

**Guru Kashi University**  
**Talwandi Sabo**  
**Doctor of Philosophy**

**Research Methodology (583101)**

**Credit: 4**

**L T P**  
**4 0 0**

**Objective**

To teach methodology of planning, layout, data recording, analysis, interpretation and report writing of Plant Pathology experiments

UNIT I

Basic principles of design of experiments: randomization, replication and local control. Uniformity trials: size and shape of plots and blocks. Elements of linear estimation. Analysis of variance and covariance.

UNIT II

Completely randomized design (CRD), Randomized complete block design (RCBD) and Latin square design (LSD). Mutually orthogonal latin squares. Graeco Latin squares. Missing plot techniques.

Unit III

General Gauss Markoff set up, Gauss-Markoff 's theorem, Aitken's transformation. Theory of linear estimation, test of hypothesis in linear models. Analysis of variance, partitioning of degrees of freedom. Restricted least squares. Special cases of one and two way classifications (including disproportionate cell frequencies and interaction, cross and nested classifications).

**Suggested Readings**

- Cochran, W.G. and Cox, G.M. 1957. *Experimental Designs*. John Wiley.
- Das, M.N. and Giri, N.C. 1986. *Design and Analysis of Experiments*. New Age.
- Dean, A.M. and Voss, D. 1999. *Design and Analysis of Experiments*. Springer.
- Dey, A. 1986. *Theory of Block Designs*. Wiley Eastern Ltd.
- Federer, W.T. 1956. *Experimental Design –Theory and Application*.
- Macmillan. Federer, W.T. 1985. *Experimental Designs*. MacMillan.
- Fisher, R.A. 1953. *Design and Analysis of Experiments*. Oliver and Boyd.
- Bapat, R.B. 1993. *Linear Algebra and Linear Models*. Springer-Verlag.
- Rao, C. R. 2001. *Linear Inference and its Application*. Wiley Eastern.
- Searle, S. R. 1998. *Variance Components*. John Wiley.

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Doctor of Philosophy**

**Computer Applications in Research (180102)**

**Credit: 2**

**L T P  
1 0 2**

**Common for all branches except Hindi, Punjabi, English, History and Religious Study.**

**Unit 1**

Generating Charts/Graphs in Microsoft Excel, Power Point Presentation, Web search, Use of Internet and www. Using search like Google etc.

**Unit 2:**

SPSS concepts and its use for Statistical Analysis.

**Unit 3:**

MatLab and its use for Statistical Analysis.

**Unit 4:**

Introduction to the use of LaTeX, Mendeley, Anti-Plagiarism Softwares .

**References:-**

- 1) Office 2007 in Simple Steps, Kogent Solutions, (Wiley Publishers).
- 2) MS-Office 2007 Training Guide, S. Jain (BPB Publications).
- 3) Bansal , R. K. and others ‘MATLAB and its applications in Engg. Second Edition , Pearson Education, Delhi.
- 4) Sabine handan & Brian S. Everitt, “ A Handbook of Statistical Analysis using SPSS” , Chapman & Hall / CRC Publication, USA.

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**Advances in Mycology (583102)**

**Credit: 4**

**L T P**  
**4 0 0**

**Objective**

To provide deep insight of fungal systematic, fungal structures and their role in identification. Recent developments in fungal classification including chemo and molecular taxonomy. Genetics and variability among fungi and their economic and industrial importance.

**Theory**

**UNIT I**

General introduction, historical development and advances in mycology.

**UNIT II**

Recent taxonomic criteria, morphological criteria for classification. Serological, Chemical (chemotaxonomy), Molecular and Numerical (Computer based assessment) taxonomy.

**UNIT III**

Interaction between groups: Phylogeny. Micro conidiation, conidiogenesis and sporulating structures of fungi imperfecti. Morphology and reproduction of representative plant pathogenic genera from different groups of fungi. Sexual reproduction in different groups of fungi.

**UNIT IV**

Population biology, pathogenic variability/vegetative compatibility.

**UNIT V**

Heterokaryosis and parasexual cycle. Sex hormones in fungi. Mechanism of nuclear inheritance. Mechanism of extra-nuclear inheritance. Biodegradation.

**Suggested Readings**

- Agrios, G.N. 2004. *Plant Pathology*. Fifth Edition, Academic Press, USA.
- Bos, C.J. 1996. *Fungal Genetics: Principles and Practice*. Marcel Dekker, Inc.: New York.
- Chawla, H.S. 2004. *Introduction of Plant Biotechnology*. Science publisher, Inc. Enfield, NH, USA.
- Pelczar, M.J., Chan, E.C.S. and Krieg, N.R. 1993. *Microbiology: Concept and Application*. McGraw- Hill, Inc. New York.

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- Singh, R.S. 1984. *Introduction to Principles of Plant Pathology*, Oxford and IBH Publishing Co Pvt. Ltd., New Delhi.

**Advances in Bacteriology**

**Objective**

To provide advanced knowledge on characterization, identification of bacteria, pathogenesis, mechanism of disease development and recent approach in bacterial disease management.

**Theory**

**UNIT I**

Nomenclature, characteristics and classification of bacteria, Ultrastructures and biology of bacteria.

**UNIT II**

Fastidious bacteria, mechanism of soft rot (*Erwinia* spp.) development, mechanism of crown gall formation (*Agrobacterium tumefaciens*), Mechanism of wilt (*Ralstonia solanacearum*) development.

**UNIT**

**III**

Role of enzyme, toxin, exopolysaccharide, polypeptide signals in disease development, epidemiology in relation to bacterial plant pathogens

**UNIT IV**

Host-bacterial pathogen interaction, quorum-sensing phenomenon, Type III secretion system, colonization ability of bacteria, bacterial EPS and their role as disease determinant.

**UNIT V**

Plasmid biology, molecular variability among phytopathogenic procarya and possible host defense mechanism(s), genetic engineering for management of bacterial plant pathogens-gene silencing, RNAi technology.

**Suggested Readings**

- Bradbury, J.F. and Saddler, G.S. 1985. *A Guide to Plant Pathogenic Bacteria*, CABI.
- Boer, S.H.D. 2001. *Plant Pathogenic Bacteria*. Kluwer Academic Publishers, Netherlands.
- Civerolo, E.L., Collmer, A., Davis, R.E. and Gillaspie, A.G. *Plant Pathogenic bacteria*, Martinus Nijhoff Publishers, Boston.

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- Gerhardt, P., Murray, R.G.E., Wood, W.A. and Krieg, N.R. 1994. *Methods for Molecular bacteriology*.
- American Society of Microbiology, Washington, DC. Gnanamanickam, S.S. 2006. *Plant Associated Bacteria*. Springer.
- Jackson, R.W. 2009. *Plant Pathogenic Bacteria: Genomics and Molecular Biology*. Caister Academic Press.

**Advances in Virology**

**Objective**

To provide knowledge in recent advancement in study of plant viruses and their management

**Theory**

**UNIT I**

Introduction to Advanced Virology Mechanism of virus transmission by vectors, virus-vector relationship, virus replication, assembly and architecture, ultrastructural changes due to virus infection, variation, mutation and virus strains.

**UNIT II**

Production PAb and hybridoma, nucleo-based diagnostic technique, methods of immunodiagnosis, hybridoma technology and use of monoclonal antibodies in identification of viruses and their strains, Polymerase Chain Reaction, Rolling Circle replication.

**UNIT III**

Genome organization, gene expression in Gemini viruses, mechanism of replication, transcription and translational strategies of pararetroviruses and gemini viruses.

**UNIT IV**

Gene expression and regulation, viral promoters, molecular mechanism of host virus interactions, virus induced gene, molecular mechanism of vector transmission, symptom expression, viroids and prions.

**UNIT V**

Genetic engineering with plant viruses, viral suppressors, a RNAi dynamics, resistant genes. Viruses potential as vectors, genetically engineered resistance, transgenic plants.

**UNIT VI**

Techniques and application of tissue culture. Origin, evolution and interrelationship with animal viruses.

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**Suggested Readings**

- Mahy, B.W.J. and Van Regenmortel, M.H.V. 2008. *Encyclopedia of Virology*-Third edition, Elsevier- Academic Press, London.
- Roger, Hull. 2004. *Matthews' Plant Virology* (IInd Edition). Academy Press, London, UK.
- Fauquet, C.M., Mayo, M.A., Maniloff, J., Desselberger, U. and Ball, L.A. 2005. *Virus Taxonomy:VIII, Elsevier-Academic Press*, London.

**Molecular Basis of Host Pathogen Interaction**

**Objective**

To provide knowledge on host pathogen interaction and its application at molecular level.

**Theory**

**UNIT I**

Importance and role of biotechnological tools in Plant Pathology- Basic concepts and principles to study host pathogen relationship.

**UNIT II**

Molecular basis of host-pathogen interaction- fungi, bacteria and viruses; recognition system, signal transduction.

**UNIT III**

Induction of defense responses- pathogenesis related proteins, HR, reactive oxygen species, phytoalexins and systemic acquired resistance, Programmed Cell Death, Viral induced gene silencing.

**UNIT IV**

Molecular basis of gene-for-gene hypothesis; R-gene expression and transcription profiling, mapping and cloning of resistance genes and marker-aided selection, pyramiding of R genes.

**UNIT V**

Biotechnology and disease management; development of disease resistance plants using genetic engineering approaches, different methods of gene transfer, biosafety issues related to GM crops.

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**Suggested Readings**

- Agrios, G.N. 1997. *Plant Pathology*. 4th Edition. Academic Press, New York.
- Huang, J. 2001. *Plant Pathogenesis and Resistance- Biochemistry and physiology of plant-microbe interactions*. Kluwer Academic Publishers, pp. 691.
- Osiewacz, H.D. 2002. *Molecular Biology of Fungal Development*, Marcel Dekker, USA, pp.607.
- Singh, R.S., Singh, U.S., Hess, W.M. and Weber, D.J. 1988. *Experimental and Conceptual Plant Pathology*. Oxford and IBH publishing Co. Pvt. Ltd., pp. 599.
- Vidhyasekaran, P. 1993. *Principles of Plant Pathology*. CBS Publishers and Distributors, New Delhi.
- Vidhyasekaran, P. 2008. *Fungal Pathogenesis in Plants and Crops-Molecular biology and host defense mechanism*. CRC press, pp. 509.

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- 8) Sabine handan & Brian S. Everitt, “ A Handbook of Statistical Analysis using SPSS” , Chapman & Hall / CRC Publication, USA.