

**Scheme of Studies for M.Phil (Pathology)**

**Department of Pathobiology, Faculty of Veterinary sciences, BZU Multan**

**Mission Statement**

Courses have been designed to enable M.Phil students to gain expertise in the discipline of Pathology. These course will be helpful to work as practical pathologist in livestock/poultry industry and also as research worker in the discipline of Pathology.

Course No.	Courses	Credit hours
PATH-601	Cellular and Molecular basis of Pathology	3(2-2)
PATH-602	Applied Clinical Pathology	3(1-4)
PATH-603	Necropsy Practice	3(1-4)
PATH-604	Canine and Feline Pathology	3(2-2)
PATH-605	Ruminant Pathology	3(2-2)
PATH-606	Pathology of infectious diseases of Poultry	3(2-2)
PATH-607	Pathology of non-infectious Diseases of Poultry	3(2-2)
PATH-608	Laboratory Aids in Poultry Health Monitoring	3(1-4)
PATH-609	Special Problem-I	1(1-0)
PATH-610	Seminar-I	1(1-0)
PATH-611	Equine Pathology	3(2-2)
PATH-612	Camel Pathology	2(1-2)
PATH-613	Research Planning in Pathology and Report Writing	2(2-0)

**NOTE:**

1. For the award of degree for M. Phil Pathology Research and Thesis carries 6 credit hours.
2. Minimum credit hours of course work should be 24 including minor subjects which shall not exceed one-third.
3. Minimum credit hours for the award of degree shall be 30.

**PATH-601**

**Cellular and Molecular basis of Pathology**

**3(2-2)**

### **Learning Objectives**

Upon completion of this course students will be able to:

- Understand the molecular mechanisms involved in cellular pathology.
- Understand the role of genetics in pathology.
- Understand the gross and histopathological lesions in various pathological conditions
- Understand the principles and practices of histochemistry and immuno-histochemistry in pathology.

### **Theory**

Introduction to Pathology and molecular basis of Pathogenesis. Molecular mechanisms in adaptation. Biochemical and molecular mechanics of cell injury. Ultra structural changes in cell injury. The genetics of cell death. Inflammation: early check points during inflammation. Cells and molecular players in sterile and non-sterile inflammation, Inflammatory reflex, inflammasome, Molecular events in phagocytosis and killing of pathogens. Untoward effects of inflammation. Role of Pattern Recognition Receptors, molecular cross-talk during healing and repair. The ubiquitin-proteasome pathway: on protein death and cell life, SUMO proteins. Chaperons and metalochaperons, their role in cell pathology. Sphingolipids and microbial pathogenesis. Molecular beacons. Stem cells and tissue repairs.

### **Practical**

Proficiency to recognize and describe gross and histological changes in tissues. Use of special and H& E stains in cell pathology. Markers of tissue injury. In situ hybridization. Karyotype analysis. Trans well chemotaxis. Electron microscopic examination of sub-cellular changes. Histochemical and immunohistochemical techniques in cell pathology.

### **Suggested readings:**

1. Zachary JF and McGavin DM, 2012. Pathologic Basis of Veterinary Disease, 5<sup>th</sup> Ed. Mosby, St. Louis, MO, USA
2. Clark DP and Pazdernik NJ, 2013. Molecular Biology. 2<sup>nd</sup> Ed. Academic Press, Elsevier, USA.
3. Lodish H, Berk A, Kaiser CA, Krieger M, Bretscher A, Ploegh H, Amon A and Scott MP 2013. Molecular Cell Biology. 7<sup>th</sup> Ed. W.H.Freeman and Company, New York.
4. Majno G and Joris I, 2004. Principles of General Pathology, 2<sup>nd</sup> Ed. Oxford University Press, USA
5. Slauson DO and Cooper BJ, 2002. Mechanisms of Disease, 3<sup>rd</sup> Ed., Williams & Wilkins, London, UK
6. Tubbs RR and Stoler MH, 2008. Cell and Tissue Based Molecular Pathology. Churchill Livingstone, USA.
7. Electronic sources – digital libraries, books, journals, etc.

**Learning Objectives:**

Upon completion of this course students will be able to:

- Collection of samples, processing and interpretation of results
- Understand various hematological and cytological techniques for animal diseases diagnosis.
- Understand and perform various biochemical tests and techniques used in Veterinary diagnostic laboratory
- Discuss various diseases of interest through case presentations.

**Theory**

Principles of organisation of a clinical laboratory. Sample selection, collection, preservation and and dispatch of morbid material for laboratory examination. Choosing an appropriate test. Different methods of blood cell counting; Performing blood cell counts and result interpretation. Anemia; diagnosis, types and interpretation. Diagnosis of polycythemia and leukemia. Leukocytic response in health and disease condition. Bone marrow; Indications, examination, interpretation of results. Myeloproliferative disorders. Exfoliative cytology; indications, sample collection, examination and interpretation of results. Use of computer in laboratory aids.

**Practical**

Haematological procedures and interpretation of results. Blood smear examination and use of various stains. Bone marrow examination and interpretation of results. Exfoliative cytology and interpretation of results. Examination of Transudate and Exudate. Liver function and kidney function tests, importance and interpretation of results. Routine urine examination and interpretation. Different screening tests for important veterinary diseases.

**Suggested readings:**

1. Latimer, K.S. (Ed.), 2011. Duncan and Prasse's Veterinary Laboratory Medicine: Clinical Pathology, 5<sup>th</sup> Ed., Blackwell Pub Professional, Ames, Iowa, USA
2. Coles, E.H., 1986. Veterinary Clinical Pathology, 4<sup>th</sup> Ed., W.B. Saunders and Co., Philadelphia, USA
3. Kerr, M.G., 2002. Veterinary Laboratory Medicine, 2<sup>nd</sup> Ed., Blackwell Science Ltd., Oxford, UK
4. Rosenfeld, A.J. and S.M. Dial, 2010. Clinical Pathology for the Veterinary Team, 1<sup>st</sup> Ed., Blackwell Pub Professional, Ames, Iowa, USA
5. Stockham, S.L. and M.A. Scott, 2009. Fundamentals of Veterinary Clinical Pathology, 2<sup>nd</sup> Ed., Blackwell Pub Professional, Ames, Iowa, USA
6. Electronic sources – digital libraries, books, journals, etc.

### Learning Objectives

Upon completion of this course students will be able to:

- Conduct the Postmortem examination of different farm animals
- Identify different gross lesions, perform different lab test to confirm the cause of death and make tentative diagnosis
- Write a post mortem report

### Theory

Death; introduction, types, vetero-legal aspects, determination of time elapsed. Postmortem block layout; aspects of construction and organization. Determination of age in different animals. The vetero-legal wounds. Postmortem serum concentration of neopterin, C-reactive protein and erythropoietin; Urine creatinine concentration. Molecular pathology of wound healing. Micro-RNA and forensic science. Determination of pesticides in postmortem blood and bone marrow. Age determination of blood spots. Extraction of diatoms from samples in cases of drowning.

### Practical

Postmortem examination procedures for different species. Selection of specimens for laboratory examination. Handling of morbid material. Abattoir pathology data and interpretation of lesions. Writing of pathology reports, death certificates and vetero-legal implications. Postmortem room safety codes. Disposal of carcass. Handling of evidence. Visit to modern slaughter house and postmortem block.

### Suggested readings:

1. Andrews, J.J. (ed.), 1986. Necropsy Techniques. The Veterinary Clinics of North America, 2 (1): 1-202
2. Strafuss, A. C., 1988. Necropsy: Procedures and Basic Diagnostic Methods for Practicing Veterinarians. Charles C Thomas Publisher, Spring Field Illinois, USA.
3. Merck, M. D., 2007. Veterinary Forensics: Animal Cruelty Investigations. Wiley-Blackwell, Oxford, UK
4. Cooper, J.E. and M.E. Cooper, 2007. Introduction to Veterinary and Comparative Forensic Medicine. Blackwell Publishing c/o Marston Book Services, Oxford, UK
5. Dabas, Y.P.S. Saxena, O.P. Dabas, Ranum, 2008. Veterinary Jurisprudence and Post Mortem. International Book Distributing Co. India
6. Electronic sources – digital libraries, books, journals, etc.
7. Munro, R. and H.M.C. Munro, 2008. Animal Abuse and Unlawful Killing: Forensic Veterinary Pathology, 1<sup>st</sup> Ed., Saunders Ltd.
8. Sharma, S.N., 1981. Veterinary Jurisprudence, 3<sup>rd</sup> Ed. Oxford and IEH Publishing Col. (Pvt.) Ltd. New Dehli, India

**Learning Objectives:**

Upon completion of this course students will be able to:

- Understand the diseases involving different systems of the body of dog and cat.
- Differentiate various diseases closely resembling to each other.
- Understand the gross and histopathological lesions produced in different diseases.
- Discuss various diseases of interest through case presentations.

**Theory**

Inventory of canine diseases; Diseases of digestive system, biliary system, liver and pancreas, respiratory system, urinary system, cardiovascular, bones, joints and muscles, skin, mammary glands and appendages, haemopoietic, lymphatic, reproductive, endocrine, central nervous systems and special senses. Metabolic and nutritional diseases. Idiopathic diseases.

**Practical**

Recognition and differential diagnosis of gross and histopathological lesions in various organs. Biochemical changes in various diseases. Data collection and interpretation of common diseases of canines and felines in Pakistan. Kennel visit(s).

**Suggested readings:**

1. Dijk JE., Gruys E, Mouwen JMVM (Eds), 2007. Color Atlas of Veterinary Pathology. General Morphological Reactions of Organs and Tissues. Elsevier Science Health Science div., New York, USA.
2. Jones TC, Hunt RD, King NW, 1997. Veterinary Pathology. 6<sup>th</sup> Ed. Blackwell Pub Professional, Ames, Iowa, USA.
3. Maxie MG, (Ed), 2007. Jubb, Kennedy & Palmer's Pathology of Domestic Animals. 5<sup>th</sup> Ed. Elsevier Science Health Science div, New York, USA.
4. Thomson RG, Carlton WW, McGavin MD, Zachary JF, 2000. Thomson's Special Veterinary Pathology. 3<sup>rd</sup> Ed. Elsevier Science Health Science div, New York, USA.
5. Electronic sources – digital libraries, books, journals, etc.

**PATH-605**

**Ruminant Pathology**

**3(2-2)**

**Learning Objectives:**

Upon completion of this course students will be able to:

- Etiopathology of ruminant animal diseases involving various systems of the body
- Gross and histopathology lesions and diagnosis of diseases
- Discuss various diseases of interest through case presentations.
- Zoonotic diseases

**Theory**

Aetiopathology of diseases of various systems including digestive (FMD, clostridial infections; black disease; para-TB; bluetongue, enterotoxemia, PPR), respiratory (CCPP, HS, TB), urinary and cardiovascular system. Disorders of bones, joints and muscles (Black quarter). Skin diseases (buffalo pox; horn core cancer), mammary glands (mastitis) and appendages. Disorders; haemopoietic & lymphatic systems, reproductive & endocrine systems, central nervous system (rabies; scrapie, border disease) and special senses. Aetiopathology and diagnosis of copper poisoning/toxicity, infectious keratoconjunctivitis (pink eye) and Q Fever and zoonotic diseases; Metabolic and nutritional disorders; idiopathic diseases and important parasitic diseases of ruminants.

**Practical**

Recognition and differential diagnosis of gross and histopathological lesions in various diseases. Visit (s) to livestock, sheep and goat farm (s). Seminars/presentations

**Suggested readings:**

1. Fthenakis GC, Menzies PI, 2011. Therapeutics and Control of Sheep and Goat Diseases. W.B. Saunders Co.
2. Dijk JE., Gruys E, Mouwen JMVM (Eds), 2007. Color Atlas of Veterinary Pathology. General Morphological Reactions of Organs and Tissues. Elsevier Science Health Science div., New York, USA.
3. Jones IC, Hunt RD, King NW, 1997. Veterinary Pathology. 6<sup>th</sup> Ed., Blackwell Pub Professional, Ames, Iowa, USA.
4. Maxie MG, (Ed) 2007. Jubb, Kennedy & Palmer's Pathology of Domestic Animals, 5<sup>th</sup> Ed. Elsevier Science Health Science div., New York, USA.
5. Rollefson IK, Mathias E, Mundy P, 2001. A Field Manual of Camel Diseases: Traditional and Modern Veterinary Care for the Dromedary. Stylus Pub Llc, USA.
6. Electronic sources – digital libraries, books, journals, etc

**PATH-606**

**Pathology of Infectious Diseases of Poultry**

**3(2-2)**

**Learning Objectives:**

Upon completion of this course students will be able to:

- have a knowledge of gross and microscopic pathology of different Viral, bacterial and parasitic diseases of poultry
- conduct post mortem examination of poultry and identify different gross lesions peculiar to different bacterial and parasitic diseases
- make a tentative and differential diagnosis of different poultry diseases

**THEORY:**

Bacterial, viral, parasitic and fungal diseases. Mycotoxicosis. Hatchery-borne diseases, Yolk sac infection, Vertically transmitted diseases. Genetic basis of disease resistance. Biosecurity, Strategies for disease control. Immunity, immunosuppression. Vaccines and vaccination. Zoonotic problems.

**PRACTICAL:**

Organization, management and control of poultry diagnostic laboratory. Gross and histopathological features of various infectious diseases of poultry. Differential diagnosis of various infectious diseases. Laboratory aids in diagnosis of viral, bacterial and parasitic diseases. Serological diagnosis of viral diseases with the help of ELISA, HA-HI. Identification of different types of tumors of poultry birds. Health monitoring programmes. Hatchery visit(s), Farm visit(s), Visit(s) to Research Institute(s).

**RECOMMENDED BOOKS:**

1. Charlton BR, Burmudez AJ, Boulianne M, Halvorson DA, Shrader JS, Newmann LJ, Sander Wakenell PS, 2006. Avian Disease Manual, 6<sup>th</sup> Ed, American Association of Avian Pathologists, Athens, Georgia, USA.
2. Electronic sources – digital libraries, books, journals, etc.
3. Jordan FTW, Pattison M, Alexander D, Faragher T, Alexander DJ, 2002. Poultry Diseases, 5<sup>th</sup> Ed. W.B Saunders Company, London, UK.
4. Saif YM, Nolan LK, Fadly AM, Glisson JR, McDouald LR, 2008. Diseases of Poultry, 12<sup>th</sup> Ed. Blackwell Pub Professional, Ames, Iowa, USA.
5. Swayne DE, Glisson JR, Jackwood MW, Pearson JE, Reed WM, 1998. A Laboratory Manual for the Isolation and Identification of Avian Pathogens, 4<sup>th</sup> Ed., American Association of Avian Pathologist inc. Kennett square, Pennsylvania, USA.
6. Tegetmeier WB, 2010. Profitable Poultry: Their Management in Health and Disease. 1<sup>st</sup> Ed. General Books.
7. Electronic sources – digital libraries, books, journals, etc

**PATH-607**

**Pathology of non-infectious Diseases of Poultry**

**3(2-2)**

### **Learning Objectives**

Upon completion of this course students will be able to:

- have a knowledge of gross and microscopic pathology of different metabolic diseases and common intoxications in birds
- conduct post mortem examination of birds and identify different gross lesions peculiar to different metabolic diseases and common intoxications in birds
- make a tentative and differential diagnosis of different poultry diseases

### **Theory**

Pathology and pathogenesis of metabolic diseases. Gout, Fat Rancidity, Water borne toxicities, Drug toxicities, Chemical toxicities (disinfectants, fumigants insecticides used on poultry farms), Litter related intoxications, Ammonia toxicity, Mycotoxicosis, Toxic residues in poultry products. Heat stress. Biosecurity. Immunity; vaccines, vaccination and immunosuppression. Water quality. Vertically transmitted diseases. Pathology and differential diagnosis of lesions in various organs/systems. Problems related to improper housing. Strategies for disease control.

### **Practical**

Evaluation of poultry feed and water for toxicities, diagnosis of metabolic and toxic diseases of poultry. Mycotoxin analysis, Evaluation of toxic residues in poultry products. Pesticide screening. Study of gross and microscopic changes in different toxicities in different tissues of birds.

### **Suggested readings:**

1. Charlton BR, Burmudez AJ, Boulianne M, Halvorson DA, Shrader JS, Newmann LJ, Sander JE, Wakenell PS, 2006. Avian Disease Manual. 6<sup>th</sup> Ed. American Association of Avian Pathologists, Athens, Georgia, USA.
2. Jordan FTW, Pattison M, Alexander D, Faragher T, Alexander DJ, 2002. Poultry Diseases, 5<sup>th</sup> Ed. W.B. Saunders Company, London, UK
3. Saif YM, Nolan LK, Fadly AM, Glisson JR, McDouald LR, 2008. Diseases of Poultry, 12<sup>th</sup> Ed. Blackwell Pub Professional, Ames, Iowa, USA
4. Swayne DE, Glisson JR, Jackwood MW, Pearson JE, Reed WM, 1998. A Laboratory Manual for the Isolation and Identification of Avian Pathogens, 4<sup>th</sup> Ed. American Association of Avian Pathologist inc. Kennett square, Pennsylvania, USA.
5. Tegetmeier WB, 2010. Profitable Poultry: Their Management in Health and Disease, 1st Ed. General Books.
6. Electronic sources – digital libraries, books, journals, etc

**PATH-608**

**Laboratory Aids in Poultry Health Monitoring**

**3(1-4)**

### **Learning Objectives**

Upon completion of this course students will be able to:

- Be able to perform post mortem of poultry birds, make a tentative and differential diagnosis of poultry diseases.
- Be proficient in performing different lab tests used for poultry diseases diagnoses.
- Evaluate the health status of poultry flocks.
- Implement the biosecurity practices at poultry farms, hatchery and feed mill.
- Perform the lab monitoring and evaluate the sanitation status of farms, hatcheries and feed mills etc.

### **Theory**

Recent advances in avian disease diagnosis. Hematology and Serum chemistry of avian species. Use of laboratory aids in differential diagnosis of avian diseases.

Laboratory aids in flock health Biosecurity principles and practices at farm, hatchery and feed mill. Daily flock behavior monitoring for health of poultry birds. Hatchery sanitation and disinfection. Maintaining quality of hatching eggs from nest to incubator. Hatchery waste disposal.

### **Practical**

Necropsy techniques for different avian species, Identification of gross lesions in different organs. Differential diagnosis of different diseases of poultry birds brought to diagnostic lab at university. Collection of blood samples, serum separation and submission to diagnostic laboratory for different tests. PCR based diagnosis of different bacterial and viral diseases. Isolation and identification of causative agents. Serological diagnosis by ELISA and HA-HI. Plate agglutination tests for Salmonella and Mycoplasma. Bacterial isolation and culture sensitivity. Quick strip tests available for early diagnosis of different diseases like avian influenza. Use of histopathology and immunohistochemistry in avian disease diagnosis.

Laboratory monitoring of hatchery. Hatchery born diseases, diagnosis and control. Aetiopathology and diagnosis of early chick mortality. Veterinary control and analysis of poor hatches.

### **Suggested readings:**

1. Charlton BR, Burmudez AJ, Boulianne M, Halvorson DA, Shrader JS, Newmann LJ, Sander JE, Wakenell PS, 2006. Avian Disease Manual, 6<sup>th</sup> Ed. American Association of Avian Pathologists, Athens, Georgia, USA.
2. Jordan, FTW, Pattison M, Alexander D, Faragher T, Alexander DJ, 2002. Poultry Diseases, 5<sup>th</sup> Ed. W.B Saunders Company, London, UK
3. Saif, Y.M., L.K. Nolan, A.M. Fadly, J.R. Glisson and L.R. McDouald, 2008. Diseases of Poultry, 12<sup>th</sup> Ed. Blackwell Pub Professional, Ames, Iowa, USA
4. Swayne DE, Glisson JR, Jackwood MW, Pearson JE, Reed MW, 1998. A Laboratory Manual for the Isolation and Identification of Avian Pathogens, 4<sup>th</sup> Ed. American Association of Avian Pathologist inc. Kennett square, Pennsylvania, USA.
5. Tegetmeier WB, 2010. Profitable Poultry: Their Management in Health and Disease. 1<sup>st</sup> Ed. General Books, USA.
6. Electronic sources – digital libraries, books, journals, etc.

**PATH-609 Special Problem**

**1(1-0)**

**Learning objectives;**

Upon completion of this course students will be able to:

- Identify, review and plan to address the specific issues pertaining to Pathology diseases

The respective supervisor of the student will assign a topic of interest to make him understand the ways and means of addressing an issue pertaining to Pathology

**PATH-610 Seminar**

**1(1-0)**

**Learning objectives**

Upon completion of this course students will be able to:

- Identify, review, plan and orally present the specific issues pertaining to Pathology

The respective supervisor of the student will assign a topic of interest to make him understand the ways and means of addressing an issue pertaining to pathology and present as a seminar

**PATH-611**

**Equine Pathology**

**3(2-2)**

**Learning Objectives:**

Upon completion of this course students will be able to:

- Etiopathology of equine diseases involving various systems of the body
- Gross and histopathology and diagnosis of equine diseases
- Discuss various diseases of interest through case presentations.
- Zoonotic diseases

**Theory**

Diseases of digestive, respiratory, urinary system, cardiovascular, Central nervous system, haemopoietic and lymphatic systems, bones, joints, tendons, muscles, skin & appendages. Disorders of reproductive and endocrine systems. Diseases of special senses. Metabolic and nutritional disorders. Zoonotic diseases.

**Practical**

Recognition and differential diagnosis of gross and histopathological lesions in different organs of equines. Biochemical changes in various diseases. Visit of stud farm(s).

**Suggested readings:**

1. Bowers R, 2009. A Modern and Practical Treatise on the Diseases of Horses, Horned Cattle and Sheep. Bibliolife Publications Llc, USA.
2. Dijk JE., Gruys E, Mouwen JMVM (Eds), 2007. Color Atlas of Veterinary Pathology. General Morphological Reactions of Organs and Tissues. Elsevier Science Health Science div, New York, USA.
3. James RR, Robertson JL, 1996. Equine Pathology. Blackwell Pub Professional, Ames, Iowa, USA.
4. Maxie MG, (Ed), 2007. Jubb, Kennedy & Palmer's Pathology of Domestic Animals. 5<sup>th</sup> Ed. Elsevier Science Health Science div. New York, USA.
5. Zidonis N, 2011. Equine Health & Pathology. Tallgrass Pub Llc, USA.
6. Electronic sources – digital libraries, books, journals, etc

**PATH-612**

**Camel Pathology**

**3(2-2)**

**Learning Objectives:**

Upon completion of this course students will be able to:

- Etio-pathogenesis of camel diseases involving various systems of the body
- Gross and histopathology and diagnosis of various diseases of camel
- Discuss various diseases of interest through case presentations.

**Theory**

Pathobiology of digestive system, liver and pancreas. Diseases of respiratory system. Diseases of urinary system. Diseases of cardiovascular system, Disease of bones, joints and muscles. Diseases of skin, mammary glands and appendages. Diseases of haemopoietic and lymphatic systems. Disorders of reproductive and endocrine systems. Diseases of central nervous system and special senses. Metabolic and nutritional diseases. Diseases of unknown aetiology.

**Practical**

Recognition and differential diagnosis of gross and histopathological lesions in various organs. Biochemical changes in various diseases. Seminars on common diseases of camel in Pakistan.

**Books Recommended**

1. Higgins A, 1986. The Camel in health and disease. Bailliere Tindall. U.K.
2. Jubb, KVF, Kennedy PC, Palmer N, 1993. Pathology of domestic animals. 4th ed. Academic Press, Inc. New York, USA.
3. Wilson, RT, 1985. The Camel. Longman Press, London, UK.
4. Sastry GA, 1983. Veterinary Pathology. 6<sup>th</sup> Ed. CBS, Publishers, Delhi. India.
5. Electronic sources – digital libraries, books, journals, etc.

**PATH-613                      Research Planning in Pathology and Report Writing                      2(2-0)**

**Learning objectives**

Upon completion of this course students will be able to:

- Plan their research according to recommended ethical and standard operational protocols
- Develop abilities to review the literature regarding topic of interest
- Understand the safety measures during conducting their research.
- Overcome the problem of bias and statistical interpretation of data
- Be familiar with norms of writing synopsis, thesis and research papers
- Understand the concept of impact factor, citation and process of publication of papers in peer reviewed journals

**Theory**

Introduction to Scientific Writing/publication; Scientific publications; Components of research paper, Review paper, short communication, extension article and case report; Definition and types of technical reports. Differences between a technical and a general report. Conventional and modern information resources . The aims of technical writing. The components of report. Organizing the material. Basic methods of analysing data. Paragraphing. Essentials for writing research paper, synopsis, thesis and scientific research proposals; Formats for research/scientific writings; Ethics of scientific writing; Plagiarism and its different types; Citation of different sources of references; use of citation management software. Introduction to different data searching databases ; Accepted abbreviations; Planning and delivering a presentation. Some “Do’s” and “Don’ts” of oral presentation. Oral and poster presentations of scientific data; Research ethics; Introduction to patents and how to patent a research.

**Suggested Readings;**

1. LSE Public Policy Group, 2011. Maximizing the Impacts of Your Research: A Handbook for Social Scientists (<http://cssp-jnu.blogspot.com/2011/06/lse-releases-maximizing-impacts-of-your.html>)
2. Blum D, M Knudson and RM Henig, 2005. A Field Guide for Science Writers. Second Edition, Oxford University Press, USA.
3. Tips for scientific writing, 1996. <http://www.srh.noaa.gov/ftproot/ssd/html/writetip.htm>.
4. A Guide to Writing in the Biological Sciences: Practical Tips for Scientific Writing. <http://classweb.gmu.edu/biologyresources/writingguide/PracticalTips.htm>.
5. Beebe, L., 1993. Professional Writing for the Human Services. Washington, DC: National Association of Social Workers.
6. Day RA, 1988. How to Write and Publish a Scientific Paper, 3<sup>rd</sup> Ed., Oryx Press, New York, USA.