



A.D.M College For Women (Autonomous)

Nationally Accredited with 'A' Grade by NAAC (Cycle-III)
Nagapattinam -611 001
TamilNadu.



B.Sc., Zoology

 Employability

 Entrepreneurship

 Skill evelopment

Name of The Programme	Course Code	Title of the Course	Employability	Entrepreneurship	Skill development
B.Sc., Zoology	ZUE4	Medical Lab Technology	✓		
	ZUES3	Vermiculture		✓	✓
	ZUS1	Apiculture		✓	✓
	ZUE1	Public health and hygiene	✓	✓	
	ZUS2	Poultry science and Management	✓		

Employability

Semester-VI /Major Based Elective course-II	Medical Lab Technology	Course Code: ZUE4
Instruction Hours: 6	Credits: 5	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To know the clinical use of instrumentation. • To study the analysis of blood, urine, sputum, semen and stool. • To study the nature and causes of various diseases. • To understand the blood component in human. • Skill in diagnosing the human disease 	
UNIT	Content	No. of Hours
I	Clinical Diagnostic equipments - Sphygmomanometer - Stethoscope - Compound microscope Centrifuge - Hot air over - Autoclave - Incubator - Refrigerator - Laminar airflow - Spectrophotometer - X- ray(Chest, Heart, Plain, Abdomen, Bones), MRI & CT Scans - ECG and EEG.	18
II	Collection of Blood - Blood grouping - blood	18

	<p>bank - Haemocytometer - Total count of Blood cells (RBC & WBC). Differential count of WBC (Leishman's stain), Platelet count, Absolute Eosinophil counts, Packed cell volume, ESR, Determination of clotting time and Bleeding time. Haemoglobinometer - Hb (Sahli's method) - Aneamias Diigital Glucometer - Blood glucose.</p>	
III	<p>Glucose tolerance test(Diabetes Mellitus), Atherosclerosis, Heart failure, Cholesterol, HDL, LDL, Urea, Creatine, Creatitine, Bill salls and Bile pigments.Composition of Urine, Methods of Urine analysis for sugar, Urea & Albumin. Glucosuria - fehling's test, Pregnancy test and Widal test</p>	18
IV	<p>General Examination - Temperature, Pulse, BP (Normal, Hypertension and Hypotension), Edema and Jaundice. Medical Emergencies - Respiratory failure, Shocks, Acute Gastroentreritis (food poisoning), haemophilia, Acute renal failure, Hypoglycemia, Amoebic dysentery, Snake bite, Rabies, Drowning. Safety precautions and First aid treatment for Superficial Wounds, Burns, Chemical poisoning and Electrical shock.</p>	18
V	<p>Diagnostic methods of Protozoan parasites - Malarial parasites and Entamoeba histolytica - Helminthes parasites - Ascaris, Tapeworm, Wuchereria and Hook Worm. VDRL test,</p>	18

	ELISA, Thyroid function test, Analysis of semen, Sputum and stools.	
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Text Books:

- 1.SAMUEL K.M – Notes on Clinical lab.
- 2.DR. NAGINI Text Book of Biochemistry.
- 3.NANCY.SR.2004.Nursing Arts Procedure- Sole Distributors –N.R.Brothers- M.Y.H Road – Indore.
- 4.ARUMUGAM.N.2014.Biotechniques- Saras Publication – Nagerkoil – Kanyakumari.

Reference Books:

- 1.METHAS P.J 1988, Practical medicine for student and Practitioners. The National book Department Mumbai,Pp 1-180.
- 2.GURUMANI N 2006, Research methodology for biological science. MJP Publications, Chennai.
- 3.HAROLD VARIEY 1988 Practical Clinical Biochemistry.
- 4.CHATTERJEE- Clinical Biochemistry.
- 5.KANAI .L.MUGARGEE-2005, Medical Laboratory Technology-A Procedure Manual for routine diagnostic tests-Tata Megraw Hill Publications.
- 6.PANIKAR C.K J AND ANATHANARAYANAN- A Text book of Microbiology.
- 7.LEHINGER – Biological Chemistry.
- 8.RAJAN.S & SELVI CHRISTY.R – Experimental Procedures in life sciences – Anjanaa Book – Koyembedu – Chennai.
- 9.RAMNIK SOOD ,2015 Concise Book of Medical laboratory Technology- Health Science Publications.

Web Resources:

1. <https://nios.ac.in/media/documents/srsec314newE/PDFEL32A.pdf>
https://www.niser.ac.in/sbs/sites/default/files/compiled_protocol_for_LAB_ORATORY_CLASSES_updated_2014.pdf

Course Outcome

C01: Acquired technical skills will help the students for collecting and processing biological specimens for analysis.

C02: Understand fundamental analytical principles and processes used in clinical laboratory testing

C03: Application of medical laboratory test will enable the students to understand normal and abnormal

C04: Students enable their critical and analytical thinking in the detection of diseases.

C05: Application of medical laboratory procedures will enable the students to distinguish normal and abnormal microscopic pathogens.

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
C01	S	S	M	S	M	S	S	S	S	S
C02	S	S	S	S	S	S	M	S	S	S
C03	S	S	M	M	M	S	M	S	S	S
C04	S	S	M	S	S	M	S	S	S	S
C05	S	S	S	S	S	S	S	S	S	S

S- Strongly correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation

Semester-III / Non Major Elective Course-1	Public Health and Hygiene	Course Code: ZUE1
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To enlighten the non- major elective students about the general knowledge on their health and hygiene. • To create general health awareness the hazardous impacts and remedy. • Understand the communicable and non communicable disease and its prevention. • Understand the different environmental pollution and its hazards. • Learn WHO programme of public health and hazards. 	
UNIT	Content	No. of Hours
I	Scope of Public health and Hygiene – nutrition and health – classification of foods – Nutritional deficiency diseases- Vitamin deficiency diseases.	6
II	Environment and Health hazards: Environmental degradation – Pollution – Air, Water, Land and Noise-associated health hazards	6
III	Communicable diseases and their preventive and	6

	control measures. Measles, Hepatitis, HIV /AIDS, Cholera, Malaria and Filariasis	
IV	Non-Communicable diseases and their preventive measures. Genetic diseases, Cancer, Cardio vascular diseases, Chronic respiratory disease, Diabetes, Epilepsy	6
V	Health Education in India - WHO Programmes - Government and Voluntary Organizations and their health services - Precautions, First Aid and awareness on epidemic/sporadic diseases	6

Text Books:

1. PARK AND PARK, 1995: Text Book of Preventive and Social Medicine – BanarsidasBhanot Publ. Jodhpur – India.

Reference Books:

1. VERMA, S. 1998 : Medical Zoology, Rastogi publ. – Meerut – India
2. SINGH, H.S. AND RASTOGI, P. 2009 : Parasitology, Rastogi Publ. India.
3. DUBEY, R.C AND MAHESWARI, D.K. 2007 : Text Book of Microbiology- S. Chand & Co. Publ. New Delhi – India.

Web Resources:

1. <https://www.nios.ac.in/media/documents/secscicour/English/Chapter-32.pdf>
2. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/ln_intro_ph_final.pdf

Course Outcome

On completion of the Course, Students should be able to

CO1: Understand public health practice requires multidisciplinary team of public health workers and professionals.

CO2: Improve the quality of life through promotion of healthy behaviors including mental health.

CO3: Learn healthy habits to protect yourself from disease and prevent germs and

infectious diseases from spreading.

C04: Understand the Socioeconomic impact of non-communicable diseases.

C05: Aware of public health is the result of society's efforts as a whole, rather than that of single individuals.

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
C01	S	S	S	S	S	S	S	S	S	S
C02	S	M	S	S	M	S	S	S	S	S
C03	S	S	S	S	S	S	S	M	S	S
C04	S	M	S	S	S	M	S	S	M	S
C05	S	S	S	S	S	S	S	S	S	S

S- Strongly correlated

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W-Weakly Correlated

N-No Correlation

Semester-IV / Skill Based Elective Course-II	Poultry Science	Course Code: ZUS2
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To understand the basics in poultry science. • To understand the management strategy • To Understand the economic importance of Poultry • Skill in observing poultry diseases. • Skill to become an entrepreneur. 	
UNIT	Content	No. of Hours
I	Introduction of Poultry Science - History & Development of Commercial Poultry Industry in India. Classification and Types of Fowls. Housing and Equipments - Construction of Poultry shed, Deep litter system, Cage system. Farming practices of Emu, Turkey, Quail and their importance.	6
II	Poultry Nutrition - Feed formulation for Chicks, Growers, Phase I to Phase III Layers & Broilers. Processing and Preservation, Feed additives	6
III	Poultry Breeding - Incubation, Hatchery Management. Brooding, Debeaking - Vaccination, Sanitation and Waste disposal.	6

IV	Economically important Poultry diseases – Bacterial[Salamonellosis, Pasteurellosis, E.Coli infection], Viral[Ranikhet disease, Fowl pox infections, Bronchitis Infection, Bursal disease], Fungal [Aflatoxicosis, Ochratoxicosis], Protozoan[Coccidiosis] – Ticks and Mites – Prevention and Control	6
V	Composition and Nutritive value of egg – Microbial spoilage – Preservation and storage of egg. Poultry meat – Care and Management of Slaughtering – Preservation of Poultry meat – Marketing of Poultry meat – Marketing of Poultry meat. Economic importance of Chicken.	6

Text Books:

1. **BANERJEE, G.C** (1992) A Text book of Animal Husbandry, Oxford and IBM Publishing & co., New Delhi.
2. **SHUKULA, G.S** and **UPADHYAY, V.B** (1997) Economic Zoology, Rakesh Rastogi Meerut.

Reference Books:

1. M.R. GNANAMANI – Modern aspects and commercial Poultry keeping – Deepam Publication.
2. JAGADISH PRASAD – Animal Husbandry & Dairy Science.
3. GOVE HAMBIDGE (2012) Diseases and Parasites of Poultry. Published by Biotech Books, New Delhi.
4. KEITH WILSON (2007) A Hand book of Poultry Practice. Published by Agrobios, Jodhpur.
5. RAM PRAKASH SINGH (2008) Published by Biotech Books, New Delhi.

Web Resources:

1. <https://dahd.nic.in/sites/default/files/Excerpts%20of%20Poultry%20Farm%20Manual-ilovepdf-compressed.pdf>
2. <https://www.helpforag.app/2018/02/livestock-production-and-management-lpm-14.html>

Course Outcome

On completion of the Course, Students should be able to

CO1: Know commercial poultry industry in India..

CO2: Understand types of poultry, feed formulation and additives

CO3: Have practical knowledge on poultry breeding processes, waste disposal and sanitation.

CO4: Aware of poultry disease prevention and control measures.

CO5: Familiar with management of slaughtering, marketing of poultry meat and its economic importance.

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	M	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	M	S	M	S	S	M	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	M	S	M	S	S	M	M	S

S- Strongly correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation

Entrepreneurship

Semester-v / Skill Based Elective Course-III	Vermiculture	Course Code: ZUE3
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To study the taxonomy and diversity of Earthworms. • To know the ecology ,biology and beneficial role of Earthworms. • To gain basic knowledge in Vermicomposting and Vermiculture. • To create awareness about vermicompost and its important as fertilizer. • Ability to provide consultancy services 	
UNIT	Content	No. of Hours
I	Earth worms – Outline Classification – Features of Eudrilidae – Megascolidae – Lumbricidae – Ecological Classification – Epigeic – Anecie and Endogeic forms – Humus Feeders – Humus Formers.	6

II	General body structures of earthworms. Morphology – Coelom – Body wall- LocomotionExcretion- Respiration- Digestive, Circulatory, Nervous and Reproductive systems- Cocoon formation	6
III	Food and Feeding of earthworm -Humus feeders- Humus formers- Saprophages- DetritivoresGeophages Role of earthworms in sustainable agriculture – organic farming – Earthworm activities- soil fertility and texture- soil aeration- water percolation- decomposition and moisture.	6
IV	Organic wastes: Municipal, Agricultural and other wastes – Animal dung- requirements/ materials required for vermiculture and vermiwash- preparation of pre-digested materials - selection of suitable species, optimal culture condition required-protection from sun light, rain, predator and parasites- methods of harvesting, packing and storage	6
V	Composting – Vermicomposting -Methods – Pit, Heap and Tank. Advantages –Products – Vermicompost and Verriwash –Earthworms in waste water management. Economy of Vermiculture. Cost benefits analysis	6

Text Books:

1. ISMAIL S.A 1970 Vermiculture, The Biology Earth worms, Orient long man, London.
2. L.S RANGANATHAN, Vermibiotechnology from soil Health to human Health, AgrobiosIndia
3. M.SEETHALAKSHMY, DR.R.SHANTHI.2012. Vermitechnology. Saras publication.

Reference Books:

1. EDWARDS C.A and P.J BOHELN 1996, Ecology and Earthworms 3rd Edition Chapman and Hall.
2. LEE K.E 1985 Earth worms Therecology and relationship with soil and land use Academic press, Sydney.
3. V. BANERJII 2003, Environmental Biotechnology.
4. S.C TALASHILKAR & A.A.K DOSANI Earthworms in Agriculture, Agrobios-India.
5. M.MARY VIOLET CHRISTY. 2008. Vermitechnology. MJP Publication.
6. GOWRAV SINGH, Organic farming & Vermiculture, ALP Books.2009.
7. SARANI. Vermicomposting & Vermiwash, Agrotech publishing.2008

Web Resources:

- 1.: <https://www.onlinebiologynotes.com/earthworm-habit-habitat-external-feature-and-morphology/>
- 2: <https://thebiologynotes.com/earthworm-habitat-morphology-locomotion/>

Course Outcome

On completion of the Course, Students should be able to

C01: Understand the classification and diversity of earthworm.

C02: Know the morphology and lifecycle of earthworm

C03: Aware of the role of earthworm in sustainable agriculture and its feeding habits.

C04: Apply the advanced techniques in organic wastes.

C05: Understand different methods of vermi composting

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
C01	S	S	M	S	M	S	S	S	M	S
C02	S	S	S	S	S	S	S	S	S	S
C03	S	S	S	S	S	S	M	S	M	S
C04	S	S	M	S	S	M	S	S	S	S
C05	S	S	S	S	S	M	S	S	S	S

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W-Weakly Correlated

N-No Correlation

Semester-III / Skill Based Elective Course-I	Apiculture	Course Code: ZUS1
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To Understand the Biology of Honey bee • Learn the Teaching of apiculture • Understand the economic importance of honey • Skill in the apiary management • Ability to do apiary cost benefit analysis 	
UNIT	Content	No. of Hours
I	History and Scope of Bee keeping: Systematics - Species diversity - Types of Honeybees in India; Biology and life-history	6
II	Honey bee colony: Caste polymorphism, Bee keeping equipments-Newton’s Bee hive. Honey extracting equipments - Honey extractor, Smoker, Queen excluder, Drone. Excluder and Bee veil.	6
III	Apiary Management: Selection of Apiary site - Supplementary feeding in dearth season - Protective measures against Bee predators - Economics of Bee	6

	keeping - Cost benefit analysis - Promotional Institution for Apiculture	
IV	Bee products: Bee Products and benefits - Honey - Chemical nature and use. Bee wax, propolis, Royal Jelly, Bee Pollen. Bee pollination and advantages	6
V	Honey bee diseases: Protozoan- Mites - Viral-causes and control	6

Text Books:

- 1.NAGARAJA.N&RAJAGOPAL.D – Honey Bees, Disease,Parasites,Pests,Predators and their Management – MJP Publishers – Chennai
- 2.RARE, S. 1988 – Introduction to Bee keeping, Vikas Publishing house

Reference Books:

1. CHERIAN, R. & K.R.RAMANATHAN, 1992, - Bee keeping in India.
.MISHRA, R.C., 1985 – Honey bees and their Management in India, ICAR.
2. SINGH, S. 1992 – Bee Keeping – ICA
3. SHARMA, P. and SINGH, L. 1987 – Hand book of Bee keeping, controller printing and stationery, Chandigar.
4. .RARE, S. 1988 – Introduction to Bee keeping, Vikas Publishing house.
5. SHUKLA, G.S. and UPADHYAY V.B (1997) Economics zoology, Rastogi Publication,
Meerut.
6. MORSE, R.A. 1990. The ABC and XYZ of Bee culture 40th edition A.1 Root & co., Ohio.
7. MANJU YADAV – Economic zoology – Discovery Publishing house – New Delhi.
8. RAVINDRANATHAN K.R. – A Text book of Economic Zoology.

9. SATHE T.V. – Fundamentals of Bee Keeping –Daya Publishing House – Delhi.
10. NAGARAJA.N&RAJAGOPAL.D – Honey Bees, Disease,Parasites,Pests,Predators and their Management – MJP Publishers – Chennai.
11. MAHINDRU.S.N – BeeKeeping – APH Publishing Corporation – New Delhi

Web-Resources:

1. <https://nios.ac.in/media/documents/nsqf/beekeeping%20theory.pdf>
2. <http://eagri.org/eagri50/ENTO232/lec03.pdf>

Course Outcome

On completion of the Course, Students should be able to

CO1: Know the scope of bee keeping and Learn various concepts of apiculture.

CO2: Understand what makes the scientific study of animal and the Bee keeping equipments

CO3: Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field .

CO4: Be aware of a broad array of career options and activities in human medicine, biomedical research and allied health professions at local or global level.

CO5: Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
C01	S	S	S	M	S	S	S	S	S	S
C02	S	S	S	S	S	S	S	S	S	S
C03	S	S	M	S	S	S	M	S	S	S
C04	S	S	S	S	M	S	S	S	S	S
C05	S	S	S	S	S	S	S	S	S	S

S- Strongly correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation

Semester-III / Non Major Elective Course-1	Public Health and Hygiene	Course Code: ZUE1
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To enlighten the non- major elective students about the general knowledge on their health and hygiene. • To create general health awareness the hazardous impacts and remedy. • Understand the communicable and non communicable disease and its prevention. • Understand the different environmental pollution and its hazards. • Learn WHO programme of public health and hazards. 	
UNIT	Content	No. of Hours
I	Scope of Public health and Hygiene – nutrition and health – classification of foods – Nutritional deficiency diseases- Vitamin deficiency diseases.	6
II	Environment and Health hazards: Environmental degradation – Pollution – Air, Water, Land and Noise-	6

	associated health hazards	
III	Communicable diseases and their preventive and control measures. Measles, Hepatitis, HIV /AIDS, Cholera, Malaria and Filariasis	6
IV	Non-Communicable diseases and their preventive measures. Genetic diseases, Cancer, Cardio vascular diseases, Chronic respiratory disease, Diabetes, Epilepsy	6
V	Health Education in India - WHO Programmes - Government and Voluntary Organizations and their health services - Precautions, First Aid and awareness on epidemic/sporadic diseases	6

Text Books:

1. PARK AND PARK, 1995: Text Book of Preventive and Social Medicine – BanarsidasBhanot Publ. Jodhpur – India.

Reference Books:

1. VERMA, S. 1998 : Medical Zoology, Rastogi publ. – Meerut – India
2. SINGH, H.S. AND RASTOGI, P. 2009 : Parasitology, Rastogi Publ. India.
3. DUBEY, R.C AND MAHESWARI, D.K. 2007 : Text Book of Microbiology- S. Chand & Co. Publ. New Delhi – India.

Web Resources:

1. <https://www.nios.ac.in/media/documents/secscicour/English/Chapter-32.pdf>
2. https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/health_science_students/ln_intro_ph_final.pdf

Course Outcome

On completion of the Course, Students should be able to

C01: Understand public health practice requires multidisciplinary team of public health workers and professionals.

C02: Improve the quality of life through promotion of healthy behaviors including mental health.

C03: Learn healthy habits to protect yourself from disease and prevent germs and infectious diseases from spreading.

C04: Understand the Socioeconomic impact of non-communicable diseases.

C05: Aware of public health is the result of society's efforts as a whole, rather than that of single individuals.

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
C01	S	S	S	S	S	S	S	S	S	S
C02	S	M	S	S	M	S	S	S	S	S
C03	S	S	S	S	S	S	S	M	S	S
C04	S	M	S	S	S	M	S	S	M	S
C05	S	S	S	S	S	S	S	S	S	S

S- Strongly correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation

Skill Development

Semester-v / Skill Based Elective Course-III	Vermiculture	Course Code: ZUE3
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To study the taxonomy and diversity of Earthworms. • To know the ecology ,biology and beneficial role of Earthworms. • To gain basic knowledge in Vermi composting and Vermi culture. • To create awareness about vermin compost and its important as fertilizer. • Ability to provide consultancy services 	
UNIT	Content	No. of Hours
I	Earth worms – Outline Classification – Features of Eudrilidae – Megascolidae – Lumbricidae – Ecological Classification – Epigeic – Anecie and Endogeic forms – Humus Feeders – Humus Formers.	6
II	General body structures of earthworms. Morphology – Coelom – Body wall- LocomotionExcretion- Respiration- Digestive, Circulatory, Nervous and Reproductive systems- Cocoon formation	6
III	Food and Feeding of earthworm -Humus feeders- Humus	6

	formers- Saprophages- DetritivoresGeophages Role of earthworms in sustainable agriculture – organic farming – Earthworm activities- soil fertility and texture- soil aeration- water percolation- decomposition and moisture.	
IV	Organic wastes: Municipal, Agricultural and other wastes – Animal dung- requirements/ materials required for vermiculture and vermiwash- preparation of pre-digested materials - selection of suitable species, optimal culture condition required-protection from sun light, rain, predator and parasites- methods of harvesting, packing and storage	6
V	Composting – Vermicomposting -Methods – Pit, Heap and Tank. Advantages –Products – Vermicompost and Vermiwash –Earthworms in waste water management. Economy of Vermiculture. Cost benefits analysis	6

Text Books:

1. ISMAIL S.A 1970 Vermiculture, The Biology Earth worms, Orient long man, London.
2. L.S RANGANATHAN, Vermibiotechnology from soil Health to human Health, AgrobiosIndia
3. M.SEETHALAKSHMY, DR.R.SHANTHI.2012. Vermitechnology. Saras publication.

Reference Books:

1. EDWARDS C.A and P.J BOHELN 1996, Ecology and Earthworms 3rd Edition Chapman and Hall.
2. LEE K.E 1985 Earth worms Therecology and relationship with soil and land use Academic press, Sydney.
3. V. BANERJII 2003, Environmental Biotechnology.

4. S.C TALASHILKAR & A.A.K DOSANI Earthworms in Agriculture, Agrobios-India.
5. M.MARY VIOLET CHRISTY. 2008. Vermitechnology. MJP Publication.
6. GOWRAV SINGH, Organic farming & Vermiculture, ALP Books.2009.
7. SARANI. Vermicomposting & Vermiwash, Agrotech publishing.2008

Web Resources:

- 1.: <https://www.onlinebiologynotes.com/earthworm-habit-habitat-external-feature-and- morphology/>
- 2.: <https://thebiologynotes.com/earthworm-habitat-morphology-locomotion/>

Course Outcome

On completion of the Course, Students should be able to

C01: Understand the classification and diversity of earthworm.

C02: Know the morphology and lifecycle of earthworm

C03: Aware of the role of earthworm in sustainable agriculture and its feeding habits.

C04: Apply the advanced techniques in organic wastes.

C05: Understand different methods of vermin composting

Mapping of COs with POs & PSOs

CO/PO	PO					PSO				
	1	2	3	4	5	1	2	3	4	5
C01	S	S	M	S	M	S	S	S	M	S
C02	S	S	S	S	S	S	S	S	S	S
C03	S	S	S	S	S	S	M	S	M	S
C04	S	S	M	S	S	M	S	S	S	S
C05	S	S	S	S	S	M	S	S	S	S

S- Strongly correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation

Semester-III / Skill Based Elective Course-I	Apiculture	Course Code: ZUS1
Instruction Hours: 2	Credits: 2	Exam Hours: 3
Internal Marks:25	External Marks:75	Total Marks: 100

Cognitive Level	K-1 Acquire/Remember K2-Understand K3-Apply K-4 Analyze K-5 Evaluate K-6 Create	
Course Objectives	Course Aims: <ul style="list-style-type: none"> • To Understand the Biology of Honey bee • Learn the Teaching of apiculture • Understand the economic importance of honey • Skill in the apiary management • Ability to do apiary cost benefit analysis 	
UNIT	Content	No. of Hours
I	History and Scope of Bee keeping: Systematics - Species diversity - Types of Honeybees in India; Biology and life-history	6
II	Honey bee colony: Caste polymorphism, Bee keeping equipments-Newton's Bee hive. Honey extracting equipments - Honey extractor, Smoker, Queen excluder, Drone. Excluder and Bee veil.	6
III	Apiary Management: Selection of Apiary site - Supplementary feeding in dearth season - Protective measures against Bee predators - Economics of Bee keeping - Cost benefit analysis – Promotional Institution	6

	for Apiculture	
IV	Bee products: Bee Products and benefits - Honey - Chemical nature and use. Bee wax, propolis, Royal Jelly, Bee Pollen. Bee pollination and advantages	6
V	Honey bee diseases: Protozoan- Mites - Viral-causes and control	6

Text Books:

1. NAGARAJA.N & RAJAGOPAL.D – Honey Bees, Disease, Parasites, Pests, Predators and their Management – MJP Publishers – Chennai
2. RARE, S. 1988 – Introduction to Bee keeping, Vikas Publishing house

Reference Books:

1. CHERIAN, R. & K.R. RAMANATHAN, 1992, - Bee keeping in India.
2. MISHRA, R.C., 1985 – Honey bees and their Management in India, ICAR.
3. SINGH, S. 1992 – Bee Keeping – ICA
4. SHARMA, P. and SINGH, L. 1987 – Hand book of Bee keeping, controller printing and stationery, Chandigar.
5. RARE, S. 1988 – Introduction to Bee keeping, Vikas Publishing house.
6. SHUKLA, G.S. and UPADHYAY V.B (1997) Economics zoology, Rastogi Publication,
7. Meerut.
8. MORSE, R.A. 1990. The ABC and XYZ of Bee culture 40th edition A.1 Root & co., Ohio.
9. MANJU YADAV – Economic zoology – Discovery Publishing house – New Delhi.
10. RAVINDRANATHAN K.R. – A Text book of Economic Zoology.
11. SATHE T.V. – Fundamentals of Bee Keeping – Daya Publishing House – Delhi.

S- Strongly correlated

M-Moderately Correlated

W-Weakly Correlated

N-No Correlation