

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI



THREE YEAR GRADUATE PROGRAMME B.Sc.

APICULTURE

Semester III and IV

FACULTY: SCIENCE AND TECHNOLOGY

**(Courses effective from Academic Year 2025-26)
Under NEP 2020**

SYLLABUS
(Revised From- 2026-27)

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Sant Gadge Baba Amravati University, Amravati FACULTY: SCIENCE AND TECHNOLOGY
Teaching and Learning Scheme: for the Degree of Bachelor of APICULTURE as Major and Minor
SECOND YEAR: SEMESTER –III

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical)/ Outdoor / Field	a.	Major	Theory -1	100204	Systematics and Morphology of honeybees	2	2	8
			Theory -2	100205	Structure of bee colony and functions.	2	2	
			Lab/Practical-	100206	Practical based on morphology and functions of bees.	2	4	
		<u>IKS</u>	Theory	100207	Apitherapy.	2	2	
	b.	Minor	Theory	100208	Colony Organization of bees	<u>2</u>	<u>2</u>	<u>6</u>
			Lab/Practical-	100209	Lab.- Colony Organization of bees	<u>2</u>	<u>4</u>	
	c.	Generic/ Open Elective	Theory	-	-	2	2	2
	d.	VSC	Lab/Practical-	100274	<i>Skill for Identification of Honey Bee Species</i>	2	4	4
	e.	FP/CES	Project	100210	Field Project / Community Engagement Services in Apiculture: Phase-I	2	4	4
	f.	cc	Outdoor	-	Separate SOP will be released	2	4	4
	g.	AEC - English	Theory		Refer University basket	1	1	2
		AEC –MIL	Theory		Refer University basket	1	1	
		<u>Total</u>						30

Note:

- VSC Should be Complementary to Major.
- SEC has to be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor

Sant Gadge Baba Amravati University, Amravati FACULTY: SCIENCE AND TECHNOLOGY
Teaching and Learning Scheme: for the Degree of Bachelor of **APICULTURE** as Major and Minor
SECOND YEAR: SEMESTER –IV

Mode of Teaching	Vertical No.	The Vertical	Type of Course	Course Code	Course Name	Credits	Workload (Hrs/Week)	Vertical Workload (Hrs/Week)
Classroom Teaching / Lab Work (Practical)/ Outdoor / Field	a.	Major	Theory -3	100211	Fundamentals of honey bee keeping.	2	2	8
			Theory-4	100212	Bee hive products.	2	2	
			Theory-	100217	Migratory Beekeeping	2		
			Lab/Practical-	100213	Experiments based on study of Characteristics of hive products.		4	
	b.	Minor	Theory	100214	Method of Bee keeping.	2	2	6
			Lab/Practical-	100215	Activities on methods of beekeeping.	2	4	
	c.	Generic/ Open Elective	Theory		--	2	2	2
	d.	VSC	Lab/Practical-	100275	Skills of Acquisition of natural bee colonies.	2	4	4
	e.	FP/CES	Project	100216	Field Project / Community Engagement Services in Apiculture: Phase-II	2	4	8
	f.	CC	Outdoor		Separate SOP will be released	2	4	
	g	AEC - English	Theory		Refer University basket	1	1	
		AEC –MIL	Theory		Refer University basket	1	1	
		Total						34

Note:

- VSC Should be Complementary to Major.
- SEC has to be selected from the Basket Provided by University, from the same Faculty/Discipline of the Major/Minor

Notes:

- a. The strength of the batch of the Practical for UG Classes shall be 16 with an addition of 10% with the permission of Hon'ble Vice Chancellor. The number of the students required to constitute a batch or calculate the workload shall be in accordance with the relevant Government Resolution in force at the time, applicable to specific time, region, course type, mode of instruction, and other pertinent factors.
- b. 1 Credit shall mean 1 Hour Teaching per Week per Semester (Total 15 Hrs/ Semester), the duration of 1 Teaching Period will be 60 Minutes. For Practical 1 Credit shall mean 2 Hour Teaching per Week per Semester (Total 30 Hrs/ Semester).
- c. For Examination and Evaluation of Theory Courses, 40 % Marks shall be assigned to Internal Examination and 60% Marks shall be assigned to end-semester external university examination.
- d. Co-curricular Courses: Health and wellness, Yoga Education, Sports and Fitness, Cultural Activities, NSS/NCC, Fine/Applied/Visual/Performing Arts During Semester I, II, III, IV, V and VI. These courses may be taught by Physical Education Director or may be assigned to Language Teacher by the Principal of HEI based on the expertise of the concerned.
- e. Value Education Courses to be selected from the Basket of Courses provided by the University. These courses may be assigned to the Language Teacher by the Principal of HEI based on the expertise of the concerned.
- f. **Generic / Open Elective Courses (GE/OE):** Courses to be selected from the Basket of Courses provided by the University
- g. **Abbreviations:** Department Specific Core: DSC, Department Specific Elective: DSE, FSC: Faculty Specific Core, FSE: Faculty Specific Elective, Indian Knowledge System: IKS, Inter Faculty Specific Core: IFSC, Inter Faculty Specific Elective: IFSE, Theory: Th, Practical/Practicum: Pr, Environment Studies: ES, Pre-requisite Course mandatory if applicable: Prq, Laboratory: Lab (Practical), Generic/ Open Electives: OE; Vocational Skill and Skill Enhancement Courses: VSEC; Vocational Skill Courses: VSC; Skill Enhancement Courses: SEC; Ability Enhancement Courses: AEC; Value Education Courses: VEC; OJT: On Job Training: Internship/ Apprenticeship; Field projects: FP; Community Engagement and Service: CES; Co-curricular Courses: CC; RM: Research Methodology; Research Project: RP; MIL: Modern Indian Language.

EXAMINATION AND ASSESSMENT PROCESS

- i. The basic principle of the Credit framework is that Credits are a function of the successful completion of a program of study/ vocational education/ training and assessment. No Credit can be earned by the student unless the student is assessed for the achievement of the desired competencies and outcome of a program.
- ii. Exit options are provided with Certificate, Diploma and Basic Bachelor's degrees to the students at the end of the second, fourth and sixth semesters of a Four Years Multidisciplinary Degree Programme. Students will receive a Bachelor's degree with Honors/ Research on successfully completing of all eight semesters of the UG Program either at a stretch or with opted exits and re-entries.
- iii. For the smooth success of four-year degree programme with multiple entry and exit systems, the examination mode should be based on the combination of innovative trends in formative (informal and formal tests administered during the learning process) and summative

(evaluation of students learning at the end of an instructional unit) examination modes in line with the UGC Report on 'Evaluation Reforms in Higher Educational Institutions (2019).

EXAMINATION, ASSESSMENT AND EVALUATION SCHEME

The total marks for each Course shall be based on Continuous Assessment and Semester End Examination. Each theory course of Major, Minor, GE/OE, AEC, IKS, VEC as mentioned in **Teaching Learning Scheme** prepared by the Board of Studies shall be evaluated as per the scheme as mentioned in the following table.

Vertical No.	The Vertical	Mode of Examination, Evaluation & Assessment	Theory				Theory (Total)		Practical				Practical (Total)	
			External		Internal				External		Internal			
			Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks	Max. Marks	Min. Marks
a	Major	External & Internal	30	9	20	6	50	20	25	10	25	10	50	20
b	Minor		30	9	20	6	50	20	25	10	25	10	50	20
c	Generic/ Open Elective		30	9	20	6	50	20	--	--	--	--	--	--
d	VSC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	SEC	Internal	--	--	--	--	--	--	--	--	50	20	50	20
e	AEC (Eng. & One MIL Composite)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	IKS (Generic)	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
	VEC	External & Internal	30	9	20	6	50	20	--	--	--	--	--	--
F	FP/CEP	Internal	--	--	--	--	--	--	--	--	50	20	50	20
	Internship/ Apprenticeship		Assessment of these verticals shall be based on various activities/practice. It shall be evaluated by giving maximum marks of 50 per 2 Credit Course with separate activity weightages/levels. A detailed SOP for this assessment process is prescribed for Phase I and Phase II											
	CC													

CONTINUES ASSESSMENT TEST

For internal assessment, the Continuous Assessment Tests (CAT) shall be conducted as under-

- Three CAT each of 8 / 10 Marks (Theory) as applicable and 10 Marks (Practical).
 - First on completion of 25% Syllabus of the course or on completion of 25 teaching days.
 - Second on completion of 50% Syllabus of the course or on completion of 50 teaching days.
 - Third on completion of 75% Syllabus of the course or on completion of 75 teaching days.
- Each concurrent assessment (CAT-I, II & III) will be mapped to relevant Course Learning Outcome.
- Total Performance in CAT (i.e. 40 %) shall be based on the **best two out of three** in CAT examinations

Internal assessment shall be carried out by the respective course teacher by choosing variety of Assessment tools/methods such as class test, record book, seminar, case study, field work, mini project work, quiz or any innovative method, which may be deemed to be appropriate for assessing the relevant course outcome.

CONDUCTION OF EXAMINATION

As per the scheme of teaching, learning, examination and evaluation, theory/practical examinations of Semester-I, II, III, IV, V, VI, VII and VIII shall be conducted by the University (except for Internal Examinations as applicable) at the end of each semester.

The theory/practical examinations of all the Semesters shall be held as per the following Schedule

Sr. No.	Name of the Examination	End Sem Examination	Supplementary Examination*
1	Semester-I, III, V and VII	Winter	Summer
2	Semester-II, IV, VI and VIII	Summer	Winter

* The University may evolve mechanism for conducting repeat end semester examination. Such repeat examinations shall have to be conducted within one month of the regular even semester examination and on demand examination.

- The practical examination of all semesters shall be conducted by the University at the end of each semester. The HEI shall conduct the Practical examination of odd semesters as per the schedule announced by the University. **However, the appointment of the External and Internal Examiners shall be done by the Head or Principal of respective HEI to conduct external examination of the odd semester and the same should be communicated to the University before commencement of the practical examination.** The University shall conduct the external practical examination of all even semester by appointing external and internal examiners.
- The examinations specified above shall be held twice in a year at such places and on such dates as may be prescribed by the University.
- An applicant to an examination specified above, shall pursue a regular course of study in courses prescribed for the examination concerned for not less than one semester in a particular semester in a College/Institute/University department.
- Provided that the student shall be eligible to appear for examination if -
 - He/she complies with the provisions of the Ordinance pertaining to the Examination in general from time to time.
 - He/she has prosecuted a regular course of study in a university department/college affiliated to the University.
 - He/she has in the opinion of the Principal shown satisfactory progress in his/her studies.
- The provisions of Ordinance No. 6 and Ordinance No. 9 shall be *mutatis-mutandis* applicable to every collegiate/non-collegiate student.
- The fees for each theory examination and practical examination conducted by the university shall be as prescribed by the University, from time to time.

B.Sc. II SEMESTER-III

Types of Course	Course Code	Course Name
Major Theory-1	100204	Systematics and Morphology of honeybees
Major Theory-2	100205	Structure of bee colony and functions.
Major Lab / Practical	100206	Practical based on morphology and functions of bees.
IKS Theory	100207	Apitherapy.
Minor Theory	100208	Colony Organization of bees
Minor Lab/ Practical	100209	<i>Lab.- Colony Organization of bees</i>
Project	100210	FP/ Community Engagement Service
G/OE Theory	--	--
VSC: Lab	100274	<i>Skill for Identification of Honey Bee Species</i>

Sant Gade Baba Amravati University, Amravati, Faculty of Science

Curriculum for B.Sc. Apiculture

B.Sc.- II Semester-III

Major Theory-Systematics and Morphology of honeybees

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100204	Major Theory-1 Systematics and Morphology of honeybees	2	30	2Hrs	30 (Ext) 20 (Int)

Course Objectives:	- To understand systematic position of honey bee. - Understanding Diversity and Evolutionary Relationship. - Understanding Honeybee Biology - In order to understand honey bees among other insects, bees and wasps. - Understanding their structure, identifying different races/subspecies, and assessing their adaptation to various environments			
Course Outcomes:	After the completion of this course, student is able to- - Identify Distinctive Traits in honey bees. - Learns distribution of specific species of honey bees. - Identify honey bee species and their cast. - Acquire knowledge of comparative features of different body parts and their functions.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
UNIT-I	1: Introduction to Honey Bee Systematics. Distribution 1.1 Overview of honey bee species and subspecies 1.2 Classification and taxonomy of honey bees (Kingdom, Phylum, Class, Order, Family, Genus, Species) 1.3 Evolutionary history and phylogenetic relationships 1.4 Major species of honey bees (Apis trigona, Apis mellifera, Apis cerana, Apis dorsata, etc.)	8Hrs	8 Marks	1- Course textbook or digital material (includes pictures, diagrams, and species details). 2- Field guides on bee species.
UNIT-II	2. External Morphology of the Honey Bee- 2.1 Head: Compound eyes and simple eyes (ocelli), 2.2: Antennae: structure and sensory functions.	7 Hrs	7 Marks	3- Access to online identification tools and apps (e.g., I Naturalist,

	2.3: Mouthparts: mandibles, proboscis, and their adaptations 2.4: Thorax: Structure and function of legs (pollen baskets in workers), Wings and flight mechanics.			Bee Identification apps). Videos and documentaries on honey bee species and conservation.
UNIT-III	3.1: Abdomen: Segmentation and structure. 3.2: Wax glands and their role in comb building 3.3: Stinger apparatus and defensive adaptations. 3.4: Major morphological differences in cast .	8Hrs	8 Marks	
UNIT-IV	4 Caste Morphology and Functional Differences 4.1: Queen bee: Morphological adaptations for reproduction 4.2: Worker bee: Specializations for foraging, brood care, and defines 4.3: Drone bee: Adaptations for mating and lifespan differences 4.4: Differences between Apis mellifera, Apis cerana, and other species	7 Hrs	7 Marks	

References

Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.

1. "The Hive and the Honey Bee" Editor: Joe M. Graha Publisher: Dadant & Sons, Inc. Edition: Revised Edition (2015) ISBN: 978-0-915698-09-9
2. "Anatomy and Dissection of the Honeybee" Author: H.A. Dade Publisher: International Bee Research Association (IBRA) First Published: 1962 Reprints: Various reprints through IBRA ISBN: 978-0860982142
3. "Honeybee Anatomy" Author: R.E. Snodgrass Publisher: Comstock Publishing Associates (Cornell University Press) Original Publication: 1956 ISBN: 978-0801491028
4. "The Insects: Structure and Function" Authors: R.F. Chapman Publisher: Cambridge University Press Edition: 5th Edition (2012) ISBN: 978-0521113892
5. "Honeybees of Asia" Editor: Friedrich Ruttner Contributors: Multiple experts in honey bee systematics Publisher: Springer-Verlag Berlin Heidelberg Publication Year: 1992 ISBN: 978-3-540-55290-9
6. "The Anatomy of the Honey Bee" Author: Robert E. Snodgrass Publisher: Originally published by Smithsonian Institution Press (1925) Republished by: Dover Publications (1975) ISBN: 978-0486232106.
7. "Bees of the World" Author: Charles D. Michener Publisher: Johns Hopkins University Press Edition: 2nd Edition (2007) ISBN: 978-0801885735

8. "Morphology and Terminology" (in The Anatomy of the Hon Author: R.E. Snodgrass Publisher: Smithsonian Institution Press (1925) Later Reprint: Dover Publications (1975) ISBN: 978-0486232106
9. "Evolution of the Insects" Authors: David Grimaldi & Michael S. Engel Publisher: Cambridge University Press Publication Year: 2005 ISBN: 978-0521821490
10. "The ABC and XYZ of Bee Culture" Editor: Keith S. Delaplane (recent editions) Publisher: A.I. Root Company Latest Edition: 42nd Edition (2022) ISBN: 978-0936028229

Model Questions

Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum

Short Type-

1. Which are major species of honey bees in India?
2. What is the function of antenna?
3. What is the function of proboscis?
4. At where and how many wax glands are located?
5. Which cast of bees contain stinging apparatus?
6. What is the basic difference between compound and simple eyes?
7. Where are the pollen baskets are located on bees?
8. Which specialization do have with worker bees for foraging?

Long Type-

1. Explain structure of mouth parts along with neat diagram.
2. Discuss distribution of honey bees in the world.
3. Discuss adaptations in drone for mating purpose.
4. Give comparative difference between in *A. dorsata* and *A. cerena indica*.

MCQs-

1. Sting apparatus is located at-----
a- Abdomen, b-thorax, c- mouth d- legs.
2. Sting secretes-----
a- Nectar, b- venom, c-honey, d- wax.
3. Wax glands are located on abdomen of ----- --.
a- Worker, b- queen, c-drone, d- wasp.
4. The worker bees suck nectar from flower with the help of ----- --.
a- Antenna, b- sting, c- proboscis, d- legs.
5. By size, biggest bee cast among colony is-----
a- Queen, b- worker, c- drone, d- pupa.
6. Smallest bee species is -----
a- *A. cerena*, b-*A. florea*, c- *A. dorsata*, d- *A. trigona*.
7. The only function of drone bee in colony is-----
a- Egg laying, b-foraging, c- mating, d- stinging.
8. Foraging adaptations occurred among -----caste of bees.
a- Drone, b- queen, c- worker, d- larvae.

Rubric for Internal Assessment for Theory

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Major-Internal Assessment for Theory-1 B.Sc. II (Apiculture) SEMESTER –III (NEP)		
Course Code: 100204	Major- Systematics and Morphology of honeybees	Max Marks: 20	
Sr. No.	Assessment Criteria	Marks	
1	MCQ	10	
2	Assignments	5	
3	Attendance	3	
4	Students' overall performance	2	

Major Theory-Structure of bee colony and functions.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100205	Major Theory-2 <i>Structure of bee colony and functions.</i>	2	30	2Hrs	30 (Ext) 20 (Int)

Course Objectives:	- To understand its social organization, the roles of different castes (queen, worker, drone). - To understand functions of each cast in colony. - To learn about life cycle of honey bees. - To understand social interaction among cast.			
Course Outcomes:	After the completion of this course, student is able to – - Understanding Social Structure and Division of Labor. - Understand the roles of different bee types (queen, worker, drone). - Demonstrate their complex, organized colony within nesting behavior. - Demonstrate stages I life cycle of bees. - Identifies brood and food on honey comb.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
UNIT-I	1.1 : Indian Species of honey bees 1.2 : Brief overview of colony behaviour. 1.3 : The Queen Bee, life span and role in reproduction 1.4 : Queen pheromones and colony control	8Hrs	8 Marks	1-Course textbook or digital material (includes pictures, diagrams,
UNIT-II	2.1: Worker Bees, functions by age	7 Hrs	7 Marks	

	(nursing, guarding, foraging). 2.2 : Structure and adaptations 2.3 : Lifespan and work cycle 2.4 : Dance and its purpose			and species details). 2- Field guides on bee cast. 3- Access to online identification tools and apps (e.g., I Naturalist, Bee Identification apps).
UNIT-III	3.1 : Drone Bees, male bees, purpose and life cycle. 3.2 : Drone cells on comb and 3.3 : Mating behaviour 3.4 : Egg to adult: stages (egg, larva, pupa, adult)	8 Hrs	8 Marks	
UNIT-IV	4.1 : Wax comb structure: hexagonal cells 4.2 : Brood, Food and honey storage in comb. 4.3 : Bee communication by pheromones. 4.4 Nesting behaviour: Dark and open nesting.	7 Hrs	12	

References

1. "The Hive and the Honey Bee" Editor: Joe M. Graha Publisher: Dadant & Sons, Inc. Edition: Revised Edition (2015) ISBN: 978-0-915698-09-9
2. "Anatomy and Dissection of the Honeybee" Author: H.A. Dade Publisher: International Bee Research Association (IBRA) First Published: 1962 Reprints: Various reprints through IBRA ISBN: 978-0860982142
3. "Honeybee Anatomy" Author: R.E. Snodgrass Publisher: Comstock Publishing Associates (Cornell University Press) Original Publication: 1956 ISBN: 978-0801491028
4. "The Insects: Structure and Function" Authors: R.F. Chapman Publisher: Cambridge University Press Edition: 5th Edition (2012) ISBN: 978-0521113892
5. "Honeybees of Asia" Editor: Friedrich Ruttner Contributors: Multiple experts in honey bee systematics Publisher: Springer-Verlag Berlin Heidelberg Publication Year: 1992 ISBN: 978-3-540-55290-9
6. "The Anatomy of the Honey Bee" Author: Robert E. Snodgrass Publisher: Originally published by Smithsonian Institution Press (1925) Republished by: Dover Publications (1975) ISBN: 978-0486232106.
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9. "Evolution of the Insects" Authors: David Grimaldi & Michael S. Engel Publisher: Cambridge University Press Publication Year: 2005 ISBN: 978-0521821490
10. "The ABC and XYZ of Bee Culture" Editor: Keith S. Delaplane (recent editions) Publisher: A.I. Root Company Latest Edition: 42nd Edition (2022) ISBN: 978-0936028229

Model Questions

Short Questions-

1. What type of nesting behaviour *A. cerena* bees have?

2. What are laying workers?
3. Where is the queen cell located on comb?
4. Which bee species have open nesting behaviour?
5. Which bee's species has single comb nesting?
6. Which bee species have multiple nesting habitat?
7. Which cast of bees is sterile female bee?
8. Which cast of bees in colony has highest population?

Long Answer Questions-

1. Discuss mating behaviour of queen bee.
2. Discuss nesting behaviour of all species of honey bees.
3. Discuss distribution of labour among worker bees in colony.
4. Give the account of formation of queen bee in colony.

MCQ-

1. ----- is the male bee in colony.
a- Queen, b- drone, c- worker, d- pupa.
2. Nest of trigona bee is made up of wax and -----
a- Paper, b- mud, c- resin, d- wood.
3. Sting secretes-----
b- Nectar, b- venom, c-honey, d- wax.
4. Wax glands are located on abdomen of-----
a. Worker, b- queen, c-drone, d- wasp
5. In a colony number of queen bee is/are-----
a- 1, b-20, c- 100, d- 10000.
6. Sexually, worker is -----
a- Male, b- female, c- sterile female, d- bisexual.
7. Mating of queen bee and drone carried out at -----
a- Water, b- in nest, c- in atmosphere, d- on land.
8. Queen lays -----eggs per day.
a- 100-200, B-1000-1500, c- 3000-4000, d- 5000-10000.

Rubric for Internal Assessment for Theory

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Major-Internal Assessment for Theory-2 B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100205	Major- <i>Structure of bee colony and functions.</i>	Max Marks: 20
Sr. No.	Assessment Criteria	Marks
1	MCQ	10
2	Assignments	5
3	Attendance	3
4	Students' overall performance	2

**Major Lab- Based Systematics and morphology of honeybees and
Structure of bee colony and functions**

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100206	Major Lab- Systematics and morphology of honeybees and <i>Structure of bee colony and functions.</i>	04	60	4 Hrs	Ext-25 Int-25

Course Objectives :	- To identify bee species. - To know structure functions of different body parts of bees. - To basic difference between in cast of honey bee. - To identify foraging species of bee in field.
Course Outcomes :	After completion of this course, student is able to- 1) Identify honey bee species among others. 2) Demonstrate function of different body part of the bee. 3) Explain structure of comb and distribution of brood and food in the comb. 4) Identify caste of bee in a colony. 5) Understand complete stages in life cycle.
Experiment/ Activity- Contents	
A) Experiments based on morphology of honey bees. 1. Study wing pattern of different species of honey bee. 2. Study of pollen bag. 3. Study of mouth parts of honey bee 4. External morphological study of parts of honey bee (antenna, legs, proboscis, wax gland) B) Experiments based on morphology of honey bees. 1. Study brood, food on honey bee comb. 2. Study of Queen cell- its position, size on comb. 3. Study of identifying characteristic of Queen, drone and worker bees. 4. External morphological study of egg, pupa and larvae of honey bees. 5. Study of stinging apparatus. C) Field observation for occurrence of different species of honey bees Or natural nesting behaviour of honey bees.	

Rubric for Internal Assessment for Practical

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Internal Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100206	Systematics and Morphology of honeybees and <i>Structure of bee colony and functions</i>	Max Marks: 25
Sr. No.	Assessment Criteria	Marks
1	Attendance	6
2	Record / Assignments	6
3	Participation in Activity/ Field visit	5
4	Reports on field visit	5
5	Students' overall performance	3

Rubric for External Assessment for Practical

E	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI External Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100206	Systematics and Morphology of honeybees and <i>Structure of bee colony and functions</i>	Max Marks: 25, Time: 4Hours
Sr. No.	Assessment Criteria	Marks
1	Practical Based on Morphology of honeybees.	10
2	Practical Based on <i>Structure of bee colony</i> .	10
3	Viva Voce	05

IKS Theory -Apitherapy

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100207	IKS Theory Apitherapy	2	30	2Hrs	30(Ext) 20(Int)

Course Objectives:	- To preserve and promote India's rich intellectual and cultural heritage, integrate it into modern education and research, and apply it to solve contemporary societal problems. - Uphold and carry forward the wisdom that has been passed down through generations - To know medicinal importance of bee product. - Explore their historical and scientific basis, and appreciate their role in traditional and modern medicine.			
Course Outcomes:	After the completion of the course , student is able to - - Understand their potential therapeutic uses. - Understand the different types of bee products and their medicinal uses. - Gain practical knowledge of how to incorporate bee products into holistic treatments. - Be familiar with scientific research on the therapeutic benefits of bee products. - Develop an understanding of ethical and safety considerations when using bee products.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
UNIT-I	1: Introduction to Apitherapy 1.1: Definition and history of apitherapy 1.2: Cultural and traditional uses of bee products 1.3: Scientific basis and modern applications 1.4 Ethical considerations in apitherapy	8Hrs	8 Marks	1-Course Reference book or digital material (includes pictures, diagrams). 4-Videos and documentary
UNIT-II	2 The Medicinal Bee Products 2.1:Honey– Types, medicinal properties, wound healing, antibacterial effects 2.2:Propolis–Composition, antimicrobial benefits, immune system support 2.3 Bee Pollen – Nutritional value, allergy treatment, energy-boosting benefits	7 Hrs	7 Marks	

	2.4 Royal Jelly – Hormonal effects, anti-aging, and neurological benefits			
UNIT-III	3: Apitherapy for Specific Conditions 3.1 Wound healing and skin disorders 3.2 Autoimmune diseases and inflammation management 3.3 Respiratory issues (asthma, sinusitis) 3.4 Neurological disorders (MS, Parkinson's, nerve pain)	8Hrs	8 Marks	
UNIT-IV	4 Apitherapy in Holistic Medicine 4.1 Integrating apitherapy with herbal and alternative medicine 4.2 Diet, lifestyle, and apitherapy synergy 4.3 Case studies and real-world applications 4.4 Cardiovascular health and metabolism	7 Hrs	7 Marks	
References Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc. Books: • "The Healing Power of Honey" by Dr. Joseph Mercola • "Apitherapy: The Medicinal Uses of Bee Products" by C. K. Kankol and L. A. Shulman • <i>Ancient Indian Wisdome: Bees and Honey in Ancient India, By DR. K. K. Kshirsagar.</i> • Research Papers: • Studies on the effects of bee venom in treating rheumatoid arthritis. • Clinical trials on the antimicrobial effects of honey and propolis. Online Resources: • Indian Council of Medical Research (ICMR) publications on apitherapy. • Journals of Ayurveda and Integrative Medicine.				
Model Questions Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum Short Answer: 1. Define Apitherapy. 2. Explain mono-floral honey. 3. Describe source and function of propolis in colony. 4. What is royal jelly? 5. Which are the bee products? 6. What is matured honey? 7. What is honey-dew honey? 8. What is medicinal importance of bee pollen? Long answer: 1. Discuss medicinal importance of Royal Jelly.				

2. Discuss significance and history of Apitherapy.
3. What is bee venom, give its medicinal importance and how it is applied to patient?
4. **Discuss source, importance of propolis in bee hive and give its medicinal value.**

MCQ:

1. Honey bees convert -----in to honey.
a- Nectar, b- pollen, c- propolis, d- venom.
2. Which cast of bee collects nectar from flower?
a- Worker, b-queen, c- drone, d- wasp.
3. ----- is not a honey bee product.
a- Honey, b- bee pollen, c- honey dew, d- wax.
4. Basically, chemical nature of-----is resin.
a- propolis, b- nectar, c- wax, d- pollen.
5. Honey does not contain ----- sugar.
a- Glucose, b-fructose, c- sucrose, d- lactose.
6. ----- has wound healing property.
a- Wax, b- honey, c- royal jelly, d- propolis.
7. ----- is useful for treatment of arthritis.
a- Venom, b- propolis, c-wax, d- royal jelly.
8. Propolis has----- property.
a- Anti-microbial, b-antibiotic, c- anti fungal, d- anti allergic.

Rubric for Internal Assessment for Theory (IKS)

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI IKS-Internal Assessment for Theory B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100207	IKS- APITHERAPY	Max Marks: 20
Sr. No.	Assessment Criteria	Marks
1	MCQ	10
2	Attendance	3
3	Assignments	5
4	Students' overall performance	2

Minor Theory-Bee Colony Organization

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100208	Minor Theory Bee Colony Organization	2	30	2Hrs	30(Ext) 20(Int)

Course Objectives:	- To understand composition of honey bee colony - Explain social behavior of the colony. - Describe the functions of castes in colony.				
Course Outcomes:	After the completion of course, student is able to- 1. Describe the meaning honey bee colony. 2. Recognize castes in bee colony. 3. Describes the functions of each cast in bee colony. 4. Differentiate colonies of different honey bee species. 5. Explain nesting behaviour of bee species.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
UNIT-I	1.1 : Indian Species of honey bees 1.2: Brief overview of colony behaviour. 1.3: The Queen Bee, life span and role in reproduction 1.4 : Queen pheromones and colony control	8Hrs	8 Marks	1- Course textbook or digital material (includes pictures, diagrams, and species details). 2- Field guides on bee,. 3- Access to online identification tools and apps 4- Videos and documentaries on honey bee species and conservation.	
UNIT-II	2.1 : Worker Bees, functions by age (nursing, guarding, foraging). 2.2 : Structure and adaptations 2.3 : Lifespan and work cycle 2.4 : Dance and its purpose	7 Hrs	7 Marks		
UNIT-III	3.1 : Drone Bees, male bees, purpose and life cycle. 3.2 : Drone cells on comb and 3.3 : Mating behaviour 3.4 : Egg to adult: stages (egg, larva, pupa, adult)	8Hrs	8 Marks		
UNIT-IV	4.1 : Wax comb structure: hexagonal cells 4.2 : Brood, Food and honey storage in comb. 4.3 : Bee communication by pheromones. 4.4 Nesting behaviour: Dark and open nesting	7 Hrs	7 Marks		

References

1. "The Hive and the Honey Bee" Editor: Joe M. Graha Publisher: Dadant & Sons, Inc. Edition: Revised Edition (2015) ISBN: 978-0-915698-09-9
2. "Anatomy and Dissection of the Honeybee" Author: H.A. Dade Publisher: International Bee Research Association (IBRA) First Published: 1962 Reprints: Various reprints through IBRA ISBN: 978-0860982142
3. "Honeybee Anatomy" Author: R.E. Snodgrass Publisher: Comstock Publishing Associates (Cornell University Press) Original Publication: 1956 ISBN: 978-0801491028
4. "The Insects: Structure and Function" Authors: R.F. Chapman Publisher: Cambridge University Press Edition: 5th Edition (2012) ISBN: 978-0521113892
5. "Honeybees of Asia" Editor: Friedrich Ruttner Contributors: Multiple experts in honey bee systematics Publisher: Springer-Verlag Berlin Heidelberg Publication Year: 1992 ISBN: 978-3-540-55290-9
6. "The Anatomy of the Honey Bee" Author: Robert E. Snodgrass Publisher: Originally published by Smithsonian Institution Press (1925) Republished by: Dover Publications (1975) ISBN: 978-0486232106
7. "Bees of the World" Author: Charles D. Michener Publisher: Johns Hopkins University Press Edition: 2nd Edition (2007) ISBN: 978-0801885735
8. "Morphology and Terminology" (in The Anatomy of the Hon Author: R.E. Snodgrass Publisher: Smithsonian Institution Press (1925) Later Reprint: Dover Publications (1975) ISBN: 978-0486232106
9. "Evolution of the Insects" Authors: David Grimaldi & Michael S. Engel Publisher: Cambridge University Press Publication Year: 2005 ISBN: 978-0521821490
10. "The ABC and XYZ of Bee Culture" Editor: Keith S. Delaplane (recent editions) Publisher: A.I. Root Company Latest Edition: 42nd Edition (2022) ISBN: 978-0936028229

Model Questions

Short Questions-

- 1) What type of nesting behaviour *A. cerena* bees have?
- 2) What are laying workers?
- 3) Where is the queen cell located on comb?
- 4) Which bee species have open nesting behaviour?
- 5) Which bee's species has single comb nesting?
- 6) Which bee species have multiple nesting habitat?
- 7) Which cast of bees is sterile female bee?
- 8) Which cast of bees in colony has highest population?

Long Answer Questions-

1. Discuss mating behaviour of queen bee.
2. Discuss nesting behaviour of all species of honey bees.
3. Discuss distribution of labour among worker bees in colony.
4. Give the account of formation of queen bee in colony.

MCQ-

- 1 --- is the male bee in colony.
a- Queen, b- drone, c- worker, d- pupa.
- 2 Nest of trigona bee is made up of wax and -----
a- Paper, b- mud, c- resin, d- wood.
- 3 Sting secretes-----

	a-Nectar, b- venom, c-honey, d- wax.
4	Wax glands are located on abdomen of ----- --. a- Worker, b- queen, c-drone, d- wasp
5	In a colony number of queen bee is/are----- a-1, b-20, c- 100, d- 10000.
6	Sexually, worker is ----- a-Male, b- female, c- sterile female, d- bisexual.
7	Mating of queen bee and drone carried out at -----. a-Water, b- in nest, c- in atmosphere, d- on land.
8	Queen lays -----eggs per day. a- 100-200, b-1000-1500, c- 3000-4000, d- 5000-10000.

Rubric for Internal Assessment for Theory

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Minor-Internal Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100208	Minor- Bee Colony Organization	Max Marks: 20
Sr. No.	Assessment Criteria	Marks
1	MCQ	10
2	Assignments	5
3	Attendance	3
4	Students' overall performance	2

Minor Lab: Bee Colony Organization

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100209	Minor Lab: Bee Colony Organization	02	60	2Hrs	Ext-25 Int-25

Course Objectives:	- To identify bee species. - To basic difference between in cast of honey bee. - To identify foraging species of bee in field.
Course Outcomes:	After completion of this course, student is able to- - Identify honey bee species among others. - Demonstrate function of different body part of the bee. - Explain structure of comb and distribution of brood and food in the comb. - Identify caste of bee in a colony. - Understand complete stages in life cycle.
Experiment/ Activity	Contents A. Experiments based on morphology of honey bees. - Study of pollen bag. - Study brood, food on honey bee comb. - Study of Queen cell- its position, size on comb. - Study of identifying characteristic of Queen, drone and worker bees. - External morphological study of egg, pupa and larvae of honey bees. - Study of stinging apparatus. - Identification of drone and worker cell on comb. - Study of wax cells of different bee species comb.

Rubric for Internal Assessment for Practical

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Minor-Internal Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100209	Minor- Bee Colony Organization	Max Marks: 25
Sr. No.	Assessment Criteria	Marks
1	Attendance	7
2	Record / Assignments	8
3	Participation in Activity	5
4	Students' overall performance	5

Rubric for External Assessment for Practical

E	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI External Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100209	Minor- Bee Colony Organization	Max Marks: 25, Time: 4Hours
Sr. No.	Assessment Criteria	Marks
1	Experiment-1	10
2	Experiment-2	10
3	Viva- voce	05

VSC Lab: Identification of Honey Bee species.

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100274	VSC Lab: Identification of Honey Bee species.	2	60	4Hrs	Int-50

Course Objectives:	- To understand the types honey bee occurred in area. - To know the methodology adapted for their identification. - Understand the importance of conservation and management practices for honey bee populations.
Course Outcomes:	By the end of the course, participants should be able to: - Identify key honey bee species found in various regions. - Understand the morphological and behavioural traits of different bee species. - Safely handle and observe bee species for identification. - Enhance your expertise in species-specific management practices. - Work on bee conservation and ecosystem monitoring. - Contribute to entomological studies related to pollination and biodiversity. - Advise on the impact of different honey bee species on crop pollination. - Engage in fieldwork and data collection on bee species.
Contents	
1-Introduction to Honey Bees and Their Importance - Overview of honey bee anatomy and biology. - Role of honey bees in pollination and the environment. - Economic importance of honey bees to agriculture. - Bee behaviour and social structure (queen, workers, drones). 2- Overview of Honey Bee Species - Classification of honey bees: A look into the Apidae family and its varieties. - Global distribution of honey bee species.	

- Common honey bee species (e.g., <i>Apis mellifera</i>, <i>Apis cerana</i>, <i>Apis dorsata</i>, <i>Apis florea</i>). 3- Morphological Characteristics for Identification - Identification of honey bee species based on physical traits (size, color, wing structure, etc.). - The importance of head shape, thorax, abdomen, and legs in identification. - Difference between native bees and invasive species. 4: Behaviour and Ecology - Behavioural traits that help in species identification (swarming, foraging patterns, nesting habits). - Habitats and regions where different honey bee species thrive. - Seasonal behaviour and how it affects species identification.	
	5: Techniques for Field Identification - Practical identification techniques in the field. - How to use field guides and online resources for species identification. - Tools and equipment for observation (magnifying glass, bee identification apps, photographic tools). - Hands-on experience: How to capture and examine honey bees safely. 6: Environmental and Conservation Impacts - The decline in honey bee populations globally. - Factors affecting honey bee species distribution and survival. - Conservation strategies to protect honey bee species. - How species identification contributes to bee conservation efforts.
	Learning Materials: - Course textbook or digital material (includes pictures, diagrams, and species details). - Field guides on bee species. - Access to online identification tools and apps (e.g., iNaturalist, Bee Identification apps). - Videos and documentaries on honey bee species and conservation.

Rubric for Internal Assessment for Practical

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI VSC: External Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –III (NEP)	
Course Code: 100274	VSC: Identification of Honey Bee species.	Max Marks: 50,
Sr. No.	Assessment Criteria	Marks
1	Practical demonstration (50%)	25
2	Attendance and participation (20%)	10
5	Viva or short test (30%)	15

Field Project / Community Engagement Services in Apiculture: Phase-I

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	III	100210	Field Project / Community Engagement Services in Apiculture: Phase-I	2	60	--	Int-50

Course Objectives:

- To develop an appreciation of honey bee biodiversity, its indigenous knowledge, and sustainable ecological advantages to students.
- To expose students to local bees and interdependence between rural communities and floral resources.
- To study local challenges for conservation of bees and identify community-driven solutions.
- To enable students to apply theoretical concept of Apiculture in real-life settings, enhancing the quality of experiential learning.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Understand the ecological, economical, and agricultural importance of native bees in rural areas.
- Build connections with local communities and learn from traditional ecological knowledge.
- Identify and assess honey bee related challenges (e.g., loss of insect pollinators, cruel honey extraction, impact of pesticides, effect of climate change on bees etc.) and suggest sustainable interventions.
- Appreciate the role of community participation in honey bee conservation and its environmental importance stewardship.
- Document and disseminate knowledge regarding bee resources and their potential applications.

Guidelines/ SoP for FP/CEP

For understanding key principles of CE, forms of CE, operational guidelines and implementation strategy please refer https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf

As per NEP 2020, students of B Sc. II of Semester III and IV need to perform a Field Project (FP) for TWO (2) credits i.e. 50 Marks.

The guidelines regarding the field project are as follows:

3. Students must complete 60 hours of field engagement.
4. Work may be done individually or in groups of up to 4 students, each under a departmental faculty guide.
5. A survey or sample collection methodology must be chosen, with appropriate documentation tools: questionnaires, datasheets, plant specimen formats, etc.
6. Projects can be survey-based, experimental, observational, or intervention-based.
7. Final report to include: Title, Introduction, Materials & Methods, Results, Discussion, Conclusion, References.
8. Minimum 6 pages excluding cover page, certificate, acknowledgement, etc.
9. Poster/PPT presentation is mandatory and will be evaluated by an appointed examiner.
10. For a SURVEY based project related questionnaire (15 or more questions) shall be prepared.
11. The departmental coordinator/guide shall check the questions and finalize the questionnaire. The question that may create unnecessary complications should be avoided. The questions should be qualitative as well as quantitative.
12. If the project is related to work that does not involve survey work, then the questionnaire part can be replaced accordingly (e.g. Sample collection/Data collection/ Experimental base etc).
13. The total project work including preparation of questionnaire to presentation should be evaluated for 2 credits (50 Marks).

SUGGESTED FORMS OF COMMUNITY-ENGAGED PRACTICE IN APICULTURE

Linking Apiculture with Community Service

- Create village floral calendar and occurrence of Honey Bee species and their abundance with help from locals to preserve indigenous flora.
 - Assist local farmers and honey harvesters in understanding bee species identification and their natural behavior and habitat.
 - Educate school children on importance of honey bees via live demonstrations.
- Community-Based Honey Bee Research
- Conduct field surveys on honey bee species and pollen and nectar yielding plants,
 - Document honey bee knowledge from tribal and rural elders.
 - Study scientific honey bee keeping and method of honey extraction.

Awareness & Knowledge Sharing

- Organize workshops on honey bee keeping.
- Conduct campaigns on importance and conservation honey bees in environment.

SUGGESTED FORMS OF COMMUNITY-ENGAGED PRACTICE IN APICULTURE

Linking Apiculture with Community Service

- Create village floral calendar and occurrence of Honey Bee species and their abundance with help from locals to preserve indigenous flora.
- Assist local farmers and honey harvesters in understanding bee species identification and their natural behavior and habitat.
- Educate school children on importance of honey bees via live demonstrations.

Community-Based Honey Bee Research

- Conduct field surveys on honey bee species and pollen and nectar yielding plants,
 - Document honey bee knowledge from tribal and rural elders.
 - Study scientific honey bee keeping and method of honey extraction.
14. Prepare easy-to-understand posters on honey bee species, their cat, products and importance and distribute in local schools/panchayats.

Social Innovation via Apiculture Projects

15. Capture and keep *Apis trigona* bee species in earthen pot.
 16. Make a survey of occurrence of bee colonies, new bee species and their migration.
 17. Collaborate with KVIB and local NGOs for beekeeping and its conservation. Examples of Apiculture -Specific Field Project Topics
 18. Survey of bee species and their habitat in local forest area.
 19. Study of occurrence of honey bee flora and preparation of local floral calendar.
 20. Survey of local honey harvesters and study of mode honey extraction.
 21. Hiving natural bee colonies.
 22. Survey of Honey Potential of local Area.
- Promotion of scientific honey harvesting among local honey harvestors.

Reference:

- Beekeeping-Honey Harvest Methods :
<https://extension.okstate.edu/fact-sheets/beekeeping-honey-harvest-methods-costs-and-breakeven-calculations.html>
- <https://honeyportal.keystone-foundation.org/species/>
- **Species, castes and biology of honey bees:** Chandrashekhar Azad University of Agriculture and Technology <https://csauk.ac.in/uploads/2022/09/Species->
- <https://www.inaturalist.org/taxa/602301-Apis-cerana-indica>

Assessment Rubric for FP/CEP: Phase-I

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II (Apiculture), SEMESTER – III (NEP)			
FP/CEP	Course Code: 100210	Field Project / Community Engagement Services in Apiculture: Phase-I	Max Marks: 50
Q. No.	Exercise		Marks
1	Field Engagement & Participation (Attendance, hands-on involvement, and community interaction)		15
2	Project Report Quality (Clarity, structure, scientific accuracy, originality, and referencing)		15
3	Data Collection & Analysis (Depth, relevance, and quality of survey/sample collection and its analysis)		10
4	Presentation (Poster or PPT) (Communication of findings, visual clarity, and confidence)		05
5	Social Relevance & Innovation (Creative solutions, awareness campaigns, or community impact beyond data.)		05

B.Sc. II SEMESTER-IV

Types of Course	Course Code	Course Name
Major Theory-3	100211	Fundamentals of honey bee keeping.
Major Theory-4	100212	Bee hive products.
Major	100217	Migratory Beekeeping
Major Lab / Practical	100213	Experiments based on study of Characteristics of hiv products.
Minor Theory	100214	Method of Bee keeping.
Minor Lab/ Practical	100215	Activities on methods of beekeeping.
G/OE Theory	--	--
VSC: Lab	100275	Skills of Acquisition of natural bee colonies.
Project	100216	FP/ Community Engage Service
Outdoor		Separate SOP will be released

Sant Gade Baba Amravati University, Amravati, Faculty of Science
Curriculum for B.Sc. Environmental Science
B.Sc.- II Semester-IV

Major Theory: Fundamentals of honey bee keeping

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100211	Major Theory:3 Fundamentals of honey bee keeping	2	30	2Hrs	30 (Ext) 20 (Int)

Course Objectives:	- To understand principles of bee keeping. - To learn the method of inspection of bee colony. - To identify brood and food condition on the bee comb. - To demonstrate bee hives its types and components. - To manage the bee colonies.				
Course Outcomes:	After the completion of course, student is able to - - Equip individuals with the knowledge and skills for successful bee colony management, - Understanding bee biology, hive operations, and bee health, ultimately enabling them to produce honey and other bee products while supporting pollination. - Selects bee species for bee keeping. - Inspects honey bee colony for further proper management. - Manage the bee colonies with changing season. - Handles bees with modern bee keeping tools. - Unite two different bee colonies with same species.				
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies	
UNIT-I	1.1- Principles of beekeeping, 1.2- Primitive and modern, aspects of modern beekeeping. 1.3- Knowledge of bees, selection of bees for beekeeping, acquiring of bees. <u>1.4-</u> Desirable traits for beekeeping, poor and best choice of bees.	8Hrs	8 Marks	1-Course textbook or digital material (includes pictures, diagrams, and keeping details).	
UNIT-II	2.1- Bee comb structure, Cells; storage, brood, 2.2- Queen, drone and worker cells. 2.3- Periodic inspection of colony.	7 Hrs	7 Marks		

	2.4- Seasonal activities of bees- winter summer and monsoon management.			2-Field guides on bee species.
UNIT-III	3.1-Modern beekeeping tools, its aspects and applications; hive tool. 3.2-Bee hive and its types. Nucleus hive. 3.3 Components of bee hive; 3.4- Safety Tools: Types and importance (Smoker, Bee veil, hand gloves, goggles)	8Hrs	8 Marks	3- Access to online identification tools and apps Videos and documentaries on honey bee keeping.
UNIT-IV	4.1- Comb foundation sheet, dummy board, queen gate, 4.2-Drone and queen excluder. swarm net, feeder, stand. 4.3- Uniting Honey bees colonies : need and principle 4.4-Methods of uniting: Newspaper, by Odor, by killing the queen.	7 Hrs	7 Marks	

References

1. Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc.
2. The Hive and the Honey Bee Editor: Joe M. Graha Publisher: Dadant & Sons, Inc. Edition: Revised Edition (2015) ISBN: 978-0-915698-09-9
3. "Anatomy and Dissection of the Honeybee" Author: H.A. Dade Publisher: International Bee Research Association (IBRA) First Published: 1962 Reprints: Various reprints through IBRA ISBN: 978-0860982142
4. "Honeybee Anatomy" Author: R.E. Snodgrass Publisher: Comstock Publishing Associates (Cornell University Press) Original Publication: 1956 ISBN: 978-0801491028
5. "The Insects: Structure and Function" Authors: R.F. Chapman Publisher: Cambridge University Press Edition: 5th Edition (2012) ISBN: 978-0521113892
6. "Honeybees of Asia" Editor: Friedrich Ruttner Contributors: Multiple experts in honey bee systematics Publisher: Springer-Verlag Berlin Heidelberg Publication Year: 1992 ISBN: 978-3-540-55290-9
7. "The Anatomy of the Honey Bee" Author: Robert E. Snodgrass Publisher: Originally published by Smithsonian Institution Pr (1925) Republished by: Dover Publications (1975) ISBN: 978-0486232106.
8. "Bees of the World" Author: Charles D. Michener Publisher: Johns Hopkins University Press Edition: 2nd Edition (2007) ISBN: 978-0801885735
9. "Morphology and Terminology" (in The Anatomy of the Hon Author: R.E. Snodgrass Publisher: Smithsonian Institution Press (1925) Later Reprint: Dover Publications (1975) ISBN: 978-0486232106
10. "Evolution of the Insects" Authors: David Grimaldi & Michael S. Engel Publisher: Cambridge University Press Publication Year: 2005 ISBN: 978-0521821490

Model Questions

Short Type (At least 8), Long Type (At least 4) and MCQs for Internal Assessment (At least 8) wherever applicable as the need of curriculum.

Short Answer-

1. What do you understand by uniting of bee colony?
2. What is the use of swarm net?
3. What is the use of queen excluder?
4. Which Indian bee is suitable for beekeeping?
5. Why A. dorsata bees are not useful for bee keeping?
6. Which are the parts of hive?
7. What is the need of uniting colony?
8. What is the function
9. What is Comb foundation sheet?

Long Answer:

1. Explain Newspaper method of uniting of bee colony.
2. Explain objective and advantages of periodic inspection of bee colony.
3. Discuss difference between primitive and modern bee keeping.
4. Discuss objectives and advantages of comb foundation sheet.

MCQ:

1. Comb foundation sheet is made up of -----
a-wood, b-wax, c- metal, d- plastic.
2. ----- is used to restrict movement of queen bee towards honey chamber.
a- Queen gate, b- queen excluder, c- dummy frame, d- queen cage.
3. -----method is popular method of uniting two colonies.
a- Newspaper, b-odour, c- killing of queen, d- dolittle.
4. Brood contains-----
5. Shape of honey bee egg is -----.
6. A- cylindrical, b- rounded, c- oval, d- elliptical.
7. **During handling of bees, for protection face ----- is used.**
a-swarm net, b- hand gloves, c- bee veil, d- hive tool.
8. -----is used to calm honey bees by masking alarm pheromones and prompting them to consume honey, making them less likely to sting during hive inspections.
a- Smoker, b- swarm net, c- bee veil, d- gloves.

Rubric for Internal Assessment for Theory

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Major-Internal Assessment for Theory B.Sc. II (Apiculture) SEMESTER –IV (NEP)		
Course Code: 100211	Major- Fundamentals of honey bee keeping .		Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	MCQ		10
2	Assignments		5
3	Attendance		3
4	Students' overall performance		2

Major Theory- Bee Hive Products

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100212	Major Theory- 4 Bee Hive Products	2	30	2Hrs	30(Ext) 20 (Int)

Course Objectives:	- To know types of bee hive products. - To know methods of extraction of bee hive products. - Aware of physico-chemical characteristics and properties of bee hive products. - To understand mode of formation of hive products in bee hive by bees.			
Course Outcomes:	After the completion of this course, student can - - Understand, how nectar is converted in to honey. - Operates honey extractor and extracts honey from its comb. - Extracts wax, bee pollen from bee colony. - Gains knowledge of chemical composition of all hive products. - Identifies the properties of different hive products. - Acquires the knowledge of formation of hive products in bee hive by bees.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
UNIT-I	<u>Honey</u> 1.1 Secretion of honey, Extraction and Chemical composition. 1.2 Properties of Honey; hygroscopicity, viscosity, specific gravity, crystallization aroma and color. 1.3 Types of honey; Uni-floral, multifloral, unmaturred and matured, honey dew honey. 1.4 Nutritional values oh honey	8Hrs	8 Marks	Learning Activities: Board Teaching, use of Audio visuals, Experiential Learning, use of charts and Power Point
UNIT-II	Wax 2.1: secretion of wax, chemical Composition. 2.2 Use of wax in colony, properties of wax. 2.3 Extraction methods of wax. 4.4: Applications and storage of wax.	7 Hrs	7 Marks	
UNIT-III	Royal Jelly and Bee venom	8Hrs	8 Marks	

	3.1: Secretion principle of royal jelly, Physical characteristics. Its uses in colony and its storage. uses 3.2: Chemical composition and properties. 3.3: Bee venom; Secretion and Physical characteristics 3.4: Chemical composition, uses and storage.			
UNIT-IV	Propolis and Bee pollen. 4.1: Source, physical characteristics and its extraction. 4.2: chemical composition, its importance in colony. Uses 4.3: Sources, physical characteristics 4.4: Its extraction and uses.	7 Hrs	7 Marks	
References Study Materials in the form of - Reference Books, Text Books, Research Articles, Digital Resources like Weblinks, E- Contents, Educational Software, Databases, etc. 1: Jayashri K.V., Tharadevi C.S., Armugam M. (2022): Sara's Publications. 2: Abrol D.P. (2009): Bees and Beekeeping in India, Kalyani Publications. 3: Dharam Singh, Devendra Pratap Singh (2010): A hand Book of Beekeeping. Agri bios (India), Jodhpur. 4: Central Bee Research and Training Institute (2008): Technical Bulletin. Director of Forest Based Industry, Khadi and Village Industries Commission, Mumbai. 5: Alison Benjamin and Brian MacCallum (2013): Keeping bees and Making Honey. A David and Charles Books. 6: Leeann Coleman and Jayne Barnes (2013): Honey Crafting. Adams Media, 7: Prasad U.K., Rajiv Kumar, Devendra Prasad (2012): Commercial Beekeeping. Enkay Publishing House, New Delhi. 8: Wakhale D.M., Kamble K.D. (2001): Technology and Value Addition of Honey, CBRTI, Pune.				
Model Questions Short Type (At least 8), 1: What is uni-flower honey? 2: Which caste of bee secretes wax in colony? 3: How the bee carries pollen from flower to colony? 4: Give the names of royal jelly secreting glands. 5: Which is the major sugar in honey? 6: Which is a raw material for honey? 7: Which apparatus/ organ is used to suck nectar from flower by bees? Long Type (At least 4) 1: Discuss the process of conversion of nectar into honey by bees. 2: Give chemical composition of bee wax. 3: Explain Hygroscopicity and crystallization of honey. 4: Explain method of extraction of bee wax.				

MCQs for Internal Assessment (At least 8)-

- 1: Honey dew is the sweet substance secreted by-----
a- Flower, b- leaves, c- buds, d- insects.
- 2: Which caste of bee collects nectar and pollen from flowers?
a- Wasp, b- queen, c- drone, d- worker.
- 3: Propolis is a-----
a- nectar, b- pollen, c- resin, d- honey dew.
- 4: Wax is secreted by Bee in colony.
a- Queen, b- worker, c- drone, d- wasp.
- 5: The bee venom is secreted by only -----bees.
a- drone, b- worker, c- queen, d- larvae.
- 6- Honey bee carries pollen grains by-----
a- mouth, b- hind legs, proboscis, d- wings.
- 7- No of wax secreting gland situated on abdomen of worker bees are ----- --.
a- 4, b-5, c-6, d-8.
- 8- For filling of crevices of nest of bees, bee uses ----- --.
a- Propolis, b- wax, c-pollen, d- paper.

Rubric for Internal Assessment for Theory

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Major-Internal Assessment for Theory B.Sc. II (Apiculture) SEMESTER –IV (NEP)		
Course Code: 100212	Major-- Bee Hive Products.		Max Marks: 20
Sr. No.	Assessment Criteria	Marks	
1	MCQ	10	
2	Assignments	5	
3	Attendance	3	
4	Students' overall performance	2	

Major Theory: Migratory Beekeeping

Level	Course Code	Semester	Course Name	Credit	Teaching Hours	Exam Duration	Max. Marks
5.5	100217	IV	Major Theory: Migratory Beekeeping	02	30	02	Ext-30 Int-20

Course Objectives	- To provide knowledge about the principles, scope and importance of migratory beekeeping. - To develop skills in planning, transportation and seasonal management of migratory bee colonies. - To understand the role of honey bees in crop pollination and enhancement of agricultural productivity. - To familiarize learners with problems, risks and preventive measures associated with migratory beekeeping. - To promote entrepreneurship and income generation through scientific migratory apiculture practices.			
Course Outcome	After successful completion of the course, students will be able to: CO-1. Explain the concept, importance and practices of migratory beekeeping. CO-2. Prepare and manage bee colonies effectively for seasonal migration and pollination services. CO-3. Identify suitable bee flora, migratory routes and pollination crops for commercial beekeeping. CO-4. Analyze major challenges such as pests, diseases, pesticide exposure and climatic stress during migration. CO-5. Apply scientific and modern technologies for profitable and sustainable migratory beekeeping enterprises.			
Unit System	Content	Workload Allotted (Hrs)	Weightage of marks allotted	Incorporation of Pedagogies
Unit-I	Introduction to Migratory Beekeeping 1.1-Concept and importance of migratory beekeeping 1.2-Advantages and limitations of bee migration . 1.3-Types of migration: seasonal, regional, commercial . 1.4-Role of migratory beekeeping in crop pollination and honey production . Climatic and floral requirements for migration	8	8	• Lecture Method • Demonstration Method ☐ Experiential Learning ☐ Laboratory Teaching ☐ Activity-Based Learning

Unit-II	Planning and Management of Bee Migration 2.1- Colony strength assessment and preparation before transport. 2.2- Hive management during different seasons. (Feeding and nutritional) during migration. 2.3- Packing, loading and unloading of bee colonies and transportation, precautions. 2.4-Legal permissions, insurance and safety measures during migration	7	7	☐ Collaborative Learning ☐ ICT-Enabled Teaching ☐ Problem-Solving Approach ☐ Project-Based Learning ☐ Field-Based
Unit-III	Pollination Management in Migratory Beekeeping: 3.1-Importance of honey bees in agricultural pollination and Pollination requirements of major crops. 3.2-Placement and density of colonies in crop fields& Bee behaviour during pollination. 3.3- Interaction between farmers and beekeepers. 3.4- Impact of pesticides on migratory colonies and preventive measures .	8	8	
Unit-IV	Economics, Challenges and Modern Trends in Migratory Beekeeping: 4.1-Economics and entrepreneurship opportunities in migratory beekeeping. 4.2-Cost-benefit analysis of migratory apiaries. 4.3- Common problems during migration: diseases, pests, climate stress and absconding. 4.4-Modern technologies in migratory beekeeping: GPS tracking, smart hives and digital monitoring systems.	7	7	
References ☐ The Hive and the Honey Bee ☐ ABC and XYZ of Bee Culture ☐ National Bee Board publications on migratory beekeeping ☐ National Bee Board India ☐ ICAR – Indian Institute of Horticultural Research ☐ FAO Beekeeping Resources				
Model Questions				
Short Answer Questions - 1. Define migratory beekeeping. 2. List any four advantages of migratory beekeeping. 3. What precautions should be taken before transporting bee colonies? 4. Name two major migratory bee flora crops in India. 5. What is the role of honey bees in crop pollination? 6. Explain colony strength in honey bees. 7. Mention any four problems faced during bee migration. 8. What is absconding in honey bees?				
Long Answer Questions - 1. Explain the concept, importance and advantages of migratory beekeeping in India. 2. Describe the preparation, transportation and management of bee colonies during migration. 3. Discuss the role of migratory beekeeping in crop pollination and agricultural productivity.				

4. Explain the economic aspects, challenges and modern technologies used in migratory beekeeping.

Multiple Choice Questions-

1. Migratory beekeeping mainly helps in:
 - a) Fish production
 - b) Crop pollination and honey production
 - c) Poultry farming
 - d) Sericulture
2. Which honey bee species is commonly used for commercial beekeeping in India?
 - a) *Apis dorsata*
 - b) *Apis florea*
 - c) *Apis cerana indica*
 - d) *Trigona iridipennis*
3. The movement of bee colonies from one place to another for better forage is called:
 - a) Swarming
 - b) Migration
 - c) Brooding
 - d) Grooming
4. Which of the following is essential before transporting bee colonies?
 - a) Removing frames
 - b) Closing hive entrance properly
 - c) Destroying queen cells
 - d) Harvesting pollen only
5. Honey bees are important as:
 - a) Predators
 - b) Pollinators
 - c) Parasites
 - d) Decomposers
6. Which factor adversely affects migratory bee colonies?
 - a) Adequate forage
 - b) Mild climate
 - c) Excessive pesticide application
 - d) Availability of water
7. Absconding in bees refers to:
 - a) Egg laying by queen
 - b) Collection of pollen
 - c) Complete abandonment of hive
 - d) Honey extraction
8. Modern migratory beekeeping may use:
 - a) GPS tracking systems
 - b) Typewriters
 - c) Hand ploughs
 - d) Seed drills

Major Lab : experiments based on Fundamentals of honey bee keeping, Bee hive products and Migratory Beekeeping

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100213	Major Lab : experiments based on Fundamentals of honey bee keeping ,Bee hive products& Migratory Beekeeping	02	60	4Hrs	Ext-25 Int-25

Course Objectives:	- To learn handling of fundamental equipment required for honey bee keeping. - To study components of equipment. - To study properties of bee hive products. - To study quality of bee hive product.
Course Outcomes:	After the completion of this course, student is able to- 1. Extracts honey and wax from the bee colony. 2. Determines the properties of bee hive products. 3. Identify floral source of honey. 4. Measures the pollen load carried by bees. 5. Treat to wax for its bleaching.
Experiment/Activity	Contents
1	1. Extracts Honey from Honey Comb/ Frames. 2. Measure the content of Moisture from given honey Sample. 3. To extract bee wax from empty wax comb. 4. Study of bleaching of bees wax. 5. To determine melting temperature of bee's wax. 6. To identify floral source of honey. 7. To fix comb foundation sheet to frame. 8. Study of components of Bee hive. 9. To measure Pollen load of Bee colonies. 10. Study of properties of Honey. 11. Study and identification of major migratory bee flora in different seasons and regions. 12. Assessment of colony strength before migration by examining brood, bee population and food reserves. 13. Preparation of bee colonies for transportation including hive fastening, ventilation and entrance closure. 14. Demonstration of safe loading and unloading techniques of bee hives during migration. 15. Study of different migratory routes and flowering calendars for major honey and pollination crops. 16. Field visit to migratory apiaries for observation of colony management practices. 17. Evaluation of pollination efficiency of honey bee colonies in agricultural crops. 18. Recording climatic factors and their influence on bee foraging activity during migration.

	19. Identification of common problems during migration such as absconding, pest attack and pesticide poisoning. 20. Preparation and maintenance of migratory beekeeping records including expenses, honey yield and pollination data
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Rubric for Internal Assessment for Practical

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Internal Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –IV (NEP)	
Course Code: 100213	Major Lab-Fundamentals of honey bee keeping study of Character of hive products	Max Marks: 25
Sr. No.	Assessment Criteria	Marks
1	Attendance	7
2	Record / Assignments	5
3	Participation in Activity/ Field visit	5
4	Reports on field visit	5
5	Students' overall performance	3

Rubric for External Assessment for Practical

E	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI External Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –IV (NEP)	
Course Code: 100213	Major Lab-Fundamentals of honey bee keeping study of Character of hive products	Max Marks: 25, Time: 4Hours
Sr. No.	Assessment Criteria	Marks
1	Exercise -1	07
2	Exercise-2.	0707
3	Exercise-3	
5	Viva Voce	05

Minor: Method Bee Keeping

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100214	Minor: 10 Method Bee Keeping	2	30	2Hrs	30(Ext) 20 (Int)

Course Objectives:	To know types of honey bees and useful species for beekeeping. To understand social behaviour of bees. To know importance of bees in agriculture To equip equip learners with the knowledge and skills for successful beekeeping. To understand complete methodology of bee keeping.			
Course Outcomes:	After the completion of this course, student is able to- 1. Understand primary requirement for beekeeping. 2. Selects bee species for beekeeping. 3. Understand bee biology, hive management, honey production, and related practices. 4. Differentiate primitive and modern beekeeping. 5. Demonstrate sustainable extraction of hive product.			
Unit System	Contents	Workload Allotted	Weightage of Marks Allotted	Incorporation of Pedagogies
UNIT-I	1.1: History and importance of beekeeping 1.2: Scope of beekeeping in agriculture and economy 1.3: Types of bees: <i>Apis mellifera</i>, <i>Apis cerana indica</i>, <i>Apis dorsata</i>, <i>Apis florea</i>. 1.4: Role of bees in pollination and biodiversity	8Hrs	8 Marks	Learning Activities: Board Teaching, use of Audio visuals, Experiential Learning, use of charts and Power Point
UNIT-II	2.1: Social organization and castes (queen, worker, drone) 2.2: Life cycle and development 2.3: Communication (dance language, pheromones) : Behaviour and colony dynamics.	7 Hrs	7 Marks	
UNIT-III	3.1 : Hive components and parts 3.2 : Protective gear and tools (smoker, hive tool, veil, bee brush) 3.3 : Modern vs. traditional equipment 3.4: Use and maintenance of equipment	8Hrs	8 Marks	

UNIT-IV	4.1 : Site selection and apiary layout 4.2: Types of hives (Langstroth, Newton, Top-bar, traditional) 4.3: Seasonal management (summer, monsoon, winter) 4.4: Handling of bees and safety precautions.	7 Hrs	7 Marks	
References 1. The Complete Idiot's Guide to Beekeeping Authors: Dean Stiglitz, Laurie Herboldsheimer Publisher: Alpha Books (Penguin Group) Year: 2010 ISBN: 978-1615640111 2. Honeybee Democracy Author: Thomas D. Seeley Publisher: Princeton University Press Year: 2010 ISBN: 978-0691147215 3. The Thinking Beekeeper: A Guide to Natural Beekeeping in Top Bar Hives. Author: Christy Hemenwa Publisher: New Society Publishers Year: 2013, ISBN: 978-0865717206 4. Top-Bar Beekeeping: Organic Practices for Honeybee Healthm Authors: Les Crowder, Heather Harrell Publisher: Chelsea Green Publishing Year: 2012 ISBN: 978-1603584616 5. The Practical Beekeeper: Beekeeping Naturally . Author: Michael Bush Publisher: X-Star Publishing Year: 2011 ISBN: 978-1614760643 6. Queen Rearing Essentials Author: Lawrence John Connor Publisher: Wicwas Press Year: 2016 ISBN: 978-1878075291 7. Hive Management: A Seasonal Guide for Beekeepers. Author: Richard E. Bonney Publisher: Storey Publishing Year: 1990 ISBN: 978-882666372 8. Bee Manual: The Complete Step-by-Step Guide to Keeping Bees, Author: Claire Waring, Publisher: Haynes Publishing UK,ISBN-13: 978-0857338099				
Model Questions				
Short Type 1. What is the main purpose of using a bee smoker? 2. Name one type of modern beehive commonly used. 3. What is the role of the queen bee in a colony? 4. What is "swarming" in beekeeping? 5. Which month is ideal for starting a new beehive in most temperate regions? 6. What is propolis used for by bees? 7. Name one method to control varroa mites. 8. What is the difference between a brood box and a honey super? Long type 1. Describe the various types of beehives used in modern beekeeping. Include their structures and advantages. 2. Explain the lifecycle of a honeybee and its relevance to effective hive management. 3. Discuss the role of each type of bee (queen, worker, drone) in the colony and how understanding their behaviour supports successful beekeeping. 4. What are the common methods of hive inspection and what signs indicate a				

healthy or unhealthy colony?

5. Describe the process of honey harvesting and the tools used in modern beekeeping.
6. Explain the significance of seasonal management in beekeeping and the different tasks required in each season.

MCQ

1. What is the primary role of a queen bee in the hive?
A) Foraging for nectar, B) Cleaning the hive, C) Laying eggs, D) Building honeycombs
2. Which of the following is a commonly used modern hive in beekeeping?
A) Mud hive, B) Langstroth hive, C) Bamboo hive, D) Log hive
3. What is the purpose of a bee smoker?
A) To kill pests, B) To calm bees, C) To attract bees, D) To extract honey
4. What is 'swarming' in a bee colony?
A) Bee aggression, B) A disease outbreak, C) A natural method of colony reproduction, D) A way to collect pollen
5. Which tool is used to extract honey from frames?
A) Queen excluder, B) Bee brush, C) Honey extractor, D) Smoker
6. Which substance do bees use to seal small gaps in the hive?
A) Honey, B) Wax, C) Propolis, D) Pollen
8. What is the purpose of a queen excluder?
A) To protect the queen from predators, B) To allow drones to exit the hive
C) To prevent the queen from entering the honey super, D) To increase egg-laying.
9. In what season do bees typically swarm?
A) Winter, B) Summer, C) Autumn, D) Spring
10. Which bee is responsible for mating with the queen?
A) Worker, B) Drone, C) Scout, D) Guard.

Rubric for Internal Assessment for Theory

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Minor-Internal Assessment for Theory B.Sc. II (Apiculture) SEMESTER –IV (NEP)		
	Course Code: 100214	Minor- Method of honey bee keeping .	Max Marks: 20
Sr. No.	Assessment Criteria		Marks
1	MCQ		10
2	Assignments		5
3	Attendance		3
4	Students' overall performance		2

Minor Lab : Experiments based on Methods of beekeeping

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100215	Minor Lab : experiments based on Methods of beekeeping	02	60	4Hrs	25 (Ext) 25(Int)

Course Objectives:	- To learn handling of fundamental equipment required for honey bee keeping. - To study components of equipment. - To study properties of bee hive products. - To study quality of bee hive product.
Course Outcomes:	After the completion of this course, student is able to- - Learn requirement for establishment of apiary. - Demonstrate components of bee hive. - Handles the bees. - Extracts honey from frames. - Identify bees cast. - Extracts bees wax and honey from comb.
Experiment/Activity	Contents
1	- Study of components of bee hive. - Study of identifying characters of cast of honey bee in colony.
	- Study of Protective wears (Bee veil, hand gloves, smoker). - Handling of bees. - Inspection of bee colony. - Study of life cycle honey bee. - Study of working of honey extractor. - Extraction bees wax from comb. - Identification of bees foraging in field. - Study of some nectar and pollen yielding plant (BEE FLORA)

Rubric for Internal Assessment for Practical

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Minor Internal Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –IV (NEP)	
Course Code: 100215	Minor Lab-Method of beekeeping	Max Marks: 25
Sr. No.	Assessment Criteria	Marks
1	Assignments	10
2	Field Study Reports.	5
3	Practical Record	5
4	Attendance	2
5	Students' overall performance	3

Rubric for External Assessment for Practical

E	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI Minor External Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –IV (NEP)	
Course Code: 100215	Minor Lab-Method of beekeeping	Max Marks: 25, Time: 4Hours
Sr. No.	Assessment Criteria	Marks
1	Exercise -1	10
2	Exercise-2.	10
5	Viva Voce	05

VSC: Skill of Acquisition of natural bee colonies

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100275	VSC: Skill of Acquisition of natural bee colonies	2	60	4Hrs	Int-50

Course Objectives:	- To identify the nest of bee colonies in nature. - To know the bee colony in nature, whether it is healthy or not. - Genetic Diversity: Natural colonies often have stronger, more locally adapted genetics, which can enhance the resilience of an apiary. - Cost-Effective Expansion: Acquiring wild colonies is a low-cost way to grow a bee yard without buying packaged bees or nucleus hives. - Supporting wild bee genetics helps preserve native traits and promotes sustainable beekeeping practices. - Studying natural colonies helps beekeepers learn about bee behavior, resilience, and natural hive dynamics.
Course Outcomes:	After the completion of this course, student is able to- - Understand the biology and behaviour of natural bee colonies, including swarming, nesting preferences, and seasonal patterns. - Identify and evaluate suitable locations for attracting or capturing natural bee swarms. - Demonstrate safe and effective methods for capturing, transferring, and housing wild or feral bee colonies. - Assess the health and viability of acquired colonies, including queen status, brood pattern, and disease resistance. - Apply ethical and sustainable practices in the acquisition and integration of natural colonies into managed apiaries. - Recognize the benefits and challenges of using natural colonies for beekeeping, including genetic diversity, disease resistance, and adaptability. - Implement post-acquisition care and management to ensure successful colony establishment and productivity. - Manage and care of post-acquisition to ensure successful colony establishment and productivity.
Unit System	Contents

	A-Bee Colony Identification (4 hours) 1. Identifying natural colonies (tree trunks, buildings, etc.) 2. Recognizing signs of active colonies. 3. Safety assessment and environmental considerations. B-Tools & Equipment (3 hours) • Beekeeping protective wear (veil, gloves, suit) • Hive types (Langstroth, top-bar, etc.) • Smoker, bee brush, hive tools C- Capturing Techniques (6 hours) • Preparation before capture • Timing and season for safe capture • Methods: shaking, cutting, trapping • Transferring bees to hive boxes • Handling queen bees
	D- Hive Installation & Management (5 hours) • Placing the captured colony into the hive • Hive placement (shade, wind, water availability) • Feeding and initial care • Regular inspection and maintenance E- Bee Health & Safety (4 hours) • Common bee pests and diseases (Varroa mite, wax moth) • Natural remedies and treatment • First aid for bee stings • Personal safety and ethical handling F- Practical Sessions & Field Work (4 hours) • Live demo or video-assisted practice • Field visit to observe natural colony capture • Hive setup and bee transfer practical • Discussion and Q&A

Rubric for INTERNAL Assessment for Practical

I	SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI VSC: External Assessment for Lab Work B.Sc. II (Apiculture) SEMESTER –IV (NEP)	
Course Code: 100275	VSC: Skill of Acquisition of natural bee colonies	Max Marks: 50
Sr. No.	Assessment Criteria	Marks
1	Practical demonstration (50%)	25
2	Attendance and participation (20%)	10
5	Viva or short test (30%)	15

Field Project / Community Engagement Services in Apiculture: Phase-II

Level	Semester	Course Code	Course Name	Credits	Teaching Hours	Exam Duration	Max Marks
5.0	IV	100216	Field Project / Community Engagement Services in Apiculture: Phase-II	2	60	--	Int-50

Course Objectives:

- To deepen field-based understanding of honey bees, conservation practices, and community-linked bee knowledge.
- To engage students in solving real-world problems through honey bee interventions and sustainability projects.
- To promote Apiculture innovation and outreach via community collaboration.
- To enhance project planning, execution, documentation, and dissemination skills.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Design and implement field-based apicultural studies and service projects.
- Collaborate with rural/urban communities in addressing ecological challenges.
- Apply indigenous and scientific bee keeping knowledge for sustainable outcomes.
- Reflect on the social, ethical, and ecological impact of their interventions.
- Present findings effectively through reports, posters, and public engagement.

Guidelines/ SoP for FP/CEP

For understanding key principles of CE, forms of CE, operational guidelines and implementation strategy please refer https://www.ugc.gov.in/pdfnews/4187860_Revised-Final-Guidelines.pdf

As per NEP 2020, students of B Sc. II of Semester III and IV need to perform a Field Project (FP) for TWO (2) credits i.e. 50 Marks.

The guidelines regarding the field project are as follows:

Phase-I was about observation; Phase II is about transformation. This stage should empower students not just to study nature with curiosity, but to engage with communities in stewardship—even in small, humble ways.

Project Format and Deliverables

Component	Description
Duration	60 hours total (fieldwork + report writing + presentation)

Group Size	Individual or up to 4 students
Guide	Supervised by departmental faculty
Project Types	Survey-based, experimental, participatory, or interventionist
Final Output	Written report + Presentation + Community feedback
Evaluation	Internal (faculty) + External (appointed examiner) = 50 marks

Suggested Methodology:

Students should:

- Revisit and reflect on Phase I: What was observed? What problems or patterns emerged?
- Identify upgrade paths:

Phase I Focus	Phase II Upgrade
Documentation of Honey bee's species	Trial field observation or awareness
campaign Survey of native honey bee species initiative	Conservation/restoration
Awareness posters on leafy greens colonies , Locating colonies in community	Live demos, field natural Pilot cultivation trials in

Suggested Project Types & Methodology

1. Problem-Solving/Intervention Projects

- Define a tangible issue (e.g., low/high availability of bee colonies, availability of bee flora, awareness about importance of honey bees, honey extraction and role of pollination in local farmers and community).
- Design and implement a simple solution: improved propagation of bee flora and scientific methods for honey extraction. etc.
- Follow up for awareness.

2. Community Co-Creation

- Collaborate with local SHGs, farmers, school eco-clubs, or NGOs.
- Involve them in designing part of the project (honey bee species, bee flora, structure of bee colony, acquiring bee colonies in pot).
- Document shared knowledge and reciprocal learning.

3. Extended Surveys with Action

- Move from just documenting (Phase I) to evaluating & advising:

e.g., from “knowledge of honey bees to tribal communities” to “reviving forgotten uses through school campaigns.”

Or from “identifying bee and bee plants rare species” to “creating signage for local bee trails.”

Field Protocol (Concise Steps)

1. Reassess Phase I findings: What insights, gaps, or opportunities emerged?
2. Design upgrade: Choose a focus: ecological impact, community outreach, practical testing and finalize objectives, participants, tools, and timeline
3. Execute fieldwork: Collect refined data and Conduct activities: bee trials, awareness sessions, school visits, community experiments
4. Monitor & Record: Use datasheets, photos, interviews, impact logs
5. Analyze: Compare results or outcomes (even in basic visual/statistical form)
6. Document & Present: Full report + visual presentation, Include community reflection or feedback if possible

Field-Based Work:

- Continued/advanced study from Phase-I or a fresh topic.
- Emphasis on data collection, analysis, and solution prototyping.

Report Format (Minimum 6 pages excluding Title, Certificate, Acknowledgement and appendices):

1. Title Page
2. Certificate
3. Acknowledgement
4. Main Report:
5. Introduction
6. Objectives
7. Methodology
8. Observations/Data
9. Discussion
10. Suggestions/Interventions
11. Conclusion
12. References

Example Upgrade Paths:

Phase I Topic	Phase II Upgrade
Bee species documentation	Searching their habitat, density and bee flora.
Common honey bee species and Bee flora of the area	Community engage in honey harvesting and its method.
Awareness posters in schools	Interactive workshops & hands-on sessions

Suggested Project Themes:

Applied Botanical Solutions:

1. Propagation of *Apis trigona* bee species by hiving in pot hives.
2. Preparation of area and scheme wise list of bee flora for plantation programme and its extension through NGO, schools, concerned Governments departments.
3. Survey of bee colonies and bee flora and its Mapping.
4. Preparation of Floral Calendar in study area.

Experimental Community Work:

1. Demonstrating effects of cruel honey harvesting on environment.
2. Survey of honey bee colonies through farmers, cattle keepers and honey extractors.
3. Cultivation of honey bee flora and documentation of outcomes

Outreach and Advocacy:

1. Conducting awareness drives in schools/panchayats on honey bees.
2. Publishing bee care brochures in vernacular language
3. Training SHGs (Self Help Groups) on bee keeping skills.

Ethics & Logistics

- Ensure voluntary community participation and informed consent.
- Avoid projects that may involve sensitive ecological areas or protected species without permissions.
- Encourage documentation in regional languages where applicable.

Assessment Rubric for FP/CEPPhase-II

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION B.Sc. II (Apiculture), SEMESTER – IV (NEP)		
Course Code:100216	Field Project / Community Engagement Services in Apiculture: Phase-II	Max Marks: 50
Q. No.	Exercise	Marks
1	Field Engagement & Application of Knowledge	10
2	Quality of Intervention/Innovation	10
3	Documentation & Report Writing	10
4	Outcome of the Project Work	10
5	Oral/Poster Presentation	10