Veterinary Public Health & Epidemiology

(All information to be provided over and above the MSVE requirements for B.V.Sc. & A.H. programmes)

1. General Requirements:

Level of programme	**Nomenclature of qualification**	**Duration of the Couse**	**Learning objectives**	**Eligibility**	**Components of the programme**
Post Graduate	Master of Veterinary Science (M.V.Sc.) in Veterinary Public Health & Epidemiology	2 years	To impart insights to the post graduate student about the frontier areas of Veterinary Public Health & Epidemiology; comprehensive perceptions of hygiene and safety of foods of animal origin, epizootiology and environmental hygiene in the pursuit public health protection embracing One-Health	1) Bachelor of Veterinary Science and Animal Husbandry (B.V.Sc. & A.H.) or 2)Doctor of Veterinary Medicine (DVM)	Course work (Major courses, Minor courses, Supporting courses, common courses and seminar) and thesis research
Ph.D.	Doctor of Philosophy (Ph.D.) in Veterinary Public Health & Epidemiology	3 years	To impart wider insights to the doctoral student of the newer horizons of the frontier areas of Veterinary Public Health & Epidemiology	1)Master of Veterinary Science (M.V.Sc.) in Veterinary Public Health & Epidemiology Or 2) Master of Veterinary Public Health (M.V.P.H.)	Course work (Major courses, Minor courses, Supporting courses, common courses and seminar) and thesis research
Diploma					
Other (specify)					

2. Infrastructure requirements (To be submitted each of the Department separately):

Level of programme	For 03 seats in the department	For 05 seats in the department	Remarks
Post Graduate	1) PG Research Lab-1. 600 sq. ft. (with biocontainment facility to handle class II biohazards)	1) PG Research Lab-1. 600 sq. ft. (with biocontainment facility to handle class II biohazards)	Lab suitable to handle potential zoonotic agents
Ph.D.	1) PG Research Lab-1. 600 sq. ft. (with biocontainment facility) 2) PG Research Lab-1. 600 sq. ft. (residue analysis facility with sophisticated instrumentation)	1) PG Research Lab-1. 600 sq. ft. (with biocontainment facility) 2) PG Research Lab-1. 600 sq. ft. (residue analysis facility with sophisticated instrumentation)	Lab suitable to analyse toxic metal, antimicrobial, pesticide and other biotoxins residues
Diploma			
Other (specify)			

*In addition to MSVE 2016 requirement of Zoonosis-cum-Epidemiology Lab.= 600 sq. ft.; Milk Hygiene Lab.= 600 sq. ft. and Meat Hygiene Lab=600 sq. ft.

3. Manpower Requirements (To be submitted separately for each of the Departments):

Level of programme	For 03 seats in the department					For 05 seats in the department				
	Prof.	**Assoc. Prof.**	**Assist. Prof.**	**Others (Specify)**	**Non-Teaching or supporting staff**	**Prof.**	**Assoc. Prof.**	**Assist. Prof.**	**Others (Specify)**	**Non-Teaching or supporting staff**
Post Graduate	1	1	1		1) Lab. Attendant 01 2) Lab. Technician 01	1	1	1	1)Scientist 01†	1) Lab. Attendant 02 2) Lab. Technician 02
Ph.D.	1	1	2	1)Senior Scientist 01†	1) Lab. Attendant 01 2) Lab. Technician 01	1	2	3	1)Scientist 01† 2)Senior Scientist 01†	1) Lab. Attendant 02 2) Lab. Technician 02
Diploma										
Other (specify)										

*In addition to MSVE 2016 requirement of Prof.=01; Assoc. Prof.=01 and Assist. Prof.=01

†Required for handling biohazards in the lab, disease investigation and data analysis

4. Equipments (To be submitted separately for each Departments):

Though the list of equipments could not be listed and would depend upon the research projects and/or the area of study being conducted at the respective veterinary colleges. It imperative that the departments may suggest the list of basic equipments to be used for the Post Graduate, Ph.D. or other programmes.

Level of programme	**For 03 seats in the department**	**For 05 seats in the department**	**Remarks**
Post Graduate	1)Gradient thermocyler (1 No.) 2)Gel documentation system (1 No.) 3)Electrophoresis unit (1 set) 4)Protein purification system (1 No.) 5)Kinetic ELISA plate reader (1 No.) 6)Nano spectrophotometer 7)PFGE unit (1 No.) 8)Automatic microbial detection system such as Vitek, BD or equivalent system (1 unit) 9)Real time thermocyler (01 No.) 10)Rotary evaporator 11)Vertical deep freeze (-80ºC) (1 No.) 12)Ultrasonicator (1 No.) 13)Vacuum manifold (1 No.) 14)Inverted trinocular microscope (1 No.) 15) Dissecting microscope (2 No.) 16) Fluorescent microscope (1 No.) 17) Refrigerated centrifuge (1 No.) 18) High precision balance (0.1 mg) (1 No.) 19)Darkfield microscopy (1 No.)	In addition to 03 seats following are additional requirements 1)Gradient thermocyler (1 No.) 2)Electrophoresis unit (1 set)	Required for undertaking research in VPE on current topics
Ph.D.	20)LC-MS System (1 unit) 21)Biosafety cabinet with air handling facility 22)New generation nucleotide sequencer (1 unit) 23)Ultracentrifuge (1 unit) 24)Individually ventilated cage system for lab rodents and specimen handling cages (I unit) 25)PAGE assembly (1 No.) 26)Western blotting unit (1 No.)		
Diploma			
Other (specify)			

*In addition to MSVE 2016 requirements *viz*. 1. Binocular microscope (10 No.); 2. Serologic water baths (2 No.); 3. pH meter (2 No.); 4. Spectrophotometer (1 No.); 5. Centrifuge (1 No.); 6. Lovibond or equivalent comparator with phosphatase and resazurin disc (1 set); 7. Colony counter (2 No.); 8. Burners (10 No.); 9. Balance (1 No.); 10. Electronic balance (2 No.); 11. Autoclave (2 No.); 12. Hot-air oven (2 No.); 13. B.O.D. incubator (1 No.); 14. Incubators (3 No.); 15. Micropipettes (and tips as required) (12 No.); 16. Deep freeze -20ºC (1 No.); 17. Laminar flow (2 No.); 18. Air sampler (1 No.); 19. Data processing and

programming units with networking (10 computers); 20. Laboratory Refrigerators 500 L (3 No.); 21. Sample Bag Mixer (1 No.); 22. Water analysis system (1 No.); 23. Microplate or ELISA reader (1 No.); 24. Tissue homogenizer (1 No.); 25. High performance liquid chromatography with accessories (1 No.); 26. Gas chromatography unit complete with all accessories (1 No.); 27. Atomic absorption spectrophotometry with all accessories (1 No.); 28. Rotary shaker (1 No.); 29. Somatic cell counter (1 No.); 30. Vortex shaker (3 No.); 31. Magnetic stirrer (3 No.); 32. Biosafety cabinet level II (1 No.).

5. Veterinary Clinical Complex: -Not applicable-

6. Livestock Farm complex: -Not applicable-

7. Syllabus: The syllabus for each of the programmes in each of the Departments may be suggested. Else, it may also be informed whether the existing PG and PhD syllabus maybe continued or amendments may be made to meet the learning objectives.

Current post graduate curriculum for Master of Veterinary Science (M.V.Sc,) and Doctor of Philosophy (Ph.D.) in Veterinary Public Health and Epidemiology degree programs are adequate. Courses for M.V.Sc. and Ph.D. degree courses in Veterinary Public Health and Epidemiology are annexed with detailed descriptions as per the existing system.

VETERINARY PUBLIC HEALTH AND EPIDEMIOLOGY
Course Structure

COURSE NO.	COURSE TITLE	CREDITS	SEM
VPE 601	Concepts in Veterinary Public Health and One Health	2+0	II
VPE 602	Zoonoses	3+1	II
VPE 603	Principles of Epidemiology	2+1	II
VPE 604	Hygiene and Safety of Foods of Animal and Aquatic Origin	2+1	II
VPE 605	Food-borne Infections and Intoxications	1+1	I
VPE 606	Environmental Pollution and Safety	2+1	I
VPE 607	Applied Epidemiology	2+1	I
VPE 608	Livestock and Poultry Disease Investigation	0+2	II
VPE 609	Veterinary Clinical Epidemiology	1+1	I
VPE 610	Techniques in Veterinary Public Health and Epidemiology	0+2	I, II
VPE 611	Bio-security and Occupational Health Safety	1+1	I
VPE 691	Master's Seminar	1	I, II
VPE 699	Master's Research	30	I, II
VPE 701	Advances in Veterinary Public Health and Epidemiology*	2+1	II
VPE 702	Emerging, Re-emerging Zoonoses and One Health	2+1	II
VPE 703	Advances in Food Safety and Quality Control of Foods of	2+1	II

	Animal Aquatic origin*		
VPE 704	Recent Concepts In Epidemiology and Disease Forecasting*	2+1	I
VPE 705	Risk Analysis and Predictive Modelling	2+1	II
VPE 706	Herd Health Management and Disease Economics	2+1	I
VPE 707	Survey, Surveillance and Data Management	2+1	I
VPE 708	Molecular Approaches in Epidemiology	2+1	I
VPE 709	Advances in Environmental Hygiene	1+1	II
VPE 790	Special Problem	0+2	I, II
VPE 791	Doctoral Seminar I	1	II
VPE 792	Doctoral Seminar II	1	I
VPE 799	Doctoral Research	70	I, II

VETERINARY PUBLIC HEALTH AND EPIDEMIOLOGY
Course Contents

VPE 601 CONCEPTS IN VETERINARY PUBLIC HEALTH AND ONE HEALTH 2+0 SEM - I

Objective

To equip students with One Health concepts and advanced skills in public health aspects of infectious disease, intelligence, response, prevention and mitigation.

Theory

Unit I- VPH administration; organization, administration and implementation of VPH services/ programs; Structure and function of VPH agencies/ organizations of national and international importance. VPH team, administration and functions; responsibilities of veterinarians in public health team.

Unit II- Definition: One Health. Historical emergence of the concept. Scope, Objective and Area of activities of One Health. Strategic frame-work. Purpose for creation of Veterinary Public Health and Epidemiology.

Unit III- Global burden of disease, Coordinated and systemic disease control response, Ecosystem, Urbanization intensive agriculture and animal husbandry practices, Host-pathogen interaction, Anti-microbial resistance and climate change.

Suggested Readings

Schwabe CW. 1969. *Veterinary Medicine and Human Health*. Williams & Wilkins.

Sherikar AT, Bachchil VN & Thapliyal DC. 2004. *Textbook of Elements of Veterinary Public Health*. ICAR.

Zinsstag J, Schelling E, Waltner-Toews D, Whittaker M and Tanner M. 2015. One Health: the theory and practice of integrated health approaches. CABI.

VPE 602 ZOONOSES AND PUBLIC HEALTH 3+1 SEM - I

Objective

To impart knowledge about importance and characteristic features of bacterial, viral, fungal, parasitic, chlamydial and rickettsial pathogens of public health significance.

Theory

UNIT-I: Definition and classification, Factors affecting the occurrence of zoonoses; Disease management strategies, Disease burden on population and socioeconomic impacts.

UNIT-II: History, Etiology, Epidemiology, Transmission pattern, Diagnosis and management of important Bacterial (Anthrax, Brucellosis, Tuberculosis, Leptospirosis, Salmonellosis, Borreliosis, Glanders, Lyme disease, Malidiosis, Streptococcosis, Plague, Tetanus, Tularemia, Yersiniosis, Staphylococcosis, Vibriosis, Listeriosis, Campylobacteriosis), mycotic (Dermatophytosis, Blastomycosis, Coccidioidomycosis, Cryptococcosis, Histoplasmosis, Aspergillosis, Candidiasis, Rhinosporidiosis, Sporotrichosis), Chlamydial (Psittacosis and Ornithosis), Prions (Creutzfeldt - Jakob disease (CJD); Variant Creutzfeldt-Jakob Disease (vCJD). Bovine Spongiform Encephalopathy (BSE), Chronic Wasting Disease (CWD) and Scrapie) and others of regional importance.

UNIT-III: History, Etiology, Epidemiology, Transmission pattern, Diagnosis and management of important viral zoonoses, (Japanese encephalitis, Tick borne encephalitis, Encephalomyelitis, Rabies, Influenza, KFD, Rift valley fever, Chickungunya and Enteroviruses, Crimean-Congo haemorrhagic fever, Dengue, West-Nile fever, Yellow fever, Rift-valley fever, Equine encephalitis, Louping ill, Ebola, Marburg, Hantavirus, Zika, Hendra, Nipah and Corona viruses) and Rickettsial zoonoses (Q fever, Typhus fever group) and others of regional importance.

UNIT-IV: History, Etiology, Epidemiology, Transmission pattern, Diagnosis and management of important Parasitic zoonoses, viz., Hydatidosis, Taeniosis, Trichinosis, Fasciolopsiosis, Toxoplasmosis, Trypanosomosis, Cryptosporidiosis, Cysticercosis, Leishmaniosis, Sarcocystosis, Dracunculosis, Paragonimosis and Diphylobothriosis and others of regional importance

Practical

Isolation and identification methods for important zoonotic agents of public health significance from host, vehicle and environment.

Suggested readings

- Bauerfeind R, Graevenitz AV, Kimmig P, Schiefer HG, Schwarz T, Slenczka W and Zahner H. 2016. *Zoonoses: infectious diseases transmissible from animals and humans* (No. Ed. 4). American Society for Microbiology (ASM).
- Mahendra Pal.Zoonoses.
- Narayan KG *Epidemiology, Diagnosis and Management of Zoonoses*.
- Pedro N Acha and Boris Szyfres. *Zoonoses and Communicable Diseases Common to Man and Animals*.
- Seyedmousavi S, De Hoog GS, Guillot J and Verweij PE. 2018. *Emerging and Epizootic Fungal Infections in Animals*. Springereds.
- Thapliyal DC. 1999. *Diseases of animals transmissible to man*. 1st ed. International Book Distributing Company, Lucknow.
- *Zoonoses: Recognition Control and Prevention* (Martin E, Jones EH, Hubbart WT and Hagstard HV)
- Bauerfeind R, Graevenitz AV, Kimmig P, Schiefer HG, Schwarz T, Slenczka W and Zahner H. 2016. *Zoonoses: infectious diseases transmissible from animals and humans* (No. Ed. 4). American Society for Microbiology (ASM).
- Mackie and Mc. Cartney. *Practical Medical Microbiology*.
- Parija SC. *Text book of Medical Parasitology*.
- Pedro N Acha and Boris Szyfres. *Zoonoses and Communicable Diseases Common to Man and Animals*.
- Soulsby JL *Helminthes, Arthropods and Protozoa of Domesticated Animals*.
- Steele JL. *CRC Handbook series in Zoonoses.*
- Thapliyal DC. 1999. *Diseases of animals transmissible to man*. 1st ed. International Book Distributing Company, Lucknow.

VPE 603 PRINCIPLES OF EPIDEMIOLOGY 2+1 SEM - II

Objective

To familiarize students with epidemiological concepts.

Theory

UNIT-I: Definitions, scope, concepts, types, application and common terms used in epidemiology.

UNIT-II: Causality of disease. Determinants of disease. Patterns of disease. Transmission and maintenance of infection. Ecological Basis of Disease.

UNIT-III: Epidemiological data: classification and sources of data; Data elements; Sources and Methods of collection of data including questionnaire. Storage and Retrieval of Data.

UNIT-IV: Disease Monitoring and Surveillance. Epidemiological Studies-Classification, Methods, Bias and Confounding. International Organizations and Laws Regulating Animal Diseases.

Practical

Designing of questionnaire for collection of information on health and diseases in populations. Measures of disease occurrence. Mapping of Disease Data. Storage, Retrieval and Presentation of Data.

Suggested Readings

- Thrusfield M. 2018. *Veterinary Epidemiology*. 4th Ed. Blackwell.
- Meek AH, Willeberg P and Martin SW. 1993. *Veterinary Epidemiology: Principles and Methods*. IBH.
- Narayan KG. 2004. *Epidemiology, Diagnosis and Management of Zoonoses*. ICAR.
- Schwabe CW, Riemann HP & Franti CE. 1977. *Epidemiology in Veterinary Practice*. Lea & Fabiger.

VPE 607 APPLIED EPIDEMIOLOGY 2+1 SEM - I

Objective

To acquaint students with the application of epidemiology for investigation, prevention, control and eradication of disease.

Theory

UNIT-I: Estimation of disease burden in population- Surveys, Sampling Methods. Epidemiological Investigations of Disease Outbreaks.

UNIT-II: Modelling, Disease Forecasting-Use of Spatial Epidemiology. Use of Computers in Epidemiological Modelling and Disease Forecasting.

UNIT-III: Serological Epidemiology- Serological Estimations and Comparisons in Populations, Interpreting Serological Tests. Molecular Epidemiology- Molecular basis of a disease, application of nucleic acid based assays for diagnosis of disease and genomic characterization of pathogens. Uses of Serological and Molecular Epidemiological Methods

UNIT-IV: Different Strategies for Prevention, Control and Eradication of Diseases-Disease Free Zones and Zero Disease Concept. The Economics of Animal Diseases.

Practical

Investigation of outbreaks. Use of Computer Software in Epidemiology. Depicting Spatial Characteristics of Diseases. Conducting Surveys for Important Diseases of Livestock and Poultry-Sampling Methods and Sample Size. Extraction and isolation of nucleic acid of field isolates and vaccine strains, and their characterization by PCR and other molecular techniques.

Suggested Readings

- Thrusfield M. 2018. *Veterinary Epidemiology*. 4th Ed. Blackwell.
- Meek AH, Willeberg P and Martin SW. 1993. *Veterinary Epidemiology: Principles and Methods*. IBH.
- Thomas B. (Ed.). 1989. *Applied Veterinary Epidemiology*. Elsevier.

VPE 608 LIVESTOCK AND POULTRY DISEASE INVESTIGATION 2+1 SEM - II

Objective

To expose students to actual field based investigations of diseases in livestock and poultry.

Practical

To attend outbreaks of infectious diseases and toxicological conditions in livestock and poultry in the field and at farms. Investigation of outbreaks of known and unknown causes-descriptive and analytic phases including derivation of hypothesis and hypothesis testing. Diagnosis on dead and live diseased animal(s) and poultry-Collection, preservation and transport of material in the face of disease outbreak, and processing of material in the laboratory for diagnosis, isolation of pathogens, antibiotic sensitivity test etc. Estimation of Aflatoxins and other toxins/chemicals in different samples. Formulating and advising prevention and control measures. Screening of animal herds and poultry flocks for certain important diseases.

Suggested Readings

- Vihan VS. 2002. *Modern Veterinary Laboratory Techniques in Clinical Diagnosis*. CBS.
- Swayne *et al.* 2006. *A Laboratory Manual for the Isolation and Identification of Avian Pathogens*. IBD.
- Thrusfield M. 2018. *Veterinary Epidemiology*. 4th Ed. Blackwell.
- Smith RD. 2020. *Veterinary Clinical Epidemiology – from patient to population*. 4th Ed. Taylor & Francis, CRC.

VPE 609 VETERINARY CLINICAL EPIDEMIOLOGY 1+1 SEM - I

Objective

To familiarize students with various epidemiological approaches for solving field problems.

Theory

UNIT-I: Definitions and epidemiological approaches. Describing disease occurrence (incidence, prevalence, occurrence etc.). Factors affecting interpretation of prevalence and incidence.

UNIT-II: Evaluation of diagnostic tests- properties, comparison and sources of bias. Uses of diagnostic tests-calculation of probability of disease for making of medical decisions, multiple testing.

UNIT-III: Clinical trials- terminology, design and evaluation.

Practical

Evaluation of diagnostic tests. Diagnosis of various diseases- clinical assessment, sampling and diagnosis by various tests and their comparison.

Suggested Readings

- Smith RD. 2020. *Veterinary Clinical Epidemiology – from patient to population*. 4th Ed. Taylor & Francis, CRC.

VPE 704 RECENT CONCEPTS IN EPIDEMIOLOGYAND DISEASE FORECASTING

2+1 SEM - I

Objective

To learn about different epidemiological aspects of major diseases and to develop suitable disease forecasting system.

Theory

UNIT-I: Review of epidemiological concepts and applications, recent concepts.

UNIT-II: Epidemiology of economically important diseases in the region (haemorrhagic septicemia, foot and mouth disease, surra, brucellosis, PPR, swine fever, IBD, fowl typhoid, avian Influenza, sheep pox etc.

UNIT-III: Geographical Information System and its applications in epidemiology, various expert systems and their role in epidemiology.

UNIT-IV: Modeling and application of various models in disease forecasting. Epidemiological software.

Practical

Epidemiological exercises of economically important diseases in the region, use of Geographical Information System in epidemiology, various expert systems, modeling and various models used in disease forecasting, use of various epidemiological softwares.

Suggested Readings

Noordhuizen JPTM, Franklin K, Thrusfield MV & Graat EAM. 2003. *Application of Quantitative Methods in Veterinary Epidemiology*. IBD.

Durr P & Gatrell, A. 2004. GIS and Spatial Analysis in Veterinary Science.

CABI

VPE 705 RISK ANALYSIS AND PREDICTIVE MODELLING 2+1 SEM-II

Objective

Acquaint the students with the latest knowledge on prediction of infections and the extent of risk in the population

Theory

Unit-I: Definitions. History of risk analysis. Relevance of risk analysis (RA) to food sector. Principles of risk analysis. Risk analysis components (risk assessment, management and communication). Microbial Risk Assessment (MRA) involving hazard identification, exposure assessment, hazard characterization, and risk characterization. Methodologies used in RA/ MRA. Qualitative and quantitative risk analysis. Quantitative Microbial Risk Assessment (QMRA) for foods of animal origin including water. Application of mathematical models to study propagation of microbial hazards from farm-to-fork. Risk-based decision-making.

Unit-II: Variability and uncertainty inherent to biological data. Measurement and modeling of uncertainty and variability during risk assessment. Risk assessment, risk analysis and HACCP. Linking microbial food safety with risk assessment. Relevance of assumptions and observed data for predictive models. Study of software packages used for risk analysis.

Unit-III: Mathematical modelling of microbial growth rate. Predictive modelling tools for food safety management. Microbial modelling for the prediction of product shelf life and safety. Applications of predictive modelling of microbial behaviour in foods.

Practical

Modelling of infectious diseases using computational and mathematical methods. Building and analysing models of infectious diseases. Study of population-level processes for infectious diseases of animals and humans. Performing risk analysis for selected food safety hazards using microbial risk analysis tools. Risk assessment through simulation modelling.

Suggested reading

- Haas CN, Rose JB and Gerba CP. 1999. *Quantitative microbial risk assessment*. John Wiley and Sons.
- Lelieveld HL, Holah J and Gabric D. eds., 2016. *Handbook of hygiene control in the food industry*. Woodhead Publishing.
- Pastorok RA, Bartell SM, Ferson S and Ginzburg LR. eds., 2016. *Ecological modeling in risk assessment: chemical effects on populations, ecosystems, and landscapes*. CRC Press.
- Subramaniam P and Wareing P. eds., 2016. *The stability and shelf life of food*. Woodhead Publishing.

VPE 706 HERD HEALTH MANAGEMENT AND DISEASE ECONOMICS 2+1 SEM - I

Objective

Adoption of holistic approach to address issues of herd health to improve production.

Theory

UNIT-I: General principles, interactions between health and production- scheduling farm visits, individual animal health care and emergency services, performance targets, record keeping, investigations of health and production problems

UNIT-II: Health management of cattle and buffalo herd, Health management of sheep and goat flocks.

UNIT-III: Health management of swine. Health management of poultry.

UNIT-IV: The economics of animal disease- Economic concepts and principles, assessing the economic costs of disease, Cost-benefit analysis of disease control, Decision analysis.

Practical

Visit to farms, assessment of their problems, planning of systematic programme to control specific disease and their economic evaluation.

Suggested Readings

- Radostits & Blood DC. 1996. *Herd Health*. Book Power.

VPE 707 SURVEY, SURVEILLANCE AND DATA MANAGEMENT 2+1 SEM - II

Objective

To demonstrate different methodologies and procedures involved in conducting survey and surveillance, collection, analysis & interpretation of data.

Theory

UNIT-I: Surveys- overview and purpose. Sampling methods and sample size. Cost of surveys.

UNIT-II: Surveillance: definitions, basic principles. Types and mechanisms of surveillance. Participatory epidemiology.

UNIT-III: Data- definitions, classification and data elements. Data collection. Use of questionnaires in data collection. Quality control of data, detection of errors and coding of data. Storage and retrieval of data. Data recording and reporting, veterinary recording schemes, veterinary information system. Databases- concept and models.

Practical

Development of questionnaires on selective topics, survey of livestock and poultry farmers to find out usefulness/effectiveness of vaccination/ artificial insemination/ other practices, surveillance of important diseases in different parts of state, analysis and presentation of data, development of suitable software.

Suggested Readings

Selected articles from journals.

VPE 708 MOLECULAR APPROACHES INEPIDEMIOLOGY 2+1 SEM - I

Objective

Learning of recent advanced molecular techniques for establishing disease diagnosis.

Theory

UNIT-I: The concept of molecular basis of a disease, molecular determinants of pathogenicity of infectious agents and their transmissibility to susceptible populations of livestock and poultry.

UNIT-II: Laboratory biosafety, antigenic, genetic and biological characterization of field isolates of pathogens incriminated in field outbreaks, differentiation of field and vaccine strains, the concept of marker vaccines, and correlation of pathotypes and genotypes of a pathogen.

UNIT-III: Immunological tests, immunoblotting techniques and use of monoclonal antibodies in different ELISAs for antigenic analysis. Application of nucleic acid based assays viz. polymerase chain reaction (PCR) assays, nucleotide sequencing, restriction endonuclease analysis and RFLP analysis for genomic characterization using the field material directly or after extraction of nucleic acid from small scale cultures, use of radio- actively labeled or non radioactive oligo-nucleotide probes in dot-blot and Southern hybridizations.

Practical

Extraction and isolation of nucleic acid from field isolates of the causative pathogens, digestion with restriction endonucleases and electrophoresis in agarose gel in order to obtain fingerprints and their comparative analysis. SDS-PAGE for protein profiling. Western blotting and ELISA for screening of field samples.

Suggested Readings

Selected articles from journals.

VETERINARY PUBLIC HEALTH AND EPIDEMIOLOGY

List of Journals

- Abstracts on Hygiene and Communicable Diseases
- Applied and Environmental Microbiology
- Avian Diseases
- Avian Pathology
- British Veterinary Journal
- Emerging Infectious Diseases
- Epidemiology and Infection
- Food Science and Technology Abstracts
- Indian Journal of Comparative Microbiology, Immunology and Infectious Diseases
- Infection and Immunity
- Journal of Food Protection
- Journal of Food Science and Technology
- Journal of Veterinary Public Health
- Letters in Applied Microbiology
- Quarterly Bulletin of O.I.E.
- Tropical Animal Health and Production
- Veterinary Microbiology
- Veterinary Record
- World Animal Health

e-Resources

- www.who.int/zoonoses/vph/en (W.H.O. website related to zoonotic diseases)
- www.fao.org (Website of Food and Agriculture Organization)
- www.cdc.gov (website of CDC publications)
- http://calvados.c3sl.ufpr.br/ojs2/index.php/veterinary/ (Archives of Veterinary Science)
- http://www.pjbs.org/ijps/ijps.htm (International Journal of Poultry Science)
- http://www.medwellonline.net/java/fp.html (Journal of Animal and Veterinary Advances)
- http://www.jstage.jst.go.jp/browse/jpsa (Journal of Poultry Science)
- http://www.jstage.jst.go.jp/browse/jvms/-char/en (Journal of Veterinary Medical Science)
- http://www.cipav.org.co/lrrd/ (Livestock Research for Rural Development)
- http://www.jstage.jst.go.jp/browse/jpestics (Journal of Pesticide Science)
- http://www.vetsci.org (Journal of Veterinary Science)

Suggested Broad Topics for Master's and Doctoral Research

- Prevention and control of emerging and re-emerging food-borne infections and

intoxications

- Prevention and control of major zoonotic diseases of local importance
- Environmental pollution and health problems
- Food safety, risk analysis and shelf life
- Food adulteration and food safety
- Molecular and epidemiological studies on infectious diseases of livestock and poultry
- Surveillance of economically important diseases of farm animals and poultry
- Development of immunodiagnostic/ sero-diagnostic tests for field application
- Monitoring of protective immunity induced by vaccines under different schedules
- Diagnostic assay for milk adulterants
- Diagnostic assays and epidemiological studies in respect of toxicants in livestock and poultry feeds

Department of Veterinary Public Health and Epidemiology

Diploma course which may be added

Diploma in One Health

The PG Diploma program provides exposure on health related threats to human medicine, veterinary and environmental health professionals and how to address such threats collaboratively. The programme is designed in a modular flexible format, ideal for health related professionals who wish to achieve a world- class award while maintaining busy professional and personal commitments. The course essentially preaches to a growing choir of visionary physicians, veterinarians and other co-equal to obtain a synergistic "One Health thinkers" mainly for the control of zoonotic diseases. This course provides an overview of strategies for promoting health for all in this planet. Project work in 2nd semester enables students to undertake cutting edge research on One Health thematic areas.

COURSE NO.	TITLE OF THE COURSE	CREDIT HRS
1st Semester		
DOH 001	Introduction and concepts of one health	2+0= 2
DOH 002	Introduction to disease agents for one health	3+0= 3
DOH 003	Zoonoses and disease economics	4+0= 4
DOH 004	Introduction to one health epidemiology and surveillance	3+0= 3
DOH 005	Environmental science	3+0= 3
2nd Semester		
DOH 006	Global health and food safety	3+0= 3
DOH 007	Fundamental knowledge of infectious diseases	4+0= 4
DOH 008	Epidemiology and its application in one health	4+0= 4
DOH 009	Research techniques and their applications for disease diagnosis	4+0= 4
DOH 010	Project work	0+5= 5

Course Contents

I. **Introduction and concepts of one health** **Cr. Hrs.- 2+0**

Definitions, introduction, concepts of one health, different organizations at national and international level

II. **Introduction to disease agents for one health** **Cr. Hrs.- 3+0**

Basic knowledge and understanding of important disease agents viz bacterial, viral, fungal, rickettsial diseases, routes and sources of transmission etc.

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III. **Zoonoses and disease economics** **Cr. Hrs.- 3+0**

Definition, history and socio-economic impact of diseases. Classification of zoonoses and approaches to their management. Multisectoral approach for zoonoses prevention and control. Emerging, re-emerging and occupational zoonoses. Role of domestic, wild, pet and laboratory animals and birds in transmission of zoonoses. Zoonotic pathogens as agents of bioterrorism

IV. **Introduction to one health epidemiology and surveillance** **Cr. Hrs.- 3+0**

Definitions, scope, concepts, types, application and common terms used in epidemiology, host-Agent-Environmental factors in causation of diseases, disease monitoring and surveillance.

V. **Environmental science** **Cr. Hrs.- 3+0**

Scope and importance of ecosystem and its components structure and functions, biodiversity and its uses, threats and conservation, natural resources: types, uses and abuses, environmental contaminants in food chain-bioaccumulation, biomagnifications and persistent organic pollutants, environmental pollution and its effects on animal and human health.

VI. **Global health and food safety** **Cr. Hrs.- 3+0**

Food hygiene; concept of food hygiene, impact of environmental sanitation and other factors on food quality. Food-borne bacterial and viral infections and intoxications, health problems due to food additives, biocides, bacterial toxins, heavy metals, antibiotics, hormones etc. in food, microbiological standards and quality control of foods to prevent food borne infections

VII. **Fundamental knowledge of infectious diseases** **Cr. Hrs.- 4+0**

Concept and classification of infectious diseases (bacterial, viral, fungal, parasitic diseases) under the ambit of one health, etiological description, host range, epidemiology, diagnosis and their management.

VIII. **Epidemiology and its application in one health** **Cr. Hrs.- 4+0**

Concepts and principles of epidemiology, biosecurity, vaccines and vaccination, disinfection, epidemiological investigations of disease outbreaks, modeling, disease forecasting etc.

IX. **Research techniques and their applications for disease diagnosis**

Cr. Hrs.- 4+0

Conventional and modern diagnostic tests viz. isolation and identification of agents, immunological, nucleic acid based assays, application of research techniques for genomic characterization of field isolates vis-à-vis vaccine strains, emerging of new strains and vaccination failure etc

X. **Project work** **Cr. Hrs.- 5+0**

Identification of a topic for project; its objectives, technical program, research and submission of project report.

Mode: Technology enabled distance learning mode

Duration: The duration of course for the diploma will be **1 year (2 semesters).** Five days on-campus contact classes per semester will be mandatory.

Degree awarded: Post Graduate Diploma in One Health

Total No. of Courses: 10 course (35 Credits)

Total No. of seats: Approx. 25 (Flexible)

Dept./ School Offering the programme: Department of Veterinary Public Health and Epidemiology, LUVAS, Hisar

Mode of Selection: Open Selection

Minimum qualification: Graduate / Post Graduate in any science subjects preferably from health sciences (Veterinary science, medicine, dentistry, complementary and alternative medicine, nursing, pharmacy, physiotherapy, Environmental Science etc.)

Fee: Rs. 15, 000 (Rupees Fifteen thousand) for entire one year diploma

Mode of evaluation: Semester end examinations, assignments, project

Other requirements:

Man power required:
Teaching:

1. Assistant Professor -2

Laboratory staff:

2. Laboratory Technician -1
3. Laboratory Attendants -2

Syllabus for Post Graduate Diploma in One Health (PGDOH)
Distance learning programme

Semester-I		
Course No.	**Course title**	**Credits**
PGDOH-01	One Health: Concepts and framework	3+0=3
PGDOH-02	Zoonoses and disease prioritization	3+0=3
PGDOH-03	Food safety and security: One Health nexus	3+0=3
PGDOH-04	Environment health and climate change	3+0=3
	Total	**12**
Semester-II		
PGDOH-05	Epidemiological principles and applications	3+0=3
PGDOH-06	Emerging and re-emerging zoonoses	3+0=3
PGDOH-07	Application of multisectoral One Health approach: Case studies	3+0=3
PGDOH-08	Research projects/surveys/critical appraisals	0+3=3
	Total	**12**
Grand total credit hours		**24**

Detailed course contents:

Course No.	**Course contents**

PGDOH-01: One Health: Concepts and framework	• What is One Health? • Historical context of the One Health • How does a One Health approach work? • One Health concept: a holistic, transdisciplinary, and multisectoral approach • Introduction to comparative medicine • One Health in the 21st Century • Challenges for the "One Health" Concept • One health framework to address health issues • Global partnerships and advocacy for One Health • Implementing One Health approaches to confront emerging and re-emerging zoonotic disease threats
PGDOH-02: Zoonoses and disease prioritization	• Introduction to Zoonoses, public health, transboundary diseases, emerging zoonoses, re-emerging zoonoses and neglected zoonoses. • Concept of disease transmission: Host, agent and environment interactions and transmission pathways of zoonoses • Bacterial, viral, parasitic, rickettsial, fungal and prions related zoonoses • Determinants in the emergence of zoonotic disease agents • Concept of disease prioritization • Understanding the methodology of World Health Organization to prioritize emerging infectious diseases in need of research and development • Prevention and control strategies for zoonoses
PGDOH-03: Food safety and security: One Health nexus	• Principles and components of food security and food safety • An overview of food-borne diseases • Food safety in context of emerging pathogens • Microbial risk assessment • Microbiological standards and quality control • Good Manufacturing Practices in context to food safety • An overview of HACCP and its applications in food production • Overview on the global and national guidelines on food hygiene
PGDOH-04: Environment health and climate change	• Understanding the ecology of zoonoses • Wildlife and zoonoses • Understanding Environmental Health • Water and air hygiene • Climate change and human and animal health • Potential impact of climate change on vector-borne diseases • Occupational health (main emphasis on farmers and veterinarians)
PGDOH-05: Epidemiological principles and applications	• Basic tenets of epidemiology • Concept of disease causation • Data collection and presentation • Survey design and questionnaire development • Epidemiological study design and interpretation of data • Introduction to disease surveillance • Guidelines for Outbreak Investigations • Analysis of risk factors and disease prevention • Molecular epidemiology and its application in health services research
PGDOH-06: Emerging and re-emerging zoonoses	• Introduction to emerging and re-emerging zoonoses • Factors related to the emergence and re-emergence of zoonoses • Details on the global and national emerging zoonoses • Details on the global and national re-emerging zoonoses • Introduction to various global and national surveillance systems for predicting and tracking of disease emergence

	• Prevention and control measures for disease emergence
PGDOH-07: Application of multisectoral One Health approach: Case studies	• Past experiences at national level One Health collaboration to tackle zoonotic threats • Past experiences on transnational level collaboration to tackle the zoonotic threats • Case studies on One Health contributions toward efficient and effective response to: a) Emerging zoonotic disease threats b) Antibiotic resistance c) Climate change and emerging vector-borne diseases
PGDOH-08: Research projects/surveys/critical appraisals:	• Students will be assigned individual research projects/surveys/critical appraisals under the supervision of the teachers which should be presented and submitted as report in prescribed format for successful completion of the course.

Learning Objectives:

- Transdisciplinary information sharing & collaborations between professionals of various health science disciplines.
- Capacity building & human resource development to counter emerging health threats effectively.
- Multidisciplinary study will open an array of career opportunities for participants.
- Enhancement of skills of participants to think critically & work collaboratively across sectors.

Non-credit compulsory courses for M.V.Sc.

Course No.	Course title	Credit hours	Semester
PGS 501	Library and information services	0+1	I and II
PGS 502	Technical writing and communication skills	0+1	I and II
PGS 503 (e-course)	Intellectual property and its management in Veterinary and animal husbandry	1+0	I and II
PGS 504	Basic concepts in laboratory techniques	0+1	I and II
PGS 505 (e-course)	Disaster management	1+0	I and II

Syllabus of Common Courses for PG programmes

PGS 501 LIBRARY AND INFORMATION SERVICES (0+1)

Objective

To equip the library users with skills to trace information from libraries efficiently, to apprise them of information and knowledge resources, to carry out literature survey, to formulate information search strategies, and to use modern tools (Internet, OPAC, search engines, etc.) of information search.

Practical

Introduction to library and its services; Role of libraries in education, research and technology transfer; Classification systems and organization of library; Sources of information-

Primary Sources, Secondary Sources and Tertiary Sources; Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts, etc.); Tracing information from reference sources; Literature survey; Citation techniques/ Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e- resources access methods.

PGS 502 TECHNICAL WRITING AND COMMUNICATIONS SKILLS (0+1)

Objective

To equip the students/ scholars with skills to write dissertations, research papers, etc. To equip the students/ scholars with skills to communicate and articulate in English (verbal as well as writing).

Practical (Technical Writing)

- Various forms of scientific writings- theses, technical papers, reviews, manuals, etc.;
- Various parts of thesis and research communications (title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion);
- Writing of abstracts, summaries, précis, citations, etc.;
- Commonly used abbreviations in the theses and research communications;
- Illustrations, photographs and drawings with suitable captions; pagination, numbering of tables and illustrations;
- Writing of numbers and dates in scientific write-ups;
- Editing and proof-reading;
- Writing of a review article;
- Communication Skills - Grammar (Tenses, parts of speech, clauses, punctuation marks);
- Error analysis (Common errors), Concord, Collocation, Phonetic symbols and transcription;
- Accentual pattern: Weak forms in connected speech;
- Participation in group discussion;
- Facing an interview;
- Presentation of scientific papers.

Suggested Readings

1. Barnes and Noble. Robert C. (Ed.). 2005. Spoken English: Flourish Your Language.
2. Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.
3. Collins' Cobuild English Dictionary. 1995.
4. Harper Collins. Gordon HM and Walter JA. 1970. Technical Writing. 3rd Ed.
5. Holt, Rinehart and Winston. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6th Ed. Oxford University Press.
6. James HS. 1994. Handbook for Technical Writing. NTC Business Books.
7. Joseph G. 2000. MLA Handbook for Writers of Research Papers. 5th Ed. Affiliated East-West Press.
8. Mohan K. 2005. Speaking English Effectively. MacMillan India.
9. Richard WS. 1969. Technical Writing.
10. Sethi J and Dhamija PV. 2004. Course in Phonetics and Spoken English. 2nd Ed. Prentice Hall of India.
11. Wren PC and Martin H. 2006. High School English Grammar and Composition.

S. Chand & Co.

PGS 503 (e-course) INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN VETERINARY AND ANIMAL HUSBANDRY (1+0)

Objective

The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledge- animal health and production based economy.

Theory

Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs; Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of animal breeds/strains and farmers' rights and biodiversity protection; Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity; International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings

1. Erbisch FH and Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.
2. Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill.
3. Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC and Aesthetic Technologies.
4. Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol.
   V. Technology Generation and IPR Issues. Academic Foundation.
5. Rothschild M and Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI.
6. Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.

The Indian Acts - Patents Act, 1970 and amendments; Design Act, 2000; Trademarks Act, 1999; The Copyright Act, 1957 and amendments; Layout Design Act, 2000; PPV and FR Act 2001, and Rules 2003; The Biological Diversity Act, 2002.

PGS 504 BASIC CONCEPTS IN LABORATORY TECHNIQUES (0+1)

Objective

To acquaint the students about the basics of commonly used techniques in laboratory.

Practical

- Safety measures while in Lab;
- Handling of chemical substances;
- Use of burettes, pipettes, measuring cylinders, flasks, separatory

funnel, condensers, micropipettes and vaccupets;
- Washing, drying and sterilization of glassware;
- Drying of solvents/ chemicals;
- Weighing and preparation of solutions of different strengths and their dilution;
- Handling techniques of solutions;
- Neutralisation of acid and bases;
- Preparation of buffers of different strengths and pH values;
- Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oil-bath;
- Electric wiring and earthing;
- Preparation of media and methods of sterilization;
- Cell/Tissue cultures
- Description of animal species and breeds

Suggested Readings

1. Furr AK. 2000. CRC Hand Book of Laboratory Safety. CRC Press.
2. Gabb MH and Latchem WE. 1968. A Handbook of Laboratory Solutions. Chemical Publ. Co.

PGS-505 (e-course) Disaster management **1+0**

Objectives:

To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards, and risks vulnerability; and capacity building.

Theory

UNIT I: Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold Waves, Climatic Change: Global warming, Sea Level rise, Ozone Depletion.

UNIT II: Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire. Oil fire, air pollution, water pollution, deforestation, Industrial wastewater pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT III: Disaster Management- Efforts to mitigate natural disasters at national and global levels. International Strategy for Disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, Community-based organizations, and media. Central, State, District and local Administration; Armed forces in Disaster response; Disaster response: Police and other organizations.

Suggested Readings

Gupta HK. 2003. Disaster Management. Indian National Science Academy. Orient Blackswan.

Hodgkinson PE & Stewart M. 1991. Coping with Catastrophe: A Handbook of Disaster Management. Routledge.

Sharma VK. 2001. Disaster Management. National Centre for Disaster Management, India.

Compulsory course for Ph.D. students from all disciplines

RPE 700 RESEARCH AND PUBLICATION ETHICS (1+1) Semester I and II

I. Theory

RPE 01: Philosophy and Ethics

- Introduction to philosophy: definition, nature and scope, concept, branches
- Ethics: definition, moral philosophy, nature of moral judgements and reactions

RPE 02: Scientific Conduct

- Ethics with respect to science and research
- Intellectual honesty and research integrity
- Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)
- Redundant publications: duplicate and overlapping publications, salami slicing
- Selective reporting and misrepresentation of data
- Publication ethics: definition, introduction and importance
- Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc.
- Conflicts of interest
- Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
- Violation of publication ethics, authorship and contributorship
- Identification of publication misconduct, complaints and appeals
- Predatory publishers and journals

II. Practical

RPE 4: Open Access Publishing

- Open access publications and initiatives
- SHERPA/ RoMEO online resource to check publisher copyright and self-archiving policies
- Software tool to identify predatory publications developed by SPPU
- Journal finder/ journal suggestion tools, viz., JANE, Elsevier Journal Finder, Springer Journal Suggested, etc.

RPE 05: Publication Misconduct

A. Group Discussions

- Subject specific ethical issues, FFP, authorship
- Conflicts of interest
- Complaints and appeals: examples and fraud from India and abroad

B. *Software tools*

- Use of plagiarism software like Tumitin, Urkund and other open source software tools

RPE 06: Databases and Research Metrics

A. Databases

- Indexing databases
- Citation databases: Web of Science, Scopus, etc.

B. Research Metrics

- Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, CiteScore
- Metrics: h-index, g index, i10 index, altmetrics