

M.Phil./Ph.D. Bridge Course
Syllabus - (For Chemistry And Agrochemical & Pest Management)

Unit - I :- Computer Applications

Introduction to computational chemistry and molecular modeling, molecular dynamics, simulations, energy minimization and search methods, use of molecular dynamics for normal mode analysis, free energy calculations and conformational analysis.

Force fields :- Various types of interactions required for defining the force fields.

Softwares :- Commercially open sourced packages such as gromax, amber, NAMD, VMD, Chemoffice ultra etc.

Unit - II :- Quantitative Techniques

Classification of quantitative methods, General steps required for quantitative analysis, reliability of the data, classification of errors, accuracy, precision, statistical treatment of random errors, the standard deviation of complete results, error proportion in arithmetic calculations, Uncertainty and its use in representing significant digits of results, confidence limits, Estimation of detection limit.

References :-

- 1) Fundamentals of analytical chemistry by D. A. Skoog, D. M. West & F. J. Hooler.
- 2) Quality in the Analytical Chemistry Laboratory by R. D. Treble & D. G. Holcombe.
- 3) Molecular dynamics simulations elementary methods by J. M. Haile.
- 4) The art of molecular dynamic simulations by D. C. Rapaport.
- 5) Introduction to computational chemistry by F. Jensen.
- 6) Molecular modeling principles and applications by A. R. Leach.
- 7) Essentials of computational chemistry by C. J. Cramer.

M.Phil./Ph.D. Bridge Course
Syllabus - (For Mathematics - Research Methodology)

Quantative Techniques and Computer Applications

Max marks : 50

Module - I : Quantitative Techniques

Information Theory :-

Communication Processes, Measure of information, measure of uncertainty, properties of entropy function, channel capacity, encoding.

Game Theory :-

Characteristics, minimax criterion and optimal strategy, saddle point, solution of game with saddle point. Rectangular games without saddle points. Minimax principle for mixed strategy games.

15 Marks

Module - II :- Introduction to Mathematics

Running Mathematica, Numerical calculations, Building up calculations. Using the Mathematics system, Algebraic Calculations, Symbolic Mathematics, Functions and Programs, Lists, Graphics and Sound, Input and output in Note books, files and External Operations.

15 Marks

Reference Books :-

- 1) Operations Research by S. D. Sharma , Kedarnath Ramnath Pub. 16th Ed. Meerat, 2010.
- 2) The Mathematics, by Stephenn Wolfram, 3rd Ed. Cambridge University press 1996.
- 3) Mathematics as a tool : An introduction, with practical examples : by Stephan Kaufmann, Birkhaiyser Uerlag, 1994.

M.Phil./Ph.D. Bridge Course
Syllabus - (For Statistics – Research Methodology)

Unit - I :- Computer Applications :-

Information Technology in Research Use of word processor, spreadsheets, presentation managers; Internet concepts, searching the web, Managing personal blogs, Open source software and its use in Research (emphasis on R). Monte Carlo Techniques : Simulation from univariate and multivariate distribution, Importance sampling, Numerical methods for integration, differentiation. Programming in R for implementing these techniques Macros in MINITAB & MATLAB.

(25)

Unit - II :- Quantitative Techniques :-

Multivariate Data analysis, Classification, Principal components, Factor analysis, Cluster analysis. Implementation of these techniques using statistical software.

(25)

M.Phil./Ph.D. Bridge Course
Syllabus - (For Geography)

Paper : Computer Applications & Quantitative Techniques

Unit - I :- Computer Applications :

Computer applications in Geography : Basics of computer, use of Microsoft office, internet surfing.

GIS : mapping, data storage and analysis.

Unit - II :- Quantitative Techniques

Measures of central tendency : mean, mode, median, quartile deviation, standard deviation.

Measures of dispersion : coefficient of variation, Lorenz curve and Gini's concentration of coefficient. Measurement of Growth and estimation of population or other phenomena.

Correlation analysis and Test of significance : correlation coefficient, T test, Chi square test, regression analysis.

Methods of Regionalization : choice of indicators and measurement of development.

References :

- Arora P. N. & Arora S (1994) : Foundation Course in Statistics, S. Chand and Company Ltd, New Delhi.
- Aslam Mehmood (1976) : Statistical Techniques in Geographical studies, Rajesh Publication, New Delhi.
- Derrenberger, R. W. (1971) : Geographical Research and Writing, Thomas Y. Cromwell & Co. New York.
- Gibbs J. P. (ed) (1966) : Urban Research Methods, D. Van Nostrand Co., Inc Princeton, New Jersey, New York.
- Gregory S. (1963) : Statistical Methods and the Geographer, Longman, London.
- Hagget Peter (1990) : Geography : Modern Synthesis. Harper International, New York.
- Hammond R. & Mc Cullagh P. (1974) : Quantitative Techniques in Geography Clarendon Press, Oxford.
- Haring L. L. & Loundbury J. F. (1975) : Introduction to Scientific Geographic Research. W. C. Brow Company, U.S.A.
- Haring, Lloyd (1975) : Scientific Geographic Research. W. C. Brow Company, U.S.A.

- Kothari C. R. (1996) : Research Methodology, Vishwas Prakashan , New Delhi.
- Lillesand & Kiefer (1994) : Remote Sensing and Image Interpretation, John Wiley and sons Inc, New York.
- Mishra R. P. (1991) : Research Methodology in Geography, Concept Publishing, New Delhi.
- Pugh, Griffith Thomason (1968) : Guide to Research Writing, Houghton Mifflin Boston, New York.
- Saha P. & Basu P. (2006) : Advanced Practical Geography, Books and allied Pvt. Ltd. , Kolkatta.
- Sarvanavel P. (1998) : Research Methodology, Kitab Mahal, Allahbad.

M.Phil./Ph.D. Bridge Course
Syllabus - (For Life Sciences)

**(Botany, Zoology, Biochemistry, Biotechnology, Microbiology,
Environmental Science, Food Science and Environmental Biotechnology)**

Paper : Computer Applications & Quantitative Analysis

Total Marks : 50

Unit 1. Basic Concepts of Computer_ (7 Lectures)

1. History of Computer
2. Concept of Computer hardware
3. Concept of Computer languages
4. Concept of Computer Softwares

Unit 2. Computer applications in Biology_ (8 Lectures)

1. **Spreadsheet tools :** Introduction to spreadsheet applications, features, Using formulas and functions, Data storing, Features for Statistical data analysis, Generating charts / graph and other features, Tools – Microsoft Excel or similar.
2. **Presentation tools :** Introduction, features and functions, Presentation of Power Point Presentation, Customizing presentation, Showing presentation, Tools – Microsoft Power Point or Similar.
3. **Web Search :** Introduction to Internet, Use of Internet and WWW, Use of search engines, Biological data bases.

Unit 3. Biostatistics_ (7 Lectures)

1. Measures of Central tendency and Dispersion.
2. Probability distribution : Binomial, Poisson and Normal.
3. Parametric and Nonparametric statistics, Confidence Interval, Errors.

Unit 4 Quantitative Techniques_ (8Lectures)

1. Levels of significance
2. Regression and Correlation
3. Use of Statistics in Biosciences
4. Use of Computers in Quantitative analysis.

M.Phil./Ph.D. Bridge Course
Syllabus - (For Computer Science)

Title of The Paper :- Computer Applications and Quantitative Techniques

Total Marks :50

Unit - I :- Current Trends and Technologies in Computer Science :-

(25 Marks, 30 Lectures)

Parallel Computing : Parallel virtual machine (pvm) and message passing interface (mpi) libraries and calls. Advanced architectures. Today's fastest computers.

Mobile Computing : Mobile connectivity - Cells, Framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications. Mobile databases-protocols, scope, tools and technology. M-business.

E-Technologies : Electronic Commerce : Framework, Media Convergence of Applications, Consumer Applications, Organisation Applications. **Electronic Payment Systems** : Digital Token, Smart Cards, Credit Cards, Risks in Electronic Payment System, Designing Electronic Payment Systems. **Electronic Data Interchange (EDI)** : Concepts, Applications, (Legal, Security and Privacy) issues, EDI and Electronic Commerce, Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Internet - Based EDI. **Digital Libraries and Data Warehousing** : Concepts, Types of Digital documents, Issues behind document Infrastructure, Corporate Data Warehouses. **Software Agents** : Characteristics and Properties of Agents, Technology behind Software Agents (Applets, Browsers and Software Agents) **Broadband Telecommunications** : Concepts, Frame Relay, Cell Relay, Switched Multimegabit Data Service, Asynchronous Transfer Mode. Main concepts in Geographical Information System (GIS), E-cash, E-Business, ERP packages. **Data Warehousing** : Data Warehouse environment, architecture of a data warehouse methodology, analysis, design, construction and administration.

Unit - II :- Quantitative Analysis and Scientific Writing :-

(25 Marks, 30 Lectures)

Mathematical Reasoning : Number series; letter series; codes; Relationships; Classification.

Logical Reasoning : Understanding the structure of arguments; Evaluating and distinguishing deductive and inductive reasoning; Verbal analogies : Word analogy-Applied analogy; Verbal classification; Reasoning Logical Diagrams : Simple diagrammatic relationship, multidiagrammatic relationship; Venn diagram; Analytical Reasoning.

Data Interpretation : Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data.

Scientific Writing : Structure and Components of Research Report, Types of Report: research papers, thesis, Research Project Reports, Pictures and Graphs, Citation Styles.

Books :-

1. Research methodology and Statistical techniques, by Santosh Gupta, Deep & Deep., 2007.
2. Research methods and Statistical techniques, by P. S. Kumar, Kumar, P. S. ,2004.
3. How to write and Publish by Robert A. Day and Barbara Gastel, (Cambridge University Press).
4. How to Research by Loraine Blaxter, Christina Hughes and Malcum Tight, (Viva Books).
5. The Craft of Scientific Writing by Michael Alley,(Springer).
6. Computer Architecture and Parallel Processing, Kai Hwang, Faye A. Brigs. , MC Graw Hill.
7. Data Warehousing in the Real World - SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.
8. Reza Behravanfar, "Mobile Computing Principles : Designing and Developing Mobile Applications with UML and XML", ISBN : 0521817331, Cambridge University Press, October 2004.
9. C. Siva Ram Murthy, B. S. Manoj " Adhoc wireless networks, architectures and protocols" peason education.
10. An Introduction to Geographical Information Systems, Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, Pearson Education, 2007.

M.Phil./Ph.D. Bridge Course
Syllabus - (For Physical Sciences)

Title of The Paper :- Computer Applications and Quantitative Techniques

Unit - I :- Basics of Computer and Applications :-

(25 Marks, 15 Lectures)

Architecture of a generic computer (with emphasis on the latest trends such as type of processor, RAM/SDRAM, SCSI Harddisk etc.), Operating System Structure and its role in the working of Computer, Case studies of Windows OS and Linux, in depth coverage of the application software such as word processing (MS office, Latex etc.) , Graph plotting and curve Fitting (Origin, Excel), Presentation (MS Power Point) Different file formats particularly useful in research communication (pdf, jpg, jpeg, djvu etc.), Techniques of internet browsing and using the e-resources for research purpose, Coverage of online paper submission / tracking systems (Manuscript central, Conference Chair etc.) Case studies of softwares' used in physical sciences such as X' pert highscore MATLAB, Mathematica etc.

Unit - II :- Quantitative Analysis and Scientific Writing :-

(25 Marks, 15 Lectures)

Mathematical Reasoning : Number series; letter series; codes; Relationship; Classification.

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Data Interpretation : Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data.

Scientific Writing : Structure and Components of Research Report, Types of Report: research papers, thesis, Research Project Reports, Pictures and Graphs, Citation styles.

Books :-

1. Research methodology and Statistical techniques, by Santosh Gupta, Deep & Deep., 2007.
2. Research methods and Statistical techniques, by P. S. Kumar, Kumar, P. S. ,2004.
3. Microsoft office 2007, by Greg Perry, Pearson Education, 2007 (Rep 2008)
4. How to write and Publish by Robert A. Day and Barbara Gastel, (Cambridge University Press)
5. How to Research by Loraine Blaxter, Christina Hughes and Malcum Tight, (Viva Books).
6. Probability and Statistics for Engineers and Scientists by Sheldon Ross, (Elsevier Academic Press).
7. The Craft of Scientific Writing by Michael Alley, (Springer).

