Cornell University
Master Beekeeper Program

This document provides an overview of course topics from the 2017/2018 and 2018/2019 program. Course topics are subject to change as new research and priorities become available.

The Cornell University Master Beekeeper Program consists of 4 online courses. Students are required to complete quizzes and assignments and must participate in class discussions to pass each course. Final written, oral, and field exams are held at the Dyce Lab for Honey Bee Studies in Ithaca, New York. Fifty students are enrolled each year.

Course 1: Honey Bee Evolution, Biology, and Behavior

The evolution of the honey bee as a superorganism	• *The honey bee colony as a superorganism* • *What does it mean to be a honey bee?* • *Distinguishing bees from other insects* • *The evolution of honey bees* • *Honey honey bees are truly social* • *Kin selection* • *Polyandry* • *The importance of wild bees*
Honey bee reproduction	• *Passing on your genes* • *The molecules of bee life* • *Mating* • *Reproductive systems*
Honey bee development	• *The stages of development* • *How sex is determined* • *How caste is determined* • *How the worker's role transitions throughout its life*
How honey bees communicate	• *Pheromone communication* • *Honey bee dances*
Honey bee biology	• *Vision* • *How can understanding honey bee vision make me a better beekeeper* • *The nervous system* • *Flight* • *The respiratory system* • *The circulatory system* • *Olfaction* • *Digestion*
How honey bees construct and maintain their nest	• *The building blocks of a nest* • *How a nest of a honey bee colony is organized* • *Temperature control in the nest*

Course 2: The Art and Science of Beekeeping

Safety and biosecurity in the bee yard	• *Preventing stings* • *Bee sting reactions* • *Hygienic management practices* • *Robbing* • *How to stop robbing*
Inspecting the colony	• *When and how often to inspect* • *Outside the hive* • *Inspecting during less-than-perfect conditions* • *Inspecting honey supers* • *Inspecting the brood nest* • *A year in the bee yard* • *Colony assessments* • *Keeping good records* • *Inspection and record keeping tips*
Honey bee nutrition	• *Nutritional requirements* • *Natural forage* • *Learn the blooms in your area* • *Feeding carbohydrates* • *Feeding protein*
Techniques in managing colony population	• *Annual population cycle of a honey bee colony* • *Splitting colonies* • *Making nucleus colonies* • *Merging colonies*
Swarming	• *Colony-level reproduction* • *The preparation and process of swarming* • *Swarming or not?* • *Swarm prevention* • *Catching and baiting swarms*
Queen management	• *Queen status* • *Signs of queenlessness* • *Considerations for requeening a queenless colony* • *Requeening to improve health and productivity* • *Managing a two-queen colony* • *Using local queens*
Variation within *Apis mellifera*	• *Honey bee subspecies and lineages* • *Apis mellifera in North America* • *Africanized honey bees*
Queen rearing with the Doolittle method	• *The Doolittle method* • *Biological considerations* • *Queen grafting* • *Considerations when placing your graft in cell builders* • *Cell builders* • *Mating yards* • *Queen rearing schedule*
Breeding for the traits you desire	• *Breeding bees* • *Genetic diversity* • *Overview of breeding bees* • *The role of drones* • *Controlled mating vs. open mating* • *Evaluating and comparing colonies' traits* • *Evaluating multiple traits across multiple yards*

Course 3: Managing Pests and Diseases

Honey bee immunity	• *Individual-level defenses* • *Colony-level defenses* • *The microbiome* • *Beyond immunity – beekeeper intervention*
Insect pests	• *Wax moth biology and identification* • *Wax moth intervention: prevention and treatment* • *Small hive beetle biology and identification* • *Small hive beetle intervention: prevention and treatment* • *Yellowjackets*
Nosema	• *Biology and symptoms* • *Prevalence and seasonality* • *The interaction between Nosema and pesticides* • *How can I tell if my colony is infected?* • *Methods to prevent and manage Nosema* • *Using fumagillin to control the infection* • *How do I apply fumagillin?*
Varroa mites	• *The rise of Varroa* • *Life cycle of Varroa* • *Varroa's impact on bee health* • *A leading cause of colony losses* • *IPM for Varroa* • *Monitoring* • *Hygienic behavior* • *Genetic stocks for Varroa resistance* • *Cultural methods for Varroa management* • *Chemical controls for Varroa management* • *Safety and biosecurity of chemical controls* • *Developing your own Varroa management plan*
Viruses	• *An overview of viruses* • *Sacbrood virus* • *Deformed wing virus* • *Black queen cell virus* • *Acute bee paralysis virus complex* • *Chronic bee paralysis* • *Other viruses* • *Managing viruses*
Honey bee parasites	• *History of tracheal mites* • *Biology and symptoms of tracheal mites* • *Zombees: honey bees parasitized by phorid flies*
Brood Diseases	• *Chalkbrood* • *American foulbrood: an overview* • *How to diagnose an AFB infection* • *You have a positive AFB result, now what?* • *Antibiotics* • *10 tips for preventing AFB infection in your colonies* • *European foulbrood: an overview* • *Diagnosing and treating EFB* • *Idiopathic brood disease syndrome*
Bee health: the big picture	• *Honey bee colony declines* • *Colony collapse disorder* • *Honey bee health in history* • *Tying it all together* • *Pathogen spillover to wild bees*

Course 4: The Rewards and Contributions of Beekeeping

Honey	• *From nectar to liquid gold* • *Medicinal benefits of honey* • *Composition of honey* • *Changes in honey over time* • *Processing liquid honey* • *Components and design of a honey house* • *Virtual field trip to a honey house* • *Selling local honey as a small-scale beekeeper* • *Selling honey as a sideliner or commercial beekeeper*
Additional hive products	• *Beyond honey* • *Rendering beeswax* • *The many uses of beeswax* • *Pollen* • *Propolis* • *Royal jelly* • *Venom* • *Mead*
Pollination Services	• *Pollination: the birds and the bees* • *Preparing colonies for pollination* • *Costs and benefits of renting hives* • *Creating a pollination contract* • *Transporting hives*
Confidence in communicating about pesticides	• *An overview of pesticides* • *Measuring harm to honey bees* • *Insecticides* • *A special class of insecticides: neonicotinoids* • *Herbicides* • *Fungicides* • *Reducing bees' exposure to pesticides*
Turning bees into business	• *Considerations when growing your operation* • *Building your business* • *Mindset and management changes* • *Deciding on business structure* • *Programs and resources to help beekeepers*
Being a leader in your community	• *Mentoring* • *Community service* • *Participating in research* • *Delivering effective presentations*
Keeping up with science	• *Where to look for new information* • *Popular science articles* • *Obtaining reputable scientific articles* • *Developing skills in reading scientific articles* • *Distinguishing science from pseudoscience* • *Exploring your curiosity: how to design your own study* • *Interpreting a scientific paper*