

SGRR UNIVERSITY

**Brochure of Value-Added Courses
School of Agriculture Sciences
2022-2023**

ABOUT THE UNIVERSITY

Shri Guru Ram Rai University was established by a religious and philanthropic leader, Shri Mahant Devendra Dass Ji Maharaj in the year 2017. It is situated in the heart of city, Uttarakhand. We are extremely privileged to extend the values and ethos of the Shri Guru Ram Rai Education mission through SGRR University to impart quality education and in successfully placing more than 80% students in various companies across the globe. SGRR University has humongous campus spread over 80 acres of land. Its state-of-art facilities give opportunities to develop leadership skills and to achieve professional excellence. It has 8500+ students from different countries, 29 states and Union Territories and providing cultural melange and global exposure to our students. One of the biggest boosts from University is its unmatched experience of 67 years of in delivering quality education that helps to develop confidence and will give you more knowledge, industry exposure, building good networking and high self-esteem. This will change your overall personality and develop you into a complete professional to face any challenge.

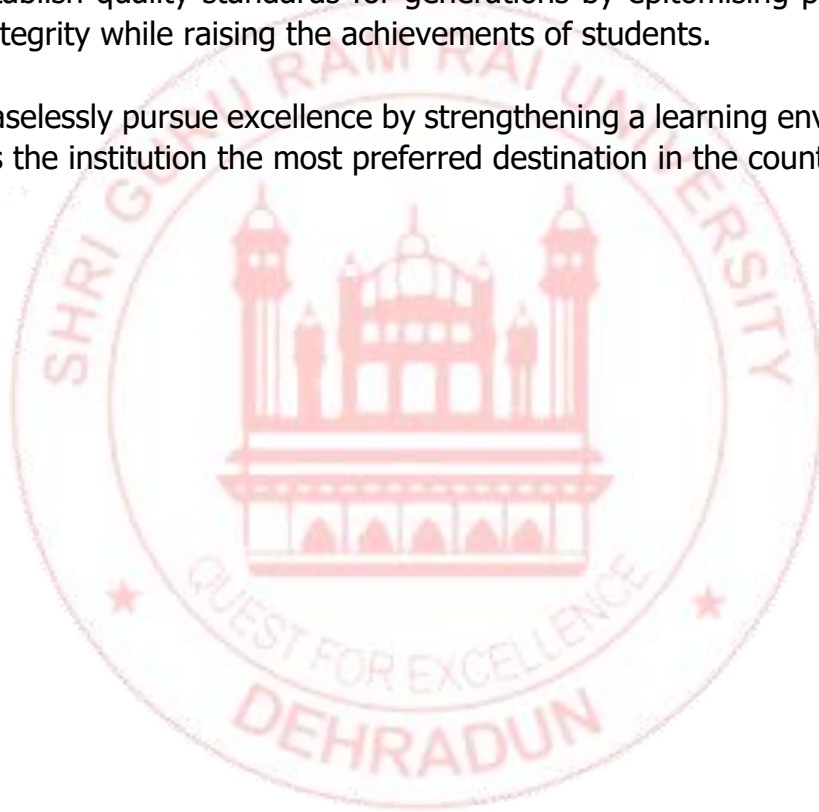
Vision

“To establish Sri Guru Ram Rai University to be a Center of Excellence in higher education, innovation and social transformation by nurturing inquisitive and creative minds and by enabling the stakeholders to become committed professionals and educators of national and global relevance.”

Mission

- ❖ To provide a comprehensive and sustainable educational experience that fosters the spirit of enquiry, scientific thinking and professional competence along with ethical and spiritual values
- ❖ To deliver a classic, well rounded learning experience that is distinctive and impactful on the young generation preparing them for a successful career
- ❖ To engage, inspire and challenge the stakeholders to become leaders with ethics and positive contributors to their chosen field and humane citizens
- ❖ To attract, train and retrain qualified staff to work efficiently to bring forth the maximum resource potential

- ❖ To develop committed and responsible professionals who work for the welfare of the society by providing innovative and efficient solutions and creating long term relationship with the stakeholders
- ❖ To create a sustainable career, by collaborating with stakeholders and participating in community partnership for life and livelihood in the local society in a responsive and dynamic way
- ❖ To make our students globally competent by introducing specialized training leading to professional capabilities and developing diverse skills in them for competitive advantage.
- ❖ To establish quality standards for generations by epitomising professionalism and integrity while raising the achievements of students.
- ❖ To ceaselessly pursue excellence by strengthening a learning environment that makes the institution the most preferred destination in the country.



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INTRODUCTION

The ever-changing global scenario makes the world more modest and needs high levels of lateral thinking and the spirit of entrepreneurship to cope up with the emergent challenges. Many a times, the defined skill sets that are being imparted to students today with Programme Specific Objectives in educational institutions become redundant sooner or later due to rapid technological advancements. No university curriculum can adequately cover all areas of importance or relevance. It is important for higher education institutions to supplement the curriculum to make students better prepared to meet industry demands as well as develop their own interests and aptitudes.

Objectives The main objectives of the Value-Added Course are:

- ✓ To provide students an understanding of the expectations of industry.
- ✓ To improve employability skills of students.
- ✓ To bridge the skill gaps and make students industry ready.
- ✓ To provide an opportunity to students to develop inter-disciplinary skills.
- ✓ To mould students as job providers rather than job seekers.

Course Designing The department interested in designing a Value Added Course should undertake Training Need Analysis, discuss with the generic employers, alumni and industrial experts to identify the gaps and emerging trends before designing the syllabus.

Conduction of value added courses :

Value Added Course is not mandatory to qualify for any programme and the credits earned through the Value-Added Courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. It is a teacher assisted learning course open to all students without any additional fee.

Classes for a VAC are conducted during the RESERVED Time Slot in a week or beyond the regular class hours The value-added courses may be also conducted during weekends / vacation period. A student will be permitted to register only one Value Added Course in a Semester.

student will be encouraged to opt for the VAC offered by his/her parent Department/Faculty. Industry Experts / Eminent Academicians from other Institutes are eligible to offer the value-added course. The course can be offered only if there are at least 5 students opting for it. The students may be allowed to take value added courses offered by other departments after obtaining permission from Dean offering the course. The duration of value added course is 30 hours with a combination 18 hours (60%) of theory and 12 hours (40%) of practical. However, the combination of theory and practical shall be decided by the course teacher with the approval of the Dean

GUIDELINES FOR CONDUCTING VALUE ADDED COURSES

- ❖ Value Added Course is not mandatory to qualify for any program.
- ❖ It is an instructor supported learning course open to all students without any added fee.
- ❖ Classes for VAC will be conducted during the **RESERVED** Time Slot in a week or beyond the regular class hours.
- ❖ The value-added courses may be also conducted during weekends / vacation period.
- ❖ A student will be permitted to register only one Value Added Course in a Semester.
- ❖ Students may be permitted to enrol in value-added courses offered by other departments/ Schools after obtaining permission from the Department's Head offering the course.

DURATION AND VENUE

- ❖ The duration of value-added course should not be less than 30 hours.
- ❖ The Dean of the respective School shall provide class room/s based on the number of students/batches.
- ❖ VAC shall be conducted in the respective School itself.

REGISTRATION PROCEDURE

The list of Value-Added Courses, along with the syllabus, will be available on the University Website. A student must register for a Value-Added Course offered during the semester by completing and submitting the registration form. The Department Head shall segregate according to the option chosen and send it to the Dean of the school offering the specific Value-Added Courses.

- ❖ Each faculty member in charge of a course is responsible for maintaining Attendance and Assessment Records for candidates who have registered for the course.
- ❖ The Record must include information about the students' attendance and Assignments, seminars, and other activities that were carried out.
- ❖ The record shall be signed by the Course Instructor and the Head of the Department at the end of the semester and kept in safe custody for future verification.
- ❖ Each student must have a minimum of 75% attendance in all courses for the semester in order to be eligible to take certificate.

- ❖ Attendance requirements may be relaxed by up to 10% for valid reasons such as illness, representing the University in extracurricular activities, and participation in NCC.
- ❖ The students who have successfully completed the Value Added Course shall be issued with a Certificate duly signed by the Authorized signatories.



Conservation, development and Economic prospects of Medicinal and Aromatic Plants

Course Code: VCASAS002

Course Objectives:

- To acquire knowledge on medicinal and aromatic plants
- To bridge the gap between industry and academia with technology for conservation, development, processing and marketing of MAPS.
- To provide an opportunity for self-employment and entrepreneurship

Course Outcome:

- To enable the students/ participants to know the Medicinal and Aromatic Plants (MAPs).
- To provide knowledge for conservation, development, extraction of MAPs; its processing & value added products.
- To provides the students awareness about the marketing trend of MAPs.
- To help the students to learn about the self-employment and income generation.

Course Content:

Module I:

Importance and Scope of MAPS. Classification of medicinal and aromatic plants.

Module II:

Conservation and development practices, processing and utilization of medicinal and aromatic plants

Module III:

Extraction, and preservation of crude drugs. Classification and estimation of phyto-constituents of crude drugs.

Module IV:

Traditional and advance knowledge about the MAPS

Module V:

Post-harvest technology in medicinal plants scope and importance. Importance of herbal marketing -Future prospects and constraints of the herbal drug industry

References:

- Farooqi, A.A. and B. S. Sreeramu, 2004. Cultivation of medicinal and aromatic crops. Revised edition, Universities Press (India) Private Limited, Hyderabad
- Harbone, J.B. 1998. Phytochemical Methods: A guide to modern techniques of plant analysis. 3rd Supplementary Reading: Edn., Springer (India) Private Limited, New Delhi.
- WHO, 2002. Quality control methods for medicinal plant materials, World Health Organization, Geneva, A.I.T.B.S., Publishers and Distributors, New Delhi.
- Halliwall, B. and J.M.Gutteridge. 1985. Free radicals in Biology and medicine. Oxford University.



Hill Agriculture

Course Code: VCASAS003

Course Objectives:

- To impart the basic knowledge about agro-ecological zones of India.
- To develop understanding of mechanization for hilly areas.
- To develop the skills to analyze soil and water conservation techniques.
- To impart the knowledge of improved crop varieties for doubling farmers income.

Course outcomes:

- Identify the crops, farm implements and manures.
- Summarize improved for crop production technologies.
- Prepare farming system models for hill agriculture.
- Integrate alternate land use system and watershed management.

Course Content

Module I:

Agro-climatic and topographical parameters prevailing in hills of India. Soil composition, pH, texture, fertility and productivity of soils in hilly region. Soil and weather constraints in hills of India. Different tillage operations required for sustainable agriculture in hills.

Module II:

Improved crop Production technology of field crops, vegetable crops and fruit crops suitable for temperate regions viz. millets, cereals, pulses, Medicinal plants, spices and condiments, traditional fruits and vegetables grown wildy in forest of hills.

Module III:

Role of women in hill agriculture, limitations and opportunities for agribusiness related in hills, Role of government and non governmental bodies for upliftment of farmers in hills, Research and extension programmes for enhancing farm returns.

Module IV:

Integrated hill farming and watershed management . Alternate land uses for community needs and conservation. Wild animal menace in agriculture and strategies for its management. government shames for farmers. Organic farming in hills.

References:

- Hartmann, H.T., Kester, D.E., Davies, F.T. and Greneve, R.L. 1997. Plant propagation – Principles and Practices, Prentice Hall of India Private Ltd., New Delhi.
- Prasad, S. and Kumar, V. 1999. Green House Management of Horticultural Crops, AgroBios India, Jodhpur.
- Kanwar, J.S. (Ed.). 1976. Soil Fertility: Theory and Practice. ICAR.
- Olson, R.A., Army, T.S., Hanway, J.J. & Kilmer, V.J. 1971. Fertilizer Technology and Use. 2nd Ed. Soil Sci. Soc. Am. Madison.
- Prasad, R., & Power, J.F. Soil Fertility Management for Sustainable Agriculture. CRC Press



Agripreneurship Development in Beekeeping

Course Code: VCASAS004

Course Objectives:

- To impart the basic knowledge about honey bee species and bee flora
- To develop understanding about handling of honey bee keeping equipments & management of diseases & pests of honey bee
- To develop the skills in scientific methods of bee keeping and extraction of honey
- To impart the knowledge regarding apiary management by month wise calendar

Course outcomes:

- Understand importance of beekeeping, Selection of bee species & Identification of bee flora and location of site.
- Handling of bee keeping equipments, Management of insects and diseases & natural enemies.
- Scientific methods of bee keeping & honey processing.
- Seasonal apiary management by month wise calendar.

Course Content:

Module I:

Introduction to Bee Keeping, History, Present scenario & scope, Selection of bee species & races, identification of bee flora and location of site.

Module II:

Honey bee keeping equipments, Building & division of comb and colony, Management of insects and diseases and nuisance in bee hives.

Module III:

Scientific methods of bee keeping, Bee Boxes Maintenance, Collection and preservation of honey,

Module IV:

Month wise calendar of operations in bee keeping, Seasonal Management of honey bees.

References:

- Graham, J M (1992) The hive and the honey bee. Dadant and Sons, Hamilton, Illinois.
- Mishra R.C. (1995) Honey bees and their management in India. ICAR Publication, New Delhi.



Protection of Plant Varieties and Farmer's Rights

Course Code : VCASAS005

Course Objective:

Creating awareness and developing skill about plant variety protection and rights of breeder's, researcher's and farmer's.

Course outcomes:

- Upon successful completion of course students are able to identify the DUS characters of crop plants.
- Students will aware about breeder's, researcher's and farmer's rights in India.
- Students will get the skill to register and protect the varieties of crop plant

Course Content:

Module I:

Historical background and importance of plant variety protection, Protection of plant varieties and farmer's rights authority, registration of plant varieties and essentially derived varieties.

Module II:

Breeder's, researcher's and farmer's rights in India, compulsory licence, Appellate Tribunal, Infringement, offences and penalties.

Module III

(Practical): Procedure to protect plant varieties, DUS testing- principles and applications in agricultural crops, visit to DUS testing centre.

References:

- Protection of Plant Varieties and Farmer's Rights Act 2001. Ministry of Law, Justice and Company Affairs (Legislative Department). New Delhi, the 30th October, 2001.
- Protection of Plant varieties and Farmers Rights Act, 2001, along with rules, 2003 & Regulations, 2006. Bare Act. Professional Book Publishers, New Delhi.
- Plant Variety Journal of India. Protection of Plant Varieties & Farmer's Rights Authority, New Delhi

On farm practices of agricultural Waste management

Course Code: VCSAS006

Course Objectives:

- To impart knowledge to students on various methods of agricultural waste management for eco friendly energy and manure production.
- To develop understanding of some identified areas of organic farming
- To develop skills at village level on organic management practices with special focus on soil health base crop management
- To create job opportunities in organic sector particularly in the area of organic production

Course outcomes:

- To acquaint with on-farm resource management under organic farming.
- To understand soil health base crop management
- To develop the skill of input production and quality control.
- To aware the traditional Biofertilizer, Biopesticides and Soil health promoters.
- To learn the nutrient management and plant protection including formulation techniques.
- To develop the skills at village level required for organic farming practices and related marketing economics.

Course Content:

Module I:

Introduction, Concept, Philosophies, Principles and Need of organic farming

Module II:

Soil health: the prime need in organic management. Organic farming an integrated approach. Traditional organic input preparation/formulation of Biofertilizer, biopesticides, plant health promoters like Panchgavya, Beejamrut etc

Module III:

Manure preparation and introduction to compost. Methods of composting – vermicomposting, Shivansh khad - Factors involved, Infrastructure required, maturity parameters, value addition and application methods

Module IV:

Crop management, Nutrient Management and Pest Management and Multilayer cropping system base farm planning.

Module V:

System of organic certification and inspection. Standards and guidelines of NPOP (National Programme for organic production). Branding of rural products, FSSAI, marketing and packaging of organic produce.

References:

- Dahama, A.K.2009. Organic farming for sustainable agriculture, Agrobros publishers.
- Mukund Joshi. 2015. Sustainability to Organic Farming, Kalyani publication
- Nicholas lampkin 1994. Organic farming. Farming press London.Arun kumar Sharma 2008. A Hand book of organic farming.Agrobios Publishers.
- SP.Palaniappan and K Annadurai.2008.Organic Farming: Theory and Practice.2008. Scientific Publishers.
- Stockdale, E et al., 2000. Agronomic and environmental implications of organic farming systems. Advances in Agronomy, 70, 261-327
- S. R. Reddy.2020. Principles of Organic farming, Kalyani publication
- T.D. Pandey et al. 2013. Organic farming, Kushal Publication and distributors, Varanasi, U.P.
- Veeresh, G.K. 2010. Organic farming, Cambridge university press.

Novel techniques of fruits and vegetables processing

Course code: VCASAS007

Course objective:

- To give the students a way to evaluate and understand ecotourism in their context.
- To increase the benefits and to reduce the negative impacts caused by tourism for destinations.
- This can be achieved by: Protecting natural environments, wildlife and natural resources when developing and managing tourism.

Course outcomes:

- To aware with the history, importance and principles of preservation.
- To learn the prospects and scope of fruit and vegetable processing sector.
- To develop skill of various processing methods.
- To aware with develop procedure of various fruits and vegetable products.
- To acquaint with organoleptic evaluation of processed products.
- To understand technologies of fruit and vegetable processing and its role in providing better quality produce to the consumer .

Course Content:

Module I:

History, importance and scope of preservation of fruits and vegetables, Principles of preservation, Methods of preservation-Physical, Chemical, Fermentation, other methods.

Module II:

Role of preservatives, fruit color, flavors, chemicals, salt, sugar and vinegar. Study of containers for packaging of preserved products- Tin cans, Glass containers, plastic and polythene pouches and their advantages and disadvantages.

Module III:

Canning of fruits and Vegetables, Drying and Dehydration of fruits and Vegetables Preparation of Juice from Fruits and Vegetables, Squash & cordial. Sensory or organoleptic evaluation of processed products.

Module IV:

Preparation of Jam, Jelly and marmalade, Preparation of unfermented fruit beverages, juice Ready to serve (RTS), nectar, Fruit juice powder, fruit juice concentrate. Preparation of preserve and candy from Fruits and Vegetables. Preparation of tomato products - Tomato juice, Tomato puree and paste , Tomato sauce and ketchup , Tomato chutney , Tomato soup , Tomato chilli sauce.

References:

- Battacharjee, S. K. and De, L. C. 2005. Post Harvest Technology of Flowers and Ornamentals Plants. Ponteer Publisher, Jaipur, India.
- Bhutani RC. 2003. Fruit and Vegetable Preservation. Biotech Books
- Fellows, P. J. 1998. Food Processing Technology: Principles and Practices. Ellis Horwood.
- Hulme, A.C. 1970. Food Science & Technology- A Series of Monograph: The Biochemistry of
- Fruits and their Products (Vol. 1). Academic Press London & New York.
- Jacob, J. P. 2008. A Handbook on Post Harvest Management of Fruits and Vegetables. Daya
- Publishing House, Delhi.
- Kitinoja, L. and Kader, A. A. 2003. Small-Scale Postharvest Handling practice: A Manual for
- Horticulture Crops (4th edt.). US Davis, PHT Research and information Center.
- Mitra, S. K. 1997. Post Harvest Physiology and Storage of Tropical and Sub-tropical Fruits. CAB
- International.
- Ranganna, S. 2017. Handbook of Analysis and Quality Control for Fruit and Vegetable Products (2nd Edt.). McGraw Hill Education.
- Saraswathy, S. 2008. Post harvest Management of Horticultural Crops. Agribios (India).
- Shanmugavelu, K. G., Kumar, N. and Peter, K.V. 2002. Production Technology of Spices and Plantation Crops. Agrobios (India).
- Sharma, N. and Mashkoo, A. M. 1998. Post Harvest Diseases of Horticultural Perishables. International Book Distributing Co., Lucknow.
- Srivastava, R.P. and Sanjeev, K. 2017. Fruit and Vegetable Preservation: Principles and Practices. CBS Publishers & Distributors.
- Stanley, J. K. 1998. Post Harvest Physiology of Perishable Plant Products. CBS, New Delhi.
- Thomposon, A. K. 1996. Post Harvest Technology of Fruits and Vegetables. Blackwell Science.
- Verma, L. R. and Joshi, V. K. 2000. Post Harvest Technology of Fruits and Vegetables (Vol. I & II). Indus Publishing Co., New Delhi

Basic Concepts in Laboratory Techniques

Course Code: VCASAS008

Course Objectives:

- To impart the basic knowledge about safety measures and good laboratory practices.
- To develop understanding of basics of sterilization techniques.
- To develop the skills to analyse different methods of preparations of solutions.
- To impart the knowledge of handling sophisticated laboratory equipment's and instruments

Course Outcome:

Upon successful completion of the course students are able to acquaint knowledge and develop skills of commonly used techniques in laboratory

Course Content:

Module I:

Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes.

Module II:

Washing, drying and sterilization of glassware; Drying of solvents/ chemicals; Weighing and preparation of solutions of different strengths and their dilution.

Module III:

Handling techniques of solutions; Preparation of different agro-chemical doses in field and pot applications; Preparation of solutions of acids; Neutralization of acid and bases; Preparation of buffers of different strengths and pH values.

Module IV:

Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, water bath, Hot air oven, Autoclave, centrifuge, spectrophotometer etc.

Artificial Intelligence in Agriculture (AIA)

Course Code: VCASAS009

Course Objectives:

- To impart the basic knowledge about artificial intelligence in agriculture
- To assess crop monitoring overall conditions.
- To integrate of the Internet of Things (IoT) in agriculture.
- To study about the challenges and opportunities in the adoption of robotics in agriculture.

Course Outcome:

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

- Imparted the basic knowledge about artificial intelligence in agriculture
- Assessed crop monitoring overall conditions.
- Integrated of the Internet of Things (IoT) in agriculture.
- Studied about the challenges and opportunities in the adoption of robotics in agriculture.

Course Content:

Module I:

Introduction to Artificial Intelligence in Agriculture, Meaning and scope of artificial intelligence (AI) and its applications in agriculture. Historical context and evolution of artificial intelligence in the agricultural sector. Current challenges and opportunities in the integration of artificial intelligence in agriculture.

Module II:

Crop Monitoring and Quality Control Management: Artificial Intelligence algorithms analyze satellite imagery and drone data to monitor crop health, identify diseases, insect- pest, weed detection and assess overall plant conditions. Yield Prediction: Machine learning models process historical and real-time data to predict crop yields, enabling farmers to optimize resource allocation and plan harvests effectively. Quality Control: AI ensures that only crops meeting specific quality standards reach the market, reducing waste and improving overall product quality.

Module III:

Precision Agriculture and IoT: Overview of precision agriculture and its components. Integration of the Internet of Things (IoT) in agriculture. Real-time data monitoring and control in smart farming. Artificial Intelligence -driven precision agriculture utilizes sensors and IoT devices to gather data on soil moisture, nutrient levels, and weather conditions.

Module IV:

Robotics in Agriculture: Introduction to agricultural robotics and automation. AI-driven robotic applications in planting, harvesting and weeding. Challenges and opportunities in the adoption of robotics in agriculture. Emerging trends in AI for agriculture. Ethical considerations and potential societal impacts. Group discussions on responsible AI use in agriculture.

References:

- C.-L. Chang, K.-M. Lin (2018) Smart agricultural machine with a computer vision-based weeding and variable-rate irrigation scheme.
- K. R. Krishna, (2016) Push Button Agriculture: Robotics, Drones Satellite-Guided Soil and Crop Management, Apple Academic Press, Waretown, NJ, USA.
- K. Sennaar. (2019, April). AI in Agriculture – Present Applications and Impact. Available: <https://emerj.com/ai-sector-overviews/aiagriculture-present-applications-impac>
- S. de Wilde (2016) "The future of technology in agriculture,"
- R. Sivarethinamohan, D. Yuvaraj, S. Shanmuga Priya, S. Sujatha, (2021) Intelligent Computing and Optimization, vol. 1324, pp. 848.
- Kohei Dozono, Sagaya Amalathas, Ravan Saravanan, (2022 Proceedings of Sixth International Congress on Information and Communication Technology, vol. 235, pp. 557.

Online Vegetable Gardening

Course Code: VCASAS010

Course Objectives:

- To impart the knowledge about the vegetable gardening.
- To assist the various types of vegetable gardening in India.
- To identify the various types of vegetables.
- To judge the maturity indices for various types of vegetables.

Course Outcome:

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

- Imparted the knowledge about the vegetable gardening.
- Assisted the various types of vegetable gardening in India.
- Identified the various types of vegetables.
- Judged the maturity indices for various types of vegetables.

Course Content:

Module I:

Introduction: Vegetable Gardening, Importance and Scope in India, Objectives, Advantages and Disadvantages of vegetable gardening, Types of vegetable gardening.

Module II:

Gardening layout, Site Selection, climate and Topography of land, Suitable soil requirement for gardening, Propagation techniques used, Different types of Propagation structures.

Module III:

Nursery establishment, Management practices, Sowing techniques, Transplanting time and methods, New techniques of harvesting vegetables, Plant protection measures.

Module IV:

Post-harvest handling of vegetable Produce, Importance of Market, Grading, Sorting, Packaging Material, New technologies to increase shelf life of produce.

References:

- Chattopadhaya T.K. A Text Book of vegetable production Vol-II (Tropical fruits) Kalyani Publishers. 2014.

- Chattopadhyaya T.K. A Text Book of vegetable Vol-III (Sub- tropical fruits). Kalyani Publishers. 2014.
- Singh A. Fruits Physiology and production. Kalyani Publishers.2003. 5th Revised edition.



Regenerative Agriculture

Course Code: VCASAS011

Course Objectives:

- To impart basic knowledge on generative agriculture
- To understand the methods and mechanism related with regeneration methods in agriculture.
- To develop skills related with generative methods related with agriculture.
- To spread awareness about the basic skills and knowledge of generative agriculture.

Course Outcome:

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

- Imparted basic knowledge on generative agriculture
- Understood the methods and mechanism related with regeneration methods in agriculture.
- Developed skills related with generative methods related with agriculture.
- Able to spread awareness about the basic skills and knowledge of generative agriculture.

Course Content:

Module I:

Definitions and importance of generative Agriculture. Agro-climatic and topographical parameters prevailing in generative Agriculture. Role of generative agriculture in reducing environmental impacts of farm practices. Study of skills and techniques used in generative agriculture which improves farming techniques. Role of organic food production generative agriculture.

Module II:

Role of agro-climatic conditions in various means of propagation in view of organic food production, soil health assessment: Soil composition, pH, texture, fertility and productivity of soils. Soil and weather constraints for generative agriculture method. Different tillage operation required for crop production. Use of bio-fertilizers and bio-pesticides for enhancement of quality and quantity seed production. Role of organic manures.

Module III:

Development of propagation methods: Natural and artificial methods of regeneration: Natural regeneration – from seed and vegetative parts, coppicing, pollarding, root

suckers, Seed propagation, germination and priming, Artificial regeneration – objectives, choice between natural and artificial regeneration. Methods used to improve natural and artificial regeneration.

Module IV:

Role of traditional and modern methods of farming in crop improvement and crop production. Impact of traditional and modern of crop production on human health. Techniques to improve traditional methods for increasing quality and quantitative seed and food production.

References:

- Hartmann, H.T., Kester, D.E., Davies, F.T. and Greeneve, R.L. 1997. Plant propagation – Principles and Practices, Prentice Hall of India Private Ltd., New Delhi.
- Prasad, S. and Kumar, V. 1999. Green House Management of Horticultural Crops, AgroBios India, Jodhpur
- Kanwar, J.S. (Ed.). 1976. Soil Fertility: Theory and Practice. ICAR.
- Seed Technology R.L Agrawal
- Seed technology : khare and Bhale Introduction to forestry. Kalyani publication
- Plant breeding: B.D singh
- Olson, R.A., Army, T.S., Hanway, J.J. & Kilmer, V.J. 1971. Fertilizer Technology and Use. 2nd Ed. Soil Sci Soc. Am. Madison.
- Prasad, R., & Power, J.F. Soil Fertility Management for Sustainable Agriculture. CRC Press
- Sankhayan, P.L., 1988. Introduction to the Economics of Agricultural Production, Prentice Hall of India, New Delhi
- Yadav, A.K. 2005. Training Manual on Certification and Inspection Systems in Organic Farming in India National Centre of Organic Farming, Ghaziabad
- Panda, S.C. 2009. Cropping and farming systems, Agribios. India.
- Singh, C. Singh P. and Singh, R. 2017. Modern Techniques of Raising Field Crops. Oxford and IBH Pub. Co.

Horticultural Marketing

Course Code: VCASAS012

Course Objectives:

- To impart the basic knowledge about general economic concepts relevant to horticulture.
- To develop understanding about different components of marketing process.
- To develop the skills regarding advertising program for a horticulture enterprise.
- To impart the knowledge about appropriate marketing strategies.

Course outcomes:

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

- Identify importance of marketing.
- Summarize use of different types marketing elements.
- Understand different types of marketing methods. Use of ICT in marketing.
- Assess and correlate the knowledge of market for different marketing strategies.

Course Content:

Module I:

Definition & concept of marketing elements, resources and networking, supply and demand.

Module II:

Horticulture marketing process: packaging, labeling, product line decision, learning projects.

Module III:

Horticulture marketing methods, types of business, value of business, use of ICT for marketing, improving results in business, legal obligations, ways of communication, selling.

Module IV:

Horticulture marketing research, Statistics, research process, recent advances, merchandising.

References:

- Bansal, R.N. (1994), 'Export of fruit and vegetables – problems and prospects', *Agricultural Marketing*, Vol 37, No 3, pp 7–10.
- Bhatia, G.R. (1994), 'Strengthening fruit and vegetables marketing for export with special reference to farmers' participation – country paper', *Agricultural Marketing*, Vol 36, No 4, pp 11–21.
- Chengappa, P.G. (2001), 'Institutional aspects of agricultural marketing in India', *Proceedings of 'Institutional Change for Greater Agricultural Technology Impact'*, NCAP Conference, New Delhi.



Introduction to Hydroponics Gardening

Course Code: VCASAS013

Course Objectives:

- To impart basic knowledge to students about hydroponics gardening.
- To develop understanding of nutrient management in hydroponics
- To develop skills about use of equipment & instruments required in hydroponics
- To create skills of planning hydroponics gardening.

Course outcomes:

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

- Imparted basic knowledge to students about hydroponics gardening.
- Developed understanding of nutrient management in hydroponics
- Developed skills about use of equipment & instruments required in hydroponics
- Created skills of planning hydroponics gardening.

Course Content:

Module I:

Definition need and scope of hydroponics gardening, area selection and planning for hydroponics gardening.

Module II:

Basic requirement for hydroponics gardening, instruments & equipments required for hydroponics and their application.

Module III:

Management of nutrients, temperature, pH, water, TDS etc. during hydroponics gardening.

Module VI:

Types of hydroponics; NFT, DFT, DWC etc. Kartky system, Wincky system of hydroponics, management, advantages, disadvantages of different hydroponics system.

References:

- Johns Jason. 2014. Hydroponics - A Beginners Guide to Growing Food Without Soil. Bookswagon.

- Howard M. Resh. 2015. Hydroponics for Home Grower. CRC Press, Taylor and Francis group.
- Howard M. Resh. 2012. Hydroponics Food Production. CRC Press, Taylor and Francis group.
- Jr. J. Benton Jones. 2014. Complete Guide for Growing Plants Hydroponically. CRC Press, Taylor and Francis group.
- J. Benton Jones. 1997 Hydroponics: A Practical Guide for the Soilless Grower. CRC Press, Taylor and Francis group.



Biological Control Agents in Agriculture

Course Code: VCASAS014

Course Objectives:

- To familiarize about the use of bioagents in agriculture for controlling pest and disease and improving soil health and plant growth.
- To develop understanding of some identified biocontrol agents.
- To develop skills at village level on formulation of bio agents special focus on soil health base crop management.
- To create job opportunities in organic sector particularly in the area of plant protection by biological control.

Course outcomes:

- On successful completion of course the student will be able to:
- To acquaint with insect pest management under biological control agents.
- To understand role of biological control agents in agriculture.
- To develop the skill of input production of quality based biological agent.
- To aware the traditional Bio fertilizer, Bio pesticides and plant extracts as bio promoters.
- To learn the Insect Pest management and plant protection including formulation techniques.
- To develop the skills at village level required for use and practice of biological control agent and related marketing economics.

Course Content:

Module I:

Introduction, Concept, Philosophies, Principles and Need of biological control, Biological control – An ecological perspective.

Module II:

Traditional organic input preparation/formulation of Biofertilizer, biopesticides, plant health promoters like Panchgavya, Beejamrut etc. Isolation of biofertilizer microbes from crops rhizosphere.

Module III:

Techniques for isolation of fungal biocontrol agents, endophytes and study on their evaluation. Preparation of liquid bioformulation of fungal biocontrol agents and its shelf life study.

Module IV:

Techniques for development of microbes based bio formulation. Preparation of plant extracts, efficacy test and their use for plant disease management.

Module V:

Preparation of some bio pesticide materials at farm level for pest management. Biological control of plant parasitic nematodes. Bio pesticides and IPR Issues.

References:

- Bailey, K. L.; Boyetchko, S.M. and Langle, T. (2010). Social and economic drivers shaping the future of biological control: a Canadian perspective on the factors affecting the development and use of microbial biopesticides. *Biological Control* 52: 221-9.
- Chaube H.S and Pandhir 2005. *Crop diseases and their management*. Prentice hall of India Pvt.Ltd.New Delhi
- Chaur, T. (1998). General mechanisms of action of microbial biocontrol agents. *Plant Pathology Bulletin* 7: 155-166.
- Dhaliwal, G.S. and Ramesh Arora. 1998. *Principles of Insect Pest Management*.
- Koul, P. (2011). *Microbial biopesticides: opportunities and challenges*. CAB Reviews: Perspectives in Agriculture, Veterinary Science, Nutrition and Natural Resources 6(056): 1- 26.
- Metcalf. C.K. and W.P. Flint. 1970. *Destructive and Useful Insects - Their Habits and Control*. Tata McGraw Hill Pub. Co., New Delhi
- Sharma, R.C.and Sharma J.N. 1995. *Integrated Plant Disease Management* (Eds), Scientific Publisher, Jodhpur.
- Singh, R.S. 2001. *Plant Disease Management*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi 246 pp. Kalyani Publishers, New Delhi.

Biofuel

Course Code: VCASAS015

Course Objectives:

- To provide the knowledge about properties, composition, features of bio fuels and uses of biomass and
- their environmental impacts.
- To provide the students a substantial knowledge of bio fuel production technologies.
- To provide knowledge about the process of biogas production and methods of production of biodiesel
- and comparison of the standards to the conventional diesel.
- To provide knowledge about the production of lipids, bio hydrogen from different bacteria and algae.
- To provide knowledge about the fuel cell technology

Course outcomes:

- On successful completion of course the student will be able to:
- Describe the functional principle of biofuel technologies in small and large scale.
- Describe the main steps and components in bioethanol, biodiesel and biogas production.
- Participate actively in teamwork and work with case related problem solving.
- work with professional problem solving in an industrial environment.
- Work in other fields of engineering.

Course Content:

Module I:

Types of biomass (e.g. wood waste, forestry residues, agricultural residues, perennial annual crops, organic municipal solid waste). Composition of lignocellulose (lignin, hemi cellulose, cellulose); energy crops; chemical pre-treatment; enzymatic pre-treatment. Sources of energy, introduction of biofuels, availability of bio mass, composition of biomass, terrestrial biomass, aquatic biomass. Physical and chemical properties of biomass. Useful and undesirable features of biofuels.

Module II:

Biogas : The substrate, the digester, the microorganisms, the process of bio gas production, factors affecting bio gas yields, advantages, disadvantages. Bioethanol : Bioethanol vs. Petrol, production of bio ethanol, ethanol recovery. Bio butanol.

Properties and standards of bioethanol. Lignocellulosic biomass composition and characterizations.

Module III:

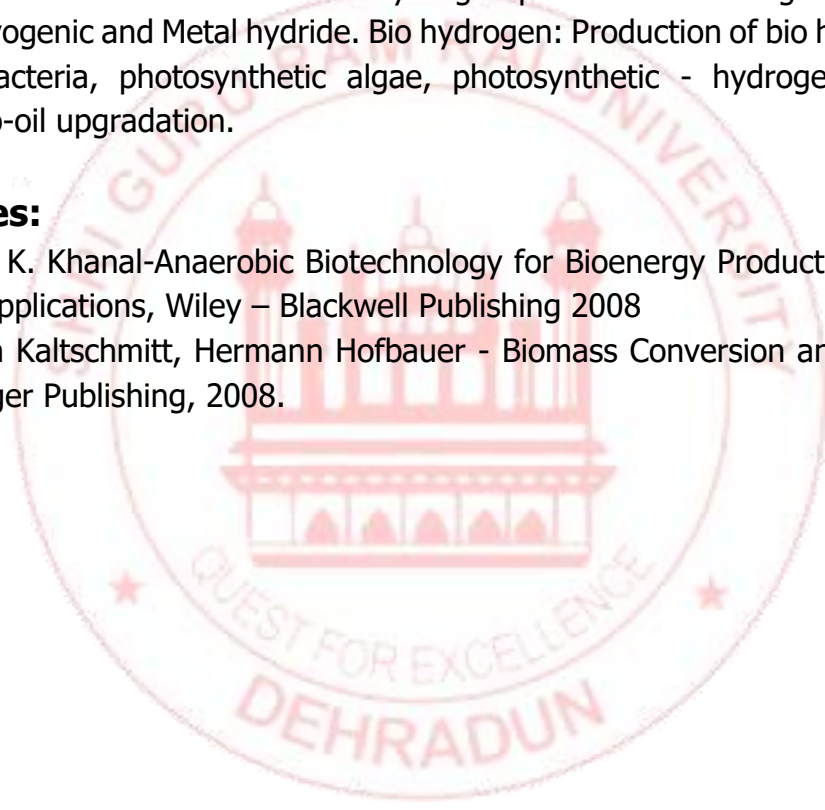
Sources and processing of biodiesel (fatty acid methyl ester); nature of lipids, especially fatty acids and triglycerides. Sources and characteristics of lipids for use as biodiesel feedstock; and conversion of feedstock into biodiesel (transesterification). Use of vegetable oil (SVO) and waste vegetable oil (WVO).

Module IV:

Hydrogen Production - Direct electrolysis of water, thermal decomposition of water, biological and biochemical methods of hydrogen production - Storage of Hydrogen - Gaseous, Cryogenic and Metal hydride. Bio hydrogen: Production of bio hydrogen from anaerobic bacteria, photosynthetic algae, photosynthetic - hydrogenase system. Pyrolysis, bio-oil upgradation.

References:

- Samir K. Khanal-Anaerobic Biotechnology for Bioenergy Production: Principles and Applications, Wiley – Blackwell Publishing 2008
- Martin Kaltschmitt, Hermann Hofbauer - Biomass Conversion and Biorefinery, Springer Publishing, 2008.



Standardization of Herbal Formulation

Course Code: VCASAS016

Course Objectives:

- Understand raw material as source of herbal drugs from cultivation to herbal drug product
- Know the WHO and ICH guidelines for evaluation of herbal drugs
- Know the herbal cosmetics, natural sweeteners, nutraceuticals
- Appreciate patenting of herbal drugs, GMP.

Course outcomes:

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

- To understand raw materials as a source of herbal drugs from cultivation to herbal drug products.
- To understand the values of herbs as a medicine and as a food product.
- Consideration of growing importance of herbal medicines and other herbal preparations.
- To understand the value of growing of plants as herbal medicine.

Course Content:

Module I:

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation, Source of Herbs Selection, identification and authentication of herbal materials Processing of herbal raw material.

Module II:

Good agricultural practices in cultivation of medicinal plants including Organic farming. Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Module III:

Indian Systems of Medicine

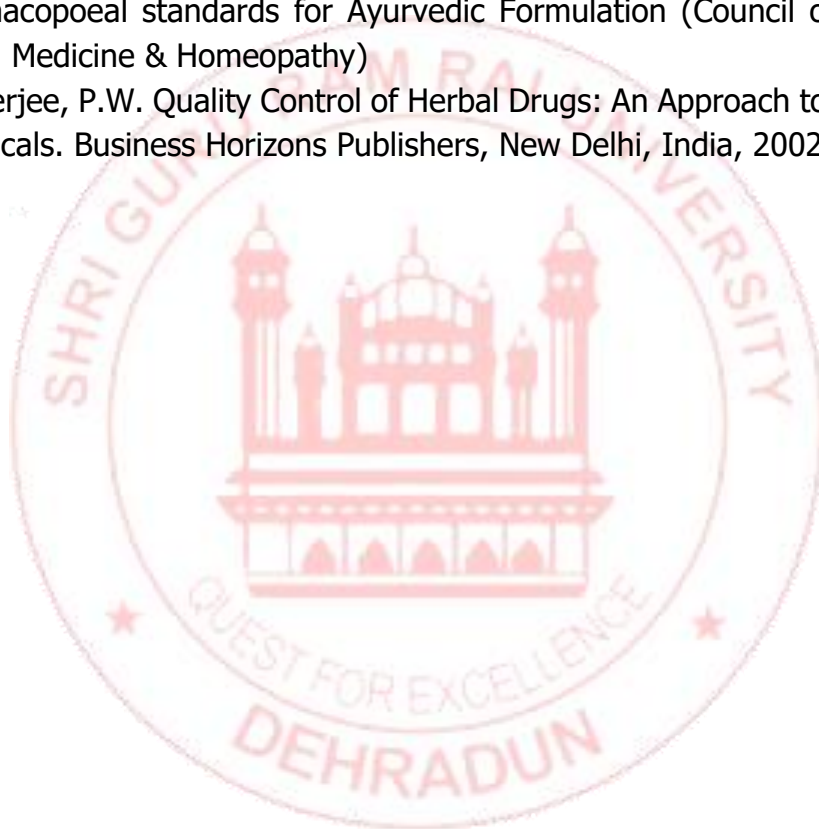
- a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy
- b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika, Churna, Lehya and Bhasma. Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Module IV:

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

References:

- Herbal Drug formulation and Standardization by Alekh Niranjana Sahu Debadatta Mohapatra.
- Herbal Drug Technology (Second Edition) By S S Agrawal.
- Pharmacognosy by Kokate, Purohit and Gokhale
- Essential of Pharmacognosy by Dr.S.H.Ansari
- Pharmacognosy & Phytochemistry by V.D.Rangari
- Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
- Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.



Significance of weather forecasting in Agriculture

Course Code: VCASAS017

Course Objectives:

- To acquire the basic knowledge of climate and weather and its impact on agriculture.
- To determine the weather forecasting in future climatic changes for smart farming.
- Weather forecasting to know about the crop diversification strategies for farmers to decide cultivates his crop
- To impart theoretical and practical knowledge of forecasting techniques used for weather prediction and preparation of agro-advisories.

Course Outcomes:

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

- Acquired the basic knowledge of climate and weather and its impact on agriculture.
- Determined the weather forecasting in future climatic changes for smart farming.
- Weather forecasting to know about the crop diversification strategies for farmers to decide cultivates his crop
- Imparted theoretical and practical knowledge of forecasting techniques used for weather prediction and preparation of agro-advisories.

Course Content:

Module I:

Meaning and scope of agricultural meteorology; components of agricultural meteorology; roles and responsibilities of agricultural meteorologists; importance of meteorological parameters in agriculture; important meteorological processes to agriculture-importance of various micro environment on plant growth and development.

Module II:

Weather forecasting system: definition, scope and importance; historical background; observational network of weather forecasting; weather forecasting network in India; benefits of weather forecasting to agriculture; forecasting problems; classified terminology of weather parameters used in weather forecasts and their interpretation.

Module III:

Weather forecasting: importance, types, tools, modern techniques and methods of weather forecasting; crop weather charts, calendars and diagrams; weather forecasting and agro advisories; crop weather calendar; general forecasting: short, medium and long range forecasting for agriculture; use of satellite cloud imageries and synoptic approach to weather forecasting..

Module IV:

Concept of agrometeorological advisory; interpretation of weather forecasts for soil moisture, farm operations, pest and disease development and epidemics, crops and livestock production; preparation of weather-based advisories for farmers and dissemination; verification of weather forecasts.

References:

- Alan Watts 2005. Instant Weather Forecasting. Water Craft Books.
- Lenka, D. 1998. Climate, weather and Crops in India. Kalyani Publishers.
- Petterssen, S. 1956. Weather Analysis and Forecasting. Mcgraw-Hill
- Ram Sastry AA. 1984. Weather and Weather Forecasting. Publication Division, GOI, New Delhi.
- Singh SV, Rathore LS & Trivedi HKN. 1999. A Guide for Agrometeorological Advisory Services. Department of Science & Technology, NCMRWF, New Delhi.
- Wegman&Depriest 1980. Statistical Analysis of Weather Modification Experiments. Amazon Book Co.

Techniques of potato seed production

Course Code: VCASAS018

Course Objectives:

- To impart the basic knowledge about potato seed tuber production.
- To develop understanding of the importance of activities during plant growth period.
- To develop the skills to analyze their diseases and their control.
- To impart the knowledge of cooperatives in seed production.

Course outcomes:

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

- Identify importance of quality seed tuber.
- Summarize different activities during plant growth period.
- Understand their diseases and pest and their management strategies.
- Integrate cooperatives in seed production.

Course Content:

Module I:

Definition & Importance of Quality seed tuber, Basic Knowledge of Potato seed tuber production, Activities before cultivation of potato seed tuber, planting.

Module II:

Activities during plant growth period: top dressing, covering method, irrigation and drainage, field inspection, Potato haulm cutting technology.

Module III:

Diseases & pest, general description, major symptoms and their control. Harvesting of potato; selection, grading, treatment, drying and storage.

Module IV:

Structure & role of seed production cooperatives and major actions to be taken.

References:

- Sergey V. Zhevora and Boris V. Anisimov (2021). Potato Seed Production, Springer, 978-3030607616.
- Thapa U & Tripathi P (2019). Production Technology of Potato & Tuber Crops, ISBN: 9788170196365