

Syllabus for Bee Keeping

Course Name	BEE KEEPING, V2
Course Code	STC - AGR/2021/0209, V2
Level	3
Occupation	BEE KEEPING
Job Description	After completion of the course, the passed out trainee will work for a diversified jute product of specific shape and size as per market demand. All items are to be made as per the standard specifications to get popularized nationally and/or globally.
Course Duration	Total Duration 390 Hrs (T-90, P-180, OJT-60 and ES-60)
Trainees' Entry Qualification	Grade 10 OR Grade 8 with two year of (NTC/ NAC) after 8 th OR Grade 8 pass and pursuing continuous schooling in regular school with vocational subject OR 8th grade pass with 2 yrs relevant experience OR Previous relevant Qualification of NSQF Level 2 with one yr experience OR Previous relevant Qualification of NSQF Level 2.5 with 6 months experience
Trainers Qualification	M. Sc. (Ag) Agricultural Entomology or Zoology ii) B. Sc. (Ag) Hons or Zoology with 1 year experience in bee keeping

Structure of Course:

Module No.	Outcome	Theory (Hrs)	Practical (Hrs)	Total (Hrs) [Multiple of 30]
1	Maintain safety at the Apiary	10	20	30
2	Illustrate manufacturing and handling of bee box	10	20	30
3	Explain bee keeping, its importance, its season wise nectar and pollen producing plants and the products obtained.	10	20	30
4	Illustrate the life cycle of honey bee i.e. about its species, casts, nesting behavior, its relation with flowers, its nectar and pollen collecting organs and related diseases, parasites and predators	10	20	30
5	Demonstrate methods of bee keeping	10	20	30

	involving arranging bee boxes, following artificial feeding methods at dearth period, extraction of honey and maintenance of hygiene.			
6	Explain the seasonal management of Bee colony through management practices, methods of swarming control and swarm catch and appropriate time and methods of queen replacement	10	20	30
7	Demonstrate Queen rearing in honey bee	10	20	30
8	Enlist the products obtained from bee keeping and processing, packaging and preservation.	10	20	30
9	Demonstrate Quality testing of honey and prepare related project on it.	10	20	30
10	OJT		60	60
11	Employability Skills	60		60
	TOTAL	150	240	390

Employability Skill: 60Hrs (Provided by NCVET)

OJT: 60 hours (in multiple of 60)

SYLLABUS:

Module No. 1: Maintain safety at the Apiary

Outcome: Maintain safety at the Apiary

Theory Content:

- Knowledge of aggressive nature and stringing habit of honey bees.
- Use the appropriate tools (like smoker) required for handling the bees.
- Knowledge of protective dress for the bee keeper.
- Ensure that the necessary protective equipment (like bee veil, gloves) are available.
- Follow safety methods while using sharp tools.
- Do not move too much while handling bees.
- Measures to be taken after stringing of bees.
- Remove burrs or stuck material from the head of the chisel and the edges of tools.
- Wear protective dress while opening the bee box
- Clean all the tools properly after use.
- Keep all the tools properly after use in clean place.
- Inspect the tools regularly.

Practical Content:

Tools & Equipment needed:

Module No. 2: Illustrate manufacturing and handling of bee box

Outcome: Illustrate manufacturing and handling of bee box

Theory Content:

- Tools used for manufacturing of bee box and wax sheet (like nail, wood cutter, screw driver)
- Specification of bee box for different bee species
- Specification of brood chamber and super chamber
- Specification of bee frame

- Specification of wax sheet

Practical Content:

- Practical handling of bee colonies
- Demonstrate Knowledge of Safe working practices(like less movement of body parts), in apiary
- Always wear protective dress and veil.
- Method of opening of bee box.
- Method of inspection of bee frames (like gentle movement of bee frames, both side inspection), of the bee box.
- Identification of tools used for manufacturing of bee box and wax sheet
- Measurement of different parts of bee box for different bee species
- Manufacturing of brood chamber and super chamber
- Manufacturing of bee frame for different species
- Manufacturing of wax sheet

Module No. 3: Explain bee keeping, its importance, its season wise nectar and pollen producing plants and the products obtained.

Outcome: Explain bee keeping, its importance, its season wise nectar and pollen producing plants and the products obtained.

Theory Content:

- Definition of bee keeping
- Importance of bee keeping as an income generation option.
- Importance of bee keeping in agriculture
- Season wise nectar and pollen producing plants(like coriander in winter)
- Different products obtained from bee keeping(like bee wax, honey)

Practical Content:

- Identification of different products obtained from bee keeping
- Identification of nectar and pollen producing plants in the locality.
- Identification of different equipment used in bee keeping.
- Survey on abundance of nectar and pollen producing plants in the locality.

Module No. 4: Illustrate the life cycle of honey bee i.e. about its species, casts, nesting behavior, its relation with flowers, its nectar and pollen collecting organs and related diseases, parasites and predators

Outcome: Illustrate the life cycle of honey bee i.e. about its species, casts, nesting behavior, its relation with flowers, its nectar and pollen collecting organs and related diseases, parasites and predators

Theory Content:

- Different species of honey bees(like *Apis dorsata*, *Apis mellifera*)
- Different casts of honey bees(like queen, drone, worker)
- Nesting behavior of different species of honey bees
- Life cycle of different casts in the colony
- Work performed by different casts in the colony

- Relation of honey bee and flower
- Nectar and pollen collection organs of honey bees(name them mouth parts of honey bee, pollen basket)
- Nectar and pollen collection methods (like nector lapping) of honey bees
- Different diseases of honey bees
 - a. Causal organism of the disease
 - b. Epidemiology of the disease
 - c. Symptom of the disease
 - d. Progress of the disease
 - e. Prevention and cure of the disease
- Different parasites of honey bees
 - a. Description of the parasite
 - b. Pattern of infestation of parasites in honey bees
 - c. Seasonal pattern of infestation
 - d. Symptom of parasite infestation in honey bee
 - e. Prevention and cure of parasite infestation in honey bees
- Different predators of honey bee
 - a. Descriptions of the predator
 - b. Symptom of predator attack
 - c. Methods of prevention against predator attack

Practical Content:

- Identification of different species of honey bees
- Identification of different casts of honey bees
- Observation on nesting behavior of different species of honey bees
- Observation on different stages of life cycle of different casts in the colony
- Observation on work performed by different casts in the colony
- Observation on honey and pollen collecting organs of honey bees
- Observation on honey and pollen collection method of honey bees
- Identification of different diseases of honey bees
 - a. Identification of symptoms of the diseases
 - b. Observation on progress of the diseases
 - c. Adoption of prevention and cure methods of the diseases
- Different parasites of honey bees
 - a. Identification of the parasite
 - b. Identification of symptoms of parasite infestation in honey bee
 - c. Adoption of prevention and cure methods of parasite infestation in honey bees
- Different predators of honey bee
 - a. Identification of the predator
 - b. Identification of Symptoms of predator attack
 - c. Adoption of methods of prevention against predator attack

Module No. 5: Demonstrate methods of bee keeping involving arranging bee boxes, following artificial feeding methods at dearth period, extraction of honey and maintenance of hygiene.

Outcome: Demonstrate methods of bee keeping involving arranging bee boxes, following artificial feeding methods at dearth period, extraction of honey and maintenance of hygiene.

Theory Content:

- Different methods of bee keeping for different species
- Structures of bee boxes for different species

- Arrangement of frames inside the bee box
- Use of different equipment and tools in bee keeping
- Artificial feeding methods (like sugar solution) for honey bees at dearth period
- Methods of combining two bee colonies
- Methods of splitting a bee colony into two colonies
- Methods of honey extraction.
- Selection of site for apiary
- Maintenance of hygiene and sanitation in apiary site

Practical Content:

- Demonstration on different methods of bee keeping for different species
- Measurement of different parameters of bee boxes for different species
- Measurement and arrangement of frames inside the bee box
- Methods of putting new frame in a bee colony
- Demonstration on use of different equipments and tools in bee keeping
- Artificial feeding methods for honey bees at dearth period with sugar solution and solid food.
- Hand on practice on different methods of combining two bee colonies
- Hand on practice on different methods of splitting a bee colonies in two colony
- Honey extraction by squeezing method
- Honey extraction by use of honey extractor
- Survey for suitable site for apiary in the locality
- Maintenance of hygiene and sanitation in apiary site by proper observation and cleaning.

Module No. 6: Explain the seasonal management of Bee colony through management practices, methods of swarming control and swarm catch and appropriate time and methods of queen replacement

Outcome: Explain the seasonal management of Bee colony through management practices, methods of swarming control and swarm catch and appropriate time and methods of queen replacement

Theory Content:

- Seasonal management of bee colony
 - a. Summer season management
 - b. Winter season management
 - c. Rainy season management
- Swarming season of honey bee
- Growth period of honey bee
- Methods of swarming control
- Methods of swarm catch
- Appropriate time of queen replacement
- Methods of queen replacement

Practical Content:

- Seasonal management of bee colony
- Methods of maintenance of ambient temperature in different seasons in bee colony (like covering the bee box with wet gunny bag in summer)
- Observation on symptoms of swarming in honey bee colony
- Observation on different parameters (like approximate number of egg laid per week) to measure the growth of honey bee colony

- Practicing different methods of swarming control
- Practicing different methods of swarm catch
- Observation on appropriate time of queen replacement
- Practice of methods of queen replacement in selected bee colony

Module No. 7: Demonstrate Queen rearing in honey bee

Outcome: Demonstrate Queen rearing in honey bee

Theory Content:

- Tools used for queen rearing
- Different methods of queen rearing
- Selection of healthy queen for queen replacement in bee colony

Practical Content:

- Identification of tools (like queen rearing frame) used for queen rearing
- Hands on practice of different methods of queen rearing
- Selection criteria for healthy queen for queen replacement in bee colony
- Process of queen replacement in bee colony.

Module No. 8: Enlist the products obtained from bee keeping and processing, packaging and preservation.

Outcome: Enlist the products obtained from bee keeping and processing, packaging and preservation.

Theory Content:

- Different products obtained from bee keeping (like honey, bee wax)
- Importance of different products obtained from bee keeping
- Different tools used for production of different products of bee keeping (like honey extractor)
- Production procedure of pollen
- Production procedure of bee venom
- Production procedures of propolis
- Production procedures of royal jelly.
- Production procedures bee wax
- Methods of honey processing and preservation (like sheaving, heating etc)

Practical Content:

- Identification of different products obtained from bee keeping
- Practical use of different products obtained from bee keeping.
- Identification of different tools used for production of different products of bee keeping
- Hands on practice on production procedure of pollen
- Hands on practice on production procedure of bee venom
- Hands on practice on production procedures of propolis.
- Hands on practice on production procedures of royal jelly.
- Hands on practice on production procedures of bee wax
- Straining of honey to remove foreign particles
- Removal of excess moisture
- Proper mixing of honey
- Proper packaging and sealing of honey

Module No. 9: Demonstrate Quality testing of honey and prepare related project on it.

Outcome: Demonstrate Quality testing of honey and prepare related project on it.

Theory Content:

- Measurement of pH of honey
- Measurement of moisture content of honey

Practical Content:

- Measurement of pH of honey by pH meter
- Measurement of moisture content of honey by hygrometer

Learning Outcome – Assessment Criteria

Outcomes to be assessed	Assessment criteria for the outcome
1. Maintain safety at the Apiary	1.1 Assessor will judge if the trainee is able to explain the techniques of handling the aggressive nature and stringing habit of honey bees. 1.2 Trainee will be able to identify appropriate tools (like smoker, screw driver etc.) required for handling the bees and ensure that necessary protective equipment (like beevail, gloves) is available. 1.3 Trainee will be able to explain the measures to be taken while handling bees and the tools (such as not move too much while handling bees, Remove burrs or stuck material from the head of the chisel and the edges of tools, Clean all the tools properly after use, Inspect the tools regularly etc.) 1.4 Trainee will be able to demonstrate safety methods of using sharp tools. 1.5 Trainee will be able to list the antidotes (like removal of the string from skin, application of soaked lime), their application method of bee stringing and measures to be taken while handling bees.
2. Illustrate manufacturing and handling of bee box	2.1 Trainee will be able to demonstrate practical process of handling bee colonies. 2.2 Trainee will be able to demonstrate Safe working practices (like less movement of body parts, gentle movement of bee frames) in apiary 2.3 Trainee will be able to demonstrate proper wearing of protective dress and vail for the bee keeper. 2.4 Trainee will be able to demonstrate safe method of opening the bee box and inspection of the bee frames of the bee box. 2.5 Trainee will be able to demonstrate methods (like presence of queen, presence of fresh eggs) of inspection of bee frames of the bee box. 2.6 Trainee will be able to identify different types of bee box. 2.7 Trainee will be able to list the specifications for different types of bee box. 2.8 Trainee will be able to identify tools used for manufacturing of bee box and wax sheet. 2.9 Trainee will be able to illustrate specification of bee box for different bee species, brood chamber and super chamber, bee

	<p>frame, wax sheet.</p> <p>2.10 Trainee will be able to demonstrate measurement of different parts of bee box for different bee species.</p> <p>2.11 Trainee will be able to demonstrate preparation of one frame of bee box.</p> <p>2.12 Trainee will be able to demonstrate the manufacturing process of brood chamber and super chamber, bee frame for different species, wax sheet</p>
<p>3. Explain bee keeping, its importance, its season wise nectar and pollen producing plants and the products obtained</p>	<p>3.1 Trainee will be able to define bee keeping and state importance as an income generation option.</p> <p>3.2 Trainee will be able to explain the importance of bee keeping in agriculture.</p> <p>3.3 Trainee will be able to identify season wise nectar and pollen producing plants (like mustard in winter, sesame in summer etc.)</p> <p>3.4 Trainee will be able to make a survey on the abundance of nectar and pollen producing plants in the locality.</p> <p>3.5 Trainee will be able to list different products (like bee wax, bee pollen etc) obtained from bee keeping.</p> <p>3.6 Trainee will be able to identify different equipment (like smoker, encapping knife etc.) used for handling the bees.</p>
<p>4. Illustrate the life cycle of honey bee i.e. about its species, casts, nesting behavior, its relation with flowers, its nectar and pollen collecting organs and related diseases, parasites and predators</p>	<p>4.1 Trainee will be able to identify different species (like <i>Apis dorsata</i>, <i>Apis mellifera</i> etc.) and casts (like queen, worker etc.) of honey bees.</p> <p>4.2 Trainee will be able to demonstrate nesting behavior of different species of honey bees through chart preparation.</p> <p>4.3 Trainee will be able to explain the life cycle of different casts in the colony and the work performed by them in the colony.</p> <p>4.4 Trainee will be able to illustrate the life cycle of different casts in the colony and the work performed by them in the colony through chart preparations.</p> <p>4.5 Trainee will be able to depict the relation of honey bee and flower through flow charts or line diagrams (example : (Flower + honey bee → pollination → development of fruit and seed → germination of seed → new plant)</p> <p>4.6 Trainee will be able to demonstrate nectar and pollen collection organs (like pollen basket) of honey bees through pictorial presentation.</p> <p>Trainee will be able to illustrate the nectar and pollen collection methods (like collection of nectar → maturation of nectar → sealing of honey chamber) of honey bees through flow charts.</p> <p>4.7 Trainee will be able to explain different features about the diseases of honey bees (such as causal organism of the disease, epidemiology of the disease, progress of the disease, prevention and cure of the disease).</p> <p>4.8 Trainee will be able to explain different features about parasites of honey bees (such as Description of the parasite, Pattern of infestation of parasites in honey bees, Seasonal pattern of infestation, Symptom of parasite infestation in honey bee, Prevention and cure of parasite infestation in honey bees).</p> <p>4.9 Trainee will be able to identify symptoms of different disease and parasite attack of honey bees.</p>

	<p>4.10 Trainee will be able to identify different parasites of honey bees, symptoms of parasite infestation.</p> <p>4.11 Trainee will be able to explain different features of the predators of honey bee (such as descriptions of the predator, symptom of predator attack, methods of prevention against predator attack).</p> <p>4.12 Trainee will be able to identify different predators of honey bee, Symptoms of predator attack. Trainee will be able to list the precautionary measures for each disease, parasite and predator attack and the medicines for controlling those.</p>
<p>5. Demonstrate methods of bee keeping involving arranging bee boxes, following artificial feeding methods at dearth period, extraction of honey and maintenance of hygiene.</p>	<p>5.1 Trainee will be able to explain different methods of bee keeping (like small box for <i>Apis cerena indica</i>) for different species (like <i>Apis cerena indica</i>, <i>Apis mellifera</i>)</p> <p>5.2 Trainee will be able to measure different parameters of bee boxes for different species.</p> <p>5.3 Trainee will be able to illustrate structures of bee boxes for different species through drawings.</p> <p>5.4 Trainee will be able to demonstrate measurement and arrangement of frames inside the bee box and methods of putting new frame in a bee colony.</p> <p>5.5 Trainee will be able to demonstrate the use of different equipment and tools in bee keeping.</p> <p>5.6 Trainee will be able to explain the artificial feeding methods (like feeding of sugar solution) for honey bees at dearth period with sugar solution and solid food.</p> <p>5.7 Trainee will be able to demonstrate the methods of combining two bee colonies and also splitting a bee colony into two colonies.</p> <p>5.8 Trainee will be able to explain manual and mechanical honey extraction process.</p> <p>5.9 Trainee will be able to demonstrate honey extraction by squeezing method and honey extraction by use of honey extractor.</p> <p>5.10 Trainee will be able to list the criteria for selection of a site for apiary.</p> <p>5.11 Trainee will be able to explain the ways of maintaining hygiene and sanitation in apiary site.</p>
<p>6. Explain the seasonal management of Bee colony through management practices, methods of swarming control and swarm catch and appropriate time and methods of queen replacement</p>	<p>6.1 Trainee will be able to explain seasonal (summer, winter, Rainy) management of bee colony.</p> <p>6.2 Trainee will be able to demonstrate the methods of maintenance of ambient temperature in different seasons in bee colony.</p> <p>6.3 Trainee will be able to list the management practices for each season.</p> <p>6.4 Trainee will be able to demonstrate at least one important management for each season.</p> <p>6.5 Trainee will be able to list the different parameters (like approximate number of worker after one month) to measure the growth of honey bee colony.</p> <p>6.6 Trainee will be able to illustrate swarming season and growth period of honey bee.</p> <p>6.7 Trainee will be able to demonstrate Methods of swarming control and swarm catch.</p>

	6.8 Trainee will be able to determine the appropriate time and methods of queen replacement
7. Demonstrate Queen rearing in honey bee	<p>7.1 Trainee will be able to identify the tools (like grafting spoon) used for queen rearing.</p> <p>7.2 Trainee will be able to demonstrate different methods of queen rearing.</p> <p>7.3 Trainee will be able to explain the selection criteria (like robust queen, disease free queen) for healthy queen for queen replacement in bee colony.</p> <p>7.4 Trainee will be able to explain the process of queen replacement in bee colony.</p> <p>7.5 Trainee will be able to illustrate the process of queen rearing through flow chart.</p>
8. Enlist the products obtained from bee keeping and processing, packaging and preservation.	<p>8.1 Trainee will be able to identify the tools required (like honey extractor) for production of different products (like honey) obtained from honey bee.</p> <p>8.2 Trainee will be able to explain the importance of different products obtained from bee keeping.</p> <p>8.3 Trainee will be able to make a flow chart on production of different products obtained from honey bee.</p> <p>8.4 Trainee will be able to identify different tools used for production of different products of bee keeping.</p> <p>8.5 Trainee will be able to demonstrate production procedure of pollen, bee venom, propolis, royal jelly, bee wax.</p> <p>8.6 Demonstration of at least one production procedures of different products obtained from honey bee.</p> <p>8.7 Trainee will be able to identify different tools and equipment used for honey processing.</p> <p>8.8 Trainee will be able to explain the different methods of honey processing and preservation.</p> <p>8.9 Trainee will be able to explain the different steps of honey processing (such as straining of honey to remove foreign particles, removal of excess moisture, proper mixing of honey)</p> <p>8.10 Trainee will be able to demonstrate at least one step of honey processing.</p> <p>8.11 Trainee will be able to illustrate the methods of packaging & sealing of honey.</p>
9. Demonstrate Quality testing of honey and prepare related project on it.	<p>9.1 Trainee will be able to identify tools and equipment used for honey testing.</p> <p>9.2 Trainee will be able to demonstrate measurement of pH of honey by pH meter, moisture content of honey by hygrometer.</p> <p>9.3 Trainee will be able to explain his planning for a small scale entrepreneurship on bee keeping consisting of land selection, no of bee boxes and their arrangement, honey bee selection, bee rearing, market survey, cost estimation, packaging, processing and quality methods and loan proposal to financial institution for actual execution.</p>

LIST OF TOOLS AND EQUIPMENT			
COURSE NAME:		(For batch of 30 candidates)	
Sl no.	Name of the Tool & Equipment	Specification	Quantity
1.	Hive tool	Standard quality	3
2.	Smoker	Standard quality	2
3.	Jacket with veil	Standard quality	6
4.	Gloves	Standard quality	6
5.	Bee brush	Standard quality	2
6.	Bee box	Standard quality	15
7.	Queen gate	Standard quality	5
1.	Queen excluder	Standard quality	7
10	Queen cage	Standard quality	5
11	Encapping knife	Standard quality	3
12	Feeder	Standard quality	30
13	Medicines	Standard quality	As per need
14	Mechanical honey extractor	Standard quality	2
15	pH meter	Standard quality	2
16	Hygrometer	Standard quality	2
17	Queen rearing frame	Standard quality	5
18	strainer	Standard quality	6
19	Food grade plastic bucket	Standard quality	20
20	Pollen collector	Standard quality	5
21	Bee venom collector	Standard quality	5
22	Propolis production net	Standard quality	7

Marks Distribution

Outcome	Outcome code	Total Th marks	Total Pr marks
Maintain safety at the Apiary	AGR/0209/OC1	10	70
Illustrate manufacturing and handling of bee box	AGR/0209/OC2	20	70
Explain bee keeping, its importance, its season wise nectar and pollen producing plants and the products obtained.	AGR/0209/OC3	20	70
Illustrate the life cycle of honey bee i.e. about its species, casts, nesting behavior, its relation with flowers, its nectar and pollen collecting organs and related diseases, parasites and predators	AGR/0209/OC4	20	80
Demonstrate methods of bee keeping involving arranging bee boxes, following artificial feeding methods at dearth period, extraction of honey and maintenance of hygiene.	AGR/0209/OC5	20	80
Explain the seasonal management of Bee colony through management practices, methods of swarming control and swarm catch and appropriate time and methods of queen replacement	AGR/0209/OC6	20	70
Demonstrate Queen rearing in honey bee	AGR/0209/OC7	10	70
Enlist the products obtained from bee keeping and processing, packaging and preservation.	AGR/0209/OC8	20	70
Demonstrate Quality testing of honey and prepare related project on it.	AGR/0209/OC9	10	70
Work in real job situation (OJT)	AGR/0209/OC9	0	150
Employability Skills (60 Hrs)	DGT/VSQ/N0102	50	0