

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 • Distinguishing bees from other insects • Distinguishing bees are truly social • Kin selection • Polyandry • The importance of wild beesHoney bee reproduction• Passing on your genes • The molecules of bee life • Mating • Reproductive systems • The stages of development • How case is determined • How case is determined • How case is determined • How case understanding honey bee vision make me a better beekeeper • The neroous system • Flight • The respiratory system • Flight • The building blocks of a nest • How an uset of a honey bee colony is organized • Temerature control in the next • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organized • How an uset of a honey bee colony is organize		
The evolution of the honey bee 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 beesHoney bee reproduction• Passing on your genes • The molecules of bee life • Mating • Reproductive systemsHoney bee development• The stages of development • How caste is determined • How the worker's role transitions throughout its lifeHomey bee biology• Vision • Honey bee dancesHoney bee biology• The circulatory system • The circulatory system • The respiratory system • The was nest of a honey bee colony is organized • Temerature control in the nest	The evolution of the honey bee as a superorganism	The honey bee colony as a superorganism
The evolution of the honey bee as a superorganismDistinguishing bees from other insects The evolution of honey bees Honey honey bees are truly social 		• What does it mean to be a honey bee?
The evolution of the honey bee as a superorganism The evolution of honey bees Honey honey bees are truly social Kin selection Polyandry The importance of wild bees Passing on your genes The molecules of bee life Money bee reproduction Reproductive systems It hours bee development The stages of development Honey bees communicate Pheromone communication Honey bee biology Vision Honey bee biology The respiratory system How honey bees construct and maintain their nest The building blocks of a nest		Distinguishing bees from other insects
as a superorganism• Honey honey bees are truly social • Kin selection • Polyandry • The importance of wild beesHoney bee reproduction• Passing on your genes • The molecules of bee life • Mating • Reproductive systemsHoney bee development• The stages of development 		The evolution of honey bees
Kin selectionPolyandryThe importance of wild beesPassing on your genesThe molecules of bee lifeMatingReproductive systemsHoney bee developmentHow honey bees communicateHoney bee biologyHoney bee sconstruct and maintain their nestHow honey bees construct and maintain their nest		Honey honey bees are truly social
Honey bee reproduction Polyandry Honey bee reproduction Passing on your genes The molecules of bee life Mating Reproductive systems The stages of development Honey bee development How sex is determined How honey bees communicate Pheromone communication Honey bee biology Vision Honey bee biology Vision How can understanding honey bee vision make me a better beekeeper The respiratory system Olfaction Digestion How honey bees construct and maintain their nest		Kin selection
Honey bee reproduction The importance of wild bees Honey bee reproduction Passing on your genes The molecules of bee life Mating Reproductive systems The stages of development Honey bee development How sex is determined How honey bees communicate Pheromone communication Homey bee biology Vision How can understanding honey bee vision make me a better beekeeper The respiratory system Flight The circulatory system Olfaction Digestion How honey bees construct and maintain their nest		Polyandry
Honey bee reproductionPassing on your genesHoney bee reproduction• Passing on your genesHoney bee development• The molecules of bee lifeHoney bee development• The stages of developmentHow honey bees communicate• The stages of developmentHow honey bees communicate• Pheromone communicationHoney bee biology• VisionHoney bee biology• The respiratory systemHow honey bees construct and maintain their nest• The mervous for a nestHow honey bees construct and maintain their nest• The mervous for a noney bee colony is organizedHow honey bees construct and maintain their nest• The mervous for a noney bee colony is organized		• The importance of wild bees
Honey bee reproductionThe stages of bee life • Mating • Reproductive systemsHoney bee development• The stages of development • How sex is determined • How caste is determined • How caste is determined • How the worker's role transitions throughout its lifeHow honey bees communicate• Pheromone communication • Honey bee dances • Vision • How can understanding honey bee vision make me a better beekeeper • The nervous system • Flight • The respiratory system • Olfaction • DigestionHow honey bees construct and maintain their nest• The building blocks of a nest • How a nest of a honey bee colony is organized • Temerature control in the nest	Honey bee reproduction	Passing on your genes
Honey bee reproduction Interindecutes of bee tige Mating Reproductive systems Honey bee development The stages of development How sex is determined How caste is determined How honey bees communicate Pheromone communication Honey bee biology Pheromone communication How can understanding honey bee vision make me a better beekeeper The respiratory system Flight The respiratory system Olfaction Digestion How honey bees construct and maintain their nest		• The molecules of healife
Honey bee development • Reproductive systems Honey bee development • The stages of development How sex is determined • How caste is determined How honey bees communicate • Pheromone communication Honey bee biology • Vision How can understanding honey bee vision make me a better beekeeper • The rervous system • Flight • The respiratory system • Olfaction • Digestion How honey bees construct and maintain their nest		• Mating
Honey bee development • The stages of development How sex is determined • How sex is determined How honey bees communicate • Pheromone communication Honey bee biology • Vision How can understanding honey bee vision make me a better beekeeper • The respiratory system • Flight • The respiratory system • Olfaction • Digestion How honey bees construct and maintain their nest		• Maing
Honey bee development• The stages of developmentHow sex is determined• How sex is determinedHow honey bees communicate• Pheromone communicationHoney bee biology• VisionHoney bee biology• VisionFlight• The respiratory system• The circulatory system• Olfaction• Olfaction• DigestionHow 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		• Reproductive systems
Honey bee development• How sex is determined • How caste is determined • How caste is determined • How the worker's role transitions throughout its lifeHow honey bees communicate• Pheromone communication • Honey bee dancesHoney bee biology• Vision • How can understanding honey bee vision make me a better beekeeper • The nervous system • Flight • The respiratory system • Olfaction • DigestionHow honey bees construct and maintain their nest• How sex is determined • How caste is determined • How caste is determined • How present is determined • How a nest of a honey bee colony is organized • Temperature control in the nest		• The stages of development
How for user user as the ising the set of a honey bees communicateHow caste is determinedHow honey bees communicatePheromone communication Honey bee dancesHoney bee biologyVision How can understanding honey bee vision make me a better beekeeper The nervous system Flight The respiratory system Olfaction DigestionHow honey bees construct and maintain their nestThe building blocks of a nest How a nest of a honey bee colony is organized Temperature control in the nest	Honey bee development	• How sex is determined
How honey bees communicate How the worker's role transitions throughout its life Pheromone communication Honey bee dances Vision How can understanding honey bee vision make me a better beekeeper The nervous system Flight The respiratory system The circulatory system Olfaction Digestion The building blocks of a nest How a nest of a honey bee colony is organized Temperature control in the nest The submit and the nest The submit and the nest Temperature control in the nest	noncy bec development	How caste is determined
How honey bees communicatePheromone communication Honey bee dancesHoney bees biologyVision How can understanding honey bee vision make me a better beekeeper The nervous system Flight The respiratory system The circulatory system Olfaction DigestionHow honey bees construct and maintain their nestThe building blocks of a nest How a nest of a honey bee colony is organized Temperature control in the nest		 How the worker's role transitions throughout its life
How honey bees construct and maintain their nest Honey bee dances • Honey bee dances • Vision • How can understanding honey bee vision make me a better beekeeper • The nervous system • Flight • The respiratory system • Olfaction • Digestion	How honow hoog communicate	Pheromone communication
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 • DigestionHow 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	now noney bees communicate	Honey bee dances
Honey bee biology• How can understanding honey bee vision make me a better beekeeper • The nervous system • Flight • The respiratory system • The circulatory system • Olfaction • DigestionHow 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		Vision
Honey bee biology • The nervous system • Flight • The respiratory system • The circulatory system • Olfaction • 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		• How can understanding honey bee vision make me a better beekeeper
Honey bee biology • 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		The nervous system
 Honey bee biology 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 	TT 1 1 1 1 .	• Flight
 The circulatory system Olfaction Digestion The building blocks of a nest How a nest of a honey bee colony is organized Temperature control in the nest 	Honey bee biology	• The respiratory 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 		• The circulatory system
 Digestion Digestion The building blocks of a nest How a nest of a honey bee colony is organized Temperature control in the nest 		Olfaction
 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 		• Diaestion
 How honey bees construct and maintain their nest How a nest of a honey bee colony is organized Temperature control in the nest 	How honey bees construct and maintain their nest	The building blocks of a nest
maintain their nest • Temperature control in the nest		How a nest of a honey bee colony is organized
		Temperature control in the nest

Course 2: The Art and Science of Beekeeping

	• Preventing stings
Safety and biosecurity in the	• Bee sting reactions
bee yard	Hygienic management practices
	Robbing
	How to stop robbing
	 When and how often to inspect
	Outside the hive
	 Inspecting during less-than-perfect conditions
	Inspecting honey supers
Inspecting the colony	• Inspecting the brood nest
inspecting the colony	• A year in the bee yard
	Colonv assessments
	Keening aood records
	 Inspection and record keening tins
	Nutritional requirements
	Natural forage
Honoy has putrition	• Learn the blooms in your area
noney bee nuclition	• Feeding carbohydrates
	Freeding curbonyundles Freeding protein
	Freeding protein
	• Annual population cycle of a noney bee colony
Techniques in managing colony	• Splitting colonies
population	• Making nucleus colonies
	Merging colonies
	Colony-level reproduction
	 The preparation and process of swarming
Swarming	Swarming or not?
	Swarm prevention
	 Catching and baiting swarms
	Queen status
	 Signs of queenlessness
Oueen menedement	 Considerations for requeening a queenless colony
Queen management	 Requeening to improve health and productivity
	 Managing a two-queen colony
	Using local queens
	Honey bee subspecies and lineages
Variation within Apis mellifera	Apis mellifera in North America
1 9	Africanized honey bees
	The Doolittle method
	Biological considerations
	Oueen grafting
Queen rearing with the	 Considerations when placing your graft in cell builders
Doolittle method	Cell huilders
	Mating yards
	Oueen rearing schedule
	Breeding bees
	Genetic diversity
Prooding for the traits you	Operation of hyperding here
dogino	• The role of drones
aesire	• Controlled mating up onen mating
	Controlled matting vs. open matting Evolution and communical colories' traits
	• Evaluating and comparing colonies traits
	 Evaluating multiple traits across multiple yards

Course 3: Managing Pests and Diseases

	Individual-level defenses
Honey bee immunity	Colony-level defenses
	• The microbiome
	Beyond immunity – beekeeper intervention
	• Wax moth biology and identification
_	• Wax moth intervention: prevention and treatment
Insect pests	• Small hive beetle biology and identification
	• Small hive beetle intervention: prevention and treatment
	• Yellowjackets
	• Biology and symptoms
	• Prevalence and seasonality
Nosema	• The interaction between Nosema and pesticides
	• How can I tell if my colony is infected?
	• Methods to prevent and manage Nosema
	• Using fumagilin to control the infection
	• How do I apply fumagillin?
	• The rise of Varroa
	• Life cycle of Varroa
	• Varroa's impact on bee nealth
	• A leading cause of colony losses
	• IPM for Varroa
Varroa mites	• Montioring
	Gonatio staska for Varma registance
	Genetic stocks for variou resistance Gultanal math ada for Variou man a some at
	Cultural methods for Varroa management Chemical controls for Varroa management
	Chemical controls for varrou management Safatu and hispacounity of chemical controls
	Sujety unu biosecurity of chemical controls Developing your own Varroa management plan
	Debeloping your own variou management plan
	An overview of viruses Sachrood minus
	Deformed using winner
	Black queen cell virus
Viruses	• Acute hee narabasis virus complex
	Chronic hee naralysis
	• Other viruses
	Managing piruses
	History of tracheal mites
Honey bee parasites	Biology and symptoms of tracheal mites
	 Zombees: honey bees parasitized by phorid flies
	Chalkbrood
	American foulbrood: an overview
	How to diagnose an AFB infection
Brood Diseases	• 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

	From nectar to liquid gold
	Medicinal benefits of honey
	Composition of honey
	Changes in honey over time
Honey	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
	• Beyond honey
Additional hive products	Rendering beeswax
	• The many uses of beeswax
	Pollen
	Pronolis
	Royal jelly
	• Venom
	• Mead
	 Pollination: the hirds and the bees
Dellingtion Somioon	Prenaring colonies for nollingtion
	 Costs and henefits of renting hives
Polimation Services	Costs und benefits of renting nives Creating a pollination contract
	Creating a pollination contract Transporting himse
	An examples of mosticides
	• An overview of pesticides
	• Measuring narm to noney bees
Confidence in communicating about pesticides	• Insecticiaes
	• A special class of insecticiaes: neonicotinoias
	• Herbiciaes
	• 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
	Mentoring
Being a leader in your	Community service
community	Participating in research
	Delivering effective presentations
	Where to look for new information
	Popular science articles
Keeping up with science	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