Sant Gadge Baba Amravati University,Amravati

Scheme of Teaching, Learning & Examination
leading to the Degree in Bachelor of Science in the Programme

APICULTURE

in the Faculty of Science and Technology

(Three years - Six Semester Degree Programme - C.B.C.S.)

B.Sc. Part III

Semester V and Semester VI

Session 2024 – 2025

Sant Gadge Baba Amravati University, Amravati

Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Apiculture in the Faculty of Science and Technology (Three Years-Six Semester Degree Programme-C.B.C.S.) (B.Sc. Part III) Semester V

Sr.	Subject	Subject code	Teaching &Learning Scheme							Duration of-Exam Hours	Examination&Evaluation Scheme						
			Teaching Periods Per Week				Credits				Theory		Practical			Minimum Passing	
			L	T	P	Total	T/T	Practical	Total		Theory +MCQ External	Skill Enhancement Module	Internal	External	Total Marks	Marks	Grade
1	DSC-V: Bees & bee hive products and applications	DSC-5S	6	-	-	6	4.5	-	4.5	3	80	20	-	-	100	40	P
		DSC Lab-/Pr-5S			**6**	**6**		2.25	2.25	**04**			**25**	**25**	**50**	**25**	**P**
2	Mini-Project/Hands-on Training/Workshop/DIY related to Apiculture.		**-**	**--**	**6**	**6**	**-**	2.25	2.25	**2**	Internal Assessment by college/institute/department				**50**	**25**	**P**
3	Open Elective Course (OEC) GIC: APC (5S)- Colony Organization of bees. (Optional)	**APC/GIC -5S**					75 hrs (during session) optional to extracurricular and co-curricular activities 1 Cr.										
4	Internship/Apprenticeship/Field Work/Work Experience						150 Hours cumulatively from Sem II to Sem V resulting into earning of 5 Credits (Minimum 120 Hours mandatory resulting into earning of 4 Credits)										

L: Lecture, T: Tutorial, P: Practical, DIY: Do It Yourself activity

Notes :

1. Internship/Apprenticeship/Field Work/Work Experience is Mandatory. It can be carried out cumulatively from Semester I to Semester V for a duration of 150 Hours resulting into earning of 5 Credits (Minimum 120 Hours resulting into earning of 4 Credits is mandatory for every student). Internship /Apprenticeship/Field Work / Work Experience will be conducted after I semester till Vth semester in vacations for minimum 120 hrs, cumulatively entailing 4 Credits. It's credits and grades will be reflected in final semester VI credit grade report.
2. Teaching period in the various subjects in the faculty of science shall be as prescribed by the executive council dated 1/2-4-1977, 11-7-1977 Appendix- P
3. If DSC (excluding Mathematics) is Physics, then 2 Tutorial be added.
4. There shall be Skill Enhancement Module (SEM) in each course of DSC and DSE
5. OEC (Optional) can be studied during semester I to V, Its credits and grades will be reflected in final semester VI credit grade report. OEC may be opted from Sem I to Sem V. It is comprised of GIC, Skill Course and MOOC (through SWAYAM)
6. Minimum 10% of the total credits of the UG (Bachelor's Degree) programme, that is, at least 12 credits are mandatory to be earned by all the students from Ancillary Credit Courses as mentioned in Table A (SGBAU, Direction No. 76/2022 ,Date 06/10/2022)
7. Extra-curricular and co-curricular activities: Maximum 5 Credits may be earned through Extra-curricular and co-curricular activities, which will be an option to OEC (maximum 75 hours and 5 credits), so that students performing in such activities shall be given exemption from undertaking

Sant Gadge Baba Amravati University, Amravati

Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Apiculture in the Faculty of Science and Technology (Three years-Six Semester Degree Programme- C.B.C.S.) (B.Sc. Part III) Semester VI

Sr.	Subject	Subject code	Teaching & Learning Scheme							Duration of Exam Hours	Examination & Evaluation Scheme						
			Teaching Periods Per Week				Credits				Theory		Practical		Total Marks	Minimum Passing	
			L	T	P	Total	T/T	Practical	Total		Theory + MCQ External	Skill Enhancement Module	Internal	External		Marks	Grade
1	DSE-I: Management of Apiary OR DSE-II: **Honey Bees and Environment.**	APC-6S	6	-	-	6	4.5	-	4.5	03	80	20	-	-	100	40	P
2	Lab-DSE-I: Management of Apiary OR DSE-II: **Honey Bees and Environment.**	APC-6S PR	-	-	6	6	-	2.25	2.25	04			25	25	50	25	P
	Mini-Project/Hands-on Training/ Workshop/DIY related Apiculture				6	6	-	2.25	2.25	02	Internal Assessment by college/institute/department				50	25	P
	APC 6S (GIC-5) (Optional) AI in Apiculture	APC 6S GIC-5	1														

L: Lecture, T: Tutorial, P: Practical, DIY: Do It Yourself activity

Notes:

1. Internship/Apprenticeship/Field Work/Work Experience is Mandatory. It can be carried out cumulatively from Semester I to Semester V for a duration of 150 Hours resulting into earning of 5 Credits (Minimum 120 Hours resulting into earning of 4 Credits is mandatory for every student). Internship /Apprenticeship/Field Work / Work Experience will be conducted after I semester till Vth semester in vacations for minimum 120 hrs, cumulatively entailing 4 Credits. It's credits and grades will be reflected in final semester VI credit grade report.
2. Teaching period in the various subjects in the faculty of science shall be as prescribed by the executive council dated 1/2-4-1977, 11-7-1977 Appendix- P
3. If DSC (excluding Mathematics) is Physics, then 2 Tutorial be added.
4. There shall be Skill Enhancement Module (SEM) in each course of DSC and DSE
5. OEC (Optional) can be studied during semester I to V, Its credits and grades will be reflected in final semester VI credit grade report. OEC may be opted from Sem I to Sem V. It is comprised of GIC, Skill Course and MOOC (through SWAYAM)
6. DSE (DISCIPLINE/DEPARTMENT SPECIFIC ELECTIVE): A BASKET CONTAINING AT LEAST TWO COURSES/SUBJECTS SHALL BE PROVIDED, SO THAT STUDENT HAS A CHOICE FOR THE SELECTION.
7. Minimum 10% of the total credits of the UG (Bachelor's Degree) programme, that is, at least 12 credits are mandatory to be earned by all the students from Ancillary Credit Courses as mentioned in Table A (SGBAU, Direction No. 76/2022 ,Date 06/10/2022)
8. Extra-curricular and co-curricular activities: Maximum 5 Credits may be earned through Extra-curricular and co-curricular activities, which will be an option to OEC (maximum 75 hours and 5 credits), so that students performing in such activities shall be given exemption from undertaking OEC.

Sant Gadge Baba Amravati University, Amravati

Faculty: Science and Technology Programme: B.Sc. (APICULTURE) Syllabus
Prescribed for Three Year UG Programme: B.Sc. III Semester- V

Code of the Course/Subject	Title of the Course/Subject	(Number of Periods per week)
APC(5S) /Apiculture	Bees & bee hive products and applications.	6

Course Outcomes:

CO1: Understand variety of products obtained from honey bee colony.
Upon completion of this course, students will be able to explain different honey bees and hive products extracted from the bee colonies.

CO2: Identifies origin of formation and purpose of formation of bee product in bee colony.
Student will explain how products are synthesized and stored and utility purpose in the colony

CO3: Apply knowledge to Extracts bee products from bee colony.
Students will be able to demonstrates the methods of extraction of different bee products from colonies.

CO4 : Determines the chemical composition of each bee product.
Student will explain chemical constituents and their proportion in each product.

CO5: Demonstrate applications of all bee products.
Learners will explain domestic, commercial, medicinal and industrial use of different bee product.

CO6: Illustrate diagnostic use of different bee products on human being.
By the end of this paper, students apply knowledge of use of bee product as a medicine for different illness on human being.

CO7: Acquire knowledge of Indian and worldwide production honey and quality standards of bee product.
Student will demonstrate production of bee product in India and in leading country inn the world.

Curriculum

Unit	Content	Lecture
Unit-I	Honey : 1.1 Conversion of honey to nectar 1.2 Types of honey- uni floral, multi floral, extrafloral. Ripened and non-ripened (apiary /squeezed) 1.3 Chemical composition of honey. 1.4 Extraction of honey : Honey extractor ; principle & its types. 1.5 Honey extraction natural bee combs and bee hives.	12
Unit -II	Properties and values of Honey 2.1 Physical properties- Hygroscopicity, viscocity, specific gravity and refractive index, Crystallisation. 2.2 Fermentation, aromas and color, antibacterial properties. 2.3 Nurtitional and medicinal values of honey. 2.4 Honey processing- objectives and stages in processing, 2.5 Handling and Storage of honey.	14
Unit -III	3.1 Quality standards of honey, spécifications of honey as per AG mark / BIS / PFA. 3.2 Factor affecting to the quality of honey, comparaison with world standards. 3.3 Value addition in honey. 3.4 Production of honey in India, Export of honey, 3.5 Worlds honey production.	14
Unit – IV	Bees wax Propolis 4.1 Wax : Chemical Composition. Extraction- Its types ; Over boiling water, Steam Solar wax Extractor. 4.2 Bleaching of wax- Physical (Adsorbant & filtre Bleaching) and chemical method (Hydrogen peroxide & sulphuric Acid). 4.3 Storage and quality standards and applications. 4.4 Propolis : Physical characteristics and composition. 4.5 Extraction, Storage and applications.	12
Unit –V	Royal Jelly and bee Venom 5.1 Royal Jelly – Secretion, physical characteristics, composition, use in bee colony. 5.2 Extraction and Storage of royal Jelly. 5.3 Applications and value addition of royal Jelly. 5.4 Bee venom- Principle of sécrétion, physical characteristics & composition, 5.5 Value addition and application of bee venom.	12
Unit -VI	Bee Pollen and Apitherapy 6.1 Bee collected pollen- Physical characteristics and composition of bee pollen. 6.2 Extraction of pollen, Applications of bee pollen, industrial use of bee pollen. 6.3 Apithérapie : History, hhoneybee Produced Substances Used for Apitherapy, 6.4 Basica, benefit and risk. 6.5 Apitherapy in India.	14

SEM: SKILL ENHANCEMENT MODULE
Any One of the Following

A. Bee Product origin -

CO's
After completion of this course successfully, the students would be able to demonstrare-
1. Raw source of bee product.
2. Purpose of synthesis of bee product in colony.
3. Identification and degree of its formation.
4. Asses factors affecting for its formation.

Content-
1.1 Availability of raw material.
1.2 Process involved in its synthesis.

Activities –
1. Identification and degree of availability of raw material.
2. Inspection of storage of raw and synthesized material in bee colony.
3. Importance of product in bee colony.
4. Factors affecting its collection, synthesis and utility.
5. Submit a report.

B. Extraction of bee product

CO's
After completion of this course successfully, the students would be able to
1. Identify degree of availability of product in colony.
2. Handle extraction equipment.
3. Apply knowledge to extract bee product from bee colony.
4. Analyze, process bee product for its quality assessment.

Content-
2.1 Identification of bee product in colony.
2.2. Operates extraction equipment.
2.3 Extracts bee products from bee colony.

Activities-
1. Identify availability of bee product in bee colony.
2. Study of different bee product extraction equipment.
3. Extraction of bee product from bee colony.
4. Analysis of bee product for its quality.
5. Handling and storage of product.
6. Submit a report

C. Apitherapy-

CO's
After completion of this course successfully, the students would be able to
1. Use of different product of bee colony for medical treatment to human beings.
2. Identify applicability of each product on specific human disease .

Content-
3.1- Medicinal applicability of honey bee produce.
3.2. Identification of typical human diseases treated with bee product.
3.3. Viability of use of bee product for medicinal treatment.

Activities
1. To determine effective use of bee product on specific health problems of man.
2. To assess way of treatment.
3. To determine degree and dose of it.
4. Study of IKS with reference to Apitherapy.
5. Submit a report.

Course Material/Learning Resources

Textbooks and Reference Books

1. Sara's Apiculture, Jayshree K.V., Tharadevi, C.S., Armugam N., 2022, Saras Publications.
2. Bees and Bee keeping in India, Abrol, D.P.,2009. Kalyni Publications.
3. Honey A Comprehensive survey pub-Heinemann(London) & International Bee Research Association England.
4. Value added products for Beekeeping Food & Agriculture - Organisation United Nation Bulletin No.124.
5. Studies in Chemistry of Indian Honeys & Bee Waxes. Thesis for M.Sc. degree submitted to Botany Uni. - Phadke.
6. The Chemistry and Technology of Waxes, Reinhold publication Corpn.
7. A.B.C.& X.Y.Z of Bee Culture 39 edition - A.Y.Root & Co. America.
8. 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 & Value addition and Honey – Dr.D. M. Wankhale, K. D. Kamble, C.B.R.T.I., KVIC, Pune.
12. Extracted Honey – specification (Second Rev.) - I S 4941`; 1994 BIS New Delhi.
13. 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.
14. Apiculture, 1987 (Translated from French in English

Sant Gadge Baba Amravati University, Amravati Syllabus
Prescribed for Three Year UG/PG Programme
B.Sc. Semester V

Code of the Course/Subject	**Title of the Course/Subject** (Laboratory/Practical/practicum/hands-on/Activity)	**(No. of Periods/Week)**
APC(5S) PR/Apiculture	Bees & bee hive products and applications.	**02**

COs

By the end of the Lab/Practical Course, generally students would be able to:
CO1: Understand the types and their origin of bee product in bee hive.
CO2: Acquire the skill handling of extraction equipment.
CO3: Extracts bee products from bee colony.
CO4: Analyze bee product for its quality.
CO5: Identify need of processing of bee product.
CO6: Processes bee products.

*LIST OF PRACTICAL /LABORATORY EXPERIMENTS/ACTIVITIES ETC.

A. Honey -

1. Détermination of moisture content from honey of same comb of sealed and unsealed cells.
2. Study of principle and méthodologies of Honey extractor.
3. Analyses of Honey ; by Honey testing kit
4. Détermine moisture content of diffèrent honey samples.
5. To study physical properties of squeezed honey.
6. Mesurément of viscocity of honey samples.
7. Détermine ash content of honey samples.
8. Study of Principle and unit opérations in honey processing plant.
9. Détermination of HMF in honey samples.

B. Wax-

1. Extraction of wax from honey comb.
2. Bleaching of wax by Physical and chemical method.
3. Analyses of bee wax : a. Melting point. b. saponification value, c. Acid value, Ester value, e. Iodine value, f. Ash Percentage, total volatiles, Aroma, color.

C. Venom, Propolis & Pollen

1. Study of principle and working of venom extractor.
2. Study of principle and working of Pollen trap.
3. Find out the source plant of honey by seperating pollens from honey.

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION
(APICULTURE), SEMESTER V – (CBCS New)
Practical – PR-V (Bees & bee hive products and applications)
Internal Practical Examination

Q.No.	Internal Practical Examination	Marks-25
1	Attendance (Entire Semester)	05
2	Performance and Participations in conduct of the practical for EntireSemester	09
3	Activity participation and Report: Academic/Institute/Industrial/Field visit or any report activity related to thesubject	03
4	Practical Record Book	05
5	Internal Viva-Voce	03

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION
(APICULTURE), SEMESTER V – (CBCS New)
Practical:PR-V (Bees & bee hive products and applications)
Time – 4 Hours Max Marks-25

External Practical Examination

Q.No.	External Practical Examination	Marks-25
1	Experiments Based on Honey	08
2	Experiment based on Extraction equipment	05
3	Experiments based on Wax.	05
4	Experiments based on- Pollen/Venom/Royal Jelly	03
5	External Viva-Voce	04

Semester	Course Code	Title of the Coursee	Teaching Hours/week
V	APC/GIC-	Colony Organization of bees.	6

Course Objectives:	• To understand composition of honey bee colony • Explain social behavior of the colony. • Describe the functions of castes in colony.	
Course Outcomes:	CO-1. Describe the meaning honey bee colony. CO-2. Recognize castes in bee colony. CO-3. Describes the functions of each cast in bee colony. CO-4. Differentiate colonies of different honey bee species. CO-5. Explain nesting behavior of bee species.	
UNIT	CONTENT	Lecture
Unit-I	1.1- Kinds of Honey Bees.	12
	1.2- Structure of Bee colony: number of bees and their castes.	
	1.3- Nesting behavior; Open and dark nesting.	
	1.4- Brood and Honey Comb; single and multi-combs.	
	1.5 -. Distribution of brood and food in comb.	
Unit-II	2.1- Social interaction among castes	12
	2.2- Queen, queen cell,.	
	2.3-. Identifying characters of queen	
	2.4-. functions of queen in colony	
	2.5-, Formation of queen, queen cell	
Unit-III	3.1 Metamorphosis	12
	3.2 Life cycle	
	3.3 Mating of queen, egg laying	
	3.4 Egg laying behavior of queen.	
	3.5- Behavior of queen less colony	
Unit-IV	4.1 Worker; Identifying characters, Population.	12
	4.2 Worker cell,	
	4.3 role and its importance in colony	
	4.4. Foraging behavior of worker	
	4.5- Laying workers	
Unit-V	5.1- Drone; identifying characters of drone.	12
	5.2- Drone cell, population, its formation.	
	5.3- Importance of drone	
	5.4- Sting, Mechanism of sting action, sting gland	
	5.5- Social life in honey bee	
Unit-VI	6.1- Food of bees	12
	6.2- Bee flora -Wild Crop	
	6.3 Bee flora- Horticultural	
	6.4- Honey flow	
	6.5- Dearth Period.	
ferences:	1. Bees and Bee keeping in India, D.P. Abrol, Kaluani Publications. 2. First Lesson in Beekeeping: Dadant C.D. Malilton, Illinois. 3. Beekeeping in Integrated Mountain Development - Economics & Scientific perspective Publication. 4.Beekeeping- Teach yourself Books, By-Vernon F. (1984) 5. Honey bee Biology 1982- By Free Johnson & Central Association of Bee Keepers England. 6. The Social Behavior of the Bees, 1974 : By Missioner C.D. 7. Beekeeping in India, 1962,82, Sardar Singh, ICAR, New Delhi. 8. Beekeeping by E.F. Phillips. Agro bios (India) Publication. 9. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios. 10. 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. 11. Bees and Mankind 1982, J.B. Free, George Allen & Unwin (Pub.), Limited London, UK. 25.	

	12. Biogeography and Taxonomy of Honeybees 1985, F. Ruttnar, Springer-Verlag, Berlin, Jermany. 13. Bee Biology of the Honey Bee, 87, M. Winston, Harvard University Press, Cambridge, England. 14. The Dance Language and Orientation of Bee 1967, K. Von Fristch, Harvard University Press, Cambridge, England. 15. Ecology and Neutral History of Tropical Bees 1989, D.W. Roubik, Cambridge University Press, Cambridge, England. 16. Honey Bee Ecology – A study of adaptation in social life 1985, T.D. Seeley, Princeton University Press, Princeton, NJOBS 40, USA.

Sant Gadge Baba Amravati University, Amravati
Syllabus Prescribed for Three-Year UG Programme
Programme: B.Sc. III Semester VI (CBCS Scheme)

Code of the Course/Subject	Title of the Course/Subject	Number of Periods per week
APC/SEC-1(6S)/ Apiculture	Management of Apiary	06

Course Outcomes:

CO 1: Understand the various aspects to establish apiary.
CO 2: Acquire knowledge of tools, techniques foe management of bee colonies in the apiary.
CO 3: Apply knowledge to solve problem of bee colony like swarm control, desertion, laying worker and queen less colony.
O 4: Identify need of and ways to perform migration of bee colonies.

CO5: Acquire knowledge of industries and institutions helping beekeeping business through providing services, research and marketing.

Unit	Detail Description / Content	Lectures require
Unit - I	**Apiary Establishment:** 1.1 Location of Apiary, site selection, closeness of food source and water. 1.2 Availability of sunlight, accessibility, hive spacing, shelter. 1.3 Acquiring bees-by capturing swarm, package bees, 1.4 Handling of bees 1.5 Climatic conditions like wind, light, rain temperature.	12
Unit - II:	**Manipulation of bee colonies:** 2.1 Uniting of bee colony, 2.2 Artificial feeding- pollen feeding, pollen substitutes, 2.3 Queen introducing/rearing-need, procedure, methods queen mating. 2.4 Division of colony, Supersedure- procedure & causes 2.5 Robbing and fighting of honey bee and its control. Laying worker causes and remedial measures.	12
Unit - III	**Seasonal Mangement :** 3.1 Winter management : Adequate population of Young bee, food in colony, protection from cold. 3.2 Spring Management-Swarm ; prévention of Swarm, use of wax foundation sheet. 3.3 Management during honey flow-Providing super, queen excluder. Honey extraction. 3.4 Summer Management : Feeding, fresh water & maintaining optimum température. 3.5 Monsoon management ; Food condition, Protection from rain, Wind, ennemis, désertion, fungal infection, wax moth. Causes and prévention of désertion.	12
Unit – IV	4.1 Adult and Larval honey bee for production of complète colony, starter colony, queen for bee keeping. 4.2 As food, composition of mature and immature honey bee. 4.3 Pollination : Management of bee for pollination, techniques. 4.4 Production of comb honey. 4.5 Honey bee and pesticides : sources of pesticides, symptômes, and management.	12
Unit – V	**Migratory beekeeping** 5.1 Migratory Beekeeping: Need of migration, types Survey, packing transporting, pollination service. 5.2 Factors considering for migration; Season, distance, number of hives, colony strength. 5.3 Preparation and packing for migration, vehicles, time of the day, 5.4 Prospectus of migratory beekeeping. 5.5 Problems and suggestions in migration.	12
Unit – VI	Bee keeping and ancillaire industries and institutions. 6.1 Supply Industries- Bee keeping Equipment and applinces and bee colonies. 6.2 Industries dépendent on apiculture- 6.3 Institutions- CBRTI, NBB, KVIC/KVIB, 6.4 Marketing – Price, Product, packaging, places and promotion 6.5 Leading countries in bee keeping, research and extension.	12

Course Material/Learning Resources

Reference Books :

1. Sara's Apiculture, Jayshree K.V., Tharadevi, C.S., Armugam N., 2022, Saras Publications.
2. Bees and Bee keeping in India, Abrol, D.P.,2009. Kalyni Publications.

3. First Lession in Beekeeping : Dadant C.D. Malilton, Illinois.
4. Honey A Comprehensive survey pub-Heinemann(London) & International Bee Research Association England.
5. Beekeeping in Integrated Mountain Development - Economics & Scientific perspective Publication.
6. Beekeeping- Teach yourself Books,By-Vernon F.(1984)
7. A.B.C.& X.Y.Z of Bee Culture 39 edition - A.Y.Root & Co. America.
8. The hive & the Honey Bee- 1975, 4th edition Dadant Publication, America.
9. Honey bee Biology 1982- By Free Johnson & Central Association of Bee Keepers England.
10. The Social Behaviour of the Bees, 1974 : By Missioner C.D.
11. Beekeeping in India, 1962,82, Sardar singh, ICAR, New Delhi.
12. Beekeeping by E.F.Phillips. Agrobios (India) Publication.
13. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios.
14. Technology & Value addition and Honey – Dr.D.M.Wankhale, K.D.Kamble, C.B.R.T.I., KVIC, Pune.
15. Extracted Honey – specification (Second Rev.) - I S 4941`; 1994 BIS New Delhi.
16. 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.
17. Apiculture, 1987 (Translated from French in English by R.K.Kauls 1994), P.Jean-Prost, Oxford and IBH Publication, New Delhi.

Skill Enhancement Module (SEM)Any one of the Following:

A. Selection of apiary site.

CO's

After completion of this course successfully, the students would be able to-

CO1: Choose proper apiary site.
CO2: Operates / handles weather monitoring equipment.
CO3: Determines average favorable weather conditions for establishment of apiary.
CO4: Identifies extreme weather conditions which are not favorable for apiary.
CO5: Designs protocol for establishment of Apiary

Contents-

1. Topographical site selection.
2. Assessment of climatic conditions.
3. Availability of closer food
4. Availability of fresh water.

Activities: (Field)

1. Determination of average weather conditions by using different wether monitoring equipments.
2. Determine availability of bee food in closer area.
3. Prepare and submit report

B. Apiary Management-

CO's

After completion of this course successfully, the students would be able to-

1. Acquire required skill to handle and manage bee colonies.
2. Understand ways to manage for bee colonies healthy and productive purpose.

Contents- (Field Activities)

1. Observation of swarm in nature- Its Causes.
2. Division of bee colony.
3. Uniting / mixing of two colonies.
4. Rearing of queen.

Activities

1. Determine causes of swarm in natural colonies.
2. Unite one weak and one strong colony by paper method.
3. Division of strong colony.
4. Produce queen into queen less colony.

C. Marketing

CO's

After completion of this course successfully, the students would be able to-

1. Identify availability and manufacturer of bee keeping required equipment and appliances.
2. Explain National Institutions working for Wild life Conservation.

Contents:

1. Beekeeping related allied industries suppling equipment and appliances.
2. Institutions and industries providing services to beekeeping industries.
3. Marketing of honey bee product.

Activities- (Field Activities)

1. Make survey of availability of bee equipment and appliences manufacturing unit and make visit. Prepare type of product manufacturing its cost, productionetc.
2. Visit to Bee keeping related Institute / Industries .
3. Make survey of market for availability of bee product in local market for its, type of product, manufacturer, cost and monthly sale.

Sant Gadge Baba Amravati University, Amravati
Syllabus Prescribed for Three Year UG
Programme: B.Sc. III Semester VI

Code of the Course/Subject	Title of the Course/Subject (Laboratory/Practical/practicum/ hands-on/Activity)	(No. of Practical /week)
APC /DSE-1(6S) PR /Apiculture	**Management of Apiary**	**0 2**

A. Climatic conditions.

1. Détermination of Rainfall by Rain gauge.
2. Détermination of Wind direction and Wind Velocity by anemometer.
3. Détermination of humidity and Relative humidity.
4. Mesurément of light intensity thorough a day.

B. Management of Bees.

1. Inspection of bee colony for observation of its brood, food, strength and diésasse status.
2. Préparation of différent Feeding to bee colony and its application method.
3. Mounting of wax foundation sheet to frame.
4. Seasonal monitoring temperature in bee hive.
5. Preparation of migration route un your local area.
6. Protocol for packing of bee products.
7. Market survey of availability of Bee hive product in local market.

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION
(APICULTURE),SEMESTER VI – (CBCS New)
Internal Practical – PR-VI (Management of Apiary)

Q.No.	Internal Practical Examination	Marks-25
1	Attendance (Entire Semester)	05
2	Performance and Participations in conduct of the practical for EntireSemester	09
3	Activity participation and Report: Academic/Institute/Industrial/Field visit or any report activity related to thesubject	03
4	Practical Record Book	05
5	Internal Viva-Voce	03

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION
(APICULTURE), SEMESTER V – (CBCS New)
External Practical: DSE-I/ PR-VI (Management of Apiary)
Time – 4 Hours Max Marks-25

Q.No.	External Practical Examination	Marks-25
1	Experiments Based on Climatic study	05
2	Experiment based on Management of Apiary Extraction equipment	08
3	Experiments based on Wax.	05
4	Experiments based on- Pollen/Venom/Royal Jelly	03
5	External Viva-Voce	04

Semester	Course Code	Course Name	Teaching Hours/Week
I	APC/Theo/DSE-2	Theory- Honey Bees and Environment.	30

Course Objectives:	• Explain, means of pollination, different insect pollinating agents and how honey bees are most suitable cross pollination. • Identify importance of honey bees in environment and agricultural productivity. • Describes role of bees in ecosystem. • Identify threats to honey bees.	
Course Outcomes:	CO-1: Define types and means of pollination CO-2: Identify pollinating agents. CO-3: Explain importance of honey bee as a best pollinator. CO-4: Asses role of bees in environment as a pollinator and member of biodiversity. CO-5: Identify threats to honey bees. CO-6: Implements effective control measures to conserve bees.	
UNIT	CONTENT	Lecture
Unit-I	1.1-Biodiversity: Insect biodiversity.	12
	1.2. Bees and wasps and	
	1.3- Honey Bee Species diversity	
	1.4-. Pollination: Self pollination and cross pollination.	
	1.5- Pollinating agent types.	
Unit-II	2.1- Insect pollinators	12
	2.2 Importance of honey bee in pollination	
	2.3- Pollination and agriculture,	
	2.4- Pollination of wild plants.	
	2.5- Food crop and honey bees.	
	2.1. Worldwide distribution of honey bees	
	2.2- Honey Bees as pollinator	
	2.3- Foraging range, Body structure, population .es	
	2.4- Honey bees in ecosystem, tapping natural resource	
Unit -III	3.1 Productivity: pollination Yield and quality	12
	3.2 Pollination support through beekeeping -	
	3.3- Role of honeybees in ecosystem. Pollination services	
	3.4.- Comparative efficiency	
	3.5. Nature and honey bees with its Constancy	
	Threats	
Unit-IV	4.1 Cruel honey extraction	12
	4.2. Habitat loss	
	4.3. Diseases.	
	4.4. Enemies	
	4.5- Pesticides	
	5.1- Exposure to multiple stressors-, land-use change, biological invasions.	
Unit-V	5.1- Cimate change, Global warming.	12
	5.2- Climate and change in flowering season, scent.	
	5.3 -Air Pollution	
	5.4- Desertification	
	5.5- Extreme weather conditions.	
Unit-VI	Conservation-	12
	6.1- Restoring and protecting Habitat	
	6.2- Expansion of habitat	
	6.3 – Protection from pesticides.	
	6.4- Reserve Forests, sacred grooves	
	6.5-Scientific extraction of honey	
ferences:	1. Bees and Bee keeping in India, D.P. Abrol, Kaluani Publications. 2. First Lesson in Beekeeping: Dadant C.D. Malilton, Illinois. 3. Beekeeping in Integrated Mountain Development - Economics & Scientific perspective Publication. 4.Beekeeping- Teach yourself Books, By-Vernon F. (1984) 5. Honey bee Biology 1982- By Free Johnson & Central Association of Bee Keepers England. 6. The Social Behavior of the Bees, 1974 : By Missioner C.D.	

	7. Beekeeping in India, 1962,82, Sardar Singh, ICAR, New Delhi. 8. Beekeeping by E.F. Phillips. Agro bios (India) Publication. 9. Handbook of Beekeeping by Dharamsingh, Devendra Pratap Singh, Agrobios. 10. 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. 11. Bees and Mankind 1982, J.B. Free, George Allen & Unwin (Pub.), Limited London, UK. 25. 12. Biogeography and Taxonomy of Honeybees 1985, F. Ruttnar, Springer-Verlag, Berlin, Jermany. 13. Bee Biology of the Honey Bee, 87, M. Winston, Harvard University Press, Cambridge, England. 14. The Dance Language and Orientation of Bee 1967, K. Von Fristch, Harvard University Press, Cambridge, England. 15. Ecology and Neutral History of Tropical Bees 1989, D.W. Roubik, Cambridge University Press, Cambridge, England. 16. Honey Bee Ecology – A study of adaptation in social life 1985, T.D. Seeley, Princeton University Press, Princeton, NJOBS 40, USA.
Model Questions:	Short Type (At least 8). 1. Give the names of any four species of honey bee. 2. What is he importance of queen bee in colony? 3. Explain the need of nectar for bee colony. 4. Explain laying worker. 5. What is the function of drone? 6. Which bee lays egg in colony? 7. What is the food of queen bee? 8. What is laying worker.
	Long Type (At least 4): 1. Explain causes of swarming and how it can be controlled? 2. Discuss life cycle of honey bee. 3. Discuss the concept of foraging. 4. Discuss the social behavior of honey bee.
	MCQs for Internal Assessment (At least 8) 1. The main food of honey bee is--------- a- Honey, b- water, c- pollen, d-wax. 2. ---------bee collects and carries pollen from flower to colony. a- Queen, b- Worker, c- Drone, d- Wasp. 3. Honey bee carries pollen into----------. a- Mouth, b- proboscis, c- pollen sac, d- wings. 4. Wax gland are situated on abdomen of -------- bee. a. worker, b- queen, c- drone, d- pupa. 5. Honey bee converts ---------- into honey. a- Nectar, b- propolis, c- pollen d- wax. 6. -------- is the only function of drone bee in colony. A – foraging, b-swarming, c- mating, d- absconding. 7. Sting apparatus is located on worker on …… a. – head, b- abdomen, c- neck , d- mouth. 8. Worker bees collects nectar from flower by…….. a- Sting, b- proboscis, c- legs, d- antenna.

Semester	Course Code	Course Name	Teaching Hours/week
VI	APC/DSE -2/Lab	Honey Bees and Environment	04

Course Objectives:	• To demonstrate the equipment/ wares useful to inspect bee colony. • To handle all types of bee equipment. • Describes the source of pollen and nectar to bee colony.	
Course Outcomes:	CO-1. Calculates incoming pollen load. CO-2. Identifies dearth period of the region. CO-3. Prepares feeding required to bee colony. CO-4. Explains components of bee hives. CO-5. Determines content of moisture of nectar and honey samples. CO-6. Demonstrate honey processing plant. CO-7. Extracts honey from honey frames.	
Experiment and activities	1. Identification of enemies of bees. 2. Study of bee diseases. 3. Study of cruel method of extraction of honey. 4. Study of effect of pesticides on bee by survey. 5. Study of local plants depends on insect pollination. 6. Observation of insect pollinators of your study area. in 7. Study of pollen from honey samples. 8. Extract nectar from different flowers. 9. Determine moisture content of collected nectar. 10. Identification of collected pollen from comb. 11. Study of components/ parts of flowers. 12. Field survey of Identification of threats to bees and bee colony Preparation of detailed report of dearth period of the region.	1. Demonstration of all equipment, wares useful in beekeeping. 2. Use of charts. 3. Experiential learning of preparation of floral calendar. 4. Demonstration of study parts of flowers. 5. Preparation of report on field study.

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(APICULTURE),
SEMESTER VI – (CBCS New)
Practical – APC/ DSE-II

Q.No.	**Internal Practical Examination**	Marks-25
1	Attendance (Entire Semester)	10
2	Performance and Participations in conduct of the practical for EntireSemester	05
3	Activity participation and Report:	05
4	Practical Record Book	05

SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI PRACTICAL EXAMINATION
(APICULTURE),
SEMESTER VI – (CBCS New)
Practical – APC/ DSE- II
Time – 4 Hours Max Marks-25

Q.No.	**External Practical Examination**	Marks-25
1	Exercise-I	10
2	Exercise-II	05
3	Field Survey Report	05
4	Viva-voce	05
Total		25