(Information to be uploaded in Standard Proforma's)

Academic:

1. Degree Offered –UG, PG, PhD
   Title of degree: **Masters of Veterinary Public Health**
   Duration: **2 years**
   Eligibility Criteria: **Bachelor of Veterinary Sciences and Animal Husbandry**
   Intake Capacity: **3**
   Opportunities: Academicians, Research Scientists, Meat, Milk, Fish and Poultry industries, Food Testing Laboratories,etc.

2. Academic Regulations:
   UG , PG, PhD (VCI, ICAR, IV, V Dean's and Corrigendum) – PDF Copies

3. Admissions:

UG, PG, PhD

List of Admitted Students – First Year to Final Year (Veterinary Year wise / Fishery and Dairy Semester wise): AY 2023-2024

Sr. No.	Name of Student (Post-Graduation Students)	Enrl. No.	Email Address	Name of Advisor
1.	Dr. Preksha Patil	V/18/280	prekshapatil2016@gmail.com	Dr. V. M. Vaidya
2.	Dr. Manisha Mahra	V/23/421	mahramanisha25@gmail.com	Dr. V. M. Vaidya
3.	Dr. Omkesh Nagargoje	V/17/214	omkeshnagargoje5@gmail.com	Dr. R. J. Zende

4. Course offered: UG, PG , PhD - Semester / Year-wise

   - List of UG Courses **(B.V.Sc & AH)** As per latest MSVE Guidelines) , B.Tech. (D.T.) and B.F.Sc as per ICAR – V Deans Committee – 2016.

Sr No	Course No.	Title	Credit	Course offered in the Year
1.	VPE – Veterinary Public Health and Epidemiology	Veterinary Public Health and Epidemiology (Unit I – IV) Unit I - Veterinary Public Health and Food Safety Unit II- Veterinary Epidemiology Unit III – Zoonotic Diseases Unit IV- Environmental Hygiene	3+1= 4	3rd Year (UG)

- List of PG Courses (MVSc) and M.Tech. (Dairy Technology)

List of PG Courses

Sr No	Course No .	Title	Credit
1. .	VPE 501	Concepts in Veterinary Public Health and One Health	2+0
2.	VPE 502	Zoonoses	2+1
3.	VPE 503	Zoonoses-II	2+1
4.	VPE 504	Principles of Epidemiology	2+1
5.	VPE 505	Hygiene and Safety of Foods of Animal and Aquatic Origin	2+1

6.	VPE 506	Food-borne Infections and Intoxications	2+1
7.	VPE 507	Food Safety Standards, and Regulations	2+1
8.	VPE 508	Environmental Hygiene and Safety	2+1
9.	VPE 509	Applied Epidemiology	2+1
10.	VPE 510	Biosecurity, Bioterrorism and Disaster Management	2+0
11.	VPE 511	Laboratory Techniques in Veterinary Public Health	0+3
12.	VPE 591	Master's seminar	0+1
13.	VPE 599	Master's research	30

List of PhD Courses

Course Code	Course Title	Credit Hours
VPE 601	Advances in Veterinary Public Health and Epidemiology*	2+1
VPE 602	Emerging, Re-emerging Zoonoses and One Health*	2+1
VPE 603	Advances in Food Safetyand Quality Control of	2+1
VPE 604	Biosecurity and Occupational Health Safety	2+1
VPE 605	Recent Concepts in Epidemiology and Disease Forecasting	2+1
VPE 606	Risk Analysis and Predictive Modelling	2+1
VPE 607	Advances in Environmental Hygiene	2+1
VPE 608	Herd Health Management and Disease Economics	2+1
VPE 609	Epidemiology of Trans-boundary, Non-infectious and Chronic diseased	2+1
VPE 610	Ecology and Animal/ Human Health	2+0
VPE 611	Diagnostic Approaches in Epidemiology	2+1
VPE 612	Surveys, Surveillance and Data Management	2+1
VPE 613	Research Methodology and Publication Ethics in VPE*	2+0
VPE 690	Special Problem	0+1
VPE 691	Doctoral Seminar-I*	0+1

VPE 692	Doctoral Seminar-II*	0+1
VPE 699	Doctoral Research	75

*Core Courses

5. Lecture Schedule – UG, PG , PhD - Theory / Practical Schedule – Approved by BoS – Subject wise

Course Outline-cum-Lecture Schedule for Master Degree Programme

I. Course Title : Concepts in Veterinary Public Health and One Health
II. Course Code : VPE 501
III. Credit Hours : 2+0

Theory:

Sr. No.	Topic
1.	VPH administration: organization and administration
2.	Implementation of VPH services/ programs
3.	Structure and function of VPH agencies
4.	VPH Organizations at national and international levels
5.	VPH team; administration and functions;
6.	Responsibilities of veterinarians in the Public Health team
7.	One Health: Definition, historical emergence of the concept.
8.	Scope, objectives and activities of One Health
9.	One Health Umbrella
10.	Stewardship of VPH for the implementation of One Health activities
11.	Strategic framework of One Health activities
12.	One Health approaches for control of zoonoses
13.	One Health approaches for ensuring food safety
14.	One Health approaches for combating antimicrobial resistance
15.	One health policies, legislation and research
16.	Transdisciplinary approach of eco-health concepts;
17.	One Health Integrating policy, Science and Practices
18.	Genesis of Veterinary public health and epidemiology as a discipline
19.	Global burden of disease – need for inter-sectoral and inter-disciplinary Collaboration – I
20.	Global burden of disease – need for inter-sectoral and inter-disciplinary Collaboration – II
21.	Coordinated and systemic disease control response
22.	Ecosystems
23.	Urbanization
24.	Intensive agriculture and animal husbandry practices

25.	Exploring host-pathogen interactions for better multi-sectoral responses at the human-animal-ecosystem interface
26.	Preventive measures/ strategies addressing food safety, zoonoses, and other public health threats
27.	Climate change and the need for multi-sectoral and collateral/ multi-lateral collaborations
28.	Sharing of epidemiological data and laboratory information on zoonoses and food safety problems across sectors
29.	Integration of One Health approach for the promotion of Ecosystem
30.	Integration of One Health approach for the promotion of Wildlife Health

31.	Organizations and agencies working to mitigate health challenges based on 'One Health Approach'
32.	One Health Initiative as a union of human and veterinary medicine
33.	Local, regional, national and international One Health networks
34.	One Health in the paradigm of preventive health care and herd health management
35.	Case study that integrates Veterinary Public Health with One Health – I
36.	Case study that integrates Veterinary Public Health with One Health – II

I. Course Title : Zoonoses-I
II. Course Code : VPE 502
III. Credit Hours : 2+1

Theory:

Sr. No.	Topic
1.	Definition and classification of zoonoses
2.	Factors affecting occurrence of zoonoses
3.	Disease management strategies, prevention and control
4.	Zoonotic disease burden on population
5.	Socioeconomic impact of zoonoses
6.	Public health implications of bacterial zoonoses
7.	History, etiology, epidemiology, symptoms, diagnosis and management of anthrax
8.	History, etiology, epidemiology, symptoms, diagnosis and management of brucellosis
9.	History, etiology, epidemiology, symptoms, diagnosis and management of tuberculosis
10.	History, etiology, epidemiology, symptoms, diagnosis and management of leptospirosis
11.	History, etiology, epidemiology, symptoms , diagnosis and management of plague and rat bite fever
12.	History, etiology, epidemiology, symptoms , diagnosis and management of borreliosis and lyme disease
13.	History, etiology, epidemiology, symptoms , diagnosis and management of glanders and malidiosis.
14.	History, etiology, epidemiology, symptoms , diagnosis and management of streptococcosis
15.	History, etiology, epidemiology, symptoms , diagnosis and management of salmonellosis
16.	History, etiology, epidemiology, symptoms, diagnosis and management of campylobacteriosis
17.	History, etiology, epidemiology, symptoms, diagnosis and management of yersiniosis
18.	History, etiology, epidemiology, symptoms, diagnosis and management of vibriosis
19.	History, etiology, epidemiology, symptoms, diagnosis and management of tetanus and listeriosis
20.	History, etiology, epidemiology, symptoms, diagnosis and management of staphylococcosis and tularemia, etc.
21.	History, etiology, epidemiology, symptoms, diagnosis and management of cat scratch disease,
22.	History, etiology, epidemiology, symptoms, diagnosis and management of dermatophytosis

23.	History, etiology, epidemiology, symptoms, diagnosis and management of, blastomycosis

24.	History, etiology, epidemiology, symptoms, diagnosis and management of coccidioidomycosis
25.	History, etiology, epidemiology, symptoms, diagnosis and management of cryptococcosis
26.	History, etiology, epidemiology, symptoms, diagnosis and management of histoplasmosis
27.	History, etiology, epidemiology, symptoms, diagnosis and management aspergillosis
28.	History, etiology, epidemiology, symptoms, diagnosis and management of candidiasis
29.	History, etiology, epidemiology, symptoms, diagnosis and management of rhinosporidiosis
30.	History, etiology, epidemiology, symptoms, diagnosis and management of sporotrichosis.
31.	History, etiology, epidemiology, symptoms, diagnosis and management of chlamydiosis - psittacosis
32.	History, etiology, epidemiology, symptoms, diagnosis and management of chlamydiosis – ornithosis
33.	History, etiology, epidemiology, symptoms, diagnosis and management of prion diseases - Creutzfeldt-Jakob Disease (CJD) and variants
34.	History, etiology, epidemiology, symptoms, diagnosis and management of prion diseases - bovine spongiform encephalopathy (BSE), kuru, chronic wasting disease (CWD) and scrapie
35.	Case studies pertaining to important zoonoses of India
36.	Case studies pertaining to important zoonoses of India

Practicals:

Sr. No.	**Topic**
1.	Sampling and laboratory preparedness for handling zoonotic bacterial and fungal agents
2.	Isolation, identification and characterization of Bacillus anthracis
3.	Isolation, identification and characterization of agents of zoonotic *Mycobacterium* species.
4.	Isolation, identification and characterization of zoonotic *Streptococcus* and *Staphylococcus* species.
5.	Isolation, identification and characterization of agents of *Clostridium tetani* and zoonotic *Listeria* species.

6.	Isolation, identification and characterization of zoonotic *Leptospira* and *Borrelia* species.
7.	Isolation, identification and characterization of *Burkholderia mallei* and *Burkholderia pseudomallei*

8.	Isolation, identification and characterization of zoonotic *Brucella* species
9.	Isolation, identification and characterization of food-borne and zoonotic *Salmonella* species including serotyping of isolates
10.	Isolation, identification and characterization of zoonotic *Yersinia* and *Vibrio* species
11.	Isolation, identification and characterization of zoonotic agents responsible for rat bite fever, cat scratch disease, tularemia, etc.
12.	Isolation and identification of zoonotic fungal agents of public health significance from the host, vehicle and environment associated with superficial mycozoonoses
13.	Isolation, identification and characterization of important mycotic agents of public health significance– blastomycosis and coccidioidomycosis
14.	Isolation, identification and characterization of important mycotic agents of public health significance cryptococcosis and histoplasmosis
15.	Isolation, identification and characterization of important mycotic agents of public health significance - aspergillosis, candidiasis, rhinosporidiosis and sporotrichosis
16.	Isolation, identification and characterization of important chlamydial agents of public health significance
17.	Isolation, identification and characterization of important rickettsial agents of public health significane
18.	Laboratory detection of prion diseases

I. Course Title : Zoonoses-II
II. Course Code : VPE 503
III. Credit Hours : 2+1

Lecture Schedule (Theory):

Sr. No	Topic
1	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Japanese encephalitis
2	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Tick-borne encephalitis
3	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Encephalomyelitis (BSE,CJD,TME,CWD, etc.)
4	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Rabies.
5	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Influenza .
6	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Rift valley fever and Chikungunya
7	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of KFD
8	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of FMD
9	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Enteroviruses
10	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Crimean-Congo haemorrhagic fever
11	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Dengue
12	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of West-Nile fever
13	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Yellow fever
14	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Rift-valley fever, Louping ill
15	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of equine encephalitis
16	History, etiology, epidemiology, transmission pattern, disease in animals and humans, diagnosis and management of Ebola
17	History, etiology, epidemiology, transmission pattern, disease in animals and humans, diagnosis and management of Marburg and Hantavirus
18	History, etiology, epidemiology, transmission pattern, disease in animals and humans, diagnosis and management of Hantavirus

19	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Hendra virus
20	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Nepah virus
21	History, etiology, epidemiology, transmission pattern, disease burden, disease in animals and humans, diagnosis and management of Zika virus
22	History, etiology, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of corona viruses
23	History, etiology, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of important rickettsial zoonoses
24	History, etiology, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Q fever
25	History, etiology, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of typhus fever group
26	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of hydatidosis
27	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of taeniosis.
28	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of cysticercosis
29	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Trichinosis
30	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of fasciolosis and fasciolopsiosis
31	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Toxoplasmosis
32	Etiology, host range, epidemiology transmission pattern, Disease burden,disease in animals and humans, diagnosis and management of Trypanosomosis
33	Etiology, host range, epidemiology transmission pattern, Disease burden,disease in animals and humans, diagnosis and management of Leishmaniosis
32	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Cryptosporidiosis
33	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Sarcocystosis
34	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Dracunculiosis
35	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Paragonimiosis
36	Etiology, host range, epidemiology, transmission pattern, Disease burden, disease in animals and humans, diagnosis and management of Diphylobothriosis

Practicals:

1.	Detection and characterization of zoonotic viral and parasitic agents from host, vehicle, environment, etc. - Sampling and laboratory preparations
2.	Detection and characterization of Japanese encephalitis, chikungunya and dengue viruses
3.	Detection and characterization of encephalomyelitis, Rift valley fever, West-Nile fever, yellow fever, louping ill and equine encephalitis viruses
4.	Detection and characterization of rabies
5.	Detection and characterization of influenza viruses
6.	Detection and characterization of FMD and entero-viruses
7.	Detection and characterization of KFD, tick-borne encephalitis and Crimean-Congo haemorrhagic fever viruses
8.	Detection and characterization of zoonotic Ebola, Marburg, Hanta, Zika, corona, Hendra and Nipah viruses
9.	Isolation, identification and characterization of agents responsible for Q fever/ scrub typhus and other rickettsial zoonoses
10.	Detection and characterization of agents responsible for hydatidosis, taeniosis/ cysticercosis
11.	Detection and characterization of agents responsible for trichinellosis
12.	Detection and characterization of agents responsible for fascioliosis and fasciolopsiosis
13.	Detection and characterization of Toxoplasma gondii
14.	Detection and characterization of zoonotic Trypanosoma species
15.	Detection and characterization of zoonotic Cryptosporidium species of health significance
16.	Detection and characterization of zoonotic Leishmania species
17.	Detection and characterization of zoonotic Sarcocystis species
18.	Detection and characterization of zoonotic agents responsible for dracunculiosis, paragonimiosis and diphylobothriosis

I. Course Title: **Principles of Epidemiology**

II. Course Code: **VPE- 504**

III. Credit Hours: **2+1**

Theory:

Sr. No.	Topic
1.	Historical perspective and scope of veterinary epidemiology
2.	Disease causation -theories of disease causation, recent advancements and iceberg concept
3.	Koch's postulates and Evan's rules
4.	Epidemiological triangle
5.	Epidemic, endemic, pandemic and sporadic diseases
6.	Qualitative approaches to epidemiology
7.	Quantitative approaches to epidemiology
8.	Measurement of disease in populations
9.	Endemic stability and herd immunity
10.	Basic reproductive ratio
11.	Trends in spatial distribution of disease
12.	Trends in temporal distribution of disease
13.	Epidemic curve and its applications
14.	Transmission of disease
15.	Role of ecology in maintenance of disease agents
16.	Epidemiological methods: Descriptive analytical and Experimental
17.	Epidemiological methods: Theorotical and mathematical models
18.	Landscape epidemiology
19.	Molecular epidemiology
20.	Epidemiological studies
21.	Observational studies - case-control studies
22.	Observational studies - cohort studies
23.	Observational studies - cross-sectional studies
24.	Experimental studies - field trials
25.	Experimental studies - clinical trials
26	Disease surveys
27.	Monitoring and surveillance
28.	Epidemiological databases
29.	Surveillance methods
30.	Definition, scope and limitations of serological epidemiology and interpretation of results
31.	Characteristics of ideal disease diagnostic tests
32.	Multiple diagnostic testing
33.	Evaluation of diagnostic tests
34.	Investigation of disease outbreaks
35.	Strategies of disease control
36.	Disease eradication

Practicals:

1.	Collection of data from various sources, analysis and interpretation
2.	Demonstration of sample collection and isolation of suspected pathogen
3.	Evaluation of diagnostic tests: Molecular
4.	Evaluation of diagnostic tests: Serological
5.	Evaluation of diagnostic tests: Advanced techniques
6.	Analytical diagnostic and relative sensitivity and specificity calculation
7.	Use of software for data analysis
8.	Designing and interpretation of a case-control study
9.	Designing and interpretation of a cohort study
10.	Designing and interpretation of a cross-sectional study
11.	Designing and interpretation of a field trials
12.	Designing and interpretation of a clinical trials
13.	Determination of vaccines effectiveness
14.	Designing of a survey
15.	Spatio-temporal distribution of disease
16.	Outbreak investigation
17.	Case study on disease eradication
18.	Case study on disease monitoring and surveillance

Course Title : Hygiene and Safety of foods of Animal and Aquatic origin

I. Course Code : VPE 505
II. Credit Hours : 2+1

Lecture (Theory):

Sr. No	Topic
1.	Importance of food hygiene in relation to the public health
2.	Principles of food hygiene in relation to foods of animal origin (including aquatic origin foods)
3.	Environmental sanitation in food establishments
4.	Food quality - perspectives
5.	Prevention of foodborne illnesses - principles
6.	Risk analysis: Physical and Chemical and Microbial
7.	Milk hygiene - importance and objectives
8.	Hygienic production, handling, transportation, storage and marketing of milk and milk products
9.	Mastitis in dairy animals and its public health significance
10.	Spoilage of milk
11.	Preservation of milk
12.	Milk-borne diseases of public health significance
13.	Epidemiology of milk allergy and lactose intolerance
14.	Public health impact of pesticide residues in milk supply chain
15.	Antimicrobial residues in milk supply chain and their public health impact
16.	Adulteration of milk and dairy products
17.	Public health implications of synthetic milk
18.	Milk plant hygiene and sanitation
19.	Meat hygiene - importance and objectives
20.	Hygienic Practices at farm
21.	Transportation of food animals
22.	Hygienic meat production and Hygienic Practices at abattoir- Buffalo, pig
23.	Hygienic meat production and Hygienic Practices at abattoir -Sheep, goat and poultry
24.	Adulteration of meat and meat speciation
25.	Spoilage of meat and meat products
26.	Preservation of meat
27.	Meat-borne diseases of public health significance
28.	Traceability of animal origin food
29.	Safe disposal of slaughter house waste and preparation of byproducts
30.	Fish, fisheries, ichthyology and Environmental factors affecting aquatic food hygiene

31.	Microbial profile and spoilage of aquatic foods

32.	Fish-borne diseases of public health significance
33.	Marine biotoxins /naturally occurring toxins from fish and shellfish and its public health significance
34.	Safe disposal of fishery waste
35.	Hygienic Practices at farm for egg production and Preservation of eggs
36.	Spoilage of eggs and Egg-borne diseases of public health significance

Practicals:

1.	Collection of samples of meat, milk, egg and fish for physicochemical and microbial analysis
2.	Analysis of foods of animal origin for physicochemical quality
3.	Analysis of foods of animal origin for microbial quality
4.	Detection of adulteration, debasement, substitution and admixing of animal origin foods and products
5.	Recent methods of speciation of meat
6.	Determination of spoilage in foods of animal origin
7.	Extension of shelf life of perishable foods of animal origin
8.	Detection of mastitis in dairy animals and linking it to consumer's health
9.	Study of supply chains of milk, meat, egg and fish
10.	Evaluation of food plant, equipment and the environment for compliance
11.	Risk analysis: Physical and Chemical
12.	Risk analysis: Microbial
13.	Risk analysis for residues of public health significance in foods of animal origin
14.	Traceability of foods of animal origin: Practical approach
15.	Source tracing of foodborne outbreaks using molecular, bioinformatics or epidemiological tools
16.	Evaluation of fish and aquatic harvest for quality and safety
17.	Visit to milk/ meat/ egg/ fish processing unit for the demonstration of food quality and safety checkpoints
18	Study of databases, information communication tools (ICT) and dedicated websites related to quality and safety of animal origin foods

I. Course Title : Food-borne Infections and Intoxications
II. Course Code : VPE 506
III. Credit Hours : 2+1

Theory

Sr. No.	Topic
1	Definitions: Food-borne infections, Food intoxications, Toxi-infections, Bacterial toxins, etc.
2	Classification and epidemiology of food-borne diseases.
3	Disease burden and economics of food-borne diseases.
4	Fungal toxins
5	Plant, algal, and other toxins
6	Reservoirs and Vehicles of food-borne pathogens
7	Mode of transmission of food-borne pathogens
8-9	Measures employed for prevention and control of food-borne diseases
10	Food- poisoning outbreak investigation - Sampling, preparedness, surveillance
11	Food- poisoning outbreak investigation - Laboratory tests
12	Management of food- poisoning outbreak
	Epidemiology, economic, diagnosis and management of bacterial food-borne diseases
13	Food-borne disease due to *Salmonella* species
14	Food-borne disease due to *Campylobacter* species
15	Food-borne disease due to *Clostridium* species
16	Food-borne disease due to *Staphylococcus* species
17	Food-borne disease due to *Listeria* species
18	Food-borne disease due to *Bacillus* species
19	Food-borne diseases due to species of *Vibrio*
20	Food-borne diseases due to species of *Escherichia*
21	Food-borne diseases due to species of *Shigella*
22	Food-borne diseases due to species of *Yersinia, Aeromonas* etc.
23	Types of bacterial toxins and their manifestations
	Epidemiology, economics, diagnosis and management of food-borne viral pathogens
24	Food-borne diseases due to hepatitis viruses and entero-viruses
25	Food-borne diseases due to noroviruses, rotaviruses, etc.
26	Food- borne rickettsial infections
27	Food- borne parasitic infections
28	Health hazards and adverse effects due to additives in foods
29	Health hazards and adverse effects due to seafood/marine toxins
30	Health hazards and adverse effects due to mycotoxins
31	Health hazards and adverse effects due to biocides and plant origin toxins
32	Health hazards and adverse effects due to heavy metals in foods and beverages
33	Residual effects of veterinary drugs, hormones, etc. in foods
34	Anti-microbial resistance (AMR) -definition, current status, factors responsible
35	Mechanism of AMR
36	Mode of AMR transmission and control

Practicals:

Sr. No.	Topic
1	Food-borne disease outbreak investigation (single source, multiple source, propogative, and non-propogative)
2	Integrating surveillance data for calculating risk across the food chain
3	Integrated surveillance for AMR in food borne bacteria
4	Detection and characterization of food-borne bacterial pathogens in foods of animal origin - *Escherichia, Salmonella, Shigella* spp. as per FSSAI protocol
5	Detection and characterization of food-borne bacterial pathogens in foods of animal origin - *Vibrio, Yersinia, Campylobacter* etc. species as per FSSAI protocol
6	Detection and characterization of food-borne bacterial pathogens in foods of animal origin - *Listeria* spp. as per FSSAI protocol
7	Detection and characterization of food-borne bacterial pathogens in foods of animal origin - *Clostridium, Staphylococcus* and *Bacillus* species as per FSSAI protocol
8	Detection and characterization of food-borne viral pathogens in foods of animal origin
9	Detection and characterization of rickettsial pathogens in foods of animal origin
10	Detection and characterization of parasites of public health in foods of animal origin
11	Detection of antimicrobial resistance in food-borne pathogens and their molecular and epidemiological characterization
12	Detection and quantification of additives, veterinary drugs and antimicrobials in foods of animal origin
13	Detection and quantification of pesticides residues in foods of animal origin
15	Detection and quantification of residues of metals and other environmental contaminants in foods of animal origin
16	Detection, quantification and characterization of microbial toxins, phytotoxins, biocides, etc. in foods of animal origin
17	Detection, quantification and characterization of toxic compounds in the fish and aquatic food supply chain
18	Case study on food-borne non-microbial hazard and microbial disease relevant to the region

I. Course Title : Food Safety Standards and Regulations
II. Course Code : VPE 507
III. Credit Hours : 2+1

Theory

Sr. No.	Topic
1	Indicators of food quality and safety
2	Food spoilage (biological, chemical, etc.)
3	Food plant hygiene
4	Sanitation program for the food plant
5	Hurdle technique and its relevance
6	Microbiological food quality criteria
7	Genesis of food safety standards
8	Mechanisms of food safety standard formulation
9	Agencies associated in food standard formulation
10	Food Safety and standards Act 2006; genesis and provisions
11	FSSAI- organizational structure, role and responsibilities
12	Private food standards (Halal certification, BRC, Global GAP)
13-14	Prerequisite programs for food safety - GAP, GMP, etc.
15	Application of ISO 9000 series to food establishments
16-17	HACCP, VACCP, TACCP, ISO 14000, ISO 22000,
18	Role of WTO and FSSAI in standard formulation, SPS measures
19	Role of BIS and other agencies in standard formulation
20	Role of EIC/ EIA, APEDA, MPEDA and marketing strategies
21-22	National regulations and legislations related to quality food production and export
23	International regulations related to quality food production (Codex)
24	International regulations related to quality food production (EC, US-FDA etc.)
25	Food safety regulations in reference to pesticide residues (MRL, ADI, etc.)
26	Food safety regulations in reference to veterinary drug residues (MRL, ADI, etc.)
27	Food safety regulations in reference to heavy metal residues (MRL, ADI, etc.)
28	Food safety regulations in reference to hormones and other residues (MRL, ADI, etc.)
29	Traceability system for foods of animal origin
30	Organic food production (National standards for organic products)
31	Organic food processing and handling
32-33	Packaging of foods of animal origin – specifications and standards
34	Public health implications of in-vitro and cultured meats as well as meat obtained from genetically modified and unconventional animals
35	SWOT analysis of emerging and novel technologies related to the quality and safety of foods of animal origin
36	Case study related to food standards

Practicals:

Sr. No.	Topic
1	Detection of pesticide residues in foods of animal origin
2	Detection of veterinary drug residues in foods of animal origin
3	Detection of heavy metal residues in foods of animal origin
4	Estimation of MRL/ MPL
5	Estimation of NOEL, ADI, etc.
6	Microbiological assessment of cleanliness of food plant surface
7	Microbiological assessment of equipment in abattoir/ meat/ milk plant
8	Demonstration of traceability system for foods of animal origin
9	Demonstration of compliance of organic production of foods of animal origin
10	Demonstration of registration and licensing of food business operator (FBO) under FSSAI regime
11	Evaluation of detergents and sanitizers used in the food plant
12	Inventory management and hygiene audit of food plant
13	Occupational safety at food plant
14	Case study on HACCP/ISO 22000
15	Principles and methods for the risk assessment of chemicals in foods
16	Visit to nearby FDA/food safety office or laboratory/NABL accrediated laboratory for understanding regulatory mechanisms
17	Visit to slaughter house/poultry/meat/fish processing plant for examining compliance of HACCP/ FSSAI regulations and other standards
18	Visit to dairy/milk processing plant for examining compliance of HACCP/ FSSAI regulations and other standards

I. Course Title : Environmental Hygiene and Safety
II. Course Code : VPE 508
III. Credit Hours : 2+1

Theory

Sr. No	Topic
1	Introduction to the environment and environmental hygiene
2	Impact of environmental pollutants on animal and human health
3	Characteristics of various environmental pollutants
4	Nature and impact of microbial pollution
5	Nature and impact of pollution due to chemical pollutants
6	Environmental risk assessment (microbial and non-microbial hazards)
7	Pollutions of soil, air and water and their effects on human, animal and environmental health
8	Dissemination of pathogens and pollutants in the environment
9	Global warming, enhanced green-house effect and climate change- impact on human, animal and environmental health
10	Impact of noise pollution on human and animal health
11	Management of environmental pollution
12	Industrial pollution including impact of plastic and petrochemical products
13	Genetic risk associated with environmental pollutants
14	Health problems due to nuclear energy, microwave, electro-magnetic and other radiation pollutions
15	Health problems due to microwave, electro-magnetic and other radiation pollutions
16	Pollution due to agrochemicals and pesticides
17	Contamination and impact of heavy metals residues etc
18	Contamination and impact of veterinary drug residues etc
19	Role of livestock in environmental pollution
20	Public health impact of animal-waste
21	Recycling of wastes (Livestock origin waste)
22	Recycling of wastes (Livestock origin aligned business waste)
23	Principles of safe disposal of bio-medical waste
24	Food chain consequences of environmental pollutants, contaminants and toxicants
25	Implications of genetically modified organisms on the animal, human and environmental health - regulations and compliance
26	Management of environmental pollution – conventions, treaties, agreements, etc.
27	Role of national pollution control agencies in the management of environmental pollution.
28	Role of international pollution control agencies in the management of environmental pollution
29	Regulations pertaining to environmental pollution and its control
30	Hygiene and safety at specialized laboratories

31	Designing and maintenance of laboratories that handle high risk pathogens
32	Conceptual framework of Environmental risk assessment and pilot studies
33	Environmental risk assessment of hazards of regional importance
34	Environmental risk assessment of hazards of national importance
35	Case studies involving impact on livestock health and the environment
36	Case studies indicating impact on animal health associated with environmental pollution

Practicals :

1	Determination of potability of the drinking water
2	Detection of pollutants in the water
3	Detection of pollutants in the air
4	Detection of pollutants in the soil
5	Detection of pollutants in the animal products
6	Detection of pollutants in the sewage
7	Detection of pollutants in the animal waste
8	Detection and quantification of environmental pollutants, toxicants and contaminants that affect animal, human and environmental health
9	Sustainable methods for animal waste disposal/ economic utilization arising from intensive animal husbandry
10	Cost-benefit analysis of environment friendly animal waste disposal approaches
11	Detection and quantification of genetically modified organisms
12	Structure and function of institutional biosafety committee (IBSC)
13	Environmental monitoring of pollutants – markers and methods
14	Preparation of feasibility report or projects pertaining to selected environmental pollutant(s) of regional importance
15	Preparation of feasibility report or projects pertaining to selected environmental pollutant(s) of national importance
16	Visit to sewage/ waste recycling/ disposal plant/ processing unit
17	Visit to water purification lant
18	Case studies on risk mapping, environmental risk assessment, pollution mitigation, etc.

I. **Course Title : Applied Epidemiology**
II. **Course Code : VPE 509**
III. **Credit Hours : 2+1**

Theory:

Sr. No	Topic
1	An introduction to applied epidemiology
2	Models, modeling and types of model
3	Epidemiological and economic models
4	Principles and classification of models
5	Deterministic and stochastic models
6	Empirical and explanatory models
7	Application of models in disease forecasting
8	Modelling in disease prevention and control
9	Disease occurrence and ecology of disease
10	Monitoring and surveillance types
11	Methods of surveillance
12	Outbreak investigation protocols
13	Path, regression and discriminate analysis
14	Time series analysis
15	Statistical analysis of the data - Analysis of variance
16	Animal disease economics - cost-benefit analysis, internal rate of return payback period, etc
17	Animal disease economics - partial budgeting
18	Animal disease economics - decision analysis
19	Bayesian analysis
20	Monte-Carlo processes and system evaluation
21	Markovian processes and system evaluation
22	Multivariate analysis
23	Disease outbreaks and participatory epidemiology
24	Disease reporting system - tracing and notification
25	Disease control strategies
26	Risk assessment
27	Epidemiology of Exotic diseases
28	Epidemiology of trans-boundary diseases
29	Vaccination for the prevention of diseases
30	Disease intelligence
31	Use of Artificial intelligence in Epidemiology
32	Tele-epidemiology
33	Application of remote sensing technology
34	Geographic information system
35	Disease surveillance and early warning system
36	Case Studies on World Animal Health Information System

Practicals :

1	Preparation of survey tools Questionnaires etc
2	Survey of animal diseases
3	Biostatistics for establishing disease causality, association and measurements
4	Profanity and non-probability sampling methods
5	Presentation of disease data
6	Measurements of disease occurrence in populations
7	Outbreak investigation
8	Disease reporting systems
9	Demonstration of epidemiological software
10	Estimation of disease burden and economics of animal/ zoonotic diseases
11	Modeling of animal diseases
12	Demonstration of cartography and disease mapping using computer software
13	Demonstration of global positioning system (GPS), remote sensing technology and geographic information system (GIS)
14	Demonstration of Quantum geographic information system
15	Working modality on disease surveillance and monitoring
16	Demonstration of disease early warning system
17	Disease modelling
18	Case study on disease reporting and notifiable disease

I. Course Title : Biosecurity, Bioterrorism and Disaster Management
II. Course Code : VPE 510
III. Credit Hours : 2+ 0

Theory:

Sr. No.	Title
1.	Introduction and definitions related to the bioterrorism
2.	Potential biological weapons
3.	Categorization agents of bioterrorism
4.	Hazard analysis in bioterrorism
5.	Strategies for combating bioterrorism
6-7.	Bio-ethics, social ethics and advisory role of veterinarians during the event of bioterrorism
8.	Disaster – Definitions, categorization (natural and man-made disasters)
9.	Impact analysis of disasters
10.	Classification of disaster scale
11.	Essential preparations for the management of disasters
12.	Role of central, state and local government bodies in disaster management
13.	Role of veterinarians/ veterinary public health personnel during emergency/disasters
14.	Sequence of emergency services
15.	Effect of natural disasters on human and animal populations
16.	Nature and characteristics of disasters - floods, tsunami, tides, etc.
17.	Nature and characteristics of disasters - prolonged draughts, forest fires, etc.
18.	Nature and characteristics of disasters - earthquakes, storms, etc.
19.	Post-disaster disease susceptibility and remedial measures
20.	Biosecurity– definition, importance, methods, pathogen inventory, etc.
21.	Biosecurity at food processing establishments
22.	Biosecurity at livestock/ poultry farms
23.	Biosecurity at specialized animal facilities
24.	Quarantine measures for disease prevention – structure and functions
25.	Biomedical hazards at hospitals, laboratories and special animal handling units
26.	Laboratory biosafety – principles, requirements and applications
27.	Guidelines for setting up and management of a Biosafety Laboratory
28.	Biosafety at the specialized laboratories
29.	Regulations and guidelines for recombinant DNA research and biocontainment
30.	Occupational health risk and its management
31.	National and International laboratory safety compliance
32.	Institutional Biosafety Committees (IBSCs)- Objectives, overview, composition, procedure of registration, role and functions
33.	Prediction, early warning or forecasting systems for disasters
34.	Case study related to bioterrorism
35.	Case study related to biosafety
36.	Case study related to disaster

I. Course Title : Laboratory Techniques in Veterinary Public Health
II. Course Code : VPE 511
III. Credit Hours : 0+3

Practicals:

Sr. No.	Practical Title
1.	General laboratory practices – safety precautions, hazardous material disposal, maintenance and compliance with existing norms
2.	Personal safety and use of PPE (personal protective equipment) in the laboratory
3.	Laminar airflows– uses, types of cabinets, SOPs, applications, etc.
4.	Biosafety cabinets – uses, types of cabinets, SOPs, applications, etc.
5.	Preparation of glassware and plastic wares
6.	Preparation of culture media: for food borne bacterial organisms
7.	Preparation of culture media: for food borne fungal organisms
8.	Preparation of culture media: for food borne rickettsial organisms
9.	Preparation of buffers and solutions of different for laboratory use: biochemical tests
10.	Preparation of buffers and solutions of different for laboratory use: molecular assays
11.	Sampling methods: simple random sampling and systematic sampling
12.	Sampling methods: stratified sampling and cluster sampling
13.	Techniques for quality analysis of milk and milk product: organoleptic and platform tests
14.	Techniques for quality analysis of milk and milk product: detection of adulterants and preservatives
15.	Techniques for quality analysis of meat and meat products (including poultry and egg): Chemical Composition, pH and Colour, Texture Analysis, Amino Acids (Free and Hydrolyzed), Cholesterol, Mineral Profile
16.	Techniques for quality analysis of meat and meat products (including poultry and egg): Lipid oxidation, Proteomics, Antioxidant Capacity
17.	Techniques for quality analysis of food/ feed samples
18.	Techniques for quality analysis of environmental samples
19.	Analysis of water for quality and safety
20.	Microbiological techniques: Plate counts – psychrophilic and mesophilic organisms
21.	Microbiological techniques: Plate counts - thermophilic and thermoduric organisms
22.	Microbiological techniques: enumeration techniques for psychrophilic and mesophilic organisms from samples of foods of animal origin
23.	Microbiological techniques: enumeration techniques for thermophilic and thermoduric organisms from samples of foods of animal origin
24.	Techniques for isolation and identification of foodborne pathogens: bacterial, viral
25.	Techniques for isolation and identification of foodborne pathogens: fungal, rickettsial
26.	Techniques for isolation and identification of zoonotic pathogens: bacterial, viral
27.	Techniques for isolation and identification of zoonotic pathogens:: fungal, rickettsial

28.	Techniques for detection of microbial toxins associated with food-poisoning and outbreaks: B. cereus enterotoxin

29.	Techniques for detection of microbial toxins associated with food-poisoning and outbreaks: Cl. botulinum toxins and staphylococcal enterotoxins
30.	Techniques for detection and confirmation of viral pathogens: Nucleic Acid Hybridization, PCR, Microarray Technologies, Next-Generation DNA Sequencing
31.	Techniques for detection and confirmation of viral pathogens: Direct method, using Enzyme immunoassays (EIA or ELISA) for detection of virus and/or viral antigen, Indirect method, using biotinylated antivirus antibody, followed by enzyme- (e.g., peroxidase)- labeled avidin.
32.	Techniques for isolation, identification of fungi of public health significance
33.	Techniques for enumeration, confirmation and characterization of fungi of public health significance
34.	Immunological techniques used for the detection of zoonotic agents - hypersensitivity based tests
35.	Immunological techniques used for the detection of zoonotic agents -Enzyme immune assay like fluorescence polarization immune assay (FPIA), micro-particle immune assay (MEIA), chemiluminescent (CLIA)
36.	Serological technique: precipitation tests
37.	Serological technique: agglutination tests
38	Serological technique: counter immune electrophoresis
39.	Serological technique: ELISA
40	Agarose Gel Electrophoresis (AGE) techniques
41.	PAGE technique
42.	SDS-PAGE techniques
43.	Chromatographic methods: gas chromatography, high-performance liquid chromatography
44	Chromatographic methods: thin-layer chromatography, and paper chro
45.	Techniques for the detection and quantification of pesticides residues: GC-MS/MS
46.	Techniques for the detection and quantification of pesticides residues: LC-MS/MS
47.	Techniques for the detection and quantification of drugs using immunological methods
48.	Techniques for the detection and quantification of drugs using chromatographic methods
49.	Methods for isolation and quantification of nucleic acids from pathogens from diverse biological specimens using latest molecular techniques
50.	Molecular techniques for the detection and characterization of organisms of veterinary public health significance – PCR
51.	Molecular techniques for the detection and characterization of organisms of veterinary public health significance – nucleic acid fingerprinting, amplification and microarray based methods
52.	Molecular techniques for the detection and characterization of organisms of veterinary public health significance – fluorescence in situ hybridization (FISH) and other molecular techniques
53.	Maintenance of laboratory records, log books of equipment laboratory accreditation (NABL)
54.	Laboratory accreditation (NABL)

PhD

Course Outline-cum-Lecture Schedule for Doctoral Degree Programme

I. Course Title : Advances in Veterinary Public Health and **Epidemiology**

II. Course Code : VPE 601

III. Credit Hours : 2+1

Theory:

Sr.No	Topic
1.	Contemporary status of Veterinary Public Health in India
2.	Contemporary status of Veterinary Public Health in abroad
3.	Public Health in the Twenty-first Century
4.	Current status Veterinary public health and its role in the society
5.	Role of veterinary public health professionals in prevention and control of zoonoses.=I
6.	Role of veterinary public health professionals in prevention and control of zoonoses.=I
7.	Opportunities for Veterinary Public Health Professionals
8.	Organization and administration of veterinary public health agencies
9.	Structure of veterinary public health
10.	Duties and Functions of veterinary public health
11.	Data analysis framework in healthcare and social sectors -I
12.	Data analysis framework in healthcare and social sectors -II
13.	Evidence-based information updates on current VPH topics on bacterial infections
14.	Evidence-based information updates on current VPH topics on viral infections
15.	Evidence-based information updates on current VPH topic fungal infections
16.	Evidence-based information updates on current VPH topics on rickettsial and parasitic infections
17.	Global animal disease surveillance -its importance and present status in India
18.	Development and implementation of global animal disease surveillance
19.	Recent diagnostic immunological tools used for emerging public health problems including zoonoses
20.	Recent diagnostic molecular tools used for emerging public health problems including zoonoses
21.	Recent diagnostic isolation used for emerging public health problems including zoonoses
22.	Molecular surveillance of recent pandemics of bacterial and viral zoonoses
23.	Molecular surveillance of recent pandemics of fungal and parasitic zoonoses
24.	Molecular surveillance of recent pandemics of rickettsial and chlamydia zoonoses
25.	Modes of evolutionary emergence of disease bacterial agents pertinent to VPH

26.	Modes of evolutionary emergence of disease viral agents pertinent to VPH
27.	Modes of evolutionary emergence of disease parasitic agents pertinent to VPH
28.	Modes of evolutionary emergence of disease fungal and rickettsial agents pertinent to VPH

29.	Application of bioinformatics and artificial intelligence tools for food hygiene. food safety quality assurance environmental health protection
30.	Application of biotechnological and computational tools for food hygiene. food safety quality assurance environmental health protection
31.	Application of whole genome sequencing tools for food safety quality assurance environmental health protection
32.	Global pandemic threats
33.	Global pandemic preparedness
34.	Emerging Disease Surveillance and Control
35.	Re-emerging Disease Surveillance and Control
36.	Biomedical models in veterinary public health

Practicals

1.	Assessment of health status of an individual
2.	Methods for estimation of disease burdens in a population
3.	Measurement and projection of disease burdens in a population
4.	Estimation of burden of food-borne diseases
5.	Estimation of burden of zoonotic diseases
6.	Molecular epidemiology of agents of VPH significance
7.	Genetic analysis of agents of VPH significance
8.	Case study related to field investigations of outbreaks of food poisoning
9.	Case study related to zoonotic diseases in a community
10.	Application of recent analytical methods (in-vitro and in silico techniques) used for public health research
11.	Application of recent analytical in-vivo methods used for public health research
12.	Visits to primary health centres to acquaint the students about public health related problems.
13.	Visits to hospitals to acquaint the students about public health related problems.
14.	Identification of health hazards across food supply chain
15.	Hygiene during production/ processing of foods of animal origin
16.	Safety management systems at the large-scale production or processing units of foods
17.	Longitudinal and integrated food safety assurance

18.	Assignment: Each student will select at least two recent articles from journals related to the course and discuss in the class through presentation/video /digital microlearning module

Course Title : Emerging, Re-emerging Zoonoses and One Health Course Code : VPE 602
Credit Hours : 2+1

Theory:

1.	Definitions – emerging and re-emerging zoonoses. Public health risks of emerging and re-emerging zoonoses,
2.	Define One Health and Concepts in One Health.
3.	Status of emerging and re-emerging zoonotic infections of National interests in emerging and re-emerging zoonoses
4.	Status of emerging and re-emerging zoonotic infections international interests in emerging and re-emerging zoonoses
5.	Measurement of emerging and re-emerging zoonoses
6.	Economics of emerging and re-emerging zoonoses
7.	Factors responsible for emergence and re-emergence of zoonotic diseases
8.	Role of wildlife in emerging and re-emerging zoonoses
9.	Current concepts in the diagnosis of emerging and re-emerging diseases
10.	Epidemiology and combating of emerging and re-emerging zoonotic diseases
11.	Latest diagnostics and management planning for emerging Zoonoses
12.	Latest diagnostics and management planning for re-emerging zoonoses
13.	Health threats at the human- animal-ecosystems/ environment interface (HAEI) tripartite (OIE, WHO and FAO) initiatives
14.	Strengthening global health security at the human- animal-ecosystems
15.	Comparative medicine and VPH - horizons and perspectives in emerging and re-emerging zoonotic infections
16.	Current challenges and strategies in the area of euzoonoses and xenozoonoses,
17.	Current challenges and strategies in the area of nosocomial zoonoses and newer zoonotic agents
18.	Characteristics, host range, epidemiology and management of Cat-scratch disease and Rat bite fever
19.	Characteristics, host range, epidemiology and management of Ebola and Marburg
20.	Characteristics, host range, epidemiology and management of Lassa, and Menangle viruses
21.	Characteristics, host range, epidemiology and management of Nipah viruses
22.	Characteristics, host range, epidemiology and management of SARS and MERS virus infections
23.	Characteristics, host range, epidemiology and management of Toro and ZIKA virus infections
24.	Characteristics, host range, epidemiology and management of zoonotic influenza viruses
25.	Characteristics, host range, epidemiology and management of herpes and hepatitis (A and E) viruses
26.	Characteristics, host range, epidemiology and management of co-infections, super- infections and syndemics - Simian and human immunodeficiency viruses
27.	Characteristics, host range, epidemiology and management of taeniasis/ cysticercosis

28.	Characteristics, host range, epidemiology and management of Bovine spongiform encephalopathy

29.	Characteristics, host range, epidemiology and management of Creutzfeldt-Jacob disease
30.	Characteristics, host range, epidemiology and management of brucellosis And other emerging bacterial zoonoses
31.	Characteristics, host range, epidemiology and management of tuberculosis
32.	Guillain-Barre Syndrome and related sequel due to emerging/ re-emerging zoonoses
33.	Close collaborations with regional, and national organizations in the control of emerging/ re-emerging pathogens
34.	Close collaborations with international organizations in the control of emerging/ re-emerging pathogens
35.	Case study on emerging zoonotic disease
36.	Case study on re-emerging zoonotic disease

Practicals:

1	Application of safety regulations in laboratories, hospitals and biological units for handling emerging/ re-emerging agents
2	Methods to elucidate epidemiology of emerging/ re-emerging zoonoses
3	Approach to establish role of wildlife in emerging/ re-emerging zoonoses
4	Epidemiology of drug resistant emerging/ re-emerging zoonotic agents
5	Establishing genetic basis of bacterial emerging/ re-emerging zoonoses
6	Establishing genetic basis of viral and prion emerging/ re-emerging zoonoses
7	Establishing genetic basis of fungal, rickettsial and chlamydial emerging/ re-emerging zoonoses
8	Recommended diagnostic testing (OIE) for emerging/ re-emerging zoonoses
9	Vaccination and other strategies for the prevention of emerging/ re-emerging zoonoses
10	Application of Novel molecular methods for the understanding of emerging/ re-emerging zoonoses
11	Study abundance, behaviour, profiling and dynamics of vectors associated with emerging/ re-emerging zoonoses
12	Study abundance, behaviour, profiling and dynamics of vectors associated with emerging/ re-emerging zoonoses
13	Institutional surveillance of emerging/ re-emerging zoonoses
14	Visits to primary health centre /hospital to study of zoonotic diseases and categorization of agents as emerging zoonosis
15	Visits to health centre to study of zoonotic diseases and categorization of agents as re-emerging zoonosis
16	Special problem related to emerging/ re-emerging or prevalent zoonotic diseases
17	Assignment: Each student will select at least two recent articles from journal related to course and discuss in the class through presentation/video/digital multimedia
18	Assignment: Each student will select at least two recent articles from journals related to course and discuss in the class through presentation/video/digital multimedia

I. Course Title : Advances in Food Safety and Quality Control of Foods of Animal/Aquatic Origin

II. Course Code : VPE 603

III. Credit Hours : 2+1

Theory:

1	Food supply chain dynamics
2	Food production, processing and handling practices
3	Food safety and quality assurance of foods of animal origin
4	New age voluntary and mandatory food standards
5	Types and evolution of food standards
6	Characteristics of food safety hazards
7	Quality control, assurance and food safety specifications for animal origin foods such as meat, milk, egg and fish-I
8	Quality control, assurance and food safety specifications for animal origin foods such as meat, milk, egg and fish-II
9	Recent innovations in shelf-life extension and preservation
10	Recent innovations in advanced packaging (active, smart and intelligent)
11	Requirements for food testing and calibration Laboratory Mechanism of food spoilage (microbial and non-microbial)
12	FSSAI/ISO guidelines for food testing and calibration Laboratory
13	Nature of major food-borne infections and intoxications
14	Elimination of food safety hazards from primary production systems
15	Rapid detection of food safety hazards
16	Impact of animal feed on food safety.
17	Prevention and control of risks arising due to animal feeds
18	Coordination of surveillance policies in animal health and food safety
19	Food safety challenges in animal production systems affecting global markets
20	Quality assurance schemes applicable to foods of animal origin
21	Veterinary services for public health and consumer safety
22	Food safety risk assessment
23	Genesis of food quality/ safety standards
24	Food quarantine and export guidelines, specifications and standards (APEDA, FSSAI etc)
25	Food quarantine and import guidelines, specifications and standards (APEDA, FSSAI etc)
26	National food safety compliances
27	International food safety compliances
28	Traceability system - Traceability of foods of animal origin
29	Global considerations and role of committees and agencies associated with food safety, quality control and quality assurance-I
30	Global considerations and role of committees and agencies associated with food safety, quality control and quality assurance-II
31	Trends in green technologies in food production and processing

32	Waste reduction along the food supply chain

33	Impacts and performance of organic farming vis-a-vis conventional farming
34	Consumer perspectives of food quality and safety
36	Environmental impact assessment of production of foods of animal origin

Practicals:

1.	Detection, enumeration and identification of food safety microbial hazards
2.	Detection, enumeration and identification of food safety hazards (physical, chemical and allergens)
3.	Pre-requisite programs for ensuring food safety
4.	Environmental impact assessment- water and air quality.
5.	Environmental impact assessment- equipment and soil quality.
6.	Application of generic traceability system for foods of animal origin
7.	Detection of allergens associated with foods of animal origin
8.	Emerging technologies for microbial control in food processing (Preservation, High-pressure processing (HPP), thermal pasteurization, sterilization, storage etc.)
9.	Emerging technologies for microbial control in food processing (isochoric freezing, high-voltage atmospheric cold plasma, electrohydrodynamic drying, oxygen isotope modeling etc)
10.	Methods of management of waste arising from production and processing units of foods of animal origin
11.	Methods of management of waste arising from production and processing units of aquaculture
12.	Rapid alert system for food and feed
13.	Detection, enumeration and identification of food safety microbial hazards
14.	Visit and hands on training at food processing establishments (Dairy processing unit)
15.	Visit and hands on training at food processing establishments (meat and fish processing units)
16.	Special problems on microbial quality and safety of foods of animal origin foods
17.	Special problems on chemical and physical quality and safety of foods of animal origin foods
18.	Assignment: Each student will select at least two recent articles from journals related to course and discuss in the class through presentation/video using digital multimedia

I. Course Title : Biosecurity and Occupational Health Safety
II. Course Code : VPE 604
III. Credit Hours : 2+1

Theory:

Sr. No.	Lecture/Topic
1	Definitions: Bio-safety, bio-security and bio-containment; physical, chemical and biological hazards
2	Elements of bio-security and bio-containment
3	Nature and types of physical and chemical hazards at work places
4	Nature and types of biological hazards at work places
5	Biosafety and Biosecurity regulations -by national agencies
6	Biosafety and Biosecurity regulations -by International agencies
7	Bio-security requirements, Containment Barriers
8	Laboratory and equipment safety
9	Risk assessment
10	Bio-safety levels
11	Bio-safety in microbiological and bio-medical laboratories
12	Risk groups, classification of organisms by risk groups
13	Classification of occupational groups
14	Laboratory designs and requirements - Biosafety Level 1 & Level 2
15	Laboratory designs and requirements - Biosafety Level 3 &Level 4
16	Laboratory designs - Animal Biosafety Level 1and 2
17	Laboratory designs - Animal Biosafety Level 3 & 4
18	Transmission, spread and maintenance of diseases affecting various occupational groups in contact with animals
19	Diseases affecting various occupational groups in contact with animals ; their public health significance and control
20	Diseases associated with various occupations (Veterinarians, Slaughter-house workers, Wildlife workers, Agricultural recreational groups etc)
21	Occupational safety and health
22	Occupational Health and Safety (OHS) management system standard ISO 45001
23	Regulations pertaining to the Occupational safety and health
24	Occupational Safety and Health Administration
25	Various occupational groups and associated risks
26	Risk group classification
27	Risk assessment strategies and five Ps of risk assessment
28	Recombinant DNA Risk rDNA Risk Assessment factors
29	Bio-risk Management
30	Fundamentals of Biorisk management and Elements of laboratory biorisk management system
31	Classification of infective microorganisms by risk groups
32	Institutional Biosafety Committees (IBCs)
33	The Bio-medical Waste Management (Amendment) Rules, 2018

34	The Bio-medical Waste Management
35	International Labour Organization and its occupational safety provisions, Research Ethics and Compliance
36	Biosecurity and Occupational Health Safety: One health approach

Practicals:

Sr. No.	Practicals
1	Standard laboratory practices
2	Classification of Biosafety cabinets
3	Handling of Bio-safety cabinets
4	Detection of occupational diseases of public health significance
5	Relation of risk group to biosafety levels, practices and equipment
6	Design of BSL-1 and BSL-2 laboratories
7	Design of BSL-3 and BSL-4 laboratories
8	Design of Animal biosafety laboratory
9	Survey of biosafety and biosecurity in biomedical laboratories
10	Preparedness for pathogen spillage/accidents in laboratories
11	Management of chemical spillage
12	Transportation of high risk pathogens/ samples – modes, guidelines and regulations
13	Handling of the high-risk samples at biosafety laboratory
14	Activity spectrum of detergents and disinfectants
15	Personal protection Equipments, Bio-risk Assessment Sheet and Material Safety Data Sheet (MSDS)
16	Case study on occupational safety in specialized laboratories/food processing industry
17	Case study on biosafety level 3 or 4 laboratory
18	Visit to the biosafety laboratory

Course code: **VPE-605**

Course title: **Recent Concepts in Epidemiology and Disease Forecasting**

Credit: **2+1**

Theory:

Sr. no.	Lecture/Topic
1	Epidemiological concepts of disease occurrence in population
2	Variations in disease by time, place, and animal/ person
3	Recent epidemiological approaches for elucidating cause and effect
4	Variations: Role of error, bias, and confounding
5	The concept of risk/ risk factor in relation to the disease
6	Characterization and quantification of risk in epidemiology
7	Concepts in the measures of disease frequency
8	Analysis and integration of data for epidemiological methods/ techniques
9	Concepts in epidemiological study designs
10	Risk factors in various important animal diseases of public health significance
11	Recent concepts in the epidemiology of economically important bacterial animal diseases of the region (haemorrhagic septicaemia, brucellosis, etc)
12	Recent concepts in the epidemiology of economically important viral animal diseases, viz., FMD, Swine fever and Avian Influenza.
13	Recent concepts in the epidemiology of economically important viral animal diseases, viz., Sheep Pox, IBD, NCD and others of the region
14	Recent concepts in the epidemiology of economically important fungal and parasitic and other animal diseases of the region
15	Recent concepts in the epidemiology of economically important conditions and other animal diseases of the region (Species wise distribution with special reference to national priority diseases)
16	Geographical Information System (GIS)
17	Advancements in GIS technology for epidemiological application in Veterinary and Animal Sciences
18	Various expert systems (National Animal Health Management , Animal production and Health Information Network, Veterinary Medical database, Disease Control System, NADRES) and their role in epidemiology
19	National agencies and their working for disease forcasting
20.	Advances in disease forecasting
21	Concepts in animal disease modelling, Animal disease modelling, Disease prediction models
22	Modelling of economically important animal diseases
23	Modelling of emerging zoonotic infections
24	Modelling of re-emerging zoonotic infections

25	Application of advanced disease forecasting concepts for animal/ zoonotic diseases
26	Disease early warning systems
27	Global disease early warning systems

28	National disease early warning systems
29	Epidemiological software and their applications related to animal/ zoonotic infections
30	Common software packages and databases used in veterinary practice
31	Epidemiological Concepts Regarding Disease Monitoring and Surveillance
32	Advances in the practice of Public Health Surveillance
33	Real-time animal tracking using global positioning systems (GPS)
34	Use of advanced computing and remote sensing/ satellite technology for the study of animal/ zoonotic diseases
35	Case study related to application of recent epidemiological tool
36	Case study related to disease forecasting

Practicals:

Sr No	Practicals
1	Use of Geographical Information System to study epidemiology of disease
2	Disease expert systems for animal/ zoonotic diseases
3	Disease investigation preparedness
4	Disease modelling for economically important animal diseases
5	Disease modelling for zoonotic diseases
6	Model designing for disease forecasting
7	Study of the epidemiology of disease outbreaks using advanced epidemiological techniques
8	Investigation of animal/ zoonotic diseases using recent epidemiological tools
9	Advanced disease reporting system
10	Study of animal/ zoonotic diseases using advanced computing tools
11	Study of animal/ zoonotic diseases using remote sensing/ satellite technology
12	Risk mapping for economically important animal diseases
13	Risk mapping for economically important zoonotic diseases
14	Epidemiological exercises of economically important diseases of the region
15	Use of artificial intelligence and neural networks in veterinary epidemiology
16	Integrated disease surveillance system – prototype development
17	Case study related to advanced epidemiological tool
18	Case study related to advanced disease forecasting/ modelling

Course Code: **VPE-606**

Course title: **Risk Analysis and Predictive Modelling**

Credits: **2+1**

Theory:

Sr. No.	Topic/Lecture
1	Definitions, History of risk analysis
2	Relevance of risk analysis (RA) to food sector
3	Principles of risk analysis
4	Risk analysis components (risk assessment, management and communication)
5	Risk assessment (Statistical Risk Assessment)
6	Risk management
7	Risk communication
8	Microbial Risk Assessment (MRA) involving hazard identification, exposure assessment, hazard characterization, and risk characterization
9	Risk Assessment of other than microbial hazards
10	Hazard identification
11	Exposure assessment
12	Hazard characterization
13	Risk characterization
14	Methodologies used in risk analysis (RA)/ Microbial Risk Assessment MRA
15	Qualitative risk analysis
16	Quantitative risk analysis
17	Quantitative Microbial Risk Assessment (QMRA) for foods of animal origin
18	Quantitative Microbial Risk Assessment (QMRA) for water
19	Application of mathematical models to study propagation of microbial hazards from farm-to-fork
20	Risk-based decision-making
21	Variability and uncertainty inherent to biological data
22	Measurement and modelling of uncertainty and variability during risk assessment
23	Integration of risk assessment/ risk analysis with HACCP system
24	Integration of risk assessment/ risk analysis with other quality management or assurance systems (QRM, ISO 9001,)
25	Linking microbial food safety with risk assessment
26	Relevance of assumptions and observed data for predictive models
27	Study of software packages used for risk analysis
28	Mathematical modelling of microbial growth rate in food/ feeds
29	Predictive modelling tools for food safety management
30	Microbial modelling for the prediction of product shelf-life and safety
31	Applications of predictive modelling of microbial behaviour in foods
32	Meta-analysis in risk analysis of economically important animal diseases
33	Meta-analysis in risk analysis of economically important zoonotic diseases
34	Risk prediction models
35	Case study related to MRA of foods of animal origin
36	Case study related to foods of animal origin other than microbial risk

Practicals:

Sr. No.	Topic
1	Microbial Risk Assessment (MRA)
2	Risk assessment (Hazard identification, characterization, exposure assessment, risk characterization
3	Risk management (Risk evaluation, assessment of management option, implementation of management decision, Monitoring and review of risk management
4	Risk communication (Communication with risk assessor, manager, consumer and industry)
5	Risk assessment of other than microbial risk
6	Qualitative MRA
7	Quantitative MRA
8	Modelling of infectious diseases using computational and mathematical methods.
9	Building and analyzing models of infectious diseases
10	Study of population-level processes for infectious diseases of animals and humans
11	Performing risk analysis for food safety hazards using microbial risk analysis tools
12	Risk assessment using high throughput simulation modelling
13	Investigation of uncertainty, variability and sensitivity analysis techniques using computer models
14	Risk prediction models – study of prototype
15	Meta-analysis – study of prototype
16	Multivariate prediction models – study of prototype
17	Case study on MRA
18	Statistical process control for microbial risk analysis

I. Course Title : Advances in Environmental Hygiene
II. Course Code : VPE 607
III. Credit Hours : 2+1

Theory:

Sr. No.	Topic
1	Current status of problems pertaining to environmental hygiene
2	Status, impact and management of indoor air pollution
3	Status, impact and management of outdoor air pollution
4	Status, impact and management of global warming
5	Status, impact and management of soil pollution
6	Status, impact and management of water pollution
7	Status, impact and management of environmental problems
8	Impact of pollution on the ecology of diseases
9	Environmental impact of intensive animal husbandry
10	Impact of intensive animal husbandry on the public health
11	Animal sector consequences of carbon footprints
12	Eco-philosophy, policy and advocacy of environmental hygiene with veterinary/animal husbandry perspectives
13	Environmental economics
14	Environmental conflicts and cooperation
15	Ethics and compliance - sustainable animal husbandry and environmental safety
16	Disinfects and disinfection procedures
17	Environmental risk analysis (assessment and management)
18	Occupational health impact of animal farming
19	Occupational environmental hygiene and safety linked to animals
20	Health risk profiling and risk analysis of animal farming and trade
21	Epidemiology of chronic occupational disease induced by environmental pollution
22	Ecotoxicology of toxicants used in the farming
23	Bio-accumulation, concentration and bio-magnification of pollutants, toxicants and hazardous substances in the environment
24	Reporting of environmental issues and global informatics
25	Environmental hazard surveillance
26	Environmental hazard monitoring systems
27	Decision making and public awareness
28	Role of public health veterinarians in National Sanitation Programmes (Swachh Bharat Abhiyan and other governmental programmes)
29	International environmental management efforts
30	International organizations and programmes
31	Legislations on environmental hygiene, safety and policy
32	Global warming and climate change in India
33	Impact of climate change on human and animal diseases
34	Case study on chemical pollutant from animal sector
35	Case study on gaseous pollutant from animal sector

36	Case study on estimation of COD/BOD from animal sector

Practicals:

Sr. No.	Topic
1	Hygiene and sanitization of animals and animal premises
2	Detection and monitoring of pollutants emanating from animals to the air
3	Detection and monitoring of pollutants emanating from animals to the soil
4	Detection and monitoring of pollutants emanating from animals to the water
5	Detection and monitoring of pollutants emanating from animals to other environmental sources
6	Advanced environmental hazard measurement methods
7	Measurement of health effects of environmental toxicants
8	Environmental risk assessment methods
9	Risk analysis of animal contributed ammonia
10	Risk analysis of animal contributed hydrogen sulphide
11	Risk analysis of animal contributed methane
12	Risk analysis of animal contributed other environmental hazards
13	Visits to domestic waste treatment plant to study characteristics, impact and mitigation of hazards and associated risks
14	Visits to meat/milk/fish processing effluent treatment plants, tannery, etc. to study characteristics, impact and mitigation of hazards and associated risks
15	Assignments: Each student will select at least two recent articles from journals related to course and discuss in the class through presentation
16	Environmental pollution prevention project report-Air pollution
17	Environmental pollution prevention project report-Water pollution
18	Environmental pollution prevention project report-Soil pollution

I. Course Title : Herd Health Management and Disease Economics
II. Course Code : VPE 608
III. Credit Hours : 2+1

Theory

Sr. No.	Topic
1	General principles of herd health
2	Interaction between health and production
3	Health effects of animal and zoonotic infections at the farm level
4	Direct and indirect losses due to zoonotic diseases
5	Components of the economic impact of animal diseases
6	Herd health management and disease economics
7	Linking heard health with economics – margin of returns
8	Health effects of animal and zoonotic infections at the regional/ state/ national/international level
9	Interactions between health, production and disease
10	General principles of enhancing herd immunity
11	Economic methods of disease control for decision support
12	Herd health management – intervention options and their economic assessment
13	Quantification of financial effects of animal disease
14	Methods for optimizing decisions at individual animal, herd and population levels
15	Determination of costs and benefits of disease control measures
16	Estimation of extent of the disease and potential spread
17	Economic aspects and impact of zoonotic diseases
18	Estimation of cost of animal/ zoonotic disease on livelihoods outcomes (income, health, and trade), including environmental impacts
19	Assessment of the cost-effectiveness of control strategies used to reduce the risk
20	Identification of factors affecting adoption of zoonotic risk reduction strategies
21	Estimation of disability adjusted life years (DALYs) parameters
22	Herd health management and disease economics of diseases in cattle/ buffalo
23	Herd health management and disease economics of diseases in sheep/ goat
24	Herd health management and disease economics of diseases in swine
25	Herd health management and disease economics of diseases in poultry
26	Herd health management and disease economics of diseases in other livestock
27	Preventive healthcare through vaccination
28	Preventive healthcare through bio-security practices
29	Economic benefits of prevention and control of diseases
30	Zoning and creation of disease-free area
31	Disease eradication and surveillance
32	Livestock disease risk forecasting methodologies
33	Livestock health and disease control schemes in India
34	Inter-sectorial coordination for prevention and control of zoonoses and TADs
35	Role of OIE/FAO/WHO in animal disease surveillance- OIE-WAHIS, OIE Wildlife Health Framework, FAO-EMPRES-I etc.

36	Case study on eradication of disease–Economic perspectives

Practicals

Sr. No.	Topic
1	Study of framework of animal health management
2	Steps and methods for assessment of the economic impact of a disease
3	Assessing economic merit of interventions to control disease
4	Decision analysis and decision support systems for promoting animal health
5	Modelling animal health economics
6	Modelling the economics of Veterinary Services at the Farm Level
7	Modelling the economics of National Disease Control Programs
8	Economic modelling techniques (i.e. partial budgeting, cost-benefit analysis, decision analysis, and systems simulation) for veterinary decision making
9	Economic assessment of problems, programmes, prevention/ control measures, impact, etc.
10	Economic evaluation of hygienic practices in the animal house
11	Estimation of burden of animal/ zoonotic diseases
12	Estimation of DALY and other disease parameters
13	Case study on economic impact of zoonotic diseases
14	Visit to various livestock farms, assessment of their problems
15-16	Assignments: Each student shall select at least two recent articles from journals related to course and discuss in the class through presentation
17	Cost economic benefit analysis of preparing national veterinary services for zoonoses and TADs
18	Project report on assessment of animal health at animal farms

I. Course Title : **Epidemiology of Trans-boundary, Non-infectious and Chronic Diseases**

II. Course Code : VPE 609

III. Credit Hours : 2+1

Theory:

Sr. No.	Topic
1	Definition and characteristics of trans-boundary diseases
2	Global trends in the occurrence of trans-boundary diseases
3	Role of wildlife in emergence of trans-boundary diseases
4	Prevention/ control of trans-boundary diseases
5	Important trans-boundary diseases categorized according to the aetiology
6	Important trans-boundary diseases categorized according to the animal species
7	New Technologies to fight transboundary animal diseases
8	Role of veterinary public health and veterinary services in the management of non-infectious and chronic diseases
9	Establishment of causality and associations in non-infectious and chronic diseases
10	Characteristics of Koch's/ Henle-Koch postulates and Evans' rules of disease causation
11	Unified principles of establishing causality for both infectious and non-infectious diseases
12	Infectious and chronic disease connections
13	Causal role of infectious agents in cancer (relating criteria)
14	Global status of non-communicable diseases
15	Establishment of trends of non-infectious and chronic disease occurrence
16	Epidemiology of non-infectious and chronic diseases affecting different species (livestock/ poultry) and production systems
17	Determinants of chronic and non-infectious diseases- reasons for emergence range of pathways and epidemiology
18	Study of characteristics of risk factors (genetic and physiological) associated with non-infectious and chronic diseases
19	Study of characteristics of risk factors (environmental, behavioural, etc) associated with non-infectious and chronic diseases
20	Demographic, epidemiological and nutritional factors
21	Economic impact of chronic and non-communicable diseases
22	Social determinants of non-communicable diseases
23	Spatial and temporal epidemiology of nutritional and metabolic diseases
24	Spatial and temporal epidemiology of reproductive diseases
25	Spatial and temporal epidemiology of chemical poisonings and toxicities (pesticides, poisonous plants, etc)
26	Spatial and temporal epidemiology of neoplastic and other miscellaneous diseases
27	Modelling of non-infectious non –communicable diseases or chronic diseases
28	Trends in the prevention and control of non-infectious – current status and future perspectives

29	Trends in the prevention and control of chronic disease – current status and future perspectives
30	Early detection, notification and surveillance
31	Participatory surveillance
32	Advances in molecular epidemiology of infectious diseases including zoonoses
33	Non communicable diseases among livestock and poultry
34	Case study on vector-borne trans-boundary diseases
35	Case study on non-infectious chronic livestock disease
36	Case study on emerging/ re-emerging zoonotic trans-boundary diseases

Practicals

Sr. No.	Topic
1	Detection and characterization of trans-boundary diseases
2	Capacity building and training
3	Study of the role of wildlife in trans-boundary animal diseases
4	Wildlife disease surveillance
5	Study of wildlife–livestock interface and disease ecology
6	Disease investigation - data and information collection, collation and sharing
7	Surveillance for trans-boundary diseases
8	Measurement of burden of non-infectious and chronic diseases (mortality, morbidity, survival, risk factors, etc.)
9	Measurement of burden of zoonotic diseases (mortality, morbidity, survival, risk factors, etc.)
10	Measurement of burden of TADs (mortality, morbidity, survival, risk factors, etc.)
11	Survey of non-infectious and chronic diseases
12	Animal models for the study of non-infectious and chronic diseases
13	Establishment of evidence/ proof of causation of non-infectious and chronic diseases
14	Study of risk factors associated with non-infectious and chronic diseases
15	Measurement of socioeconomic impacts associated with non-infectious and chronic diseases
16	Controlled trials involving contemporary non-infectious and chronic diseases
17	Estimation of disease frequencies
18	Case study on trans-boundary/ chronic livestock disease

Course Title : Ecology and Animal/ Human Health

I. Course Code : VPE 610

II. Credit Hours : 2+0

Theory

Sr. No	Topic
1	Definitions related to ecology and animal or human health
2	Linkage between human- animal health and the ecosystem
3	Spill-over of diseases – elucidation of social and ecological basis of disease
4	Case studies of regional Spill-over of diseases
5	Assessment of changing trends in the environments and its impact on the animal/ human health
6	Study of emerging public health threats linked to the changes in the environment
7	Study of landscape epidemiology of diseases
8	Case studies : landscape epidemiology of Bacterial/Viral/Rickettsial/Parasitic diseases
9	Study of contemporary issues centred on ecological and evolutionary perspectives of infectious diseases
10	Animal–human-ecosystem interface
11	Study of ecological/ environmental factors influencing spatio-temporal occurrence of disease such as temperature, rainfall and other environmental factors
12	Ecological conditions and evolutionary dynamics
13	Disease ecology based explanatory and predictive models
14	Elucidation of natural history and host-parasite interactions linked to the ecological factors
15	Ecology of vector borne diseases
16	Vector dynamics and ecology
17	Study extrinsic incubation period
18	Understanding of critical risk factors of disease spread – timing, distribution, and abundance of competent vectors
19	Study of cyclical patterns of disease
20	Mapping environmental conditions with disease
21	Establishing functional links between environmental modifications and infectious diseases
22	Establishing functional links between environmental modifications and Non Infectious diseases
23	Linking climate change with disease occurrence
24	Impact of climate change on disease occurrence
25	Study of dynamics of ENSO with climate change and disease
26	El Niño/ Southern Oscillation (ENSO), influence on global climate variability and disease occurrence
27	Evolution of disease alert and forecasting systems
28	Use of global positioning and remote sensing tools for disease management
29	Early warning and GIS based disease predictions
30	Role of bio-security measures in curtailing transmissible diseases at the animal-animal, animal-human and human-human interface
31	Vector-borne diseases–intersection of human and animal health

32	Impact of ecological/ environmental factors on the emergence of human/ animal diseases
33	Clusters of disease outbreaks
34	Role of Environmental pollutant in AMR
35	Environmental Resistomes and AMR
36	Preparedness for combating the impacts of climate change

I. Course Title : Diagnostic Approaches in Epidemiology
II. Course Code : VPE 611
III. Credit Hours : 2+1

Theory:

Sr. No	Title
1	Concepts of molecular basis of a disease
2	Molecular epidemiology of diseases/ infections
3	Molecular determinants of pathogenicity and virulence amongst agents
4	Dynamics of disease transmissibility in populations of livestock and poultry
5	Epidemiology of antigenic, genetic and biological diversity amongst pathogens associated with disease/ outbreaks : Bacterial and Viral disease/ outbreaks
6	Epidemiology of antigenic, genetic and biological diversity amongst pathogens associated with disease/ outbreaks : : Rickettsial and Parasitic disease/ outbreaks
7	Differentiation of field isolates (wild) from vaccine strains (markers, DIVA, etc).
8	Marker vaccine development
9	Detection and characterization of pathotypes, serotypes, biotypes and genotypes of pathogens
10	Understanding epidemiology of disease using immunological, immunoblotting and monoclonal antibody-based tests
11	Understanding epidemiology of disease using conventional immune assays.
12	Understanding epidemiology of disease using rapid enzyme immune assays.
13	Use of monoclonal antibodies in different ELISAs for antigenic analysis
14	Understanding epidemiology of disease using pathogen typing methods, viz., polymerase chain reaction, sequencing, RFLP, etc.
15	Understanding epidemiology of disease using radio-actively labelled or nonradioactive oligo-nucleotide probes - dot-blot and Southern hybridizations
16	Evaluation of diagnostic tests/ assays using epidemiological approaches
17	Vaccine efficacy/ effectiveness trails
18	Epidemiology of screening and confirmatory diagnostic assays
19	Estimation of disease burden in populations
20	Estimation of frequency and pattern of health events in a population
21	Designing of epidemiological studies
22	Representation disease data/ information
23	Study of disease databases and online resources
24	Quantification of zoonotic agents using conventional tools
25	Quantification of zoonotic agents using molecular tools
26	Rapid detection of foodborne agents
27	Rapid detection of zoonotic agents
28	On-site, on-farm and animal-side disease detection systems- approaches and applications
29	Phylogenetic analysis of disease agents
30	Use of modern bio-informatics and disease informatics tools for the study of zoonotic and other determinants of public health significance
31	Source tracing of origin of infectious agents
32	Outbreak investigation and disease reporting including notifiable diseases
33	Traceability of livestock and its implications
34	Multi-centric molecular typing and validation of foodborne and zoonotic agents

35	Epidemiology of chronic disease makers
36	Case study on quantitative epidemiological analysis
	Practicals:
1	Molecular fingerprinting of pathogens
2	Molecular epidemiology of foodborne and zoonotic agents
3	Detection and characterization of pathogens using nucleic acid based techniques : Bacterial and Viral Pathogens
4	Detection and characterization of pathogens using nucleic acid based techniques :Rickettsial and Parasitic Pathogens
5	Sero-epidemiology – methods and applications
6	Multi-locus sequence typing (MLST), and amplified fragment length polymorphism (AFLP) typing of pathogens
7	Pulsed-field gel electrophoresis (PFGE) typing of pathogens
8	Source tracing of outbreaks
9	Construction and characterization of epidemic curve
10	characterization of Iceberg Phenomenon in Epidemiology
11	Spatio-temporal clustering of diseases
12	Mapping disease and risk factors
13	Statistical Analysis to eliminate confounding effects : Stratification method
14	Statistical Analysis to eliminate confounding effects : Calculation of variables and confounders using logistic regression and Linear Regression analysis
15	Epidemiological analysis for the disease prediction, early warning and forecasting-I
16	Epidemiological analysis involving remote sensing, GIS and satellite technologies
17	Assignment: Each student shall select at least two recent articles from journals related to the course and discuss in the class through presentation: Viral and Bacterial Disease Diagnostic Epidemiology
18	Assignment: Each student shall select at least two recent articles from journals related to the course and discuss in the class through presentation : Rickettsial and Parasitic Disease Diagnostic Epidemiology

I. Course Title : Surveys, Surveillance and Data Management
II. Course Code : VPE 612
III. Credit Hours : 2+1

Theory

	Lecture Schedule
Sr. No	**Title**
1	Robust survey: planning, statistical models. Survey iceberg (tools and technologies).
2	Structured population-based surveys, types of surveys.
3	Survey design - Sampling, Sampling methods, Sample size, etc.
4	National surveys.
5	Surveillance – definition, goals and types of surveillance system.
6	Principles of surveillance.
7	Critical elements of surveillance.
8	Surveillance methods and approaches.
9	Surveillance for distribution and occurrence of infection.
10	Information architecture for surveillance.
11	Structured non-random surveillance.
12	Surveillance programmes. Designing an active surveillance program.
13	Surveillance to demonstrate freedom from disease or infection.
14	Epidemiological surveillance network.
15	Components of regional or national surveillance system.
16	Statistical models for surveillance. (logistic regression, time-series,)
17	Statistical models for surveillance. (clustering, and decision trees)
18	Introduction of software tools for epidemiological surveillance and Software used for surveillance.
19	State, National and International agencies (OIE, CDC, etc.), databases and management systems
20	Surveillance of emerging diseases
21	Surveillance of re-emerging diseases
22	Animal health surveillance
23	Data and database of Animal Diseases
24	Data acquisition - Questionnaires
25	Data acquisition - Sampling
26	Disease/ data recording and reporting
27	Veterinary data recording schemes and information system (databases) : National
28	Veterinary data recording schemes and information system (databases) : International
29	National veterinary epidemiology and disease informatics
30	Epidemiology informatics on nationally important emerging/ reemerging diseases and designing of strategies for their prevention and control.
31	Epidemiology informatics on globally important emerging/ reemerging diseases and designing of strategies for their prevention and control.
32	Analysis of disease data using software analysis
33	Study of veterinary epidemiology and disease informatics software : Epidzoo, EpiInfo, Episcope etc

34	Study of veterinary epidemiology and disease informatics software: WinBUGS and OpenBUGS, MLwiN, Arc-SDM etc
35	Case study on disease surveillance of International importance
36	Case study on disease surveillance of National importance
	Practicals:
1	Data collection, storage and quality control
2	Sampling methods - confidence level, sample unit, sample size, etc.
3	Statistical methods for analysis of disease data
4	Preparation and analysis of questionnaires
5	Questionnaire survey for disease prevalence
6	Data analysis using computer software
7	Data analysis and representation of data pertaining to animal disease/ productivity
8	Evaluation of animal disease surveillance systems
9	Survey for livestock and poultry diseases
10	Study/ development of computer software for animal disease/ productivity
11	Evaluation of veterinary/ animal husbandry interventions
12	Handling of epidemiology software : Open Epi, Epi Info™, Epitools - Epidemiological Calculators etc
13	Study of national health surveys related to human disease
14	Study of national health surveys related to animal disease
15	Surveillance of economically important disease of the region
16	Surveillance of economically important disease of the state
17	Usefulness/ efficacy/ effectiveness of vaccines/ vaccination
18	Assignment: Each student will select at least two recent articles from journals related to course and discuss in the class through presentation

I. **Course Title: Research Methodology and Publication Ethics in VPE***
II. **Course Code: VPE 613**
III. **Credit Hours: 2+0**

Sr. No	Topic
1.	Introduction to philosophy: definition, nature and scope
2.	Introduction to philosophy: concept, branches
3.	Ethics: definition, moral philosophy,
4.	Nature of moral judgements and reactions
5.	Ethics with respect to science and research
6.	Intellectual honesty and research integrity
7.	Scientific misconduct: Falsification, Fabrication
8.	Scientific misconduct: Plagiarism (FFP)
9.	Redundant publications: duplicate and overlapping publications, salami slicing
10.	Selective reporting and misrepresentation of data
11.	Publication ethics: definition, introduction and importance
12.	Best practices/ standards setting initiatives and guidelines: Committee on Publication Ethics (COPE)
13.	Best practices/ standards setting initiatives and guidelines: World Association of Medical Editors (WAME) etc.
14.	Conflict of interest
15.	Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types
16.	Violation of publication ethics, authorship and contributorship
17.	Identification of publication misconduct, complaint and appeals
18.	Predatory publishers and journals
19.	Open access publications and initiatives
20.	SHERPA/RoMEO online resource to check publishers copyright and self-archiving policies
21.	Software tool to identify predatory publications developed by SPPU
22.	Journal finder/ journal suggestion tools viz. JANE, Elsvier Journal Finder, Springer Journal Suggester, etc.
23.	Subject specific ethical issues: Use of various experimentation techniques in VPH research, animal experimentation techniques,
24.	Subject specific ethical issues: Planning and design of various types of experiments through study of literature for selection of appropriate methodology and evaluation parameters including scoring system, data evaluation methods, etc.
25.	Subject specific ethical issues: OECD-GLP guidelines, Reference studies through literature for safety evaluation of drug/ plant/ plant molecules using In-vitro and In vivo techniques, Determination and calculation of LD50, ID50, MIC, MTD, etc.
26.	Subject specific ethical issues: implementation of IAEC and IBSC guidelines
27.	FFP, authorship
28.	Conflicts of interest
29.	Complaints and appeals: examples and fraud from India and abroad
30.	Use of plagiarism software: Turnitin
31.	Use of plagiarism software Urkund and other open software tools
32.	Indexing databases

33.	Citation databases: Web of Science, Scopus,
34.	Citation databases: Google Scholar, Citation analysis, PubMed
35.	Impact factor of journal citation report, SNIP, SJR, IPP, Cite score
36.	Metrics: h-index, g index, i10 index, altmetrics

6. Teaching Schedule :UG, PG , PhD - Prepared by – Course Teacher – Year wise / Course Wise

7. Academic Calendar – UG, PG, PhD -Year wise / Semester Wise

8. College Classes Time Table :UG, PG , PhD - Year wise / Semester Wise

9. Examination Time Table – UG, PG , PhD - Semester / Year wise - Theory and Practical

10. Result –UG, PG , PhD - Semester Wise / Year Wise