Seed and seed production technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production. Seed quality; Definition and Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables. Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test. History and development of Seed Industry in India. Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing, Private and public sectors and their production and marketing strategies.

References:

1. Gaur, S.C. 2012. A handbook of seed processing and marketing. Agrobios, India.
2. Vanangamudi, K., S. Kavitha and K. Raja, 2017. Objective Seed Science and Technology, Scientific Publishers, New Delhi. India.
3. Singh, B.D. 2018. Plant breeding principles and methods. Kalyani Publishers, India.
4. Neto, R.F. and A. Borem. 2012. Plant breeding for abiotic stress tolerance. Springer-Verlag,
Germany.
5. Phundan Singh. 2015. Essentials of Plant Breeding. Kalyani Publishers, India.

BVDSUA123S: Fundamentals of Plant Breeding and Seed technology (Skill based)

Total credits: 6

List of Practicals:

1. Seed production in major cereals (Wheat, Rice, Maize, Sorghum, Bajra and Ragi)
2. Seed production in major pulses (Urd, Mung, Pigeonpea, Lentil, Gram,Field bean and pea.)
3. Seed production in major oilseeds (Soybean, Sunflower, Rapeseed,Groundnut and Mustard.)
4. Seed production in important vegetable crops.
5. Seed sampling and testing: Physical purity, germination and viability
6. Plant Breeder's kit.
7. Study of germplasm of various crops.
8. Study of floral structure of self-pollinated and cross-pollinated crops.
9. To work out the mode of pollination in a given crop
10. Designs and their analysis in plant breeding experiments.
11. Honeybee farming
11. Visit to seed production farms, seed testing laboratories and seed processing plant.
12. Laboratory Note Book
13. Internal assessment

(Dr. J. D. Sonkhaskar)

Principal