25 Other Compulsory Courses

A. Other Compulsory Courses for all M.Sc./M.Tech. & Ph.D. Students

S. No.	Name of the Course	Code No.	Name of the Discipline	Compulsory course for the stdents of
1	Library and information services	PGS 501 (0L+1P)	Library Services	M.Sc./M.Tech.
2	Technical writing and communication skills	PGS 502 (1L+1P)	Agricultural Extension	M.Sc./M.Tech.
3	Basic statistical methods in agriculture	PGS 504 (2L+1P)	Agricultural Statistics	M.Sc./M.Tech. and Ph.D.
4	Intellectual property and its management in agriculture	PGS 503 (1L+0P)	Plant Genetic Resources	Ph.D.
5	Agricultural research, research ethics and rural development programmes	PGS 505 (1L+0P)	Agricultural Extension	Ph.D.
6	History of agriculture	PGS 506 (1L+0P)	Genetics	M.Sc./Ph.D.

PGS 501 LIBRARY AND INFORMATION SERVICES (0L+1P) I, II, III

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 COMMUNICATION SKILLS (1L + 1P) I, II, III

Objective

This course is intended to expose the students about the basics skills needed for writing, reporting scientific data in the form of reports, research papers, manuals etc., and develop skill in preparing appropriate graphics to be used in such documents and presentations.

UNIT I

Basics of writing, writing style, art of clear writing: Readability and comprehension testing procedures, Principles of technical writing, purpose of technical reports, Preparing a documentation plan, Understanding information types, Gathering the data, Analyzing and sorting the results, Outlining the report

UNIT II

Use of charts, graphs, tables, diagrams and photographs, scientific photography, Graphic formats, typology, Presentation of scientific data, general and exact data, Editing, Proof reading, Bibliography

UNIT III

Role of visuals in Communication; Characteristics of visuals, functions of visuals and graphics; Theories of visual perception; Classification of visuals**,** visual formats, Selection of visuals, Preparing lecture slides – content, limitation and layout; its utility in preparing presentations for research papers and other publications, Public speaking.

Practical

Writing technical reports, research papers, preparing graphics, preparing computer based presentations.

Suggested Reading

Day, Robert A. and Gastel, Barbara 2006. *How to Write and Publish a Scientific Paper*. 6th Edition, Cambridge University Press, U.K.

Matthews, Janice R. and Matthews, Robert W. 2008. *Successful Scientific Writing*. 3rd Edition, Cambridge University Press, U.K.

Turk, Christopher and Kirkman, John 1994. *Effective Writing*. Second Edition, E&FN Spon, London

James W.B., Richard B.L., Fried F. Harcleroad. 1952. A.V. *Instructional Material & Methods*. McGraw Hill.

Lucas, S.E. 2007. *The Art of Public Speaking*, 10th Edition; New York: McGraw-Hill.

PGS 503 INTELLECTUAL PROPERTY AND ITS MANAGEMENT IN AGRICULTURE (1L+0P) I, II, III

Scope and Objectives

Generation of intellectual property (IP) and Protection of intellectual property rights (IPRs) play vital role in enhancing the inventive and hence developmental activities of the nation. IPRs provide structured mechanisms of rewarding and nurturing inventive activities. Advanced nations and globally competitive corporations strategically protect their IPs in all potential markets/countries through various IPR arrangements.

Indian agriculture requires earnest inventive activities, committed translation of research into technologies and enthusiastic efforts for trasfer of technology. Propitiously, agriculture and agricultural research present themselves as immense opportunities for Indian research and development endeavors (both public and private) to compete globally. However, comprehension and implementation of IP management practices are fundamental.

India, as state, is well equipped with government investments in R&D to generate IPs as well as with legislative instruments and institutions to implement IPRs. It is, therefore, imperative for today's research scholars in the field of agriculture to not only have some basic understanding of the IPRs but also their potential strategic relevance and the management issues. Provision of such an understanding in a nut-shell is the objective of this course.

Pedagogy

Interactive lecture sessions will be the main medium of learning in this course. Each session will be of one hour duration and the course will be covered in 10 sessions at the maximum. Practicing experts may also be invited and there may be some pre-arranged visits.

UNIT I. BASICS

- Concept of IP, need for IPRs, various legal instruments to protect IPRs
- Types of agricultural technologies that may be protected
- Interface between IPR regime, public good, biodiversity and environment

UNIT II. LEGISLATIONS AND INSTITUTIONS

- International Treaties and Conventions affecting agriculture innovation system
- Institutional mechanism of the IPR regime in India: Legislation and authorities
- Protection of Plant Variety and Farmers' Right, Authority, implementation, implications

UNIT III. IP MANAGEMENT

- Management of IPs: (i) Internal assessment of technology and IP audit; (ii) Licencing strategies, technology transfer and commercialization; (iii) Alliances and partnerships
- IP management structure in publicly funded agricultural research systems: a case study of ICAR
- Prior art search, filing of application, examination, grant: Generic procedure
- Case studies

Suggested Readings

Following websites provide excellent information (concepts, national and international legislations and institutions, statistics, procedures, FAQs etc.)

World Intellectual Property Organization (http://www.wipo.int/portal/index.html.en)

World Trade Organization (http://www.wto.org/)

United States Patent and Trademark Office (www.uspto.gov)

International Union for the Protection of New Varieties of Plants (http://www.upov.int/)

Convention on Biological Diversity (www.cbd.int)

Indian Patent Office (http://www.patentoffice.nic.in/)

National Institute for Intellectual Property Management (http://ipindia.nic.in/Niipm/index.htm)

PPV and FR Authority (http://plantauthority.gov.in/)

National Innovation Foundation (www.nif.org.in)

National Biodidiversity Authority (http://nbaindia.org/)

ICAR guide on IP management (www.icar.org.in/files/reports/other-reports/icar-ipmttcguide.pdf)

Journal of Intellectual Property Rights (http://www.niscair.res.in/sciencecommunication/ResearchJournals/rejour/jipr/jipr0.asp)

Course webpage (http://www.nbpgr.ernet.in/pgs-503.htm)

PGS 504 BASIC STATISTICAL METHODS IN AGRICULTURE (2L+1P) I, II, III

Objective

This basic course is meant for students who do not have sufficient background of statistical methods. The students would be exposed to concepts of statistical methods that would help them in understanding the importance and need of statistics. It would also help them in understanding the concepts involved in data presentation, analysis and interpretation. The students would get an exposure to presentation of data, probability distributions, correlation and regression, tests of significance and multivariate analytical techniques. The students would also be exposed to basic design of experiments and sample surveys.

Theory

UNIT I

Classification, tabulation and graphical representation of data. Levels of measurement. Descriptive statistics. Theory of probability. Random variable and mathematical expectation. Probability distributions: Binomial, Poisson, Normal distributions and their applications. Concept of sampling distribution: t, χ^2 and F distributions. Tests of significance based on normal, t, χ^2 and F distributions. Non-parametric tests.

UNIT II

Correlation and regression: Correlation, partial correlation coefficient, multiple correlation coefficient, rank correlation, simple and multiple linear regression model. Estimation of parameters. Coefficient of determination. Introduction to multivariate analytical tools: Principal component analysis and cluster analysis.

UNIT III

Planning of an experiment and basic principles of design of experiments. Analysis of variance. Completely randomized design (CRD), Randomized complete block design (RCBD), Latin square design (LSD). Randomization procedure, analysis and interpretation of results. Concept of factorial experiments.

UNIT IV

Planning of sample surveys. Sampling *vs* complete enumeration, Simple random sampling, Stratified sampling.

Practical

Descriptive statistics. Exercises on probability distributions. Correlation and regression analysis. Large sample tests, testing of hypothesis based on χ^2, t and F. Exercises on non-parametric tests. Principal component analysis and cluster analysis. Analysis of data obtained from CRD, RBD, LSD. Analysis of data of factorial experiments. Selection of a random sample, estimation using simple random sampling. Exercises on stratified sampling.

Suggested Readings

Campbell, R.A. 1974. *Statistics for Biologists.* Cambridge University Press.

Cochran, W.G. and Cox, G.M. 1957. *Experimental Designs.* John Wiley.

Cochran, W.G. 1959. *Sampling Techniques*. John Wiley.

Das, M. N. and Giri, N.C. 1986. *Design and Analysis of Experiments.* New Age International.

Dillon, W.R. and Goldstein, M. 1984. *Multivariate Analysis: Methods and Applications.* John Wiley.

Goon, A.M., Gupta, M.K. and Dasgupta, B. 1977. *An Outline of Statistical Theory.* Vol. I. The World Press Pvt. Ltd.

Goon, A.M., Gupta, M.K. and Dasgupta, B. 1983. *Fundamentals of Statistics.* Vol. I. The World Press Pvt. Ltd.,

Gomez, K.A. and Gomez, A.A. 1984. *Statistical Procedures for Agricultural Research.* John Wiley.

Gupta, S.C. and Kapoor, V.K. 2007. *Fundamentals of Mathematical Statistics.* Sultan Chand and Sons.

Panse, V.G. and Sukhatme, P.V. 1967. *Statistical Methods for Agricultural Workers.* ICAR Publication.

Siegel, S., Johan, N. and Casellan Jr. 1956. *Non-parametric Tests for Behavior Sciences.* John Wiley.

Snedecor, G.W. and Cochran, W.G. 1936. *Statistical Methods.* Oxford University.

Steel, R.G.D. and Torrie, J.H. 1960. *Principles and Procedures of Statistics.* McGraw Hill.

Sukhatme, P.V., Sukhatme, B.V., Sukhatme, S. and Asok, C. 1984. *Sampling Theory of Surveys with Applications.* Indian Society of Agricultural Statistics.

PGS 505 AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES (1L+0P) I, II, III

Objective

The course intends to sensitize the scholars about the basic issues related with agricultural research, ethics in research as well as rural development. The scholars will be also educated about principles and philosophy of rural development and motivated towards practising and promoting ethics in research and developmental endeavours.

UNIT I

Agricultural Research System - NARS and CGIAR; Agricultural Revolutions; Food and Livelihood Security; Climate Change - Mitigation and Adaptation; Overview of ethics and research; Principles and foundations of research ethics; Publishing and Authorship, Plagiarism, Intellectual property Rights and Policy, Researchers' responsibilities, Research participants' rights- consent, Privacy and confidentiality; Interviewing ethics; Agricultural research and bioethics; Incentives, Regulation and Activism for ethics;

UNIT II

Ethics and development; Process and outcome of development; Decentralized decision making; Vulnerable groups; Beneficence; Social justice and Equity; Gender sensitivity; Ethics in agriculture - social contract, socio-economic issues, environment, etc; Indigenous knowledge and benefit sharing; Values and attitude for Conservation, improvement and sustainable utilization of natural resources; Overview of rural development programmes in India; Panchayati Raj Institution;

Suggested Readings

Thompson, P. 1997. The spirit of the soil: Agriculture and environmental ethics. New York: Routledge Press.

Gadgil, M. and Guha, R. 1995. Ecology and equity. The use and abuse of nature in contemporary India. New Delhi: Penguin Books.

Ableman, M. 2005. Fields of plenty: A farmer's journey in search of real food and the people who produce it. San Francisco: Chronicle Books.

Agarwal, A. 2005. Environmentality: Technologies of government and the making of subjects. Durham, NC: Duke University Press.

Minakshi Bhardwaj, Fumi Maekawa, Yuki Niimura, Darryl RJ Macer. 1999. Ethics in Food and Agriculture: Views from FAO.

Rivera, Roberto and David Borasky 2009. Research Ethics Training Curriculum, Family Health International. P.O. Box 13950 Research Triangle Park, NC 27709. USA.

Jain, L.C., Krishnamurthy, B.V. and Tripathi, P.M. 1986. Grass without roots under Government Auspices. Sage Publications, New Delhi.

Singh, Kartar 2001. Rural Development – Principles, Policies and Management. Sage Publications, New Delhi.

PGS 506 HISTORY OF AGRICULTURE (1L+0P) III

Objective

To learn about the evolution and achievements of agricultural science in India, lessons learnt and vision for future

UNIT I

Agriculture in ancient India: archaeological findings and literature.

UNIT II

Ancient literature on: farm implements, forecast of weather and rains, types of lands, manure, irrigation, seed and sowing, pests and their management, horticulture and arboriculture, cattle management etc.

UNIT III

Agricultural research, education and extension in pre-and post-independent India. Green revolution, success, associated problems, lessons learnt.

UNIT IV

Challenges to Indian agriculture: future needs and capabilities, environmental problems, international agriculture and partnership. Emerging scenario and expectations.

Suggested Readings

Jain, H.K. 2010. The Green Revolution: History, Impact and Future. Studium Press LLc, Houston USA, 276 pp.

Saxena, R.C., Choudhary, S.L. and Nene, Y.L. 2009. A Text Book on Ancient History of Indian Agriculture. Asian Agri-History Foundation, Secundarabad, 148 pp.

Nene, Y.L. (Ed.) 2007. Glimpses of the Agricultural Heritage of India. Asian Agri-History Foundation, Secundarabad, 912 pp.