



**Department of Agricultural Economics**  
**Mahatma Phule Krishi Vidyapeeth**  
**Rahuri-413 722, Dist. Ahmednagar (MS)**



## Doctoral Programme *in* Agricultural Economics

### Course Layout

#### Minimum Credit Requirements

Sr. No.	Subject	Minimum credit(s)
1.	Major	18
2.	Minor	09
3.	Supporting	05
4.	Seminar	02
5.	Research	45
	<b>Total Credits</b>	
	Compulsory Non Credit Courses	06

Sr. No.	Course Number	Course Title	Credits
<b>A) Major subjects (Min. 18 credits)</b>			
1	AG.ECON-601	Advanced Micro-economic Analysis	1+1=2
2	AG.ECON-602	Advanced Macro-economic Analysis	2+0=2
3	AG.ECON-605	Quantitative Development policy Analysis	1+1=2
4	AG.ECON-606	Advanced Agricultural Marketing and Price Analysis	2+1=3
5	AG.ECON-603	Advanced Econometrics	2+1=3
6	AG.ECON-604	Advanced Production Economics	2+1=3
7	AG.ECON-609	Environmental Economics	2+1=3
		<b>Total</b>	<b>12+6=18</b>
<b>B) Minor Subjects (Min. 09 credits)</b>			
	EXTN-603	Advanced Training technology	2+1=3
	EXT- 604	Organizational Development	2+1=3

	EXT- 605	Advanced Instructional Technology	2+1=3
		<b>Total</b>	<b>6+3=09</b>
<b>C) Supporting Subjects (Min. 05 credits)</b>			
	STAT-601	Advanced Statistical Methods	2+1=3
	STAT-602	Advanced Mathematics for Economics	2+0=2
		<b>Total</b>	<b>4+1=05</b>
<b>D) Seminar ( 02 credit)</b>			
	AG.ECON-691	Doctoral Seminar (Minor)	0+1
	AG.ECON-692	Doctoral Seminar (Minor)	0+1
		<b>Total</b>	<b>0+2=2</b>
<b>E) Doctoral Research ( 45 credits)</b>			
	AG.ECON-699	<b>Research Work</b>	<b>0 + 45</b>
<b>F) Non Credit Compulsory Courses</b>			
	PGS 501	Library and Information Services	1+0
	PGS 501	Basic Concept in Laboratory Techniques	1+0
	PGS 502	Technical Writing and Communication Skills	1+0
	PGS 503	Intellectual Property and Its Management	1+0
	PGS- 505	Agricultural Research, Research Ethics and Rural Development Programmes	1+0
	PGS 506	Disaster Management	1+0
		<b>Total</b>	<b>6+0=06</b>

# Course Contents

## A) Major Subjects

### Syllabus of Theory and Practical with Suggested Readings/Books

<b>Course No. : AG ECON 601</b>	<b>Semester : I</b>
<b>Credit : 1+1</b>	<b>Course Title : ADVANCED MICRO ECONOMIC ANALYSIS</b>

#### Theory Syllabus :

##### UNIT I

Theory of consumer behavior – Duality in consumer theory - expenditure function and indirect utility function - Measurement of Income Effect and Substitution Effect.

Measurement of Changes in Consumers' Welfare – Consumer's Surplus, Compensating Variation and Equivalent Variation - Dynamic versions of demand functions – Integrability of demand functions. Demand Models – Linear Expenditure System, Almost Ideal Demand System. Applications of consumer theory – Household model and time allocation – Labour supply decisions by households.

##### UNIT II

Perfect competition – Monopoly, monopolistic competition and oligopoly. Oligopoly models – collusive and non-collusive models of oligopoly - Cournot model, Chamberlin model, Stackleberg solution.

##### UNIT III

General equilibrium theory – Conceptual overview - General equilibrium conditions with Production and Consumption. Existence, Uniqueness and Stability of general competitive equilibrium. Walrasian general equilibrium – Mathematical derivation of conditions for general equilibrium.

##### UNIT IV

Market failure - Incomplete markets - Asymmetric information – Principal-Agent problem, adverse selection and moral hazard. Externalities – Network externalities- Public goods – Optimal provision of public goods.

##### UNIT V

Welfare Economics - Concepts, problems, approaches and limitations of Welfare Economics, Pareto conditions of maximum welfare – Criteria for social welfare - Social Welfare functions, Social versus Private costs and benefits.

#### Practical Syllabus:

Problems in consumer utility maximization – Estimation of income and substitution effects; Estimation and comparison of Consumer's surplus, equivalent variation and compensating variation. Estimation of demand models – Derivation and estimation of labour supply equations from household models comparative static analysis in consumption. Advanced problem solving in price determination under perfect competition, monopoly, oligopoly and monopolistic competition. Game theory models. Problems solving in General Equilibrium Theory and Welfare Economics. Problems in public goods provision.

### **Suggested Readings**

- Chiang AC. 1981. *Fundamental Methods of Mathematical Economics*. McGraw-Hill.
- Henderson JM & Quandt RE. *Microeconomic Theory: A Mathematical Approach*. McGraw-Hill.
- Koutsoyiannis A. 2003. *Modern Microeconomics*. The Macmillan Press.-Kreps DM. 1990. *A Course in Microeconomic Theory*. Princeton Univ. Press. -Silberberg E & Suen W. 2001. *The Structure of Economics - A Mathematical Analysis*. -McGraw-Hill.
- Varian HR. 1992.

*Microeconomic Analysis*. WW Norton & Co.- Varian HR. 1999. *Intermediate Microeconomics*. Affiliated East-West Press.

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Course No. : **AG ECON 602** Semester : I

Credit : 2+0

Course Title : **ADVANCED MACRO ECONOMIC ANALYSIS**

### **Theory Syllabus :**

#### **UNIT I**

Review of Macro Economics concepts-Comparative statistics- Keynesian theory- Consumption Function and Theories of Consumption -Saving Function and Theories of Saving.

#### **UNIT II**

Theories of Investment-Savings and Investment Equality - IS - LM Framework and its demand for and Supply of Money-Monetary Policy in the static model – Inflation.

#### **UNIT III**

Stagflation and Supply side Economics - Theory of Unemployment - Phillips Curve controversy - Inflation, Productivity and distribution - Fiscal policy: Effectiveness and Problems.

#### **UNIT IV**

Social Accounting Matrix Framework - General Equilibrium Analysis - Neo classical Macro Economics - Stochastic Macro Economics.

#### **UNIT V**

BOP & Adjustment Policies - Foreign Exchange Policy - Foreign sector : Capital and Current Account - Impact of WTO on Indian Economy - Impact of IMF & IBRD on Indian Economy - Review of Macro Economic Policies in India.

### **Suggested Readings**

- Diulio EA. 2006. *Macroeconomics*. 4<sup>th</sup> Ed. Schaums' Outlines.
- Frogen RT. 1999. *Macro Economic: Theory and Policies*. 6<sup>th</sup> Ed. Prentice Hall.
- Samuelson PA & Nordhaus WD. 2004. *Economics*. McGraw

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Course No. : **AG ECON 603**

Semester : II

Credit : 2+1

Course Title : **ADVANCED ECONOMETRICS**

### **Theory Syllabus :**

#### **UNIT I**

Review of classical regression model – review of hypothesis testing – restrictions on parameters – single equation techniques.

#### **UNIT II**

Ordinary least squares – weighted least squares - generalized least squares –method of principal components – instrumental variables method – maximum likelihood method - errors

in variables, non-linearity and specification tests – non spherical error terms.

### **UNIT III**

Dummy variables - Qualitative and truncated dependent variables - limited dependent variables –LPM, probit and logit models, their multinomial extensions. UNIT IV

Autoregressive distributed lag models – panel data fixed and random effects models and their extensions.

### **UNIT V**

Simultaneous equation methods –identification – estimation by indirect least squares 2SLS, PIML, SURE, 3SLS.

### **Practical Syllabus:**

Estimation of multiple regression model - GLS estimation methods - testing misspecification errors – Testing and Managing multicollinearity, heteroscedasticity and autocorrelation - estimation of LPM, Logit and Probit models - comparing two regressions - Chow test - estimation of distributed lag models – panel data random and fixed effects models - Indirect least squares 2SLS, SURE, 3SLS, estimation of simultaneous equation models.

### **Suggested Readings**

- Greene WH. 2002. *Econometric Analysis*. Pearson Edu.
- Johnston J & Dinardo J. 2000. *Econometric Methods*. McGraw-Hill.
- Kelejan HH & Oates WE. 2001. *Introduction to Econometrics Principles and Applications*. Harper & Row.
- Maddala GS. 2002. *Econometrics*. McGraw Hill.

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Course No. : **AG ECON 604** Semester : II

Credit : 2+1

Course Title : **ADVANCED PRODUCTION ECONOMICS**

### **Theory Syllabus :**

#### **UNIT I**

Agricultural Production process – Relationship between farm planning and production economics-scope agricultural production and planning- methods/procedures in agro-economic research and planning.

#### **UNIT II**

Production functions, components, assumptions, properties and their economic interpretation - Concepts of homogeneity, homotheticity, APP, MPP, elasticities of substitution and their economic relevance – Production relations –optimality- Commonly used functional forms, nature, properties, limitations, estimation and interpretation -linear, Spillman -Cobb Douglas, quadratic, multiplicative (power) functional forms - Translog, and transcendental functional forms -CES, production functional forms-Conceptual and empirical issues in specification, estimation and application of production functions- Analytical approaches to economic optimum - Economic optimum – determination of economic optimum with constant and varying input and output prices- Economic optimum with production function analysis - input use behaviour.

#### **UNIT III**

Decision making with multiple inputs and outputs – MRT and product relationshipcost of production and adjustment in output prices-single input and multiple product decisions- Multi input, and multi product production decisions -Decision making with no risk -Cost of wrong decisions - Cost curves – Principles and importance of duality theory - Correspondence of production, cost, and profit functions - Principles and derivation of demand and supply

functions.

#### UNIT IV

Technology, input use and factor shares -effect of technology on input use- decomposition analysis-factor shares-estimation methods- Economic efficiency in agricultural production – technical, allocative and economic efficiency – measurement -Yield gaps analysis – concepts and measurement - Risk and uncertainty in agriculture – incorporation of risk and uncertainty in decision making – risk and uncertainty and input use level-risk programming.

#### UNIT V

Simulation and programming techniques in agricultural production-Multiple Course Objective Programming-Goal programming and Compromise programming – applications.

#### Practical Syllabus:

Estimation of different forms of production functions- Optimal input and product choice from estimated functions-Derivation of demand and supply functions and estimation-Estimation of cost function and interpretations-Optimal product and input choice under multi input and output

system-Estimation of factor shares from empirical functions estimated-Estimating production functions incorporating technology changes: Decomposition analysis and incorporation of technology- Estimation of efficiency measures – Stochastic, probabilistic and deterministic frontier production functions-Risk programming MOTAD-Quadratic programming-Simulation models for agricultural production decisions-Goal programming–

Weighted,lexicographic and fuzzygoal programming- Compromise programming.

#### Suggested Readings:

- Chambers RG. 1988. *Applied Production Analysis*. Cambridge Univ. Press.
- Gardner BL & Rauser GC. 2001. *Handbook of Agricultural Economics*. Vol. IA *Agricultural Production*. Elsevier.
- Palanisami KP, Paramasivam & Ranganathan CR. 2002. *Agricultural Production Economics: Analytical Methods and Applications*. Associated Publishing Co.

### B) Minor Subjects

Course No.: EXT- 603

Semester : I

Credit: 3=2+1

Title: ADVANCES IN TRAINING TECHNOLOGY

#### Theory Syllabus:

Unit No.	Lecture No.	Topic	Weightage
UNIT I	1, 2	Paradigm shift in training - learning scenario	4
	3, 4, 5	Training Approaches – Experiential learning - laboratory - organization development (system) approaches	8
	6, 7, 8, 9, 10	Training Design, Designing an effective training programme, Harmonizing training needs, Course Objective, content and methods	10
UNIT II	10, 11	Designing an effective training session - the semantics involved,	8

	12, 13, 14, 15, 16	Designing experiential training sessions, simulation exercises, and openness in training transaction - managing dilemmas, ambivalence and conflicts and confusion (for both trainers and trainees).	10
<b>UNIT III</b>	17, 18, 19, 20, 21, 22	Recent Training Techniques for understanding and facilitation team building, group dynamics, motivation and empowerment, laboratory methods: micro-lab process work, and sensitivity training,	10
	23, 24, 25	Psychological instruments as training tools: TAT, Inventories, Cases, etc.	10
<b>UNIT IV</b>	26, 27, 28, 29	Participatory Training Techniques - Lecture, Brainstorming, Group discussion work shop Seminar, Symposium and Training Games. Role Play, Psycho-drama, Coaching, Counseling, etc.	10
	30, 31, 32	Trainer's roles and dilemmas, Factors affecting Training Effectiveness and Training Evaluation.	10

### Practical:

- Techniques of participatory training need assessment.
- Formulation of Course Objective, design of training programmes.
- Simulation exercises. Participatory training methods - Role Play & Brainstorming, Group discussion and Counseling and Conducting experiential learning sessions.
- Training evaluation - Techniques of Knowledge, Skill & Attitude evaluation.
- Visit to training institutions and study of training technologies followed.

### Suggested Readings:

- Agochiya D. 2002. *Every Trainer's Handbook*. Sage Publ.
- Alan B & Calardy 2004. *Five Case Studies in Management Training*. Jaico Publ.
- Kumar A. 2000. *Management Training Process*. Anmol Publ.
- Leslie Rae. 1998. *Techniques of Training*. Jaico Publ.
- Lynton RP & Pareek U. 1999. *Training for Development*. 2nd Ed. Vistar Publ.
- Reid MA. 1997. *Training Interventions, Managing Employee Development*. Jaico.Publ.
- Samanta RK. 1993. *Training Methods for Management and Development*. M.D.Publ.
- Sethy ED. 2003. *A Practical Hand Book on Training*. Anmol Pub

**Course No.: EXT -604**

**Semester: II**

**Credit: 3=2+1**

**Title: ORGANIZATIONAL DEVELOPMENT**

### Theory Syllabus:

Unit No.	Lecture No.	Topic	Weightage
UNIT I	1, 2	Introduction to organizations: Concept and Characteristics of organizations,	4
	3, 4, 5	Organizational Behaviour - Context and concept - levels of organizations – formal and informal organizations	8
	6, 7	Theories of organizations	4

	8, 9, 10	Nature of organizational theory - classical theories - features of Bureaucracy - administrative theory and Scientific management - Neo-classical theories - the human relations movement - modern theory	4
UNIT II	11	Systems approach to study organization needs and motives	4
	12, 13	Attitude, values and ethical behaviour	4
	14	Alienation and work – Work motivation	4
	15, 16	Communication and interpersonal behaviour – Organizational communication, obstacles in organizational communication.	4
	17	Leadership behaviour	4
	18, 19	Decision making, problem solving techniques	4
	20, 21	Organizational climate – change proneness and resistance to change, Organizational change	4
	22	Organizational structure - Process in organizing	4
	23	Dimensions of Motivational Climate	4
UNIT III	24, 25, 26	Departmentation - Span of Management - Delegation of authority – Centralization and decentralization - line and staff organization - functional organization - divisionalisation - Project organization - Matrix organization - free form organization - top management structure	8
UNIT IV	27	Individual behaviour in organization.	4
	28	Fundamentals of Human relations and Organizational behaviour	4
	29, 30, 31, 32	Groups and teams - Organisational culture and performance. Dynamics of Organization behaviour - leadership conflict situations and inter group behavior- Organisational Development - Factors affecting organization effectiveness. Creativity, leadership, motivation and organization development	8

#### Practical:

- Simulation exercises on problem-solving
- Study of organizational climate in different organizations
- Study of organizational structure of development departments
- Study of departmentalization, span of control, delegation of authority, decisions making patterns
- Study of individual and group behaviour at work in an organization
- Conflicts and their management in an organization
- Comparative study of functional and non-functional organizations and drawing factors for organizational effectiveness

#### Suggested Readings:

- Ancona, Kochaw, Scully, Van Maanen, Westney 1999. *Organizational Behaviour and Processes*. South Western College Publ., New York.
- Banerjee M. 1984. *Organizational Behaviour*. Allied Publ.



- Deka GC. 1999. *Organizational Behaviour - A Conceptual Application Approach*. Kanishka Publ.
  - Dwivedi RS. 2006. *Human Relations and Organization Behaviour- A Global Perspective*. 5th Ed. Macmillan.
  - Kumar A. 2000. *Organizational Behaviour Theory and Practice*. Anmol Publ.
  - Luthans F. 1998. *Organizational Behavior*. Tata McGraw Hill.
  - Luthans F. 2001. *Organizational Behaviour*. McGraw Hill.
  - Newstrom JW & Davis K. 1997. *Human Behaviour at Work*. Tata McGraw Hill.
  - Robbins SP. 2007. *Organizational Behaviour*. Prentice Hall.
  - Shaun T & Jackson T. 2003. *The Essence of Organizational Behaviour*. Practice Hall of India.
  - Stephen RR. 1999. *Organizational Behaviour*. 5th Ed. Practice Hall of India.
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**Course No.: EXT- 605**

**Semester: III**

**Credit: 3=2+1**

**Title: ADVANCED INSTRUCTIONAL TECHNOLOGY**

**Theory Syllabus:**

Unit No.	Lecture No.	Topic	Weightage
UNIT I	1	Concepts in Instructional Technology, Scope of Instructional Technology	2
	2, 3	History of agricultural education in India	2
	4	Guidelines for curriculum development in Agricultural Universities.	4
	5, 6	Curriculum design development	4
UNIT II	7	Course outline	4
	8, 9	Lesson plans for theory and practicals	4
	10	Teaching and learning styles	4
	11, 12	Theories of learning. Cognitive levels	4
	13	Instructional Course Objective	4
	14	Motivation of students	4
UNIT III	15, 16	Instructional Methods	6
	17	Experiential learning cycle.	4
	18, 19, 20	Innovative Instructional Aids	6
	21, 22	Computer Assisted Instruction.	4
	23	Programmed instruction technique	4
	24	Team Teaching	2
	25	E-Learning	2
	26	Art of Effective Communication	2
	27	Distance education	2
	28	Student evaluation	2
	29	Question Bank	2
	30	Appraisal of Teacher Performance	2
	31, 32	Review of research in Instructional Technology	2

**Practical:**

- Formulation of instructional Course Objective.
- Development and presentation of course outlines.
- Preparation & presentation of lesson plans for theory & practical with CAI design.
- Preparation of innovative low cost instructional aids.
- Development of model question bank.
- Preparation of schedule for teacher evaluation.
- Visit to Distance Education centre.
- Study of research reviews and Presentation of reports.

**Suggested Readings:**

- Agarwal JC. 2007. *Essentials of Educational Technology Innovations in Teaching – Learning*. 2nd Ed. Vikas Publ. House.
- Agarwal R. 2000. *Educational Technology and Conceptual understanding*. Anmol Publ.
- Dayal BK. 2005. *Educational Planning and Development*. Dominant Publ.
- Grover I, Kaushik S, Yadav L & Varma SK. 2002. *Communication and Instructional Technology*. Agro Tech Publ. Academy.
- Jacobsen D, Eggen P & Kauchak D. 1985. *Methods for Teaching - A Skills Approach*. 2nd Ed. Charles E. Merrill Publ.
- Joyee B & Well M. 1980. *Models of Teaching*. 2nd Ed. Prentice Hall.
- Khan PM. 2002. *Text Book of Extension Education*. Himanshu Publ.
- Rush N. 1987. *Technology Based Learning - Selected Readings*. London Publ. Co., New York.
- Tara Chand 1999. *Educational Technology*. Anmol Publ.

**C)Supporting Subjects**

**Course No.: STAT -601**  
**Credits: 2+1**

**Semester: I**  
**Title: Advanced Statistical Methods**

**Theory Syllabus:****Unit I**

Correlation, Simple and Rank correlation, matrix and vector, Regression: Linear and non – linear regression models, Stepwise regression , Path analysis, t, F, Z and chi- square test.

**Unit II**

Time series – linear and seasonal trend; Index number-weighted and unweighted index numbers, Principle of construction of index number, construction of different types of index numbers.

**Unit III**

Concept of Discriminant function: definition, identification and separation of data.

**Unit IV**

Concept and elements of sampling techniques, Simple random sampling, Stratified random sampling, Systematic sampling, Non parametric, Rank correlation, Coefficient of Concordance.

**Practical**

Correlation , Regression, Linear and non – linear, Path analysis, Time series, Index numbers,

Discriminant analysis, Simple random sampling, Application of t, F, Z and chi- square test, run test, sign test, Mann – Whitney U- Teat, Median test, Rank Correlation.

### **Suggested Readings:**

1. Snedecor G.W. & W.G. Cochran, (1967) Statistical Methods Sixth Edition, Oxford & IBH Publishing Company, Bombay, W.
2. Anderson TW 1984. An Introduction to Multivariate Statistical Analysis. 2<sup>nd</sup> Ed. John Wiley.
3. Ostle B, (1967) Statistics in Research Oxford & IBH Publishing Company, Bombay, W.
4. Robert G. D. Steel and James H. Torrie (1971). Principles and Procedures of Statistics. Biometrical Approach, McGraw Hill International Book Company, New York
5. Gupta S. C., V.K. Kapoor (1991). Fundamental of mathematical statistics, Sultan Chand and sons Pub., New Delhi.
6. Cochran W. G. 1977. Sampling Techniques. John Wiley.
7. Singh D, P. and Praneshkumar 1982. Handbook of Sampling Methods IASRI, Delhi Publication.
8. Sukhatme P. V. And Sukhatme B. V. 1984. Sampling Theory of Surveys with application, II Edition, Asia Publication House, New Delhi.

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<b>Course No.: STAT-602</b>	<b>Semester: II</b>
<b>Credits: 2+0</b>	<b>Title: Advance Mathematics for Economics</b>

### **Theory Syllabus:**

#### **Unit I**

Derivatives and their interpretation, Derivative as a rate of change of a given function, Average rate of change, Instantaneous rate of change, Exponential and logarithmic function and logarithmic derivation, applications of first derivative in Business and Economics.

#### **Unit II**

Cost Revenue Elasticity, National Income, Consumption and savings, the first derivative, (I) Increasing and decreasing (II) Maximum and minimum points of function by using first derivative method. The Second derivative concavity, Convexity, relative maxima and minima by using second derivative, Point of inflexion, Application of Derivative in Business and Economics.

#### **Unit III**

Average cost, Cost and marginal cost, linear cost function, quadratic cost functions, Elasticity – arc elasticity, Point elasticity, elasticity of demand, cross elasticity, constant elasticity of demand, Revenue, Marginal Revenue and Elasticity of Demand, Revenue from Taxation, Profit under monopoly, Effect of taxation from monopoly.

#### **Unit IV**

Functions of more than one variable, Definition of partial differentiation, Definition total differentiation, application of partial derivatives in business and Economics, Marginal cost, Marginal demand production functions, Maxima and Minima of functions of two variables, Problems of maximum and minimum values, Integration – Integrals of functions of one variable, Application of Indefinite Integration and Economics, Cost, Revenue, National Income, Consumption and saving Capital formation, Differential equation: Introduction, definition and classification of differential equations, Solution of ordinary, Differential equations: differential equation of first degree and first order.

**Suggested Readings:**

1. Taro Yamano. Mathematics for Economics. Prentice- Hall of India Pvt. Limited, New Delhi.
2. Harville D.A. 1997. Matrix Algebra from a Statisticians Perspective. Springer.Publ.
3. Stewart J. 2007. Calculas.Thompson Pub.
4. Thomas GB. Jr. & Finney RL. 1996. Calculas 9<sup>th</sup> Ed. Pearson Edu.
5. Monga G.S.1972. Mathematics and Statistics for Economics, Vikas Publishing House Pvt., Limited, New Delhi.
6. Allen R.G.D. Mathematical Analysis for Economist. Macmillan Co.

**D)Seminar**

Course No.Econ-691      Semester :III  
 Credit:0+1=1      Title: Doctoral Seminar  
 Syllabus : Seminar topic on current issues and related Ph.D research  
 Course No.Econ-692      Semester :IV  
 Credit:0+1=1      Title: Doctoral Seminar  
 Syllabus : Seminar topic on current issues and related Ph.D research

**E) Doctoral Research**

Total Research Credit:45

**F) Compulsory Non Credit Courses**

**Course No. : PGS 501 Semester: I**  
**Course Credits : 0+1=1 Course Title: LIBRARY AND INFORMATION SERVICES**

**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 :**

Exercise No.	Title of the exercise
1-2	Introduction to library and its services; types of library.
3	Role of libraries in education, research and technology transfer;
4	Classification systems and organization of library;
5-6	Sources of information- Primary sources, secondary sources and tertiary sources
7-9	Intricacies of abstracting and indexing services (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABS reference sources;
10	Literature survey;
11	Citation techniques/Preparation of bibliography;
12	Use of CD-ROM Databases,
13	Online Public Access Catalogue and other computerized library services;
14-15	Use of Internet including search engines and its resources;
16	e-resources access methods.

<b>Course No. : PGS 502</b>	<b>Semester :II</b>
<b>Course Credits : 0+1=1</b>	<b>Course Title: TECHNICAL WRITING AND COMMUNICATIONS SKILLS</b>

### 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 :

Exercise No.	Title of the exercise
1	Various forms of scientific writings- theses, technical papers, reviews, manuals etc;
2	Various parts of thesis and research communications (title page, authorship, contents page, preface, introduction, review of literature, material and methods, experimental results and discussion);
3	Writing of abstracts, summaries, précis, citations etc.;
4	Commonly used abbreviations in the theses and research communications;
5	Illustrations, photographs and drawings with suitable captions;
6	Pagination, numbering of tables and illustrations;
7	Writing of numbers and dates in scientific write-ups;
8	Editing and proof-reading;
9	Writing of a review article.
10-11	Grammar (Tenses, parts of speech, clauses, punctuation marks);
12	Error analysis (Common errors);
13	Concord; Collocation; Phonetic symbols and transcription; Accentual pattern;
14	Weak forms in connected speech;
15	Participation in group discussion: Facing an interview;
16	Presentation of scientific papers.

### Suggested Readings :

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

**Course No. : PGS 503 Semester:II**  
**Course Credits : 1+0=1 Course Title : INTELLECTUAL PROPERTY AND IT MANAGEMENT IN AGRICULTURE**

### 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 based economy.

### Theory:

Lecture No.	Topics to be covered
1-2	Historical perspectives and need for the introduction of Intellectual Property Right regime
3-4	TRIPs and various provisions in TRIPS Agreement
5	Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs
6	Indian Legislations for the protection of various types of Intellectual Properties
7-9	Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and bio-diversity protection
10-11	Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection
12	National biodiversity protection initiatives
13	Convention on biological diversity
14-15	International Treaty on Plant Genetic Resources for Food and Agriculture
16	Licensing of technologies, Material transfer agreements, Research Collaboration Agreement, License Agreement

### Suggested Readings:

- Erbisch FH & Maredia K.1998. *Intellectual Property Rights in Agricultural Biotechnology*. CABI.
- Ganguli P. 2001. *Intellectual Property Rights: Unleashing Knowledge Economy*. McGraw-Hill.
- Intellectual Property Rights: Key to New Wealth Generation*. 2001. NRDC & Aesthetic Technologies. Ministry of Agriculture, Government of India. 2004. *State of Indian Farmer*. Vol.
- V. *Technology Generation and IPR Issues*. Academic Foundation.  
Rothschild M & Scott N. (Ed.). 2003. *Intellectual Property Rights in Animal Breeding and Genetics*. CABI.
- 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; National Biological Diversity Act, 2003.*

**Course No. : PGS 504 Semester: I**  
**Course Credits : 0+1=1 Course Title :BASIC CONCEPTS IN LABORATORY TECHNIQUES**

**Objective**

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

**Practical :**

Exercise No.	Title of the exercise
1	Safety measures while in Lab;
2	Handling of chemical substances;
3	Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vascupets;
4	washing, drying and sterilization of glassware;
5	Drying of solvents/chemicals.
6	Weighing and preparation of solutions of different strengths and their dilution;
7	Handling techniques of solutions;
8	Preparation of different agro-chemical doses in field and pot applications;
9	Preparation of solutions of acids;
10	Neutralization of acid and bases;
11	Preparation of buffers of different strengths and pH values.
12	Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath;
13	Electric wiring and earthing.
14	Preparation of media and methods of sterilization;
15	Seed viability testing, testing of pollen viability;
16	Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy

**Suggested Readings :**

- Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.
  - Gabb MH & Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.
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**Course No. : PGS 505 Semester: III**  
**Course Credits : 1+0=1**  
**Course Title : AGRICULTURAL RESEARCH, RESEARCH ETHICS AND RURAL DEVELOPMENT PROGRAMMES**

**Objective**

- To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.



**Theory:**

Lecture No.	Topics to be covered
1	History of agriculture in brief;
2	Global agricultural research system: need, scope, opportunities; Role promoting food security, reducing poverty and protecting the environment;
3	National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions;
4	Consultative Group on International Agricultural Research (CGIAR International Agricultural Research Centres (IARC), partnership with NARS,
5	role as a partner in the global agricultural research system, strengthening capacities at national and regional levels;
6	International fellowships for scientific mobility.
7	Research ethics: research integrity, research safety in laboratories,
8	Welfare of animals used in research,
9	Computer ethics,
10	Standards and problems in research ethics.
11	Concept and connotations of rural development,
12-13	rural development policies and strategies.
14	Rural development programmes: Community Development Programme, Intensive Agricultural District Programme, Special group – Area Specific Programme, Integrated Rural Development Programme (IRDP), Panchayati Raj Institutions, Co-operatives, and Voluntary Agencies/Non Government Organizations.
15	Critical evaluation of rural development policies and programmes.
16	Constraints in implementation of rural policies and programmes.

**Suggested Readings:**

1. Bhalla GS & Singh G. 2001. *Indian Agriculture - Four Decades of Development*. Sage Publ.
  2. Punia MS. *Manual on International Research and Research Ethics*. CCS, Haryana Agricultural University, Hisar.
  3. Rao BSV. 2007. *Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives*. Mittal Publ.
  4. Singh K. 1998. *Rural Development - Principles, Policies and Management*. Sage Publ.
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**Course No. : PGS 506 Semester: III**  
**Course Credits : 1+0=1 Course Title : DISASTER MANAGEMENT**

**Theory:**

Lecture No.	Topics to be covered
1-3	To introduce learners to the key concepts and practices of natural disaster management; to equip them to conduct thorough assessment of hazards and risk vulnerability; and capacity building.



4-5	Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, Drought, Cyclone, Earthquakes, Landslides, Avalanches, Volcanic eruptions, Heat and cold waves	
6-7	Climatic Change: Global warming, Sea level rise, Ozone depletion	
8-10	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	
11-12	Disaster Management- Efforts to mitigate natural disasters at national and global levels.	
13-14	International Strategy for Disaster reduction.	
15-16	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 :**

1. Gupta HK. 2003. *Disaster Management*. Indian National Science Academy. Orient Blackswan.
2. Hodgkinson PE & Stewart M. 1991. *Coping with Catastrophe: A Handbook of Disaster Management*. Routledge.
3. Sharma VK. 2001. *Disaster Management*. National Centre for Disaster Management, India.