

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

**B.Sc. APICULTURE**

**Name of the Programme: B.Sc. II**

**Class: Part 3S**

**Semester: III DSC-3-03S**

**Subject: Apiculture**

**Name of the course (Paper): Fundamentals of beekeeping**

**Course Outcomes Code: COs-03**

**About the course**

The course is aimed at imparting the student basic knowledge about beekeeping for the Bachelor's degree so that the student can take his first steps towards entrepreneurship. The course discusses desirable traits of honey bees for beekeeping and offers the student excellent opportunity to have his first brush with various equipment of beekeeping.

**Syllabus Prescribed for Second Year UG Programme**

Programme-	Code of the course/Subject	Title of the course/subject	Total Number of Periods
B.Sc.- Semester- 3	APC (3S) Th/Apiculture	Fundamentals of Honey Beekeeping	72

**CO's**

**By the end of this program, the students will be able to-**

1. Handle bee colonies.
2. Describe fundamental requirement for Apiary.
3. Describe the history of bee-keeping and primitive beekeeping.
4. Apply, practical and theoretical concept to identify status of brood and food conditions in bee colony.
5. Describe/Use different equipment and appliances used in beekeeping.
6. Identify brood food conditions in the comb.
7. Acquire the knowledge behavior.
8. Identify the cell of bees cast.
9. Develop colony inspection skill.
10. Evaluate income of pollen in colonies.

Unit	Content	Periods
I	History, Scope, Advantages and principles of beekeeping, Methods of beekeeping: Primitive and modern, aspects of modern beekeeping. Knowledge of bees, acquiring of bees.	12
II	Desirable traits for beekeeping, poor and best choice of bees. Bee comb structure, Cells; storage, brood, queen, drone and worker cells,	12
III	Modern beekeeping and its aspects. Bee hive- types ; their components, comb frame, nucleus hive, Products collected and synthesized by Bees-Honey, Propolis, Pollen, Wax, Royal Jelly and Bee Venom	12
IV	Equipments - comb foundation sheet, dummy board, queen gate , drone and queen excluder. Smoker, bee veil, swarm net, feeder, stand, honey extractor, its types.	12
V	Method of handling of bee colony, Importance of periodic inspection of colony- food, brood , queen, queen cell, enemies and diseases.	12
VI	Seasonal activities of bees- winter summer and monsoon management, Queen Bee Management, Concept of Apiary and fundamental requirement. Bee flora and Pollination, Introduction to migratory beekeeping	12
SEM	To handle bee colony. Inspect bee colony for their brood, food, disease condition. To handle all bee equipments. To identify brood cells whether its is, queen, drone or worker cell. To identify suitable spot for apiary	
Activities	Inspection of Bee colony To survey for availability of natural bee colonies in surrounding areas.	

### PRACTICALS SEMESTER-3

#### Equipments :-

Bee hives (*Cerana mellifera*) , Bee specimens, Hive tools: Honey extractor, smoker, bee veil, swarm net, wax foundation sheet, digital thermometer,

Code of the Course/ Subject	Title of the Course/ Subject	No. of period.
APC3S PR / Apiculture	Fundamentals of Honey Beekeeping	26

#### LIST OF PRACTICAL:

1	Study of components of bee hive.
2	Study of Bee comb-Brood and food conditions.

3	Study cells of Queen, worker and drone. Identification of Queen cells, Drone cells & Brood.
4	Study of bee safety Equipments- Smoker, bee veil, etc.
5	Inspection of colony.
6	Study behavior of bees at extreme weather conditions.
7	To fix wax foundation sheet to frame.
8	To estimate pollen income by bees.
9	Identification of Development stages
12	To study floral preference of honey bees for familiarization of bee flora
13	To observe the activity pattern of worker, queen and drone
14.	To study the foraging behaviour of worker honey bee
15.	Handling of Honeybee Colony
16.	Honey Extraction Process
17.	Wax Extraction and Purification

### DISTRIBUTION OF MARKS DURING PRACTICAL EXAMINATION (Time 5 Hours)

#### Internal Marks

1. Regularity & sincerity in Practical -	07
2. Practical Book -	08
3. Practical Internal Test -	05
4. Field Bee Observations-Diary -	05
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Total Marks -	25

#### External Marks

1. Assemble and give the functions of each component of bee hive.	05
2. Determine morphological difference among queen, drone and worker-	05
3. Fix wax foundation sheet to frame. –	05
4. Demonstrate Safety equipment and wares . -	05
5. Viva-voce -	05
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Total Marks -	25

#### Reference Books-

1. First lesson in Beekeeping- Dadant C.D. Malliton, Illinois.
2. Honey a Comprehensive survey Pub.- Heinemann (London) & International Bee Research Association England.

3. Investigation on Indian Honey bee products 6 Beekeeping in Integrated Mountain Development-Economic & Scientific perspective Publication.
4. Beekeeping-Teach yourself Books, By-Vernon F. (1984)
5. The hive & the Honey Bee-1975, 4th Edition, Dadant Publication, America
6. Bees their vision, chemical senses & language-1950, Cornel University Press – By – Fon frish, & Karl.
7. Honey bee Biology 1982-By Free & Johnson & Central Association of Bee Keepers England
8. The social Behavior of the Bees 1974-By Missioner C.D.
9. Beekeeping in India 1962, 82 Sardar Singh- ICAR, New Delhi
10. Technical Bulletins-C.B.R.T.I. Pune
11. Beekeeping By- E.F.Phillips. Agrobios (India) Publication
12. Hand Book of Beekeeping-By Dharamsingh, Devendra Pratap SinghAgrobios.
13. Beekeeping in India Sardar Singh Required

### **B.Sc. APICULTURE**

**Name of the Programme: B.Sc. II**

**Class: Part 4S**

**Semester: III DSC-3-03S**

**Subject: Apiculture**

**Name of the course (Paper): Bee breeding and Bee diseases**

**Course Outcomes Code: COs-03**

#### **About the course**

The course is aimed at imparting the student basic knowledge about bee breeding and diseases of Bees for the Bachelor's degree so that the student becomes adept at breeding techniques. The course describes methods of diagnoses of diseases of bees and equipment of bee breeding.

Programme-	Code of the course/Subject	Title of the course/ subject	Total Number of Periods
B.Sc.- Semester- 4	APC (4S) Th/Apiculture	Bee breeding and Bee diseases.	72

## CO's

### By the end of this program, the students will be able to-

1. Aware about importance of bee breeding in bee keeping.
2. Identify special characteristics of bees.
3. Capable to diagnose the type of disease on bees.
4. Acquire knowledge of methods to control bee diseases or protect the bee colonies from diseases.
5. Identify bee enemies of that area.
6. Apply the knowledge to protect the bees from their enemies. Identifies enemies of bees- reptiles, birds and mammals .
7. Acquire knowledge of toxic plants and pollen.

Unit	Content	Periods
I	A. Bee breeding: General methods of breeding and selection, mitosis and meiosis, applicability of individual methods for bees. B. Organization of breeding apiaries: Acquisition of colonies from their natural nests. Their transference to movable frame of standard hives.	12
II	Equipment and tools for bee breeding programme. Special apiary management problems for bee breeding programme. Selection Criteria : General Criteria- Particular criteria to meet the demands of local habitats, Desirable and undesirable characters. Quantitative and qualitative characters.	12
III	Individual colony records: Pedigree records system adapted for maternal living age of bees. Periodicity for observation and recordings. Evaluation of Individual colony records : Tabulation of individual colony records. Apiary averages for characters susceptible to environmental influences. Grouping of individual colonies.	12
IV	Assigning of maternal pedigree number for selection: Rearing of pedigree queen bees. Migration for queen rearing programme. Distribution of individual groups to isolated apiaries for maximizing superior mating and minimizing inferior mating.	12
V	Transport of sealed queen cells: Preparation of mating nuclei with sealed queen cells or virgin queens, Special management problems for organizing mating yards. Provision of adequate population or pedigree drones, single and multiple mating, mating signs. Re-migration of stocks, Progeny testing. Equalization of colony, strength through upgrading or downgrading for equal starts for pedigree and unselected controls.	12
VI	General classification of bee diseases (brood diseases, adult diseases- Viral, bacterial, protozoan) symptom, causes and control.	12

	<p>a. Enemies- Inset, birds, reptiles and mammals (wasps, robber fly, and dragon fly, mites, spider, pseudo scorpion, bee louse, wasp moth, frogs, lizard, birds and monkey).</p> <p>b. General methods of diagnostic preventing, curative measures Toxic effects and lethal effects of poisonous pollen, nectar, insecticides &amp; chemicals)</p>	
SEM	<p>Identify bee diseases. To search wax moth in old combs, study them. To identify bee enemies of your area. To observe the special positive characteristic of bees with respect to production of honey and other product.</p>	
Activities	Make a survey of bee enemies and how the act.	

### Practicals:

Code of the Course/ Subject	Title of the Course/ Subject	No. of period.
APC4S PR / Apiculture	Bee breeding and Bee diseases.	26

### LIST OF PRACTICALS FOR SEMESTER IV

1	Experiment on to study mitosis and meiosis
2	Study of Bee breeding tool and equipment.
3	Methodology for keeping Individual colony Records.
4	Study of individual characteristics of bee colony
5	Study of queen, worker and drone cell.
6	Study of wax moth, its life cycle
7	Survey of bird enemy
8	Study of toxic plant/ pollen
9	Study of enemy reptiles
10	Study of enemy mammals.
11	Demonstration of division of bee colony
12	Traditional and Commercial methods of Mass Queen Rearing
13	Preparing Queen Bee Banks
14	Identification and Management of Bee Enemies
15	Diagnosis and Management of Bee Diseases
16	Techniques in Dividing Colonies
17	Preparation and Application of Artificial Diet
18	Capturing of Swarm
19	Visit to Honey Bee Rearing Center

## DISTRIBUTION OF MARKS DURING PRACTICAL EXAMINATION (Time 5 Hours)

### Internal Marks

1. Regularity & sincerity in Practical----	07
2. Practical Book-----	08
3. Practical Internal Test-----	05
4. Field observations of bee enemies-----	05
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Total Marks -----	25

### External

1. Experiment on Meiosis and Mitosis-----	10
2. Morphological Study of pollens of toxic plants---	05
3. Life cycle of wax moth -----	05
4. Demonstrate Bee colony Division.--	03
5. Viva-voce -	02
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Total Marks -----	25

### Reference Books:

1. Bees and beekeeping in India,. Dr. D.P. Abrol.Kalyani Publishers.
2. Sara's Apiculture. K.V. Jayshree, C.S. Tharadevi, N. Armugam. Saras Publication.
3. Neurobiology and Behaviour of Honey, 1985, R.Menzal & A.Mercer, Springer-Verlag, Berlin, Germany.
4. Phenomenon of Bee, 1987, J.B.Free, Chapman and Hall, London.
5. The hive & the Honey Bee- 1975, 4th edition Dadant Publication, America.
6. Bees their vision, chemical senses & language-1950, Cornell University Press- By Fonsch, & Karl.
7. Honey bee Biology 1982- By Free Johnson & Central Association of Bee Keepers England.
8. The Social Behaviour of the Bees, 1974 : By Missioner C.D. 14. Beekeeping in India, 1962,82, Sardar singh, ICAR, New Delhi.
9. Beekeeping by E.F.Phillips. Agrobios (India) Publication.
10. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios.
11. Technology & Honey Bull.- R.Bornecke & Gonnet. 20. ABC & XYZ of Bee Culture (40th Edition) 1982, R.A.Morme and K.Flattum, A.I.Root & Co., 623, W. Liberty St. Medina, Dhid, 44336, USA.
12. Apiculture, 1987 (Translated from French in English by R.K.Kauls 1994), P.Jean-Prost, Oxford and IBH Publication, New Delhi. 158

13. Bee Genetics and Breeding 1986, T.E.Reinderer, Academic Press Inc., London.
14. Bees and Bee Keeping Science, Prentice & World Resources, 1990 – Eva Crane, Heinemann Newnes, Oxford, UK.
15. Bees and Mankind 1982, J.B.Free, George Allen & Unwin (Pub.), Limited London, UK.
16. Biogeography and Taxonomy of Honeybees 1985, F.Ruttnar, Springer-Verlag, Berlin, Jernany.
17. Bee Biology of the Honey Bee, 87, M.Winston, Harvard University Press, Cambridge, England.