



## MAHATMA GANDHI UNIVERSITY, KERALA

### Abstract

Bachelor of Science (Honours) Zoology and Industrial Microbiology (Double Major) - Fifth Semester  
- Modifications to the Course Outcomes, Course Content and pattern for End Semester Evaluation  
- Approved - Orders Issued.

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### ACA 16

No. 5276/ACA 16/2026/MGU

Priyadarsini Hills, Dated: 26.05.2026

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*Read:-* 1. U.O.No.5797/AC A16/2024/MGU, dated.27.06.2024.

2. Minutes of the meeting of the Expert Committee on Zoology (UG)

4. Orders of the Vice Chancellor under Section 10 (17), Chapter III of the Mahatma Gandhi University Act 1985, dated 23.05.2026.

### ORDER

The syllabi of various Honours Under Graduate Programmes coming under The MGU-UGP (Honours) Regulations, 2024, have been approved vide paper read as (1) above and published on the website of the University.

The Expert Committee on Zoology (UG), deliberated on modifying the **Course Outcomes, Course Content and pattern for End Semester Evaluation of the DSC, DSE and SEC** type courses in the **Fifth Semester** syllabus of **Bachelor of Science (Honours) Zoology and Industrial Microbiology (Double Major)** programme and has submitted recommendations, vide paper read as (2) above. (**Recommendations are attached as Annexure**).

Considering the urgency of the matter, sanction has been accorded by the Vice Chancellor, in exercise of the powers of the Academic Council vested upon him under Section 10(17), Chapter III of the Mahatma Gandhi University Act 1985, vide paper read as (3) above, to approve the aforementioned recommendations.

Hence, the **Course Outcomes, Course Content and pattern for End Semester Evaluation** of the said courses in the **Fifth Semester** syllabus of **Bachelor of Science (Honours) Zoology and**

**Industrial Microbiology (Double Major)** programme stands modified to this extent.

Orders are issued accordingly.

SUDHA MENON J

ASSISTANT REGISTRAR III

(ACADEMIC)

For REGISTRAR

Copy To

1. PS to VC
2. PA to Registrar/CE
3. Convenor, Expert Committee, Zoology(UG)
4. JR 2 (Admin)/DR 2, AR 3 (Academic)
5. JR/DR/AR (Exam)
6. Tabulation/Academic Sections concerned
7. AC C1/AC C2 Sections
8. IT Cell 3/OQPM1Sections
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Section Officer

The document is digitally approved. Hence signature is not needed.

**ANNEXURE**  
**SEMESTER V**

**ALL COURSES**

Course Level	300-399 (Modified)
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**Course Name : Animal Diversity Chordata - II**

**Course Code : MG5DSCZIM300**

**Course Outcomes (CO)**

CO.No	Expected Course Outcome	Learning Domains (Modified)	PO.No	Page No.
1	No Change	No Change	No Change	101
2		An		
3	Explain flight adaptation in birds, endemic birds of the Western Ghats and aquatic mammals.	U		
4	Identify the specimen, dissect the pecten and hyoid of a bird.	A,S		
5	Removed			

**Course Content**

**Content for Classroom transaction (Units)**

Module	Units	Course Description (Modified)	Hours	CO.No (Modified)	Page No.
1	1.1	No Change	No Change	1	102-104
	1.2			No Change	
	1.3			3	
2	2.1	No Change	No Change	1	
	2.2			No Change	
	2.3			3	
3	3.1	Type Specimens (Euphlyctis, Pigeon and Rabbit – Brief study only) Integumentary System, Skeletal System: Axial	No Change	No Change	



Record- 10 marks	
Minor Dissection-8 marks	
Osteology- 5 marks	
Spotter Identification- 6 marks	
Identify the labelled parts and write notes on-6 marks	

**Course Name : Fundamentals of Genetics**

**Course Code : MG5DSCZIM301**

### Course Outcomes (CO)

CO.No	Expected Course Outcome (Modified)	Learning Domains (Modified)	PO.No.	Page No.
1	Discuss Mendelian principles of inheritance and gene interactions.	U,A	No Change	106
2	Understand and analyze genetic recombination, linkage and sex determination.	U,A		
3	Discuss the mechanism of mutation.	U		
4	Comprehend the organization of genetic material and pedigree analysis.	U		
5	Familiarize with genetic diseases.	No Change		

### Course Content

#### Content for Classroom transaction (Units)

Module	Units	Course Description (Modified)	Hours (Modified)	CO.No (Modified)	Page No.
1		No Change			107-108
2		No Change			
3		No Change			
4		<b>Cytogenetics and Genetic disorders</b>			
	4.1	No Change	No Change	No Change	
	4.2	Pedigree Analysis (Brief account only) – Pedigree	2	4	

		symbols and construction of Pedigree.		
	4.3	Human chromosomal anomalies: Autosomal (Down syndrome, Edward's syndrome and Cri du chat syndrome). Sex chromosomal anomalies (Klinefelter syndrome, and Turners syndrome), Single gene disorders - Sickle cell anemia, cystic fibrosis, Tay Sachs disease. ACTIVITY: Study of syndromes and karyotypes using photograph	5	No Change
	4.4	Inborn errors of metabolism: Genetic basis of Phenyl ketonuria, Alkaptonuria, Albinism.	3	No Change
	4.5	Multifactorial disorders - Cleft lip and cleft palate.	1	No Change
	4.6	No Change	No Change	No Change
5		<b>Teacher Specific Content</b>		

<b>Teaching and Learning Approach (Modified)</b>	<b>Classroom Procedure (Mode of Transaction)</b>	Page No. 108
	Lectures, Flipped classroom, Participative Learning, Interactive Sessions, Practical based learning, Peer teaching.	

## Mode of Assessment

Assessment Type	<b>B. End Semester Evaluation (Modified)</b>			Page No.
	<b>Theory</b>			108
	<b>Total Marks = 70</b>		<b>Duration- 2 hrs</b>	
	Type of Questions	No. of Questions to be Answered	Total Marks	
	Multiple Choice Questions	10 out of 10	10 x 1 = 10	
Short Answer	10 out of 12	10 x 3 = 30		
Short Essays	6 out of 8	6 x 5 = 30		

**Course Name : Biotechnology - Principles & Practices**  
**Course Code : MG5DSEZIM300**

### Course Outcomes (CO)

CO.No	Expected Course Outcome (Modified)	Learning Domains (Modified)	PO.No.	Page No.
1	No Change	U	No Change	110
2		No Change		
3		No Change		
4	Describe biosafety concerns in biotechnology and the protection of intellectual property rights.	No Change		
5	Removed			

### Course Content

#### Content for Classroom transaction (Units)

Module	Units	Course Description	Hours	CO.No (Modified)	Page No.
1	No Change				111-112
2	No Change				
3	No Change				
4		<b>A.Biosafety concerns</b> <b>B.Intellectual</b>			

		<b>Property Protection</b>		No Change	No Change
	4.1	No Change	No Change	No Change	4
	4.2				
5		<b>Teacher Specific Content</b>			

### Mode of Assessment

<b>Assessment Type</b>	<b>B. End Semester Evaluation (Modified)</b>			<b>Page No.</b>
	<b>Theory</b>			113
	<b>Total Marks = 70</b>		<b>Duration- 2 hrs</b>	
	<b>Type of Questions</b>	<b>No. of Questions to be Answered</b>	<b>Total Marks</b>	
	Multiple Choice Questions	10 out of 10	10 x 1 = 10	
Short Answer	10 out of 12	10 x 3 = 30		
	Short Essay	6 out of 8	6 x 5 = 30	

**Course Name : Wildlife Management**

**Course Code : MG5DSEZIM301**

### Course Outcomes (CO)

CO.No	Expected Course Outcome (Modified)	Learning Domains (Modified)	PO.No.	Page No.
1	No Change	No Change	No Change	115
2	Describe primate biology, ecology and wildlife, with special reference to mammals, birds and reptiles.	No Change		
3	Discuss the man-wildlife conflict, its consequences and remedial measures.	U		
4	No Change	U		
5	No Change	No Change		

**Course Content****Content for Classroom transaction (Units)**

Module	Units	Course Description	Hours	CO.No (Modified)	Page No.	
1	No Change					116-117
2		<b>Introduction to wildlife &amp; Man wildlife conflict</b>		No Change	No Change	
	2.1	No Change No Change	No Change	No Change	3	
	2.2					
	2.3					
	2.4					
	Activity					
3	No Change					
4	No Change					
5	<b>Teacher Specific Content</b>					

**Mode of Assessment**

Assessment Type	B. End Semester Evaluation (Modified)			Page No.
	Theory			117
	Total Marks = 70		Duration- 2 hrs	
	Type of Questions	No. of Questions to be Answered	Total Marks	
	Multiple Choice Questions	10 out of 10	10 x 1 = 10	
Short Answer	10 out of 12	10 x 3 = 30		
Short Essay	6 out of 8	6 x 5 = 30		

**Course Name : Climate Change and Disaster Risk Reduction****Course Code : MG5DSEZIM302****Course Outcomes (CO)**

CO.No	Expected Course Outcome (Modified)	Learning Domains (Modified)	PO.No.	Page No.
1	No Change	U	No Change	119

2	Recognize the challenges and impacts in urban, rural, and industrial disaster risk management in the context of climate change.	U		
3	Comprehend basic concepts, approaches and tools of Disaster Risk Management and appropriate mitigation measures.	No Change		
4	Apply preparedness measures and natural resources management strategies for disaster risk reduction and climate change adaptation.	A		
5	Understand national and international climate change policies and risk assessment methods for effective disaster resilience.	U, A		

## Course Content

### Content for Classroom transaction (Units)

Module	Units (Modified)	Course Description (Modified)	Hours	CO.No (Modified)	Page No.
1		<b>Climate Change &amp; Disasters</b>	No Change		120-122
	1.1	No Change		No Change	
	1.2			1	
	1.3			1	
	1.4 (Added)	Carbon to Climate Control: A Path to Disaster Reduction: Carbon trading, carbon credit; Carbon footprint, carbon sequestration. Carbon neutral, alternate sources of energy, ecological footprint, Polluter Pays Principle,	4	1	

		3'R Principle, Green auditing.		
2		<b>Disaster Risk Reduction (DRR)</b>	No Change	
	2.1	Issues in Urban, Rural and Industrial disaster risks management with respect to climate change. Resilient agriculture, Disaster Resilience-Infrastructure, Industry, Livelihoods, Schools, Hospitals. Issues of special needs - gender, aged, children, Disabled; psycho-social Impact of climate change in India/Kerala.	No Change	No Change
	2.2	Psycho-social Impact of climate change in India/Kerala:Extreme Heat, changing rainfall patterns, increased droughts, depletion of ground water, melting of glaciers, rise of sea level, faunal decline.	No Change	No Change
	2.3	Climate change- Impact on Agriculture & Food Security, Energy Security, Water Security. Health, Migration & Conflict  <b>ACTIVITY</b> 1. Energy audit of your house/college. 2. Survey in your locality regarding measures adopted for energy utilisation, rainwater harvesting etc. and conducting awareness programs.	4	2
	2.4	Removed		
2.5				

3		<b>Adaptation strategies</b>	No Change	
	3.1	<b>Basic concepts and terminologies:</b> Hazard, Risk, vulnerability, Disaster, Mitigation, DRR and its evolution, Disaster Risk Management (DRM), Emergency, Response, Relief; Resilience, Reconstruction, Recovery	4	3
	3.2	<b>Disaster Risk Mitigation</b> Disaster management journey and paradigm shift; Approaches in disaster management—Engineering-centric, Community-Based Disaster Preparedness (CBDP), Incident management, Ecosystem-based Disaster Risk Reduction (ecoDRR). Land Use Planning and Development Regulations, Disaster Safe Designs and Constructions - Structural and Non-Structural measures of mitigation, International and national policy frameworks and guidelines.	5	3
3.3	<b>Disaster Risk Management</b> Tools and Methods in Disaster Risk Management: Hazard, risk and vulnerability analysis; legislations, Codes & Standards,	5	3	

		<p>Risk sensitive land use planning, Safety auditing, Role of Strategic Environmental Assessment (SEA)/ Environmental Impact Assessment (EIA), situation analysis, Incident response system, Post-Disaster Needs Assessments (PDNA), Environmental economics &amp; DRR, Recovery framework. DM Planning for Government at national/ sub- national, Ministry/ departments, organization/establishments and at local levels.</p>			
	3.4 (added)	<p><b>Applications of science and technology for DRR &amp; Climate Change Adaptation (CCA)</b>                  Geo-informatics in Disaster Management (RS, GIS, GPS and RS) Disaster Communication System (Early Warning and Its Dissemination), S&amp;T; Institutions for Disaster Management in India.</p>	3	4	
	3.5 (added)	<p><b>Disaster Preparedness</b>                  Crisis management, Early warning and communication, Emergency response, Local preparedness, Relief management-</p>	3	4	

		Shelter, & quot; water, sanitation and hygiene & quot; (Watsan), environmental health, trauma care; Role of agencies, technology and coordination; Issues of green relief, sustainable recovery, built back better; Climate Change Adaptation - Disaster Risk Reduction (CCA-DRR) and sustainability integration into post-disaster/post-conflict development, International response.			
4		<b>Challenges, issues &amp; impact of Climate change</b>	No Change		
	4.1	Natural Resource Management-Disaster Risk Management (NRM-DRM) integration, ecosystem-based adaptation and eco DRR; Role of Green growth, sustainable NRM – WRM (Natural Resource management - Integrated Water Resources Management), Watershed, River basin, Integrated Coastal Zone Management Plan: (ICZM), Socioeconomic resilience, Capacity building.	5	No Change	
	4.2	<b>Policies/treaties to combat Climate change:</b> International - Montreal protocol, Kyoto Protocol,	4	5	

		Earth summit, Paris Agreement 2005, IPCC, & UNFCCC; National - Disaster management Act, 2005, NAPCC - National Action Plan on Climate Change; Role of government, NGOs, and communities.			
	4.3	<p><b>Methods of risk assessment in the Kerala context:</b>GIS and remote sensing applications for risk mapping role of local government in disaster management Case studies on policy implementation Early warning systems and their implementation Community-based disaster preparedness Infrastructure planning for disaster resilience Analyzing successful disaster management cases in Kerala Data analytics for predicting and managing disasters</p> <p><b>Activity:</b></p> <ol style="list-style-type: none"> <li>1. Case studies; Field work at areas with history of natural disasters in Kerala – Report submission and Presentation.</li> <li>2. Visit to disaster prone areas &amp; report.</li> </ol>	No Change	5	
5		<b>Teacher Specific Content</b>			

## Mode of Assessment

Assessment Type	<b>B. End Semester Evaluation (Modified)</b>			Page No.
	<b>Theory</b>			123
	Total Marks = 70		Duration- 2 hrs	
	Type of Questions	No. of Questions to be Answered	Total Marks	
	Multiple Choice Questions	10 out of 10	10 x 1 = 10	
Short Answer	10 out of 12	10 x 3 = 30		
Short Essay	6 out of 8	6 x 5 = 30		

**Course Name : Food and Dairy Microbiology**  
**Course Code : MG5DSCZIM302**

### Course Content

#### Content for Classroom transaction (Units)

Module	Units (Modified)		Course Description	Hours (Modified)	CO.No (Modified)	Page No.
1	1.1		No Change		No Change	126-127
	1.2					
	1.3				2	
2			No Change			
3			No Change			
4			<b>Practicals</b>			
	Existing	Modified	No Change		No Change	
	4.1	No Change				4
	4.2	No Change				No Change
	4.3	No Change			4	
	Nil	4.4			2	1
	4.4	4.5			2	1
	4.5	4.6			No Change	1
	4.6	4.7				1
4.7	4.8	No Change				
5			<b>Teacher Specific Content</b>			

**Course Name : Food and Water Quality Management**  
**Course Code : MG5SECZIM300**

**Course Outcomes (CO)**

CO.No	Expected Course Outcome (Modified)	Learning Domains (Modified)	PO.No.	Page No.
1	Understand various food adulterants, food additives, their detection methods and health impacts.	No Change	No Change	129
2	Discuss food laws, regulations, quality management systems, and the role of agencies in ensuring food safety.			
3	Identify food spoilage, methods for analysis of spoiled foods, and assessment of water quality.	U		
4	Explain principles and methods of food preservation and modern food packaging techniques to maintain food safety.	No Change		
5	<b>Removed</b>			

**Course Content**

**Content for Classroom transaction (Units)**

Module	Units	Course Description (Modified)	Hours (Modified)	CO.No (Modified)	Page No.
1	1.1	No Change	No Change	No Change	130-131
	1.2			No Change	
	1.3			2	
	1.4			2	
2	2.1	No Change	No Change	3	
	2.2			3	

	2.3			No Change	
	2.4			3	
	2.5	No Change	No Change	3	
3					
	3.1	Principles and methods of food preservation. Temperature-Based Methods of Food Preservation High Temperature Preservation (Thermal Methods): Principle, process, advantages, and limitations of blanching, Pasteurization, Ultra-High temperature (UHT) Sterilization, canning; spoilage of canned foods. Low temperature preservation; Processing and Preservation by low-temperature refrigeration and cold storage, chilling, freezing, cryogenic freezing, freeze drying. Effect of freezing on constituents of foods; chilling injury, freezer burn.	No Change	4	
	3.2	Different techniques of Food Preservation: Drying, dehydration and concentration: Factors affecting rate of drying and dehydration; water activity and relative humidity, drying methods. Methods of concentration; preservation using sugar, salt and acids. Effect of drying, dehydration and concentration on quality of foods. Hurdle technology.	5	4	
	3.3	Recent advances in food packaging: Active	5	4	

		packaging, intelligent packaging, modified atmosphere packaging (MAP), controlled atmosphere packaging (CAP, biodegradable plastics, edible gums and Coatings. Retort pouches, Aseptic and shrink packaging.			
	3.4	Removed			
4		<b>Teacher Specific Content</b>			

### Mode of Assessment

<b>Assessment Type</b>	<b>B. End Semester Evaluation (Modified)</b>			<b>Page No.</b>
	<b>Theory</b>			132
	<b>Total Marks = 50</b>		<b>Duration- 1.5 hrs</b>	
	<b>Type of Questions</b>	<b>No. of Questions to be Answered</b>	<b>Total Marks</b>	
	Multiple Choice Questions	12 out of 12	12 x 1 = 12	
Short Answer	6 out of 8	6 x 3 = 18		
	Short Essay	4 out of 6	4 x 5 = 20	