2018

[OBE DESIGN- ZOOLOGY DEPARTMENT]

PREFACE

Outcome Based Education (OBE) is the educational approach which focuses on student centric education in the context of development of personal, social, professional and knowledge (KSA) requirements in one's career and life. It is the decade ago curriculum development methodology. The educational triangle of _LEARNING-ASSESSMENT-TEACHING_ is the unique nature of the OBE approach. The curriculum practices such as Competency Based Curriculum, Taylor's Model of Curriculum Development, Spadys' Curriculum principles, Blooms taxonomy and further use of assessment methodologies like, Norm-reference testing and Criterion reference testing, etc is being practiced since decades. It is also interesting to know that, globally, different countries and universities adopts the curriculum development models/approaches such as, CDIO (Conceive-Design-Implement-Operate), Evidenced Based Education, Systems' Approach, etc as the scientific and systematic approaches in curriculum design.

The authorities of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) in-lieu of accreditation standards of National Assessment and Accreditation Council, decided to opt for Outcomes Based Education (OBE). As the part of the decision, different meetings, workshops and presentations were held at the campus of university.

This document is the outcome of different meetings and workshops held at university level and department level. The detailed document is designed and the existing curriculum of the department is transformed in to the framework of OBE. This is the first step towards the implementation of OBE in the department. The document will serve all stakeholders in the effective implementation of the curriculum. The OBE is continuous process for quality enhancement and it will go a long way in order to enhance the competencies and employability of the graduates/Post-graduates of the university department.

Head of Department

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OUTCOME BASED EDUCATION

Faculty of Science & Technology

Department of Zoology

1. Mission:

Mission Statement

- Provide inexpensive educational services, inspire to all the section of society to get expertise /skills at P.G. and above level in biological sciences.
- To develop research aptitude and a scientific advancement.
- Inculcate high values through a liberal education and also to provide platform to have non-formal educational services.
- To bring about an awareness regarding nature and biodiversity and help to solve different problems to establish sound and peaceful environment and life for community and society.
- Provide a broad range of Transform society through the empowerment of youth.
- Reinvent ourselves in response to the changing demands of society with high moral values as a good citizen.

2. Vision:

Vision Statement

The center for zoological research and teaching for the holistic development of the student to contribute for the welfare of human and animal through the research and innovation practices of the department.

3. Title of the Program (s):
a. **Master of Science (Zoology)**

4. Program Educational Objectives:
The program educational objectives (PEO) are the statement that describes the career and professional achievement after the program of studies (graduation/ post-graduation). The PEO s are driven form question no. (ii) of the Mission statement (What is the purpose of organization). The PEOs can be minimum three and maximum five.

PEO1: To have advance knowledge and application of zoology in the field of research, and developmental domains.

PEO2: To provide the professional services to industry, research organization, institutes.

PEO3: To provide the professional consultancy and research support for the relevant organization in the domain of super specialization.

PEO4: To opt for higher education, disciplinary & multi-disciplinary research and to be a life-long learner.

PEO5: To provide, value based and ethical leadership in the professional and social life.

5. Program Outcomes:

The program outcomes (PO) are the statement of competencies/ abilities. POs are the statement that describes the knowledge and the abilities the graduate/ post-graduate will have by the end of program studies.

a. Application of advanced knowledge of Taxonomy, Bio-chemistry, Genetics, cell biology and aspects of zoological domains/subjects (structures and functions).
b. Analyze zoological structures and functions and work on the developmental of their life.
c. The ability to exercise critical judgment, independent thinking and problem solving in human and animal physiological structure, phenomenon and functions;
d. Familiarity with the kinds of data generated by biological and environmental research programs;
e. The ability to writing scientific reports and communicate results in oral presentations;

6. Course- Program outcome Matrix:

The Program Outcomes are developed through the curriculum (curricular/co-curricular-extra-curricular activities). The program outcomes are attained through the course implementation. As an educator, one must know, ***"to which POs his/her course in contributing?"***. So that one can design the learning experiences, select teaching method and design the tool for assessment. Hence, establishing the Corse-PO matrix is essential step in the OBE. The course-program outcomes matrix indicates the co-relation between the courses and program outcomes. The CO-PO matrix is the map of list of courses contributing to the development of respective POs.

The template is provided in the below table.

Course Title	a	b	c	d	e
401	*	*	*		
402	*	*	*		
403	*	*	*		
404	*	*	*		
405	*	*	*		
406	*	*	*		
441	*	*	*	*	*
442	*	*	*	*	*
443	*	*	*	*	*
444	*	*	*	*	*
446	*	*	*	*	*
447	*	*	*	*	*
411	*	*	*		
412	*	*	*		
413	*	*	*		
414	*	*	*	*	*
415	*	*	*		
416	*	*	*		
451	*	*	*	*	*
452	*	*	*	*	*
453	*	*	*	*	*
454	*	*	*	*	*
456	*	*	*	*	*
457	*	*	*	*	*
501		*	*	*	
502		*	*	*	*
503		*	*	*	
504		*	*	*	
505		*	*	*	
506		*	*	*	
541		*	*	*	
542		*	*	*	
543		*	*	*	
544		*	*	*	
545		*	*	*	
546		*	*	*	
547		*	*	*	
511		*	*	*	*
512		*	*	*	*
513		*	*	*	*
514		*	*	*	*
515		*	*	*	*

516		*	*	*	*
551		*	*	*	*
552		*	*	*	*
553		*	*	*	*
554		*	*	*	*
555		*	*	*	*
557		*	*	*	*
PROJECT		*	*	*	*

7. Course Outcomes (for all courses):

The course outcomes are the statement that describes the knowledge & abilities developed in the student by the end of course (subject) teaching. The focus is on development of abilities rather than mere content. There can be 5 to 7 course outcomes of any course. These are to be written in the specific terms and not in general. The list of Course Outcomes is the part of ***Annexure-C*** attached herewith.

8. Set Target levels for Attainment of Course Outcomes:

The course outcome attainment is assessed in order to track the graduates' performance w.r.t target level of performance. The CO-PO attainment is the tool used for continuous improvement in the graduates' abilities through appropriate learning & teaching strategies. In order to assess students' performance with respect to abilities (at the end of course teaching/by the end of program) the course outcome attainment are measured/calculated. In order to calculate the program outcome attainment, the course outcome attainment is calculated. Prior to that, the course-program outcome mapping is done.

9. Set Target level for Attainment of Program Outcomes:

The program outcome attainment is assessed in order to track the graduates' performance w.r.t target level of performance. The CO-PO attainment is the tool used for continuous improvement in the graduates' abilities through appropriate learning & teaching strategies. In order to assess students' performance with respect to abilities (at the end of course teaching/by the end of program) the course outcome attainment and program outcome attainment is measured/calculated. The program outcome attainment is governed by curricular, co-curricular and extra-curricular activities including the stakeholders' participation. The direct method and indirect method is adopted to calculate the PO attainment. The direct method implies the attainment by course outcomes contributing to respective program outcomes. And indirect method is the satisfaction/feed-back survey of stakeholders. In order to calculate the program outcome attainment, the course outcome attainment is calculated. Prior to that, the course-program outcome mapping is done.

The set target level is the set benchmark to ensure the continuous improvements in the learners/ graduates' performance.

10. Course Attainment Levels:
   a. CO attainment is defined/set at three levels;
   b. The CO attainment is based on end term examination assessment and internal assessment;
   c. The Co attainment is defined at three levels in ascending order-
      i. e.g. For end term and internal examination;
      ii. Level-1: 30% students scored more than class average
      iii. Level-2: 40% students score more than class average;
      iv. Level-3: 50% students score more than class average.
   d. The target level is set (e.g. Level-2). It indicates that, the current target is level-2; 40% students score more than class average. The CO attainment is measured and the results are obtained. Based on the results of attainment, the corrective measures/remedial action are taken.
   e. CO Attainment= 80% (Attainment level in end term examination) + 20% (Attainment level in internal examination).

11.Program attainment Level:
   a. PO attainment is defined at five levels in ascending order;
   b. The PO attainment is based on the average attainment level of corresponding courses (Direct Method) and feed-back survey (Indirect method);
   c. The PO attainment levels are defined / set as stated below;
      i. Level-1: Greater than 0.5 and less than 1.0 (0.5>1)- Poor
      ii. Level-2: 1.0>1.5-Average
      iii. Level-3: 1.5>2.0-Good
      iv. Level-4: 2.0>2.5-Very Good
      v. Level-5: 2.5>3.0 -Excellent
   d. The PO attainment target level is set/defined (say, Level-4). It implies that, the department is aiming at minimum level-4 (very good) in the performance of abilities by the graduates. Based upon the results of attainment, the remedial measures are taken;
   e. PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).

12. The Results of CO Attainment:

The Results of CO Attainment is provided in Annexure-B

FOR EXAMPLE:

COURSE CODE/TITLE: ZOO-502

e.g. For end term and internal examination;
i.   Level-1: 30% students scored more than class average
ii.   Level-2: 40% students score more than class average;
iii.   Level-3: 50% students score more than class average

Average Marks in External examination: 45.53 i.e. 46.00

% Students score more than 46 is 33/68 i.e. 48.53% i.e. Levl-2

Average Marks in Internal examination= 10.70 i.e. 11.00

% Students score more than 11 is 35/68 i.e.51.47 %, i.e. Level-3

A (CO) CHE-103= 80% (2) +20(3)

=1.6+0.6

= 2.2

Hence, The attainment level is Level-2 and the set target level is Level-2 and therefore the CO is Fully attained.

Table No. 1.0: CO Attainment Level

Course Title	CO Attainment Value	Target Attainment Level	Fully Attained/ Not Attained	Remedial Measures
401	3	2	**Fully Attained**	
402	2.2	2	**Fully Attained**	
403	2.8	2	**Fully Attained**	
404	1	2	**Fully Attained**	
405	3	2	**Fully Attained**	
406	3	2	**Fully Attained**	
441	3	2	**Fully Attained**	
442	2	2	**Fully Attained**	
443	3	2	**Fully Attained**	
444	3	2	**Fully Attained**	
446	3	2	**Fully Attained**	
447	3	2	**Fully Attained**	

411	3	2	**Fully Attained**	
412	2.2	2	**Fully Attained**	
413	3	2	**Fully Attained**	
414	2	2	**Fully Attained**	
415	3	2	**Fully Attained**	
416	2	2	**Fully Attained**	
451	3	2	**Fully Attained**	
452	3	2	**Fully Attained**	
453	3	2	**Fully Attained**	
454	3	2	**Fully Attained**	
456	3	2	**Fully Attained**	
457	3	2	**Fully Attained**	
501	2.8	2	**Fully Attained**	
502	2.2	2	**Fully Attained**	
503	2.6	2	**Fully Attained**	
504	3	2	**Fully Attained**	
505	2.2	2	**Fully Attained**	
506	2	2	**Fully Attained**	
541	3	2	**Fully Attained**	
542	3	2	**Fully Attained**	
543	3	2	**Fully Attained**	
544	2	2	**Fully Attained**	
545	3	2	**Fully Attained**	
546	3	2	**Fully Attained**	
547	2	2	**Fully Attained**	
511	2.2	2	**Fully Attained**	
512	3	2	**Fully Attained**	
513	3	2	**Fully Attained**	
531	3	2	**Fully Attained**	
532	2.2	2	**Fully Attained**	
534	2	2	**Fully Attained**	
551	2	2	**Fully Attained**	
552	1	2	**Fully Attained**	
553	3	2	**Fully Attained**	
554	3	2	**Fully Attained**	
555	3	2	**Fully Attained**	
557	3	2	**Fully Attained**	
PROJECT	3	2	**Fully Attained**	

13. The Results of PO Attainment:

The Results of PO attainment are provided in Annexure-B

FOR EXAMPLE:

PO NO.: a

(Note: Refer point No. 11 above which describes the attainment level and set target attainment level)

PO Attainment= 80% (Average attainment level by direct method) + 20% (Average attainment level by indirect method).

A (PO) a = 80% (3+2.2+2.8+1+3+3+3+2+3+3+3+3+3+2.2+3+2+3+2+3+3+3+3+3+3)/24 +
       20% (2.72)
     =80% (2.7) 2+ 20% (2.72)
    = 2.72 i.e. Level-5. The Target Level is Level-4.
    Hence, PO is attained

Table No. 2.0 PO Attainment Level

PO/PSO number	PO Attainment Value	Target Attainment level	Fully attained/ Not Attained	Remedial Measures
a	2.72	4	Fully attained	Not Applicable
b	2.66	4	Fully attained	
c	2.66	4	Fully attained	
d	2.69	4	Fully attained	
e	2.71	4	Fully attained	

14. Planned Actions for Course Attainment:

Not applicable.

15. Planned Actions for Program Outcome Attainment:

Not Applicable.

ANNEXURE-B

RESULTS OF CO-PO ATTAINMENT

PO ATTAINMENT: M.Sc. ZOOLOGY					
Course Code	A	b	c	d	e
401	3	3	3	3		
402	2.2	2.2	2.2	2.2		
403	2.8	2.8	2.8	2.8		
404	1	1	1	1		
405	3	3	3	3		
406	3	3	3	3		
441	3	3	3	3	3	3
442	2	2	2	2	2	2
443	3	3	3	3	3	3
444	3	3	3	3	3	3
446	3	3	3	3	3	3
447	3	3	3	3	3	3
411	3	3	3	3		
412	2.2	2.2	2.2	2.2		
413	3	3	3	3		
414	2	2	2	2	2	2
415	3	3	3	3		
416	2	2	2	2		
451	3	3	3	3	3	3
452	3	3	3	3	3	3
453	3	3	3	3	3	3
454	3	3	3	3	3	3
456	3	3	3	3	3	3
457	3	3	3	3	3	3
501	2.8		2.8	2.8	2.8	
502	2.2		2.2	2.2	2.2	2.2
503	2.6		2.6	2.6	2.6	
504	3		2	2	2	
505	2.2		2.2	2.2	2.2	
506	2		3	3	3	
541	3		3	3	3	
542	3		3	3	3	
543	3		3	3	3	
544	2		2	2	2	
545	3		3	3	3	
546	3		3	3	3	

547	2		2	2	2	
511	2.2		2.2	2.2	2.2	2.2
512	3		3	3	3	3
513	3		3	3	3	3
531	3		3	3	3	3
532	2.2		2.2	2.2	2.2	2.2
534	2		2	2	2	2
551	2		2	2	2	2
552	1		1	1	1	1
553	3		3	3	3	3
554	3		3	3	3	3
555	3		3	3	3	3
557	3		3	3	3	3
PROJECT	3		3	3	3	3
	2.66	2.72	2.66	2.66	2.69	2.71

ANNEXURE-C

COURSE OUTCOMES

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc.First Year (Semester – I)

Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	**ZOO-401**	Taxonomy and Animal Diversity	4	4	60	100/40
	ZOO-402	Ecology	4	4	60	100/40
	ZOO-403	Biochemistry	4	4	60	100/40
Research component	**ZOO-404**	Research Methodology	2	2	30	50/20
Elective Courses (ANY ONE)	**ZOO-421**	Helminthology - I	4	4	60	100/40
	ZOO-422	Protozoology – I	4	4	60	100/40
	ZOO-423	Entomology – I	4	4	60	100/40
	ZOO-424	Endocrinology - I	4	4	60	100/40
Compulsory course		Constitution of India	2	2	30	50/20
		Total Credit	**20**	**20**	**300**	**500/200**

Practical course

Paper code	Practical	Credit	Work Load hrs		Max./Min Mark
			Per week	per Term	
ZOO -441	Practical based on ZOO-401	2	4	60	50/20
ZOO-442	Practical based on ZOO-402	2	4	60	50/20
ZOO-443	Practical based on ZOO-403	2	4	60	50/20
ZOO-444	Practical based on ZOO- 421	2	4	60	50/20
ZOO-445	Practical based on ZOO-422	2	4	60	50/20
ZOO-446	Practical based on ZOO-423	2	4	60	50/20

ZOO-447	Practical based on ZOO-424	2	4	60	50/20
	Total Credit	**8**	**16**	**240**	**200**

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc. Ist Year Semester – II

Course	Theory course					
	Paper code	**Paper nomenclature**	**Credit**	**Work Load hrs**		**Max/Min Marks**
				Per week	Per term	
Core Course	**ZOO-411**	General Animal Physiology	4	4	60	100/40
	ZOO-412	Genetics	4	4	60	100/40
	ZOO-413	Cell Biology	4	4	60	100/40
Research Component	**ZOO-414**	Scientific Writing	2	2	30	50/20
Elective Courses (Any ONE)	**ZOO-431**	Helminthology – II	4	4	60	100/40
	ZOO-432	Protozoology – II	4	4	60	100/40
	ZOO-433	Entomology – II	4	4	60	100/40
	ZOO-434	Endocrinology - II	4	4	60	100/40
		Total Credit	**18**	**18**	**270**	**450/180**
Practical course						
Paper code	Practicals		Credits	Work Load hrs		Max./Min Mark
				Per week	Per Term	
ZOO-451	Practical based on ZOO-411		2	4	60	50/20
ZOO-452	Practical based on ZOO-412		2	4	60	50/20
ZOO-453	Practical based on ZOO-413		2	4	60	50/20
ZOO-454	Practical based on ZOO- 431		2	4	60	50/20
ZOO-455	Practical based on ZOO-432		2	4	60	50/20
ZOO-456	Practical based on ZOO-433		2	4	60	50/20
ZOO-457	Practical based on ZOO-434		2	4	60	50/20

Total Credit		8	16	240	200/80

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc. Second year (Semester – III)

Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	ZOO-501	Developmental Biology	4	4	60	100/40
	ZOO-503	Fundamental processes	4	4	60	100/40
Elective Courses (ANY ONE)	ZOO-521	Fishery Science I	4	4	60	100/40
	ZOO-522	Animal Physiology-I { Invertebrate }	4	4	60	100/40
	ZOO-523	Molecular Biology- I	4	4	60	100/40
	ZOO-524	Applied Parasitology-I	4	4	60	100/40
Research Component	ZOO-502	Quantitative biology	4	4	60	100/40
		Project Work**	4	4	60	Evaluated inIVthSem.
Service courses* (ANY ONE)	ZOO-580	Apiculture	4	4	60	100/40
	ZOO-581	Personality Development	4	4	60	100/40
	ZOO-582	Pisciculture	4	4	60	100/40
	ZOO-583	Sericulture	4	4	60	100/40
	ZOO-584	Wild life & nature interpretation	4	4	60	100/40
		Total Credit	**24**	**24**	**360**	**500/200**
Practical course						
Paper code	Practicals		Credits	Work Load hrs		Max./Min Mark
				Per week	Per Term	
ZOO-541	Practicals based on ZOO-501 Developmental Biology		2	4	60	50/20
ZOO-542 (Research	Practicals based on ZOO-502 Quantitative biology		2	4	60	50/20

Compone nt)					
ZOO-543	Practicals based on ZOO-503 Fundamental processes	2	4	60	50/20
ZOO-544	Practicals based on zoo-521 Fishery Science I	2	4	60	50/20
ZOO-545	Practicals based on ZOO-522 Animal Physiology I	2	4	60	50/20
ZOO-546	Practicals based on ZOO-523 Molecular Biology- I	2	4	60	50/20
ZOO-547	Practicals based on ZOO-524 Applied Parasitology-I	2	4	60	50/20
	Total Credit	**8**	**16**	**240**	**200/80**

* Service course as decision of University and ** project work allotted

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc. Second year (Semester – IV)

Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	**ZOO-511**	Evolution and Animal behavior	4	4	60	100/40
	ZOO-513	Applied Zoology	4	4	60	100/40
Elective Courses (Any ONE)	**ZOO-531**	Fishery Science –II	4	4	60	100/40
	ZOO-532	Animal Physiology – II (Vertebrates)	4	4	60	100/40
	ZOO-533	Molecular Biology - II	4	4	60	100/40
	ZOO-534	Applied Parasitology – II	4	4	60	100/40
Research Component	**ZOO-512**	Methods in Biology	4	4	60	100/40
		Total Credit	16	16	240	400/160

Practical course

Paper code	Practicals	Credits	Work Load hrs		Max./Min Mark
			Per week	Per Term	
ZOO-551	Practical based on ZOO-511	2	4	60	50/20
ZOO-552 (Research Component)	Practical based on ZOO-512	2	4	60	50/20
ZOO-553	Practical based on ZOO-513	2	4	60	50/20
ZOO-554	Practical based on ZOO- 531	2	4	60	50/20
ZOO-555	Practical based on ZOO-532	2	4	60	50/20
ZOO-556	Practical based on ZOO-533	2	4	60	50/20
ZOO-557	Practical based on ZOO-534	2	4	60	50/20
Research Component * ZOO- 561	Project work**	4	4	120	100/40
	Total Credit	**12**	**20**	**360**	**300/120**

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc.First Year (Semester – I)

Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	**ZOO-401**	Taxonomy and Animal Diversity	4	4	60	100/40
	ZOO-402	Ecology	4	4	60	100/40
	ZOO-403	Biochemistry	4	4	60	100/40
Research component	**ZOO-404**	Research Methodology	2	2	30	50/20
Elective Courses (ANY ONE)	**ZOO-421**	Helminthology - I	4	4	60	100/40
	ZOO-422	Protozoology – I	4	4	60	100/40
	ZOO-423	Entomology – I	4	4	60	100/40
	ZOO-424	Endocrinology - I	4	4	60	100/40
Compulsory course		Constitution of India	2	2	30	50/20
		Total Credit	**20**	**20**	**300**	**500/200**

Practical course						
Paper code	Practical		Credit	Work Load hrs		Max./Min Mark
				Per week	per Term	
ZOO -441	Practical based on ZOO-401		2	4	60	50/20
ZOO-442	Practical based on ZOO-402		2	4	60	50/20
ZOO-443	Practical based on ZOO-403		2	4	60	50/20
ZOO-444	Practical based on ZOO- 421		2	4	60	50/20
ZOO-445	Practical based on ZOO-422		2	4	60	50/20
ZOO-446	Practical based on ZOO-423		2	4	60	50/20

ZOO-447	Practical based on ZOO-424	2	4	60	50/20
	Total Credit	**8**	**16**	**240**	**200**

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc. Ist Year Semester – II

Course	Theory course					
	Paper code	**Paper nomenclature**	**Credit**	**Work Load hrs**		**Max/Min Marks**
				Per week	Per term	
Core Course	**ZOO-411**	General Animal Physiology	4	4	60	100/40
	ZOO-412	Genetics	4	4	60	100/40
	ZOO-413	Cell Biology	4	4	60	100/40
Research Component	**ZOO-414**	Scientific Writing	2	2	30	50/20
Elective Courses (Any ONE)	**ZOO-431**	Helminthology – II	4	4	60	100/40
	ZOO-432	Protozoology – II	4	4	60	100/40
	ZOO-433	Entomology – II	4	4	60	100/40
	ZOO-434	Endocrinology - II	4	4	60	100/40
		Total Credit	**18**	**18**	**270**	**450/180**
Practical course						
Paper code	Practicals		Credits	Work Load hrs		Max./Min Mark
				Per week	Per Term	
ZOO-451	Practical based on ZOO-411		2	4	60	50/20
ZOO-452	Practical based on ZOO-412		2	4	60	50/20
ZOO-453	Practical based on ZOO-413		2	4	60	50/20
ZOO-454	Practical based on ZOO- 431		2	4	60	50/20
ZOO-455	Practical based on ZOO-432		2	4	60	50/20
ZOO-456	Practical based on ZOO-433		2	4	60	50/20
ZOO-457	Practical based on ZOO-434		2	4	60	50/20

Total Credit		8	16	240	200/80

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
Department of Zoology
M. Sc. Second year (Semester – III)

Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	ZOO-501	Developmental Biology	4	4	60	100/40
	ZOO-503	Fundamental processes	4	4	60	100/40
Elective Courses (ANY ONE)	ZOO-521	Fishery Science I	4	4	60	100/40
	ZOO-522	Animal Physiology-I { Invertebrate }	4	4	60	100/40
	ZOO-523	Molecular Biology- I	4	4	60	100/40
	ZOO-524	Applied Parasitology-I	4	4	60	100/40
Research Component	ZOO-502	Quantitative biology	4	4	60	100/40
		Project Work**	4	4	60	Evaluated inIVthSem.
Service courses* (ANY ONE)	ZOO-580	Apiculture	4	4	60	100/40
	ZOO-581	Personality Development	4	4	60	100/40
	ZOO-582	Pisciculture	4	4	60	100/40
	ZOO-583	Sericulture	4	4	60	100/40
	ZOO-584	Wild life & nature interpretation	4	4	60	100/40
		Total Credit	**24**	**24**	**360**	**500/200**
Practical course						
Paper code	Practicals	Credits	Work Load hrs		Max./Min Mark	
			Per week	Per Term		
ZOO-541	Practicals based on ZOO-501 Developmental Biology	2	4	60	50/20	
ZOO-542 (Research	Practicals based on ZOO-502 Quantitative biology	2	4	60	50/20	

Compone nt)					
ZOO-543	Practicals based on ZOO-503 Fundamental processes	2	4	60	50/20
ZOO-544	Practicals based on zoo-521 Fishery Science I	2	4	60	50/20
ZOO-545	Practicals based on ZOO-522 Animal Physiology I	2	4	60	50/20
ZOO-546	Practicals based on ZOO-523 Molecular Biology- I	2	4	60	50/20
ZOO-547	Practicals based on ZOO-524 Applied Parasitology-I	2	4	60	50/20
	Total Credit	**8**	**16**	**240**	**200/80**

* Service course as decision of University and ** project work allotted

Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
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Course	Theory course					
	Paper code	Paper nomenclature	Credit	Work Load hrs		Max/Min Marks
				Per week	Per term	
Core Course	**ZOO-511**	Evolution and Animal behavior	4	4	60	100/40
	ZOO-513	Applied Zoology	4	4	60	100/40
Elective Courses (Any ONE)	**ZOO-531**	Fishery Science –II	4	4	60	100/40
	ZOO-532	Animal Physiology – II (Vertebrates)	4	4	60	100/40
	ZOO-533	Molecular Biology - II	4	4	60	100/40
	ZOO-534	Applied Parasitology – II	4	4	60	100/40
Research Component	**ZOO-512**	Methods in Biology	4	4	60	100/40
		Total Credit	16	16	240	400/160

Practical course

Paper code	Practicals	Credits	Work Load hrs		Max./Min Mark
			Per week	Per Term	
ZOO-551	Practical based on ZOO-511	2	4	60	50/20
ZOO-552 (Research Component)	Practical based on ZOO-512	2	4	60	50/20
ZOO-553	Practical based on ZOO-513	2	4	60	50/20
ZOO-554	Practical based on ZOO- 531	2	4	60	50/20
ZOO-555	Practical based on ZOO-532	2	4	60	50/20
ZOO-556	Practical based on ZOO-533	2	4	60	50/20
ZOO-557	Practical based on ZOO-534	2	4	60	50/20
Research Component * ZOO- 561	Project work**	4	4	120	100/40
	Total Credit	**12**	**20**	**360**	**300/120**

Paper NO. ZOO- 401
Taxonomy and Animal diversity

Course Outcomes:
1. To describe the fundamental aspects of taxonomy.
2. To analyze the animal diversity.
3. To apply concepts and principles of taxonomy in analyzing animals.
4. To describe the animal diversity.

Paper No. ZOO- 402
ECOLOGY

Course Outcomes:
1. To describe fundamental aspects of ecosystems.
2. To analyze and describe the different ecosystems and biological diversity.
3. To describe the importance of interactions among the species.
4. To explain the importance of maintenance, conservation of ecosystems.
5. To analyze and describe the current trends in conservation biology, wildlife biology and management.

Paper No. ZOO 403
BIOCHEMISTRY

Course Outcomes :
1. To explain the fundamental aspects of Biochemistry.
2. To perform/operate different biological reaction mechanism.
3. To explain the process of metabolism.
4. To analyze and describe the structure and functions of the biochemical molecules and their interactions

PAPER ZOO-404

RESEARCH METHODOLOGY

Course Outcomes:
1. To explain fundamental aspects of Research.
2. To describe different types of research in biology.
3. To design the research proposal.
4. To describe the methods of research and its appropriate application in zoological research.

Paper No. ZOO-421

Helminthology- I

Course Outcomes

1. Explain concepts of Helminthology.
2. Describe Cestodes & Trematodes.
3. Explain types of important cestodes & Trematodes.
4. To collect, identify important cestodes and Trematodes, from locally available hosts.
5. To develop the experts in the field of Helminthology.

Paper No. ZOO-422
Protozoology- I

Course Outcomes :

1. To explain the basic concepts of 28systematic28y.
2. To describe 28systematic of Subkingdom Protozoa .
3. To analyze and describe the biological importance of free living Protozoa.
4. To implement the methodology of collection and identification of free living protozoa.
5. To describe the culture methods of free living protozoa.

Paper No.-ZOO-423
Entomology I

Course Outcomes:-
1. To develop a strong foundation in entomology, including understanding of the importance of insects to human society.
2. To analyze and explain the insects for their external and internal features,
3. To analyze and explain the insect biology such as morphology, physiology, ecology, behavior, genetics, phylogeny, ontogeny and population biology.

Paper No. ZOO-424
Endocrinology I

Course Outcomes:
1. To describe the endocrine glands/ tissue, so far identified in invertebrates.
2. To describe the neuroendocrine system and their hormones.
3. To describe and implement/practice/experiment histology and physiological interaction of endocrine hormones and their regulation by environmental factors in invertebrates is the tenet of each unit.
4. To experiment /practice endocrine manipulations that is used in Aquaculture.

Paper No. ZOO-411

General Animal Physiology

Objectives :-
1. To describe the physiological processes important in medical, Non- medical and veterinary sciences.
2. To experiment and analyze the physiological processes.
3. To compare the physiological processes in medical, non-medical and veterinary science.
4. To analyse the physiological process in research and applications.

Paper No. ZOO-412
Genetics

Course Outcomes :
1. To describe the hereditary biology
2. To analyze and explain the mechanism involved in hereditary diseases and disorders.
3. To explain the fundamental processes of life.

Paper No. ZOO-413
Cell Biology

Course Outcomes:
1. To describe the applications of cell biology in zoological science.
2. To analyze and describe the fundamental process governing life and information flow in cell
3. To apply the knowledge of cell biology in its application and research.

PAPER ZOO-414

SCIENTIFIC WRITING

Course Outcomes :
1. To demonstrate/ implement scientific writing.
2. To analyze the structure and different types of reports.
3. To identify and list the importance of facets of scientific writing.
4. To explain the IPR, plagiarism in research.

Paper No. ZOO-431
Helminthology II

Course Outcomes
 1. Explain the basic concepts of Helminthology.
2. Analyze and explain the major types of important helminth parasites(Animal & plant Nematodes).
4. Develop the ability to collect, identify important Nematodes and Plant Nema from locally available hosts.
5. To prepare the experts in the field of Helminthology

Paper No. ZOO-432
Protozoology II

Course Outcomes :
 1. To describe the systematics of Subkingdom Protozoa .
2. To analyze and explain the biological importance of parasitic Protozoa.
3. To describe and implement the methodology of collection and identification of parasitic protozoa.

Paper No.ZOO-433
Entomology II

Course Outcomes:-
1. To develop a strong foundation in entomology, including understanding of the importance of insects to human society.
2. To familiarize the students with identification of insect pests, vectors and their control methods.
3. To introduce the students with entomological cottage industry.

Paper No. ZOO-434
Endocrinology II

Course Outcomes:
1. Describe the aspects of vertebrate endocrinology.
2. Explain the morphology and histological structure of endocrine glands and their hormones attributed with various physiological functions in vertebrates.
3. Analyze and describe the classes of hormones, synthesis and general mechanism of hormone action in   vertebrates.

Paper No. ZOO 501

Developmental Biology

Course Outcomes:-
1. To analyze and describe the evolving biological science with respect to Developmental biology.
2. To describe the fundamental process governing development of life.

Paper No. ZOO-503
Fundamental Processes

Course Outcomes:-
1. To describe the evolving biological science at molecular level.
2. To describe the fundamental process governing life and information flow in cell.
3. To inculcate interest in molecular biology research and capacity building.

Paper No. ZOO- 521
Fishery Science-I

Course Outcomes:-
1. To develop the scientific outlook and awareness in Inland water bodies and its great potential for fish and fish seed production.
2. To analyze and describe the phylogeny of fishes.
3. Application of the fishery science knowledge for the biological productivity of inland waters.
4. Explain the phenomenon of commercial fish species exploitation by sharing ecological niches.

Paper No. ZOO- 522
Animal Physiology – I (Invertebrate Physiology)

Course Outcomes :-
1. To explain the physiological processes in invertebrates.
2. To describe the physiological processes and their use in medical, Non- medical and veterinary sciences.
3. To experiment and monitor and analyze the physiological processes in medical, non- medical and veterinary science.

Paper No. ZOO- 524

Applied Parasitology- I

Course Outcomes:
1. Explain the basic and general concepts of Parasitology.
2. Describe the major types of parasites of medical & veterinary importance
3. Implement the identification of common parasites of humans and animals.
4. Design and evaluate an intervention to control food and waterborne diseases.
5. Critically read and evaluate epidemiologic studies in the different disease
6. Critically read and evaluate epidemiologic studies in emerging disease and bioterrorism literature.
7. To prepare the experts in the field of Medical and veterinary Parasitology.

Paper No. ZOO-502
Quantitative Biology

Objective:
1. Apply Mathematical and statistical approaches in understanding biological concepts.
2. Use such tools of greater significance.
3. Implement computing and data mining inmodern sciences.

Paper No. ZOO 511

Evolution, Animal behavoiur

Course Outcomes :
1. To analyze and explain the Origin of various animal groups.
2. To describe the mechanism involved in evolution.
3. To describe the significance and pattern of evolution.
4. To analyze and explain the behavioral mechanisms.

Paper No. ZOO 513
Applied Zoology

Course Outcomes :
1. To analyse the application of zoological science in different sciences/modern science..
2. To describe the principle and functioning of new technologies used in Zoology.

Paper No. ZOO- 531
Fishery Science-II

Objectives

1. Analyze and explain the recent trends and techniques of hybridization and induced breeding.
2. Describe the role of endocrine glands and their role in reproductive fish biology.
3. Explain processing, storage and preservation of pituitary gland in fishes.
4. Describe the adaptations, migration, feeding etc. in fishes.
5. Explain the lateral line system and it's role in fishes.
6. Explain the fish behavior and physiological aspects.

Paper No. ZOO- 532
Animal Physiology – II (Vertebrate Physiology)

Objectives

1. The To explain the physiological processes in invertebrates.
2. To describe the physiological processes and their use in medical, Non- medical and veterinary sciences.
3. To experiment and monitor and analyze the physiological processes in medical, non-medical and veterinary science.

Paper No. ZOO-533
Molecular Biology II

COURSE OUTCOMES:

1. To analyze and describe evolving biological science at molecular level.
2. To explain the fundamental process governing life and information flow
3. To inculcate interest in research molecular biology and creating human capacity for this region.

Paper No. ZOO- 534
Applied Parasitology- II

Course Outcomes:

1. Explain basic and general concepts of Parasitology.
2. Describe types of parasites of medical & veterinary importance.
3. Implement basics of identification of common parasites of humans and animals.
4. Design and evaluate an intervention to control food and waterborne diseases.
5. Critically read and evaluate epidemiologic studies in the different disease.
6. Critically read and evaluate epidemiologic studies in emerging disease and bioterrorism literature.
7. To prepare the experts in the field of Medical and veterinary Parasitology.

Paper No. ZOO-512
Methods in Biology

Course Outcomes:
1. To describe the biochemical molecules and their interactions
2. To explain principle and functioning of instruments used for biological study
3. To implement/experiment different methods in biological study.
4. Review the significance of methods in biology.