COURSE OUTLINE BRIEFS

DEPARTMENT OF AGRICULTURAL EXTENSION

SARGODHA UNIVERSITY
Pathway to Progress

FACULTY OF AGRICULTURE

OVERVIEW

Agricultural Extension is about extending research based knowledge of Agricultural Sciences at grass root level to its clients in the fields for adoption and for better agricultural production. It is the most unique knowledge transfer approach that has been prevailed for thousands of years since the first basic profession adopted by humans on this planet was agriculture. Agricultural technology transfer, advisory services for respondents, human resource development in agriculture through educational and awareness programs and facilitation for empowerment are major prevailing schools of thought in Agricultural Extension educational system.

The Department of Agricultural Extension was officially established in 2012 to bring the fresh wave of change in the national economy of the country and to spread the research based agricultural knowledge in the closing vicinities of Sargodha district.

The Department offers BSc (Hons), MSc (Hons) and PhD programs and is planning to start new post-graduate degree program in Rural Development. It has always been in the front line to organize workshops, seminars, festivals and conferences during the academic year.

The Department's faculty is a blend of highly qualified agriculture scientists. The faulty includes four PhD and one MSc qualified members. In perspective of the growing trends of value-addition and knowledge-based economy, the faculty members of the Department conducts outreach program for local farming community in the area for the last 10 years.

Academic Programs Offered

1. BSc (Hons) Agriculture (Major in Agricultural Extension)
2. MSc (Hons) Agricultural Extension
3. PhD Agricultural Extension

BSc (Hons) Agriculture

Eligibility: At least 45% marks in intermediate or equivalent.
Duration: 04 - Years Program (08 Semesters)
Degree Requirements: 134 Credit hours

Semester-I

Course Code	Course Title	Credit Hours
SAES-5801	Introduction to Soil Science-I	3(2+1)
AGRO-5901	Basic Agriculture	3(2+1)
ZOOL-6141/ MATH-5128	Introduction to Biology-I (for Pre-Engineering students)/ Mathematics (for Pre-Medical students)	3(3+0)/ 3(3+0)
URCI-5109	Introduction to Information & Communication Technologies	3(2+1)
URCE-5102	English-II (Language Comprehension & Presentation Skills)	3(3+0)
URCI-5105/ ISLS-5108	Islamic Studies/ Ethics (for Foreigner or Non-Muslims)	2(2+0)/ 2(2+0)

Semester-II

AGRO-5902	General Crop Production	3(2+1)
SAES-5802	Introduction to Soil Science-II	3(2+1)
FWRW-5701	Introduction to Forest and Watershed Management	3(2+1)
AEXT-5401	Introduction to Agricultural Extension and Rural Development	3(3+0)
URCE-5103	English-III (Academic Writing)	3(3+0)
URCP-5106	Pakistan Studies	2(2+0)

Semester-III

PLBG-5201	Introductory Genetics	3(2+1)
ENTO-5101	Introductory Entomology	3(2+1)
PLPT-5301	Introduction to Plant Pathogens	3(2+1)
HORT-5601	Introductory Horticulture	3(2+1)
FWRW-5702	Introduction to Rangelands and Wildlife Management	3(2+1)
AGEC-5501	Introduction to Agricultural Economics	3(3+0)
URCC-5110	Citizenship Education and Community Engagement	3(3+0)

Semester-IV

PLBG-5202	Introductory Plant Breeding	3(2+1)
ENTO-5102	Applied Entomology	3(2+1)
PLPT-5302	Introductory Plant Pathology	3(2+1)
HORT-5602	Horticultural Crop Production	3(2+1)
FSAT-5101	Introduction to Food Science and Technology	3(2+1)
STAT-5126	Statistics for Agricultural Sciences	3(3+0)

Semester-V

AEXT -6403	Extension Program Development	3(2+1)
AEXT -6404	History and Philosophy of Agricultural Extension Education	3(3+0)
AEXT -6405	Rural Development Programs in Pakistan	3(2+1)
AEXT -6406	Rural Youth in Agricultural Development	3(2+1)
AEXT -6407	Leadership and communication Skills in Agricultural Extension	3(2+1)
AEXT-6408	Communication Skills in Agricultural Extension	3(2+1)

Semester-VI

AEXT -6409	Agricultural Extension Methods	3(2+1)
AEXT -6410	Computer Application in Agricultural Extension	3(1+2)
AEXT -6411	Psychology for Adult Learning	3(3+0)
AEXT -6412	Human Resources Development	3(2+1)
AEXT -6413	Gender Studies in Agricultural Extension	3(3+0)

Semester-VII

AEXT -6414	Interviewing Skills	3(2+1)
AEXT -6415	Agricultural Technology Transfer	3(2+1)
AEXT -6416	Agricultural Journalism	3(2+1)
AEXT -6417	Preparation of Research Project and Scientific Writing	3(2+1)
AEXT -6418	Poverty Alleviation and Sustainable Development	3(3+0)

Semester-VIII

AGEC-6523	Agribusiness, Marketing and Trade	3(3+0)
AEXT -6419	Research Methods in Agricultural Extension	3(3+1)
AEXT -6420	Program Evaluation in Agricultural Extension	3(3+1)
AEXT -6421	Food Security through Precision Agricultural Technology	3(2+1)
AEXT -6422	Research Project/Internship	4(0+4)

MSc (Hons) Agricultural Extension

Eligibility: B.Sc. (Hons.) 4-Years or equivalent (16 years of Education) in the relevant field or equivalent degree from HEC recognized institution with at least second Division or CGPA 2.00 out of 4.00.
Duration: 02 Years (04 Semesters)
Degree Requirements: 30 Credit hours (24 Credit hours Course work + 6 Credit hours thesis)

AEXT-7101	Agricultural Extension Methods	3(2+1)
AEXT-7102	Program Planning	3(2+1)
AEXT-7103	Human Resource Development	3(2+1)
AEXT-7104	Monitoring and Evaluation in Agricultural Extension	3(2+1)
AEXT-7105	Communication Strategies in Agricultural Extension	3(2+1)
AEXT-7106	Advances in Research Methods	3(2+1)
AEXT-7107	Scientific and Technical Writing	3(2+1)
AEXT-7108	Application of ICTs in Agricultural Extension	3(2+1)
AEXT-7109	Special Problem	1(1+0)
AEXT-7110	Seminar	1(1+0)
STAT-7152	Statistical Methods for Social Research	3(3+0)

PhD Agricultural Extension

Eligibility: MPhil/M.Sc. (Hons.) Agricultural Extension or equivalent from HEC recognized institution with at least CGPA 3.00 out of 4.00.
Duration: 03-05 Years (06-10 Semesters)
Degree Requirements: 18 Credit hours Course work + Dissertation

AEXT-8101	Food Security Issues and Role of Agricultural Extension	3(3+0)
AEXT-8102	Gender Issues in Community Development	3(3+0)
AEXT-8103	International Agricultural Extension Systems	3(2+1)
AEXT-8104	Qualitative and Quantitative Research Methods	3(2+1)
AEXT-8105	Extension Management and Administration	3(2+1)
AEXT-8106	Managing Learning Experiences in Agricultural Extension Education	3(3+0)
AEXT-8107	Role of Agriculture in Rural Development	3(2+1)
AEXT-8108	Sustainable Rural Development	3(3+0)
AEXT-8109	Special problem	1(1+0)
AEXT-8110	Seminar	1(1+0)
STAT-8132	Advanced Statistical Methods for Social Research	3(3+0)

BSc
(Hons)
AGRICULTURE
AGRICULTURAL EXTENSION

SAES-5801 Introduction to Soil Science-I 3(2+1)

This is an introductory course designed to introduce the concept and significance of soil science to the students of agriculture at undergraduate level. It provides information to the students about soil science, its branches, their environmental significance, weathering of rocks and minerals, their classification, physical properties of soil and their significance in agriculture. The course would provide awareness to the students about impact of agricultural and industrial wastes on our environment. In addition, this course also teaches the students, skills to collect soil and water samples for physico-chemical analysis. Laboratory exercises are designed to develop skills for analysis of irrigation water and soil samples which would highlight and support the importance of both water and soil quality analysis for judicious use of resources.

Contents

1. Introduction to Soil and environment: definition of earth, geology and soil science
2. Soil forming rocks and minerals: types and their formation
3. Weathering of rocks and minerals: definition. Agents and classification
4. Parent materials: definition and types
5. Soil formation: definitions, processes and factors
6. Soil profile: definition and description
7. Physical properties of soil and their significance
8. Introduction to soil classification and land use capability classes
9. Soil, water and air pollution: sources and types

Practical

1. Methods of soil sampling and handling
2. Preparation of saturated soil paste
3. Determination of soil water contents
4. Analysis of irrigation water, report writing and interpretation
5. Textural analysis of soil

Recommended Texts

1. Bashir, E., & Bantel, R. (2001). *Soil Science*. Islamabad: National Book Foundation.
2. Brady, N. C., & Weil, R. R. (2007). *The Nature and Properties of Soils* (14th ed.). New Jersey: Pearson Education.

Suggested Readings

1. Brady, N. C., & Weil, R. R. (2009). *Elements of the Nature and Properties of Soils* (3rd ed.). New Jersey: Pearson Education.
2. Das, D. K. (2011). *Introductory Soil Science* (3rd ed.). New Delhi: Kalyani Publications.
3. Hillel, D. (2008). *Soil in the Environment: Crucible of Terrestrial Life*. Burlington: Elsevier.

AGRO-5901 Basic Agriculture 3(2+1)

Basic Agriculture is a course designed to provide the students with the basic knowledge of agriculture. It will enable the students to understand the basic terminologies of agriculture, its different branches, allied disciplines, salient features of agriculture in Pakistan including climate and land resources. There will be detailed discussions about the various agro-ecological zones of Pakistan. Basic knowledge about agricultural inputs such as seed, fertilizer, irrigation and post-harvest technology would be communicated to the students. The students will be able to understand the conventional and international system of land measurements. Crop growth related problems like weeds, insect pests will be elaborated. The students will be able to understand the conventional and international system of land measurement. The knowledge of post-harvest technology is also shared with the students.

Contents

1. Agriculture, history, importance, branches and allied sciences
2. Salient features of Pakistan's agriculture
3. Climate, land and water resources
4. Agro ecological zones of Pakistan
5. Farming systems
6. Tillage: objectives and types
7. Seed: types and quality
8. Crop nutrients, manures and fertilizers, sources and methods of application
9. Irrigation: systems, types and management
10. Crop protection measures
11. Crop rotation
12. Harvesting, processing, storage and marketing of farm produce
13. Agro-based industries
14. Environmental pollution and health hazards

Practical

1. Land measuring units
2. Demonstration of hand tools and tillage implements
3. Identification of meteorological instruments
4. Identification of crop plants, weeds and seeds
5. Identification of organic and inorganic fertilizers
6. Calculation of nutrient-cum-fertilizer unit value
7. Demonstration of various irrigation methods
8. Field visits

Recommended Texts

1. Bashir, E., & Bantel, R. (2001). *Soil Science*. Islamabad: National Book Foundation.
2. Brady, N.C., & Weil, R.R. (2013). *Elements of the Nature and Properties of Soils* (3rd ed.). New Jersey: Pearson Education.

Suggested Readings

1. Hillel, D. (2008). *Soil in the Environment: Crucible of Terrestrial Life.* Burlington: Elsevier.
2. Singer, M. J., & Munns, D. N. (2002). *Soils- An Introduction* (5th ed.). New Jersey: Prentice-Hall.
3. Das, D.K. (2011). *Introductory Soil Science* (3rd ed.). New Delhi: Kalyani Publications.

ZOOL-6141 Introduction to Biology I 3(3+0)

The purpose of this course is to produce a sense of practical relevance of biology to everyday life. This will make students comprehend life by understanding some of the molecular processes that occur in and around cells to make students cognizant of biologic phenomena (nature, body, etc.) on an evolutionary, ecological, behavioral, physiologic, tissue, cellular, and molecular level. In this subject, students will examine how life is organized into hierarchical levels; how living organisms use and produce energy; how life grows, develops, and reproduces; how life responds to the environment to maintain internal stability; and how life evolves and adapts to the environment. Moreover, it will also enable the students to investigate the biological molecules, homeostasis in vertebrates, and the influence of hormones on coordination and control systems of animal body. Upon completion of this subject, students will be having an enhanced knowledge and appreciation of the basics of growth and development plans of animals and can develop cogent and critical arguments based on the course material.

Contents

1. Introduction: Nature and scope of biology
2. Branches of biology, Relationship between biology and psychology
3. Biological molecules: Carbohydrates, Proteins, Fats, Nucleic acids, Water
4. The cell: Structure and function of cell, Cell organelles, Different types of cells
5. Homeostasis: Osmoregulation, Structure and functions of Nephron, Thermoregulation
6. Coordination and control: Structure and physiology of Neuron
7. Introduction to central and peripheral nervous system
8. Hormones
9. Basics of growth and development: Embryonic and post embryonic development

Recommended Texts

1. Campbell, M., & Christopher, J.P. (2016). *Organismal homeostasis*. New York: Momentum press.
2. Snow, A. L., & Leonardo, M. J. (Eds.) (2013). *Immune homeostasis: Methods and protocols*. New York: Humana Press.

Suggested Readings

1. Anna, A. S., & Richard, B. P. (2019). *An Introduction to Conservation Biology* (2nd ed.). Oxford: Oxford University Press.
2. Cambell, N. A., Mitchell, l. G., & Reece, J. B. (2009). *Biology: Concepts and connections* (6th ed.). San Francisco: Addison Wesley Longman.
3. Urry, L. A., Cain, M. L., Wasserman, S. A., Minorsky, P. V., & Reece, J. B. (2017). *Campbell biology*. New York: Pearson.

MATH-5128 **Mathematics** **3(3+0)**

This course is built upon the mathematical concepts, principles and techniques that are useful in almost all undergraduate programs. The main objectives of the course are to enhance student's competency in application of mathematical concepts in solving problems and to improve their level of quantitative approach. Upon the successful completion of this course students would be able to develop understanding about mathematical functions, building and solving linear and quadratic equations, matrices and determinants with application, sequences and series, and basic financial mathematics. This course has been designed to prepare the students, not majoring in mathematics, but with the essential tools of financial mathematics, algebra and geometry to apply the concepts and the techniques in their respective disciplines. The aim of teaching and learning mathematics is to encourage and enable students to recognize that mathematics permeates the world around us, appreciate the usefulness, power and beauty of mathematics, enjoy mathematics and develop patience and persistence when solving problems.

Contents

1. Real Numbers
2. Relations and Functions
3. Inequalities
4. Quadratic Functions and Complex Numbers
5. Linear Equations and Quadratic Equations: Formation of Linear equation
6. Solving Linear equation involving one variable
7. Solution of Quadratic equation: factorization, square completion method & quadratic formula
8. Application of quadratic equation
9. Sequence and Series
10. Types of Sequences; A. P, A. M., G. P., H. P
11. Trigonometric Functions, Trigonometric Applications
12. Graph of Functions and Modelling
13. Limits and Continuity
14. Derivatives, Integration
15. Probability and Binomial Theorem

Recommended Texts

1. Gantert, A. X. (2009). *Algebra 2 and trigonometry*. New York: Amsco School Publication.
2. Kaufmann, J. E. (1994). *College algebra and trigonometry* (3rd ed.). Boston: PWS-Kent Pub.

Suggested Readings

1. Anton, H. (1999). *Calculus: A new horizon* (6th ed.). New York: John Wiley.
2. Nauman, K. (2019). *Basic mathematics I: algebra and trigonometry* (2nd ed.). Lahore: Al-Hassan Pub.
3. Stewart, J. (2012). *Calculus* (7th ed.). Belmont: Brooks/Cole.
4. Swokowski, E. W. (1993). *Fundamentals of algebra and trigonometry* (8th ed.). Boston: PWS-Kent Pub.

URCI-5109 Introduction to Information & Communication Technologies 3(2+1)

The course introduces students to information and communication technologies and their current applications in their respective areas. The students will learn the basic understanding of computer software, hardware, and associated technologies to get maximum benefit related to their study domain. Students will learn how the information and communications systems can improve their work ability and productivity, how Internet technologies like e-commerce applications and mobile computing can influence the businesses and workplace. At the end of semester, students will get basic understanding of computer systems, storage devices, operating systems, e-commerce, data networks, databases, and associated technologies. They will also learn Microsoft Office tools that includes Word, Power Point, Excel. They will also learn Open office being used on other operating systems and platforms. Specific software's related to specialization areas are also part of the course. The course will also cover computer ethics, social media norms and cyber laws.

Contents

1. Introduction, Overview and its types
2. Hardware: Computer Systems & Components, Storage Devices and Cloud Computing
3. Software: Operating Systems, Programming and Application Software
4. Introduction to Programming Language
5. Databases and Information Systems Networks
6. The Hierarchy of Data and Maintaining Data
7. File Processing Versus Database Management Systems
8. Data Communication and Networks
9. Physical Transmission Media & Wireless Transmission Media
10. Applications of smart phone and usage
11. The Internet, Browsers and Search Engines
12. Websites Concepts, Mobile Computing and their applications
13. Collaborative Computing and Social Networking
14. E-Commerce & Applications
15. IT Security and other issues
16. Cyber Laws and Ethics of using Social media
17. Use of Microsoft Office tools (Word, Power Point, Excel), mobile apps or other similar tools
18. Other IT tools/software specific to field of study

Recommended Texts

1. Vermaat, M. E. (2018). *Discovering computers: digital technology, data and devices.* Boston: Course Technology Press.

Suggested Readings

1. Schneider, G. M., & Gersting, J. (2018). *Invitation to computer science*. Boston: Cengage Learning.
2. Timothy J. O., & Linda I. (2017). *Computing essentials* (26th ed.). San Francisco: McGraw Hill Higher Education.

URCE-5102 Language Comprehension & Presentation Skills 3(3+0)

The course seeks to develop a linguistic competence by focusing on basic language skills in integration to make the use of language in context. It also aims at developing students' skills in reading and reading comprehension of written texts in various contexts. The course also helps in developing students' vocabulary building skills as well as their critical thinking skills. The contents of the course are designed based on these language skills: listening skills, pronunciation skills, comprehension skills and presentation skills. The course provides practice in accurate pronunciation, stress and intonation patterns and critical listening skills for different contexts. The students require a grasp of English language to comprehend texts as organic whole, to interact with reasonable ease in structured situations, and to comprehend and construct academic discourse. The course objectives are to enhance students' language skill management capacity, to comprehend text(s) in context, to respond to language in context, and to write structured response(s).

Contents

1. Listening skills
2. Listening to isolated sentences and speech extracts
3. Managing listening and overcoming barriers to listening
4. Expressing opinions (debating current events) and oral synthesis of thoughts and ideas
5. Pronunciation skills
6. Recognizing phonemes, phonemic symbols and syllables, pronouncing words correctly
7. Understanding and practicing stress patterns and intonation patterns in simple sentences
8. Comprehension skills
9. Reading strategies, summarizing, sequencing, inferencing, comparing and contrasting
10. Drawing conclusions, self-questioning, problem-solving, relating background knowledge
11. Distinguishing between fact and opinion, finding the main idea, and supporting details
12. Text organizational patterns, investigating implied ideas, purpose and tone of the text
13. Critical reading, SQ3R method
14. Presentation skills, features of good presentations, different types of presentations
15. Different patterns of introducing a presentation, organizing arguments in a presentation
16. Tactics of maintaining interest of the audience, dealing with the questions of audience
17. Concluding a presentation, giving suggestions and recommendations

Recommended Texts

1. Helgesen, M., & Brown, S. (2004). *Active listening: Building skills for understanding*. Cambridge: Cambridge University Press.
2. Mikulecky, B. S., & Jeffries, L. (2007). *Advanced reading power: Extensive reading, vocabulary building, comprehension skills, reading faster*. New York: Pearson.

Suggested Readings

1. Horowitz, R., & Samuels, S. J. (1987). *Comprehending oral and written language*. San Diego: Academic Press.
2. Roach, C. A., & Wyatt, N. (1988). *Successful listening*. New York: Harper & Row.

URCI-5105 **Islamic Studies** **2(2+0)**

Islamic Studies is the academic study of Islam and Islamic culture. The basic sources of the Islamic Studies are the Holy Qur'an and Sunnah or Hadith of the Holy Prophet Muhammadﷺ. The learning of the Qur'an and Sunnah guides the Muslims to live peacefully. It engages the students in the study of Islam as a textual tradition inscribed in the fundamental sources of Islam; Qur'an and Hadith, history and cultural contexts. The subject seeks to introduce Islam through a large variety of expressions (literary, poetic, social, and political) and through a variety of methods (literary criticism, hermeneutics, history, sociology, and anthropology). It provides introduction to foundations of Islam that include Qur'anic studies, Hadith and Seerah of Prophet Muhammad (PBUH), Islamic philosophy, and Islamic law, culture and theology through the textual study of Qur'an and Sunnah. It is one of the best systems of education which grooms a person with the qualities which he/she should have as a human being.

Contents

1. Study of the Qur'an
2. *Surah Al-Baqarah, Al-Furqan, Al-Ahzab, Al-Mu'minoon, Al-An'am, Al-Hujurat, Al-Saff*
3. Study of the Hadith (Introduction to Hadith literature, Selected Ahadith (Text and Translation)
4. Introduction to Qur'anic Studies
5. Basic Concepts of Qur'an
6. History of Quran
7. Basic Concepts of Hadith
8. History of Hadith
9. Kinds of Hadith
10. Uloom –ul-Hadith
11. Sunnah & Hadith
12. Seerat ul-Nabi (PBUH), necessity and importance of Seerat
13. Pact of Madinah, Khutbah Hajjat al-Wada' and ethical teachings of Prophet (PBUH)
14. Legal Position of Sunnah
15. Islamic Culture & Civilization
16. Characteristics of Islamic Culture & Civilization
17. Historical Development of Islamic Culture & Civilization
18. Comparative Religions and Contemporary Issues
19. Impact of Islamic civilization

Recommended Texts

1. Hassan, A. (1990). *Principles of Islamic jurisprudence*. New Delhi: Adam Publishers.
2. Zia-ul-Haq, M. (2001). *Introduction to al-Sharia al-Islamia*. Lahore: Aziz Publication.

Suggested Readings

1. Hameedullah, M. (1942). *Muslim conduct of state.* Lahore: Sh M Ashraf Publisher.
2. Hameedullah, M. (1957). *Introduction to Islam*. Lahore: Sh M Ashraf Publisher.
3. Hameedullah, M. (1980). *Emergence of Islam*. New Delhi: Adam Publishers.

ISLS-5108 **Ethics** **2(2+0)**

This course is an introduction to the philosophical study of morality including the theory of right and wrong behavior, the theory of value (goodness and badness), and the theory of virtue and vice. Besides providing familiarity with the primary questions addressed within moral philosophy and the most influential answers given by well-known philosophers, this course is designed to help students develop their abilities to read, explicate, analyze, and evaluate philosophical literature, write and express themselves well about their own ethical positions, and think critically and analytically about ethical issues. This course is intended for the students who have had little or no prior exposure to philosophy. It will provide a broad but reasonably detailed examination of the central issues of moral philosophy and will also consider how these can be applied to several contemporary moral problems. This course has been designed to familiarize about some of the most important theories and figures of moral philosophy in the hope that you can develop a clear understanding of the questions that recur in ethical debate.

Contents

1. Overview of moral philosophy
2. Theoretical ethics
3. Moral concepts and justify moral principles and theories
4. Applied ethics: an Islamic point of view
5. Metaphysics and morality
6. Moral objectivism and relativism
7. Features of moral objectivism
8. Qur'an and sunnah on ethics
9. Individual relativism
10. God and morality
11. Criticism and its manners
12. Reason and emotion
13. Principles of moral reasoning
14. Ethics in *Seerah* and *Taswwuf*
15. Gender and morality
16. Significant Muslim masters of ethics
17. Rule-utilitarianism, moral foundations of authorities
18. The social contract, libertarianism, welfare liberalism

Recommended Texts

1. Mackenzie, J. S. LL. D. G. (1983). *A manual of ethics*. London: University Tutorial Press.
2. Nadwi, S. S. (1999). *Ethics in Islam*. Karachi: Darul-Ishaat.

Suggested Readings

1. Cahn, S. M., & Markie, P. (2019). *History, theory, and contemporary issues*. Oxford: Oxford University Press.
2. Williams, B. (1972). *Morality: An introduction to Ethics*. Cambridge: Cambridge University Press.

AGRO-5902 General Crop Production 3(2+1)

This course will acquaint the students with the basic concepts of Agronomy and crop production. It has been designed to develop understanding among the students about production technology of major and minor field crop grown under the agro-ecological conditions of Pakistan. In addition, the commonly followed cropping systems schemes and patterns by the farmers in the country are also discussed in detail indicating the potential opportunities and issues. It also deals with the scientific management of crop environment and pests of field crop cultivated in the country. This course contains the practical aspects of crop production such as demonstration of improved sowing methods, intercultural operations, harvesting and threshing. The student will have a comprehensive knowledge of the production of crop from sowing to the harvesting.

Contents

1. Concept of crop production
2. Classification of field crops
3. Cropping scheme, cropping patterns, cropping systems, cropping intensity
4. Production technology of major field crops: cereals (wheat, rice, maize, barley)
5. Sugar crops (sugarcane, sugar beet) and fiber crops (cotton, jute)
6. Traditional oil seed crops (rapes, mustards, peanut, linseed, sesame etc.)
7. Non-traditional oil seed crops (sunflower, soybean, safflower)
8. Grain legumes (chickpea, lentil, green gram, black gram)
9. Fodders (berseem, lucerne, oats, sorghums, millets, mott grass, cowpea)
10. Special crops (tobacco)
11. Green manure crops (Guara, Dhancha. Pigeon pea, Senji etc.)

Practical

1. Identification of crops and their seeds
2. Demonstration of improved sowing methods of crops
3. Delinting of cotton seed
4. Raising of crop nurseries and transplanting
5. Intercultural practices
6. Seed Inoculation
7. Seed treatment with fungicides
8. Demonstration of harvesting and threshing operations
9. Field visits

Recommended Texts

1. Balasubramaniyan, P., & Palaniappan, S. P. (2004). *Principles and practices of agronomy*. Jodhpur: Agrobios.
2. Khalil, I.A., Jan, A. (2002) *Cropping technology*. Islamabad: National Book Foundation.

Suggested Readings

1. Martin, J.H., Waldren, R.P., & Stamp, D.L. (2006). *Principles of field crop production* (4th ed.). New York: The McMillan.
2. Nazir, M.S., Bashir, E., & Bantel, R. (Eds.) (1994). *Crop production*. Islamabad: National Book Foundation.

SAES-5802 Introduction to Soil Science-II 3(2+1)

This course provides information to the students about chemistry of soils especially soil colloids and their environmental significance. How organic matter play a role for enhancing availability of macro and micronutrients from soil environment? This subject also clears the concept of the students about soil pH and its significance regarding nutrients availability from soil to plant. This course also delivers knowledge to the students how to use sagaciously essential elements for better crop growth and production. Acquisition of specific and technical understanding of the students to select best management strategies for soil reclamation and land evaluation. In addition, this introductory course also improves the skills of the students how to calculate percent nutrients in available fertilizer and their chemical analysis about their percent grade.

Contents

1. Soil colloids and clays: description and environmental significance
2. Sources of charges on soil colloids
3. Cation and anion exchange properties of soil and their significance
4. Basic cation saturation percentage
5. Soil pH and its importance
6. Buffering of soil
7. Soil organic matter: sources, composition and significance
8. Elements essential for plant growth: macro and micronutrients, organic and inorganic fertilizers
9. Salt-affected and waterlogged soils: types, reclamation and management
10. Soil erosion: causes and remedies: soil and water conservation
11. Environmental impact of agricultural and industrial wastes

Practical

1. Fertilizers: Identification, composition and calculation of nutrient percentage
2. Fertilizer analysis for N, P and K
3. Soil analysis for EC and pH
4. Determination of soil organic matter

Recommended Texts

1. Bashir, E., & Bantel, R. (2001). *Soil Science*. Islamabad: National Book Foundation.
2. Brady, N.C., & R.R. Weil. (2007). *The Nature and Properties of Soils* (14th ed.). New Jersey: Pearson Education.

Suggested Readings

1. Brady, N.C. & R.R. Weil. (2009). *Elements of the Nature and Properties of Soils* (3rd ed.). New Jersey: Pearson Education.
2. Hillel, D. (2008). *Soil in the Environment: Crucible of Terrestrial Life.* Burlington: Elsevier.
3. Singer, M.J., & Munns, D.N. (2002). *Soils - An Introduction.* (5th ed.). New Jersey: Prentice-Hall.

FWRW-5701 Introduction to Forest and Watershed Management 3(2+1)

Forest and Watershed management emphasize the understanding of forest resources in relation to watershed with practical knowledge of forest survey and its analysis and interpretation in a valid manner. The objectives of studying this course are to acquaint the students with basic knowledge of forestry, develop understanding about principles used in watershed management, to impart knowledge about forest resources in Pakistan, and to teach skills to the students about practical forest and watershed management in Pakistan. Watershed management is closely related to forest management as the selection and implementation of different forestry practices play a crucial role in it. Students will learn different biological and engineering approaches to control and regulate water flow and reduce the sedimentation of the streams and lakes fed by this water.

Contents

1. Introduction to Forest and watershed management
2. Forest resources of Pakistan (description, composition, distribution and status)
3. Importance of these natural resources of Pakistan
4. Constraints and problems in natural resource management
5. Principles of sustainable forest management
6. Forestry practices (Agroforestry, social forestry etc.)
7. Watershed Management: Principles, Watersheds of various streams/rivers of Pakistan, their area, distribution, land use patterns, climatic, physiographic, ecological and socio-economic features
8. Hydrological cycle
9. Management problems and potentials of various watersheds, afforestation programmes
10. Watershed as a source of power generation and irrigation
11. Watershed research and education

Practical

1. Identification of important forest tree species
2. Visits to various forest types and watershed areas
3. Watershed measurements (instruments, area, drainage, flow etc.)

Recommended Texts

1. Franzel, S., Scherr, S.J. (2001). *Trees on the Farm.* CAB International.
2. Quraishi, M. A. A. (1999). *Basics of Forestry and Allied Sciences*. Lahore: A-One Publishers.

Suggested Readings

1. Quraishi, M.A.A. (2002). *Watershed Management in Pakistan*. Department of Forestry. UAF.
2. Quraishi, M.A.A. and Siddiqui, M.T. (2002). *Practical manual of watershed management*. Department of Forestry. UAF.
3. Sheikh, M.I. (1999). *Forests and Forestry in Pakistan*. Lahore: A-One Publishers.
4. Siddiqui, M.T., Sands R., & Shah, A.H. (2009). *Glossary of forestry terms.* Faisalabad: Pulschay Publisher.

AEXT-5401 Introduction to Agricultural Extension and Rural Development 3(3+0)

The purpose of this course is to give a brief introduction of Agricultural Extension education at undergraduate level. The students must know the history and philosophy of agricultural education in the development of present era agricultural system across the world. The concepts of extension education and rural development, principles of effective extension work, concepts of program planning, research, program evaluation and their importance in agricultural extension and rural development work, role of communication and ICTs in extension work and development activities in rural areas for the growth of the masses are important to disseminate among undergraduate students, so that students will prepare themselves to learn more advance ideas in agricultural education and research. The students will be able to perform better in dissemination of different agricultural technologies.

Contents

1. Agricultural extension; its definition, objectives and importance
2. Types of education, Brief history/recent trends in agricultural extension
3. Organizational setup of agricultural extension in Pakistan
4. Rural development, its definition/concept, objectives, importance and indicators
5. Elements of rural development process
6. Rural development through agricultural extension work in Pakistan
7. Characteristics and problems of Pakistani farmers
8. Current issues and problems of rural development and extension work in Pakistan
9. Roles and duties of extension workers at various organizational levels
10. Extension programs and activities since 1947 to date in Pakistan
11. Role of communication and ICT in extension and rural development work
12. Principles of effective extension work. Adoption and diffusion of agricultural innovations
13. Agricultural technology and its application for Pakistani farmers
14. Extension, research and farmer's linkages
15. Basic concept of planning, monitoring and evaluation in agricultural extension

Recommended Texts

1. Ison, R., & Russell, D. (2004). *Agricultural Extension and Rural Development: Breaking out of Knowledge Transfer Traditions.* Cambridge: Cambridge University Press.
2. Ray, G.L. (2006). *Extension Communication and Management*. New Delhi: Kalyani Publishers.

Suggested Readings

1. Bashir, E. (2005). *Extension Methods* (2nd ed.). Islamabad: National Book Foundation.
2. Narasaiah, M.L. (2003). *Approaches to Rural Development.* New Delhi: Discovery Publishing House.
3. Leeuwis, C. & Van den Ban, A. (2004). *Communication for rural Innovation: Rethinking Agricultural Extension* (3rd ed.). New Jersey: Wiley-Blackwell.

URCE-5103 **Academic Writing** **3 (3+0)**

Academic writing is a formal, structured and sophisticated writing to fulfill the requirements for a field of study. The course aims at providing understanding of writer's goal of writing (i.e. clear, organized and effective content) and to use that understanding and awareness for academic reading and writing. The objectives of the course are to make the students acquire and master the academic writing skills. The course would enable the students to develop argumentative writing techniques. The students would be able to the content logically to add specific details on the topics such as facts, examples and statistical or numerical values. The course will also provide insight to convey the knowledge and ideas in objective and persuasive manner. Furthermore, the course will also enhance the students' understanding of ethical considerations in writing academic assignments and topics including citation, plagiarism, formatting and referencing the sources as well as the technical aspects involved in referencing.

Contents

1. Academic vocabulary
2. Quoting, summarizing and paraphrasing texts
3. Process of academic writing
4. Developing argument
5. Rhetoric: persuasion and identification
6. Elements of rhetoric: Text, author, audience, purposes, setting
7. Sentence structure: Accuracy, variation, appropriateness, and conciseness
8. Appropriate use of active and passive voice
9. Paragraph and essay writing
10. Organization and structure of paragraph and essay
11. Logical reasoning
12. Transitional devices (word, phrase and expressions)
13. Development of ideas in writing
14. Styles of documentation (MLA and APA)
15. In-text citations
16. Plagiarism and strategies for avoiding it

Recommended Texts

1. Bailey, S. (2011). *Academic writing: A handbook for international students* (3rd ed.). New York: Routledge.
2. Swales, J. M., & Feak, C. B. (2012). *Academic writing for graduate students: Essential tasks and skills* (3rd ed.). Ann Arbor: The University of Michigan Press.

Suggested Readings

1. Craswell, G. (2004). *Writing for academic success*. London: SAGE.
2. Johnson-Sheehan, R. (2019). *Writing today*. Don Mills: Pearson.
3. Silvia, P. J. (2019). *How to write a lot: A practical guide to productive academic writing* Washington: American Psychological Association.

URCP-5106 **Pakistan Studies** **2(2+0)**

The course is designed to acquaint the students of BS Programs with the rationale of creation of Pakistan. The students would be apprised of the emergence, growth and development of Muslim nationalism in South Asia and the struggle for freedom, which eventually led to the establishment of Pakistan. While highlighting the main objectives of national life, the course explains further the socio-economic, political and cultural aspects of Pakistan's endeavors to develop and progress in the contemporary world. For this purpose, the foreign policy objectives and Pakistan's foreign relations with neighboring and other countries are also included. This course has been developed to help students analyze the socio-political problems of Pakistan while highlighting various phases of its history before and after the partition and to develop a vision in them to become knowledgeable citizens of their homeland.

Contents

1. Contextualizing Pakistan Studies
2. Geography of Pakistan: Geo-Strategic Importance of Pakistan
3. Freedom Movement (1857-1947)
4. Pakistan Movement (1940-47)
5. Muslim Nationalism in South Asia
6. Two Nations Theory
7. Ideology of Pakistan
8. Initial Problems of Pakistan
9. Political and Constitutional Developments in Pakistan
10. Economy of Pakistan: Problems and Prospects
11. Society and Culture of Pakistan
12. Foreign Policy Objectives of Pakistan and Diplomatic Relations
13. Current and Contemporary Issues of Pakistan
14. Human Rights: Issues of Human Rights in Pakistan

Recommended Texts

1. Kazimi, M. R. (2007). *Pakistan Studies.* Karachi: Oxford University Press.
2. Sheikh, J. A. (2004). *Pakistan's Political Economic and Diplomatic Dynamics.* Lahore: Kitabistan Paper Products.

Suggested Readings

1. Hayat, S. (2016). *Aspects of Pakistan Movement.* Islamabad: National Institute of Historical and Cultural Research.
2. Kazimi, M. R. (2009). *A Concise History of Pakistan.* Karachi: Oxford University Press.
3. Talbot, I. (1998). *Pakistan: A Modern History*. London: Hurst and Company.

PLBG-5201 **Introductory Genetics** **3(2+1)**

The course provides an overview of Genetics. Genetics is a field of biology that studies how traits are passed from parents to their offspring. The passing of traits from parents to offspring is known as heredity, therefore, genetics is the study of heredity. This introduction to genetics takes you through the basic components of genetics such as DNA, genes, chromosomes and genetic inheritance. Genetics is built around molecules called DNA. DNA molecules hold all the genetic information for an organism. It provides cells with the information they need to perform tasks that allow an organism to grow, survive and reproduce. A gene is one particular section of a DNA molecule that tells a cell to perform one specific task. Heredity is what makes children look like their parents. During reproduction, DNA is replicated and passed from a parent to their offspring. This inheritance of genetic material by offspring influences the appearance and behaviour of the offspring. The environment that an organism lives in can also influence how genes are expressed.

Contents

1. Definition of genetics, concepts of heredity and variation
2. Cell and cell divisions. Mendelian genetics: chromosome
3. Theory of heredity, various genotypic and phenotypic ratios and their modifications
4. Differences between allelic and non-allelic interactions (epistasis), illustration of epistasis
5. Pleiotropy and multiple allelism.
6. Multiple factor hypothesis.
7. Linkage and crossing over
8. Sex determination: sex-linked and sex influenced traits
9. Chromosomal aberrations
10. Nucleic acids: nature, structure and function
11. Classical vs modern concepts of gene

Practical

1. Study of cell divisions and gametogenesis
2. Calculation of monohybrid and dihybrid ratios
3. Numerical examples: gene interaction, multiple alleles and multiple factor inheritance
4. Calculation of linkage from test cross and F_2 data

Recommended Texts

1. Klug, W.S., & Cummings, M. R. (2003)). *Concepts of Genetics* (7th ed.). Singapore: Pearson Education.
2. Singh, B.D. (2004). *Genetics.* New Delhi: Kalyani Publishers.

Suggested Readings

1. Khan, I.A., Azhar, F.M., Ali, Z., & Khan, A.A. (2008). *Solving Numerical Genetic Problems*. Faisalabad: University of Agriculture.
2. Singh, P. (2003). *Elements of Genetics* (2nd ed.) Delhi: Kalyani Publishers.
3. Stansfield, W.D. (1988). *Theory and Problems of Genetics* (4th ed.). New York, NY: McGraw-Hill.

ENTO-5101 Introductory Entomology 3 (2+1)

This course is aimed to make the students familiar with the basic information about the study of insects. Students would be able to know about arthropods and especially insects with their morphological features, identify insects of economic importance and acquire working skills for collecting, mounting, and preserving insects. The course briefs about the basic external and internal morphological and anatomical features along with their basic functioning principles. Students will learn about the insect classification and nomenclature so that they can easily identify the insect order, family and type and can properly collect, mount and preserve these invertebrates for further studies. Insect body features and their habits help for their identification. This is the basic course that enables students to further understand the ways and techniques adopted for the control and management of economically important insect pests.

Contents

1. Introduction
2. Phylum Arthropoda and its classification
3. Metamorphosis and its types
4. External and internal morphology and physiology with a reference to typical insect, 'ak' grasshopper, *Poekiloceruspictus*
5. Insect classification and nomenclature
6. Salient characters of insect orders with important families and examples of important members

Practical

1. Characters of classes of Arthropoda
2. Collection and preservation of insects
3. Morphology and dissection of a typical insect (digestive, reproductive, excretory, nervous, circulatory and tracheal systems)
4. Temporary mounts of different types of appendages of insects
5. Observations for types of metamorphosis

Recommended Texts

1. Lohar, M.K. (1998). *Introductory Entomology*. Hyderabad: Kashif Publications.
2. McGavin, G. C. (2001). *Essential entomology: an order-by-order introduction*. USA: Oxford University Press.

Suggested Readings

1. Mani, M.S. (1990). *General Entomology* (4th ed.) Delhi: Oxford/IBH Publishing Co.
2. Tonapi, G.T. (1994). *Experimental Entomology, an Aid to Lab. and Field Studies*. Delhi: C.B.S. Publishers.

PLPT-5301 Introduction to Plant Pathogens 3(2+1)

Plant pathology is a science that studies plant diseases and attempts to improve the chances for survival of plants when they are faced with unfavorable environmental conditions and parasitic microorganisms that cause disease. As such, plant pathology is challenging, interesting, important, and worth studying. It is also, however, a science that has a practical and noble goal of protecting the food available for humans and animals. Plant diseases, by their presence, prevent the cultivation and growth of food plants in some areas; or food plants may be cultivated and grown but plant diseases may attack them, destroy parts or all of the plants, and reduce much of their produce, i.e., food, before they can be harvested or consumed. The objective of this course is to acquaint the students with basic concepts and identification of plant pathogens. The course covers all aspects of plant pathogens which include their economic importance, morphology, reproduction and ecology. The course also covers classification of different plant pathogens. In addition to plant pathogens, phanerogamic parasites, viroids and fastidious bacteria will also be covered briefly during this course.

Contents

1. Introduction; economic importance
2. General characteristics (morphology, reproduction and ecology)
3. Identification of plant pathogens including fungi, prokaryotes, viruses, viroids, nematodes, fungus like organisms and phanerogamic parasites
4. Taxonomic position of economically important plant pathogens

Practical

1. Orientation of laboratory equipment
2. Sterilization of glassware
3. Preparation of media and isolation of different plant pathogens
4. Study of characteristics of various plant pathogens through slides
5. Live specimens and their comparative account/study

Recommended Texts

1. Agrios, G. N. (2005). *Plant Pathology* (5th ed.). Burlington: Elsevier Academic Press.
2. Ahmad, I., & Bhutta, A.R. (2005) *Textbook of introductory Plant Pathology*. Islamabad: NBF Publisher.

Suggested Readings

1. Bos, L. (1999). *Plant viruses, unique and intriguing pathogens: a textbook of plant virology*. Netherlands: Backhuys Publishers.
2. Mehrotra, R. S., & Aggarwal, A. (2003). *Plant Pathology* (2nd ed.). India: Tata McGraw Hill Education.
3. Ravichandra, N. G. (2013). *Fundamentals of plant pathology*. India: PHI Learning.
4. Windham, M. T., Trigiano, R. N., & Windham, A. S. (2003). *Plant pathology: concepts and laboratory exercises*. UK: Taylor and Francis.

HORT-5601 Introductory Horticulture 3(2+1)

Students will learn the fundamentals of plant structure and how cells, tissues, organs and whole plants develop and function. Students will then explore how environmental factors affect growth and development, and how humans manipulate them to produce horticultural crops: fruits, vegetables, flowers and landscape plants. Students will learn the division of horticulture and classification of horticultural plants as well as plant parts and their modifications. This course would help understand propagation methods, punning, training and laying out of an orchard, vegetable farm. This course will help students to identify the key issues being faced by the growers such as purchasing of plants from nursery, establishing an orchard, pruning, training and wind breaks. Taking this course would broaden their vision regarding the horticulture industry at domestic and international level. Labs are designed to emphasize and reinforce the principles covered in lecture and will give students a hands-on introduction to horticulture.

Contents

1. Introduction, history, importance and future scope
2. Definition and divisions of horticulture
3. Classification of horticultural crops, Plant parts, their modifications and functions
4. Plant environment
5. Climate (temperature, light, humidity etc)
6. Soil (structure, texture, fertility etc)
7. Phases of plant growth, Propagation of horticultural plants

Practical

1. Visit of nurseries, commercial gardens and public parks
2. Identification and nomenclature of important fruits, vegetables and ornamental plants
3. Garden tools and their uses, Media and its preparation
4. Techniques of propagation

Recommended Texts

1. Carrol, L., Shry, J.R., & Reily, H.E. (2011). *Introductory Horticulture* (8th ed.) Albany: Delmar-Thomson Learning.
2. Christopher, E. P. (2012). *Introductory Horticulture*. New Delhi: Biotech books.

Suggested Reading

1. Hartmann, H.T., Kester, D.E., Davies, E.T., & Geneve, R.L. (2009). *Plant Propagation–Principles and Practices* (7th ed.). New Delhi: Prentice-Hall India Learning.
2. Peter, K.V. (2009). *Basics of Horticulture*. New Delhi: New India publishing Agency.

FWRW-5702 Introduction to Rangelands and Wildlife Management 3(2+1)

The course will introduce the students with knowledge of rangelands and their importance as major land use in Pakistan. Students will be able know the characteristics of rangelands of the country and complexities associated with management of rangelands. The course describes the range ecosystem, its components and types of range vegetation in different ecological zones of the country with brief discussion of the botany of range grasses, shrubs and trees, range plant ecology, range animal behavior, rangeland stocking rate and selection of grazing system. There is a comprehensive discussion on principles of scientific management of all the components of range ecosystem and its relationship with wildlife. The key objectives of this course are to introduce the rangeland resources and associated wildlife of Pakistan to make the students identify major range vegetation types and wildlife species of the country and to provide information about the problems of rangelands and their scientific management.

Contents

1. Introduction to Rangelands, scope and importance, basic terminology
2. Components of Rangelands, Constraints and problems of rangelands
3. Rangeland Resources of Pakistan; ecological zones and vegetation types
4. Range ecosystem, Principles of Rangeland Management
5. Grazing systems of the world, Grazing systems and grazing pattern in Pakistan
6. Range improvement techniques
7. Wildlife: Definition and values
8. Ecosystem concept, characteristics and management requirements for regional eco-systems in Pakistan including arid, wetland, forest, mountain and coastal ecosystems
9. Introduction to protected areas (National Park, Game Reserve and Wildlife Sanctuary)

Practical

1 Identification and preservation of important Grasses and Plant species of a rangeland
2 Visits to various Rangeland types and Plantations
3 Quantitative analysis of range vegetation
4 Identification of important wildlife species

Recommended Texts

1. Holechek, J. (1989). *Range Management, Principles and Practices*. Newberry: Prentice Hall.
2. Quraishi, M. A. A., Khan, G.S., & Yaqoob, M. S. (1993). *Range Management in Pakistan*. Faisalabad: University of Agriculture.

Suggested Readings

1. Mohammad, N. (1989). *Rangeland Management in Pakistan*. NARC: ICIMOD.
2. Quraishi, M.A.A., & Ishaque, M. (1995). *Practical Manual of Range Management*. Faisalabad: University of Agriculture.
3. Stoddard, L.A., Smith, A.D., & Box, T.W. (1975). *Range Management.* New York: McGraw Hill.

AGEC-5501 Introduction to Agricultural Economics 3(3+0)

Agricultural economics is defined as the economic system that produces, distributes, and consumes agricultural products and services. The rapid expansion coupled with the essential role of food in our society has generated a field of economics solely dedicated to observing and predicting trends within the agriculture market landscape. Basic macro and micro-economic principles apply to farming, as do the existence of externalities such as climate change and nutritional health. The goals for this course are for students to understand and display knowledge of the Producer/Consumer Theory, Agricultural Markets, Resource Markets and Agriculture trade/policy. At the end of the course, students will be able to apply market analysis (supply and demand) to various commodity market scenarios, explain agricultural production and consumption by using economic theory for support and discuss the impact of regional, national, and global agribusiness policy.

Contents

1. Definitions and overview of economics and related terms, subject matter & scope
2. Contents of consumer behavior; Scale of preferences; Utility, Indifference Curve & related concepts
3. Demand & Supply analysis, Elasticity of Demand and Supply, Market Equilibrium
4. Production, factors of production, laws of return and their significance in agriculture
5. Concept of macroeconomics approaches to national income estimation
6. Growth, Unemployment & Inflation
7. Important macroeconomic issues in agriculture sector of Pakistan

Recommended Texts

1. Parkin, M. (2010).*Economics*, 10th Edition, Addison Weslay Publishing Company.
2. Penson, J. B., Capps O., Rossen, C. P., & Woodward, R. (2013). *Introduction to Agricultural Economics* (5th ed.). New Jersey: Prentice Hall.

Suggested Readings

1. Cramer, G. L., Jensen, C. W., Southgate Jr., D. D. (2001). *Agricultural Economics and Agribusiness* (8th ed.). New Jersey: Wiley Publisher.
2. Mankiw, N. Gregory. (2011). *Principles of Economics* (5th ed.). Mason: South-Western Cengage learning Publisher.
3. Penson, J. B., Capps, O., Rossen C. P., & Woodward, R. (2013). *Introduction to Agricultural Economics* (5th ed.). New Jersey: Prentice Hall.

URCC-5110 Citizenship Education and Community Engagement 3 (3+0)

In order to secure the future of a society, citizens must train younger generations in civic engagement and participation. Citizenship education is education that provides the background knowledge necessary to create an ongoing stream of new citizens participating and engaging with the creation of a civilized society. Community engagement seeks to better engage the community to achieve long-term and sustainable outcomes, processes, relationships, discourse, decision-making, or implementation. This course will provide a critical interrogation of the central conceptual issues as well as an examination of how to design a program of effective community engagement. This course begins by asking: Why involve citizens in planning and policymaking? This leads to an examination of the politics of planning, conceptualizations of "community" and, to the tension between local and professional knowledge in policy making. This course will also analyze different types of citizen engagement and examine how to design a program of public participation for policy making. Approaches to evaluating community engagement programs will also be a component of the course.

Contents

1. Introduction to Citizenship Education and Community Engagement: Orientation
2. Introduction to Active Citizenship: Overview of the ideas, Concepts, Philosophy and Skills
3. Identity, Culture and Social Harmony: Concepts and Development of Identity
4. Components of Culture and Social Harmony, Cultural & Religious Diversity
5. Multi-cultural society and inter-cultural dialogue: bridging the differences, promoting harmony
6. Significance of diversity and its impact, Importance and domains of inter-cultural harmony
7. Active Citizen: Locally active, globally connected
8. Importance of active citizenship at national and global level
9. Understanding community, Identification of resources (human, natural and others)
10. Human rights, Constitutionalism and citizens' responsibilities: Introduction to human rights
11. Universalism vs relativism, Human rights in constitution of Pakistan
12. Public duties and responsibilities
13. Social Issues in Pakistan: Introduction to the concept of social problem, Causes and solutions
14. Social Issues in Pakistan (Poverty, Equal and Equitable access of resources, unemployment)
15. Social Issues in Pakistan (Agricultural problems, terrorism & militancy, governance issues)
16. Social action and project: Introduction and planning of social action project
17. Identification of problem, Ethical considerations related to project
18. Assessment of existing resources

Recommended Books

1. Kennedy, J. K., & Brunold, A. (2016). *Regional Context and Citizenship Education in Asia and Europe*. New York: Routledge Falmer.
2. Macionis, J. J., & Gerber, M. L. (2010). *Sociology*. New York: Pearson Education.

Suggested Books

1. British, Council. (2017). *Active Citizen's Social Action Projects Guide.* Scotland: British Council.
2. Larsen, K. A., Sewpaul, V., & Hole, G. O. (Eds.). (2013). *Participation in Community Work: International Perspectives*. New York: Routledge.

PLBG-5202 **Introductory Plant Breeding** **3(2+1)**

This course is designed to help understand the basis of plant breeding and the application of genetic principles for the improved heredity of plants. The objectives of the course include: how to improve yield, quality, disease-resistance, drought and frost-tolerance and important characteristics of the crops? How to create desired genotypes and phenotypes for specific breeding objectives as per crop? The process of creating variation and then utilizing the variation for the plant improvement, understanding how to exploit the available natural variation and if natural variation is not having selection potential then the method of artificial creation of variation, understanding the reproductive mechanisms in major crops, application of genetic principles in crop improvement, understanding breeding methods in self-pollinated crops and the principle of breeding self-pollinated crops as homozygosity. Students will also learn about comparative advantage of different breeding methods in terms of time required for breeding a crop variety and understand breeding methods in cross pollinated crops.

Contents

1. Introduction to plant breeding and its role in crop improvement
2. Reproductive systems in major crop plants
3. Genetic variation and its exploitation, creation of variation through genetic recombination, mutation and heteroploidy
4. Breeding self-pollinated crops: introduction, mass selection, pure line selection; hybridization, pedigree method, bulk method and backcross techniques
5. Breeding cross-pollinated crops: introduction, mass selection, recurrent selection
6. Development and evaluation of inbred lines
7. Development of hybrids, synthetic and composite populations
8. Breeding clonally propagated crops
9. New trends in plant breeding

Practical

1. Descriptive study of floral biology
2. Scientific names, chromosome number and ploidy level of important field crops
3. Selfing and crossing techniques in major crops
4. List of approved varieties in major field crops
5. Field visits of different research organizations

Recommended Texts

1. Sleper, D. A., & Poehlman, J.M. (2006). *Breeding Field Crops* (5th ed.) Ames, USA: Iowa State University Press.
2. Chahal, G.S., & Gosal, S.S. (2003). *Principles and Procedures of Plant Breeding.* New Delhi: Narosa Publishing House.
3. Singh, B. D. (2003). *Plant Breeding: Principles and Methods*. New Delhi: Kalyani Publishers.

Suggested Readings

1. Singh, P. (2003). *Essentials of Plant Breeding.* New Delhi, India, Kalyani Publishers.
2. Khan, M.A. (Ed.). (1994). *Plant Breeding.* Islamabad: National Book Foundation.
3. Acquaah, G. (2009). *Principles of Plant Genetics and Breeding*. UK, John Wiley & Sons.

ENTO-5102 Applied Entomology 3 (2+1)

The students would be able to acquire the knowledge of different practical aspects of entomology. For instance, they will learn to identify the major insect pest species of agricultural, horticultural and forest crops, vegetables, fruits, stored grains and household pests. Course aims to demonstrate the students about the identification of insect pests, their control methods and pesticide application equipment with basic objective to enhance farmer's productivity through better management and control of insect pests. Moreover, course includes the basic information and introduction related to entomological cottage industries (i.e. honeybee farming, silkworm rearing and lac culture) in order to enhance the productivity of farming community. This course is the continuation of the introductory course which involves the techniques and practices used for the application of the basic entomological knowledge for the control and management of economically important agricultural insect pests and best possible utilization of useful aspects of insects.

Contents

1. Introduction
2. Causes of success and economic importance of insects
3. Principles and methods of insect control i.e. cultural, biological, physical, mechanical, reproductive, legislative, chemical and bio-technological control
4. Introduction to IPM; insecticides, their classification, formulations and application equipment
5. identification, life histories, mode of damage and control of important insect pests of various crops, fruits, vegetables, stored grains, household, termites and locust
6. Entomological industries: apiculture, sericulture and lac-culture

Practical

1. Collection, identification and mode of damage of insect pests of various crops, fruits, vegetables, stored grains and household
2. Insecticide formulations, their dilutions and safe handling
3. Use of application equipment, instructions in apiculture, sericulture and lac-culture

Recommended Texts

1. Atwal, A.S. (2005). *Agricultural Pests of Southeast Asia and their Management*. Ludhiana: Kalyani Publishers.
2. Pedigo, L. P., & Rice, M. E. (2014). *Entomology and Pest Management* (6th ed.). USA: Waveland Press.

Suggested Readings

1. Duncton, P.A. (2007). *The Insect: Beneficial and Harmful Aspects*. Ludhiana: Kalyani Publishers.
2. Mathews, G.A. (2004). *Pesticide Application Methods* (3rd ed.). New York: John Wiley & Sons.

PLPT-5302 Introductory Plant Pathology 3(2+1)

Plant Pathology or Phytopathology is the branch of agriculture, which deals with the study of plant diseases. The detailed study includes the importance and occurrence, symptoms, cause, etiology, disease cycle, epidemiology and management of diseases. Disease may be defined as "abnormal changes in physiological processes which disturbs the normal activity of plant organs". Disease is a condition in which the functions of the organism are improperly discharged, or in other words, it is a state, which is physiologically abnormal and threatens the life of the being or organs. Disease is a variation from normal physiological activity, which is sufficiently permanent or extensive to check the performance of normal functions by the plant or completion of its development. The objective of this course is to acquaint the students with basic concepts of Plant Pathology. The course comprises history of different plant diseases, their symptoms, etiology, epidemiology and management. The course also has brief introduction of different plant pathogens which include fungi, viruses, bacteria and nematodes. The course also covers historical background of different plant pathogens and the discoveries related to management of different diseases.

Contents

1. Introduction and history of plant pathology
2. Basic characteristics of fungi, bacteria, viruses and nematodes
3. Concept of disease in plants; economic importance of plant diseases
4. Nature and cause of (biotic and abiotic) diseases
5. Components of plant disease development
6. Diagnosis of plant diseases
7. Principles of plant disease management
8. Introduction to IDM and IPM; symptoms, etiology
9. Mode of infection, disease cycle and management of representative diseases of agricultural and horticultural crops

Practical

1. Demonstration of lab equipment and reagents
2. Collection, preservation and identification of plant diseases based on symptoms
3. Isolation and inoculation techniques
4. Demonstration of Koch's postulates

Recommended Texts

1. Agrios, G. N. (2005). *Plant Pathology* (5th ed.). Burlington: Elsevier Academic Press.
2. Chaube, H.S., & Singh, R. (2002). *Introductory Plant Pathology*. India: International Book.

Suggested Readings

1. Mehrotra, R.S., & Aggarwal, A. (2003). *Plant Pathology* (2nd ed.). India: Tata McGraw Hill Education.
2. Strange, R.N. (2006). *Introduction to Plant Pathology*. USA: John Wiley & Sons.

HORT-5602 Horticultural Crop Production 3(2+1)

The objective of this course is to familiarise students with production of horticultural crops such as fruit, vegetables and ornamental crops. Students are expected to understand various stages of fruit, vegetables and ornamental plants phenology and physiology in order to solve related problems for horticultural crops. After completing this course student will be able to grow and manage horticultural crops successfully on a commercial scale. This course would help understand students regarding the key phenomenon's related with fruits such as incompatibility, fruits set, and biennial bearing. Similarly, students will also learn about disease and insect problem in vegetables and ornamental plants. This course will help students to identify the key issues being faced by the growers such as alternate bearing, fruit drop and possible options to control these issues using different approaches.

Contents

1. Establishment of orchards, vegetable farms and ornamental gardens
2. Site selection, layout methods, wind breaks and their role
3. Management practices; irrigation, manures and fertilizers, training and pruning, cultivation and weed control
4. Climate, soil, propagation, rootstocks, cultivars, important pests, harvesting, post-harvest handling and marketing of important horticultural crops (fruits, vegetables and ornamentals) of the region

Practical

1. Practice in layout methods
2. Selection of plants from nursery, propagation methods
3. Planting and after care
4. Production techniques and identification of important cultivars of horticultural crops of the region

Recommended Texts

1. Acquaah, G. (2009). *Horticulture: Principles and Practices* (4th ed.). New Delhi: Prentice-Hall India Learning.
2. Adams, C. R., Bamford, K.M., & Early, M. P. (2012). *Principles of Horticulture* (6th ed.). New York: Routledge.

Suggested Readings

1. Singh, B. (2007). *Horticulture at a Glance*. Ludhiana: Kalyani Publishers.
2. Pradeepkumar, T. (2008). *Management of horticultural crops* (Vol. 11). New Delhi: New India Publishing.
3. Yadav, P.K. (2007). *Fruit Production Technology*. Lucknow: International Book.

FSAT-5101 Introduction to Food Science and Technology 3 (2+1)

This is an introductory course which enables the students to understand the basics of food science and technology. Students will study the physical, biological, and chemical makeup of food; the causes of food deterioration; and the concepts underlying food processing. Food scientists and technologists apply scientific disciplines including chemistry, engineering, microbiology, and nutrition to the study of food to improve the safety, nutrition, wholesomeness and availability of food. Depending on their area of specialization, food scientists may develop ways to process, preserve, package, and/or store food according to industry and government specifications and regulations. It could involve enhancing the taste, making it last longer, making sure it's safe to eat, or even boosting its nutritional content. Students will explore and gain an understanding into the history of food science and the factors that have shaped food science in Pakistan, organizations involved in food manufacturing, food regulatory processes, food composition, its classification depending on sources, consumption pattern and basic analysis of food components.

Contents

1. Introduction to food science, food technology, relationship with other disciplines
2. Career opportunities. Significance of food science and technology
3. Food industry: history, developments, important food industries in Pakistan
4. Food sources: plants, animals and marine
5. Food constituents and their functions: water, carbohydrates, lipids, proteins, vitamins, minerals
6. Classification of foods on the basis of perishability and pH
7. Food spoilage agents: enzymes, microorganisms, pests, physical factors
8. Principles of food preservation: prevention or delay of autolysis, microorganisms and pests

Practical

1. Use of basic food laboratory equipment
2. Estimation of Moisture, Fat, Protein, Carbohydrates, Fiber and Ash content in food samples
3. Determination of soluble solids, total solids, pH, Acidity, total sugars, Specific gravity and Refractive index

Recommended Texts

1. Awan, J. A. (2018). *Food science and technology*. Faisalabad: Unitech Communications.
2. Robert, L. S., Ramirez, A. O., & Clarke, A. D. (2015). *Introducing Food Science*. (2nd ed.). Florida: CRC Press.

Suggested Readings

1. Stewart, G. F., & Amerine, M. A. (2012). *Introduction to food science and technology*. New Jersey: Elsevier.
2. Potter, N. N., & Hotchkiss, J. H. (2012). *Food science*. Berlin: Springer Science & Business Media.

STAT-5126 Statistics for Agricultural Sciences 3(3+0)

This course is designed for undergraduate programs of agriculture sciences. The objective of this course is to impart basic and applied knowledge about statistics for collection, presentation, analysis and interpretations of data related to agriculture issues. After completing this course agriculture student will be able to understand the general concepts of basic statistics, to conduct agriculture surveys, to understand design of experiments, and other statistical tools. These statistical concepts are further will be helpful to complete a research related to agriculture sciences. Moreover, over students will also learn some statistical software such as Minitab, SPSS and Design Expert to improve their computational and analytical skills. Through this course, students will be able to understand and analyze the agricultural problems in field as well as in lab conditions.

Contents

1. Definition and importance of Statistics in Agriculture
2. Data, Different types of data and variables
3. Classification and Tabulation of data
4. Frequency distribution, Graphical representation of data
5. Measure of Central tendency and Measure of Dispersion. Calculation of averages, Range, variance, Standard deviation and coefficient of variation
6. Regression and Correlation Analysis: Simple and Multiple regression, correlation cases
7. Sampling and its types: Probability and non-Probability Sampling, Simple random sampling, stratified random sampling, Systematic sampling, Sampling and non-sampling error
8. Sampling distribution of mean and difference between two means
9. Inference Theory: Estimation and testing of hypothesis, Type-I and type-II error, Testing of hypothesis about mean and difference between two means using Z-test and t-test, Paired t-test
10. Test of association of attributes using χ^2 (chi-square) Testing hypothesis about variance
11. ANOVA and its assumptions, One-way ANOVA, Two-way ANOVA

Recommended Texts

1. Muhammad, F. (2000). *Statistical methods and data analysis*. Pakistan: Ilmi Kitab Khana.
2. Rao, G. N. (2007). *Statistics for agricultural sciences* (2nd ed.). Hyderabad: BS Publication.

Suggested Readings

1. Lawal, B. (2014). *Applied statistical methods in agriculture, health and life sciences*. USA: Springer.
2. Sahu, P. K. (2016). *Applied statistics for agriculture, veterinary, fishery, dairy and allied fields*. USA: Springer.
3. Crawshaw, J. & Chambers, J. A. (1994). *Concise course in A. level statistic with world examples.* USA: Springer.

AEXT-6403 Extension Program Development 3(2+1)

This course has been designed so that students will be able to learn the concepts of program development, program planning, why planning is important for professionals and difference between planned and unplanned activities. The course also describes why all stakeholders need to participate in the planning process. The students will learn the principles of effective program development, program monitoring and evaluation, analysis of various program development tools and models. A successful program plan begins with a strong logic model that connects program goals to expected outcomes. Also, including stakeholders in the process—both local organizations and community leaders interested in the goals of the program—is a key to develop buy-in at the beginning of program development. Finally, the students will be able to develop an effective extension program for respondents.

Contents

1. Program development; purpose, concept, scope, significance and assumptions
2. Characteristics and principles of program planning and development
3. Program development approaches and models
4. Steps in program development: Situation analysis and needs assessment, statements of Mission, vision, core values and objectives of any organization, and plan of work
5. Planning, implementing, monitoring and evaluating the programs

Practical

1. The students will conduct situation analysis and needs assessment
2. They will plan extension programs based on prioritized needs of extension clientele.
3. They are required to submit a written report

Recommended Texts

1. Ray, G.L. (2006) *Extension Communication and Management*. Kalyani Publishers.
2. Santha, G., Tamilselvi, G., & Meenambigai, J. (2010). *Extension Education and Rural Development*. Jhodpur: Agrobios.

Suggested Readings

1. Caffarella, R. S. (2001). *Planning programs for adult learners: A practical guide for educators, Trainers, and staff developers*. (2nd ed.). San Francisco: Jossey-Bass Publishers.
2. Dasgupta, D. (2008). *Extension Education*: *Core Contents & Emerging Areas*. India: Agrobios.
3. Singh, D., & Singh, B. K., (2012). *Agriculture Extension and Rural Development*, India: Narendra Publishing.

AEXT-6404 History and Philosophy of Agricultural Extension Education 3(3+0)

The primary purpose of this course is to provide the students with an examined grounding in the seminal events and people in the history of agricultural and extension education (history), principle divisions of thought (philosophies), and decisions made (policy), resulting in the current state of affairs in agricultural and extension education. The convergence of these factors has a notable impact on the current challenges and future direction of agriculture and extension education. The focus of this course is to introduce the evolution of agriculture and extension education through history. The secondary purpose is to study the philosophical approaches applied in the development of this unique educational system at the beginning. The students will learn how agricultural extension gave birth to agricultural research and developed advanced agricultural knowledge up to the present era of technology. They will also learn role of philosophical thinking behind development of agricultural knowledge. At the end of this course, the students will be able to explain philosophical roots of agriculture and extension education, describe historical perspectives of agricultural extension in the given area and analyze Islamic philosophy of extension education.

Contents

1. Evolution of agricultural extension worldwide
2. Historical perspective of agricultural extension education in Pakistan
3. The past performance of various extension programs, systems and models practices in Pakistan
4. The emergence of private sector extension in Pakistan including input manufacturing and supply agencies, commercial banks and NGO's private advisory services
5. Philosophy, its definition and branches
6. Philosophical foundation of agricultural extension education
7. Islamic bases and foundations of agricultural enterprises
8. Islamic philosophy of extension education

Recommended Texts

1. Anandajayasekeram, P., Puskur, R., Workneh, S., & Hoekstra D. (2008). *Concepts and practices in agricultural extension in developing countries: A source book*. Washington, DC: IFPRI (International Food Policy Research Institute).
2. Cahn, S. M. (2009). *Philosophy of Education. The Essential Texts*. Abingdon: Routledge.

Suggested Readings

1. Swanson, B. E., & Rajalahti, R. (2010) Strengthening Agricultural Extension and Advisory Systems: Procedures for Assessing, Transforming, and Evaluating Extension Systems. *Agriculture and Rural Development Discussion Paper 45.* Washington, DC: The World Bank.

AEXT-6405 Rural Development Programs in Pakistan 3(2+1)

Rural development is a complex phenomenon and despite a long history of efforts claimed by several government and related agencies in Pakistan, visible changes in rural scene are far too meager and fragmentary to present a total impact. Attempts for rural development have been going on for the last four decades in the country. The primary purpose of this course is to point out the functions of rural development programs, objectives, problems, scope, and teaching system of rural development. The focus of this course is to assess the rural development concepts and its relationship with extension education. Further to describe important programs those were designed for local and rural development during the past seven decades since independence. At the completion of this course, the students will be able to describe philosophy of rural development programs, identify key rural development programs and evaluate critically the government's plans and policies related to rural development.

Contents

1. Concept, Philosophy, importance and objectives of rural development
2. Main approaches/programs of rural development in Pakistan i.e. V-AID, Basic Democracies, rural works program, IRDP, social action program, village cooperatives, supervised credit schemes
3. Participatory rural development projects, community-based organizations
4. Current rural development programs; rural support programs and rural development programs of NGO's.
5. A critical analysis of current government plans and policies for rural development
6. Emerging trends of rural development in Pakistan

Practical

1. Each student will be assigned a project related to any important aspect of rural development.
2. After completing the project, each student will write, submit, and present a comprehensive report on the given problem.

Recommended Texts

1. Bapatla, A. P. (2001). *Extension Education.* Andhra Pradesh: Sri Lakshmi press.
2. Narasaiah, M.L. (2003). *Approaches to Rural Development*. New Delhi: Discovery Publishing House.

Suggested Readings

1. Ison, R., & Russell, D. (2004). *Agricultural Extension and Rural Development: Breaking out of Knowledge Transfer Traditions*. Cambridge: Cambridge University Press.
2. Singh, D. (2012). *Agriculture Extension and Rural Development*. New Delhi: Discovery Publishing House.

AEXT-6406 Rural Youth in Agricultural Development 3(2+1)

The main aim of this course is to understand the importance of youth involvement in rural and agricultural development activities at village level in Pakistan. Youth is the future of the country. Youth comprised of 60% of the country's population. Their involvement in developmental process will further give the boost to economy of the country. At the completion of this course, the students will be able to define the meaning and philosophy behind rural youth work, describe rural youth clubs/work in global perspective, developing guidelines for involving youth in agricultural extension work, establishment & management of youth clubs for agricultural development.

Contents

1. Meaning, philosophy and objectives of rural youth work
2. Characteristics, needs, and problems of rural youth in Pakistan
3. Participation of rural youth in agricultural development programs
4. Review of youth organizations
5. Guidelines for organizing a youth program
6. Identification of projects for the youth clubs
7. Participation of rural schools in dissemination of agricultural information

Practical

1. The students will be assigned projects involving youth in agricultural development and submit the report

Recommended Texts

1. Curtis, K. (2008). *Empowering Youth: How to encourage young leaders to do great things*. Minneapolis: Search Institute Press.
2. Singh, D. (2012). *Agriculture Extension and Rural Development*. New Delhi: Discovery Publishing House.

Suggested Readings

1. Swanson, B.E. (1997). *Improving Agricultural Extension; A reference manual*. Rome-Italy: FAO.

AEXT-6407 Leadership and Communication Skills in Agricultural Extension 3(2+1)

The world has embraced the largest revolution so far in the history of mankind called communication revolution. Everything has been tagged to communication. Communication provides the way to resolve mutual conflicts not only between two individuals, groups but also between the countries. Communication has lot more importance in the development of leadership qualities among the masses of civil society. The aim of this course is to develop the communication and leadership skills among future extensionists. At the completion of this course, the students will be able to conceptualize the concepts communication process and demonstrate improved communication/leadership skills being used for agricultural technology dissemination among different stakeholders.

Contents

1. Leadership and its types, Communication process for leadership and its components
2. Concept, purpose and scope of communication in agricultural extension
3. Barriers to effective communication
4. Factors affecting communication fidelity
5. Types/forms of communication i.e. written, verbal, and non-verbal
6. Communication skills: Speaking, listening, writing and reading.
7. Improving facilitation skills
8. Listening---Reasons for poor listening, Tips for improving listening skills
9. Writing---Art of good writing, Writing for newspapers and magazines
10. Writing letters, reports and articles frequently required for the job of an extension worker.
11. Tips for developing effective reading skills
12. Use of audio-visual aids, Presentation skills
13. Leadership: concept, functions, styles and types. Roles and characteristics of leadership

Practical

1. Micro-teaching-Students will plan and practice extension teaching in small groups. They will also maintain a practical notebook regarding preparation of instructional designs
2. Interviewing-Students will interview farmers and extension workers to identify their problems Writing Skills-Students will prepare various registers including stock register, store book, etc. and will prepare different types of reports required for the job of extension worker including maintenance of office records

Recommended Texts

1. Chauhan, J. (2007). *Agricultural Extension Education Communication in Agriculture*. Bichpuri, Agra, India: RBS College.
2. Kalla, P.N. (2006). *Communication Skills for Extension Workers*. Udaipur, India: Agrotech Publishing Academy.
3. Muhammad, S. (2005). *Communication Skills & Leadership Development*. Faisalabad: Unitech Communications.

Suggested Readings

1. Shriberg, B., Kumari, R., & Shirberg. A. (2011). *Practicing Leadership: Principles and Applications;* (3rd ed.). New York: Willy & Sons.
2. Calvert, P. (2000). *The Communicator's Handbook: Tools, Techniques and Technology* (4th ed.). USA: Maupin House Publishing.

AEXT-6408 Communication Skills in Agricultural Extension 3(2+1)

The world has now embraced the largest revolution so far in the history of mankind called communication revolution. Everything has been tagged to communication. Communication provides the way to resolve mutual conflicts not only between two individuals, groups but also between the countries. Communication has lot more importance in the human growth and development. The main aim of this course is to develop effective communication skills among students. How to develop communication ethics and techniques with other stakeholders in the society is also important to learn. At the end of this course, students will be able to define the given concepts of communication, identify the types of communication, conduct interviews and will be able to demonstrate improved communication skills.

Contents

1. Concept, Purpose and scope of communication in Agricultural extension
2. Forms of communication in the past, present and future
3. Communication and the concept of global community
4. Communication as the problem-solving approach
5. Communication process, elements and their role in effective communication
6. Principles of communication
7. Basic communication models
8. Forms of communication: interpersonal, intrapersonal and impersonal; Written, verbal and non-verbal communication
9. Barriers to communication and measures to overcome these barriers

Practical

1. Students will be involved in developing and critically analysing different extension messages. Each student will have to design a project for class presentation
2. Students will have to practice different forms of communication in the class

Recommended Texts

1. Calvert, P. (2000). *The communicator's Handbook. Tools, Techniques and technology* (4th ed.). USA: Maupin House Publishing.
2. Muhammad, S. (2005). *Communication Skills & Leadership Development.* Faisalabad: Unitech Communications.

Suggested Readings

1. Murphy, H. A., Hildebrandt, H. P., & Thomas, J. P. (2000). *Effective business communication.* Islamabad: NBF.

-AEXT-6409 Agricultural Extension Methods 3(2+1)

Extension methods are the devices used to create the situations in which meaningful communication takes place between the instructor and the learners. The primary purpose of extension methods is to provide communication so that the learner may see, hear and do the things to be learnt. Another purpose is to provide stimulation that causes the desired mental and or physical action on the part of the learner. The focus of this course is to develop teaching skills in students. At the end of this course, students will be able to develop an appropriate extension teaching method, apply the given extension teaching method under given situation and apply teaching-learning process in filed according to the situation.

Contents

1. Teaching as process of facilitating learning
2. Developing an instructional plan for extension teaching
3. Classification and critical analysis of extension teachings methods: individual, group and mass
4. Planning, conducting and making follow up of various extension methods

Practical

1. Each student will develop an instructional plan for a given extension-teaching situation. The student(s) will be involved in micro teaching/field situation concerning agricultural extension work

Recommended Texts

1. Bashir, E. (2005). *Extension Methods.* Islamabad: National Book Foundation.
2. Swason, B.E. (2005). *Improving Agricultural Extension; A reference Manual*. Rome: FAO.

Suggested Readings

1. Saravanan, R. (2008). *Agricultural Extension-Worldwide Innovations*. India: New India publishing agency.
2. Anandajayasekeram, P. (2008). *Concepts and Practices in Agricultural Extension in Developing Countries: A source book*. Washington, D.C., USA: IFPRI.

AEXT-6410 Computer Application in Agricultural Extension 3(1+2)

Like in other disciplines, computer applications in agriculture have also increased and there is need to develop computer skills among future agriculturists and academicians. Computer also provides modern communication tools at mass level. It is important for students that besides enhancing their skills in core courses of agriculture, they must improve and learn advance uses of computer applications to be successful in educational and professional life ahead. Computer applications provide the base for learning advance applications of ICTs such as precision agricultural computer-based technologies at higher level of learning. At the completion of this course, the students will be able to use different software, develop computer literacy and demonstrate computer skills for research and farm management.

Contents

1. Importance of information and communication technologies in extension education
2. Developing computer files and data bases
3. Data communication and networks, Internet basics, E-commerce
4. MS office, MS Excel, MS Power Point.MS-Project, Internet Browsers, Use of software for farm management
5. Browsing of agricultural related websites
6. Use of search engines, e-mail systems, and knowledge portals
7. Use of social networking websites for agricultural information desegregations, ICTs and use of mobile technology in agriculture for technology transfer

Practical

1. Statistical calculations in MS Excel
2. Graphs in Excel. Introduction to SPSS
3. Entering, importing, and exporting data in SPSS
4. Statistical analysis and data presentation in SPSS
5. Introduction to Minitab
6. Entering, importing, and exporting data in Minitab
7. Statistical analysis and data presentation in Minitab

Recommended Text

1. Norton, P. (2006). *Introduction to computers* (6th ed.). New York: McGraw Hills.
2. Sarawan, R. (2010). *ICTs for Agricultural Extension: Global Experiments, Innovations and Experiences.* India: New India publishing.
3. Singh, D. (2012). *Agriculture Extension and Rural Development*. New Delhi: Discovery Publishing House.

Suggested Readings

1. Prasad, K. (2009). *Communication for development: Reinventing theory and action*. Delhi: B.R. Publications.
2. Tomas, M., & Karel, C. (Eds.). (2012). *ICT for Agriculture, Rural development and Environment*. Litovel: Czech Centre for Science and Society; Wireless info.

AEXT-6411 Psychology of Adult Learning 3(3+0)

Adult education psychology is the systematic side of the development of the individual within educational settings. It helps the volunteer to foster harmonious development of the learners into a responsible and a participating citizen, a sensitive and a reflective human being and a productive and creative person. The purpose of this course is to apply psychological techniques for adult learning at farm level during outreach extension activities. Before using any teaching method in extension education, to study the psychic of the specific group of farmers is important. At the completion of this course, students will be able to describe the Psychology and discuss its applications in agricultural extension, differentiate between active and passive learners, demonstrate the working knowledge of theories of learning and evaluate the learners' achievements, teaching styles of the educator and learning styles of learners.

Content

1. Definition of psychology and relate concepts
2. Application of educational psychology in Agricultural Extension Education
3. Domains of Learning: cognitive, psychomotor and effective
4. Levels of learning
5. Teaching styles of the educator and learning styles of the leaner
6. Comparative analysis of active learners with passive learners
7. Farmers as adult learners; implications of physical, mental, emotional and social aspects for learning; personality types and their effect on learning and human relationship
8. Information processing models. Sensory input
9. Pattern recognition and various theories of pattern recognition
10. Theories of attention and motivation
11. Problems of adjustment and understanding human behavior according to the changed conditions
12. Problem-solving and decision-making strategies. Evaluation of learners' achievements

Recommended Texts

1. Jarvis, P. (2004). *Adult Education and Lifelong Learning: Theory and Practice*. New York: Routledge Falmer.
2. Tennant, M. (2005). *Psychology and Adult Learning*. New York: Routledge Publishers.

Suggested Readings

1. Elias, J. & Merriam, S. B. (2005). *Philosophical Foundations of Adult Education* (3rd ed.). Malabar: Krieger.
2. Knowles, M. S., & Elwood F. H. (2011). *The Adult Learner, The definitive classic in adult education and human resource development* (7th ed.). Burlington: Elsevier.

AEXT-6412 Human Resources Development 3(2+1)

Development of human resources is essential for any organization that would like to be dynamic and growth oriented. Unlike other resources, human resources have rather unlimited potential capabilities. The potential can be used only by creating a climate that can continuously identify, bring to surface, nurture and use the capabilities of people. Human Resources Development (HRD) system aims at creating such a climate. Several HRD techniques have been developed in recent years to perform the above task based on certain principles. This course provides an understanding of the concept of HRD system, related mechanisms and the changing boundaries of HRD. At the end of this course, students will be able to learn the jobs demands and requirements, skills, management styles, skills to resolve group conflicts and to develop human resources for the success of any organization, right individual for the right job, exploration of the maximum potential of an individual to perform the job.

Contents

1. Concept of Human Resources Development
2. Job design and analysis; personnel recruitment, selection; training and development, compensation and performance evaluation
3. Exploring the maximum potential of an individual
4. Administration, management, leadership, supervision, authority, role, staffing, communication, conflict, control, motivation, negotiation, delegation, consultation and participation
5. Management theories
6. Organizational behavior analysis, Dimensions of human behavior, Behavior style patterns
7. Process of behavior modification
8. Group Behavior: group meetings, group conflict and management.
9. Strategic management
10. Effective leadership styles

Practical

1. The students will be required to analyze their own management style using various techniques and participatory approaches
2. The students will also be required to develop strategies to improve their management styles

Recommended Texts

1. Hellrigel, D. (2004). *Organization Behavior* (10th ed.). USA: Thomson
2. Michael A. (2006). *A Handbook of Human Resource Management Practice*. USA: Kogan Page Publishers.
3. Noe, R., Hollenbeck, J., Gerhart, B., & Wright, P. (2008). *Fundamentals of Human Resource Management*. New York: McGraw-Hill.

Suggested Readings

1. Knowles, M. S., & Elwood, F. H. (2011). *The Adult Learner, The definitive classic in adult education and human resource development* (7th ed.). Burlington: Elsevier.
2. Michael A., Stephen, T. (2014). *Armstrong's Handbook of Human Resource Management Practice* (13th ed.). Burlington: Elsevier.

AEXT-6413 Gender Studies in Agricultural Extension 3(3+0)

Gender Studies in Agricultural Extension focus on role of women, they have played in agriculture, food production and food resiliency throughout human history. This course will examine this history and current global scope of women's involvement from interdisciplinary lenses, including social sciences, women's studies and agricultural sciences. At the completion of this course, the students will be able to know more about the men and women contribution in agricultural development, health, education etc., understand the status of women and men in relation to income generation and welfare of rural society. Concepts of Gerontology and its role/application in agricultural extension and rural development is another area to study the demographic structure of gender-based distribution of the population with respect to age and time periods in the history.

Contents

1. Women role in the development of agriculture
2. Issues related to women's health and education
3. Gender discrimination in Agricultural Extension and Rural Development with special reference to Pakistan
4. Rural economics and small businesses for rural women
5. Gerontology in relation to Agricultural Extension and Rural Development
6. Gender Mainstreaming in Agricultural Extension
7. Gender Mainstreaming tools and techniques
8. Status of women and men in connection of income generation for home and for the welfare of rural society

Recommended Texts

1. Catherine L.M. H. (2003). *Gender-Disaggregated Data for Agriculture and Rural Development Socio-Economic and Gender Analysis Program*. Rome: SEAGA, FAO.
2. IFAD (2009). *Gender in Agriculture: A Source book.* Washington, D.C., USA: IFAD, FAO, The World Bank.
3. Lerber, J. (2000). *Paradoxes of Gender*. USA: Yale University Press.

Suggested Readings

1. Pearson, R. (2000). *Rethinking Gender Matters in Development in Poverty and Development into the 21st Century*. Oxford: Oxford University Press.
2. *Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and Other Stakeholders* (2001). UK: Commonwealth Secretariat.

AEXT-6414 Interviewing Skills 3(2+1)

Interviewing is a commonly used method of information gathering and knowledge transfer. Interviewing is a skill that can be learned, which is what this course is all about. For agro-ecology, interviewing is a skill that can allow us entry into a farmer's routine, their culture, practices, and land ethics. However, the art of asking questions, transcends this course and will be helpful beyond your lives as students as probing for information and searching for knowledge are aspects of our daily lives. Skills developed in this course will aid future research, job, and personal relations allowing insight into fellow human beings, enabling clarity in verbal expression. The purpose of this course is to prepare students to conduct interviews, media talks, news reporting, and developing public relations. The course will develop interviewing skills among students. After the completion of this course, students will be able to develop, and conduct interview protocols being used in the field of agricultural extension and development studies.

Contents

1. Interviewing
2. Dyadic communication: its uses in Agricultural Extension Education
3. Informal face to face communication and its application in Agricultural Extension
4. The interviewing processes
5. Structure of interview
6. Types of questions and their uses
7. Planning, conducting and interpreting interviews: briefing, probing, selection, performance appraisal and discipline, counseling, persuasive, press conference and broadcast interviews
8. Principles and techniques of conducting interviews
9. The interview guide and the interview schedule
10. Types of questions to be asked in interviews
11. Criteria for phrasing questions and sequence

Practical

1. Students will plan and conduct interviews in the class in a simulated situation; interviews will be recorded and discussed in the class

Recommended Texts

1. Joseph, A, D. (2012). *The interpersonal communication*. New Jersey: Pearson publishers.
2. Wilmot, W. W. (2009). *Dyadic communication.* New York: Addison Wesley Publishing Co.

Suggested Readings

1. Broadwell, M.M. (1990). *Interviewing skills. The New Supervisor* (4th ed.). New York: Addison Wesley Publishing Co.
2. McDowell, E.E. (1991). *Interviewing Practices for Technical Writers*. New York: Baywood Publishing Company.
3. Perkins, P. S. (2008). *The Art and Science of Communication: Tools for Effective Communication in the Workplace.* USA: Wiley Publishers.

AEXT-6415 Agricultural Technology Transfer 3(2+1)

Dissemination of advanced technology among end-users for sustainable agricultural development is the core issue for Extension field staff. This course will prepare students to analyze the desired technologies required for agricultural development based on the needs of the end users. The technology will be disseminated as per the needs of the famers and growers. Before dissemination each step must be critically reviewed and discussed with clients. If required, the advanced technology may be converted to local mode for better adoption among farmers. At the end of this course, the students will be able to describe the scope and importance of technology transfer, criticize technology transfer process, identify barriers to technology transfer and analyze issues in technology transfer.

Contents

1. Definition and importance of technology transfer
2. Characteristics of promising agricultural technology
3. Barriers to technology transfer
4. Technology and food security
5. Business considerations of farm enterprise and its technological aspects
6. Farm safety measures
7. Preparing feasibility reports of alternative farm enterprises
8. Recent technological developments in agriculture
9. Characteristics of technology generation, transfer and utilization sub-systems in Pakistan with special reference to agricultural development
10. WTO and its implications for Pakistan's agriculture. Corporate farming and its issues

Practical

1. Students will be required to demonstrate/present promising technologies in the class

Recommended Texts

1. Janis, T. F. (2003). *Technology transfer emerging issues, High impact trends.* Berlin: Kluwer Academic Publishers.
2. OECD/FAO (2016). *OECD-FAO Agricultural Outlook 2016-2025*. Paris: OECD Publishing. http://dx.doi.org/10.1787/agr_outlook-2016-en

Suggested Readings

1. Rogers, E.M. (1995). *Diffusion of Innovations.* New York: The Free press.

AEXT-6416 Agricultural Journalism 3(2+1)

Agricultural journalism is a specialized branch of journalism which deals with the techniques of receiving, writing, editing and reporting from information through the media like newspapers, periodicals, radio, TV, advertising etc. and the management processes connected with such production and other areas of agriculture. The purpose of this course is to give insight of journalism in agriculture. In the present era of communication, reporting or providing accurate information is a huge challenge for journalist. All decisions at government level are based on provision of accurate information. Therefore, agricultural journalism has critical role in sustainable agricultural development in near future. This course has been designed to prepare students for jobs in print and electronic media industry. At the end of this course, students will be able to understand the concepts of agricultural journalism to develop news, news stories, and articles related to agriculture and criticize various news stories and articles.

Contents

1. Journalism: definition, types, importance, and history
2. Development Journalism: concept, scope, significance, roles, and functions
3. Application of Agricultural Journalism in Agricultural Extension Education
4. Fundamental elements of print and broadcast Journalism
5. Preparation and reporting news for print media
6. News editing and its significance. Column writing
7. Laws and codes of ethics for the agricultural professional journalists involved in publishing
8. Review of some important world newspapers publishing agricultural news stories, articles, and related information
9. Introduction to e-journalism
10. Exposure to important agricultural news channels, websites, radio, and TV

Practical

1. The student(s) will prepare and report agricultural information in the form of news, news stories, news articles, and/or documentaries

Recommended Texts

1. Harcup, T. (2009). *Journalism: Principles and practices*. California: SAGE Publishers.
2. Muhan, S. (2010). *Handbook of farm journalism.* California: SAGE Publishers.
3. Vivian, J. (2000). *Media of mass Communication* (5th ed.). London: Allyn and Bacon.

Suggested Readings

1. Rathakrishnan, T., Israel T. M., & Nirmala, L. (2010). *Communication techniques in farm extension.* California: SAGE Publishers.

AEXT-6417 Preparation of Research Project and Scientific Writing 3(2+1)

The research process allows you to gain expertise on a topic of your choice, and the writing process helps you remember what you have learned and understand it on a deeper level. Knowing how to write a good research proposal, paper, thesis or dissertation is a valuable skill that will serve you well throughout your career. Whether developing a new product, studying the best way to perform a procedure, or learning about challenges and opportunities in the field of employment, one will use research techniques to guide his or her exploration. The students may even need to create a written report of the research findings. Since effective communication is essential to any company, employers seek to hire people who can write clearly and professionally. The purpose of this course is to develop technical writing ethics and skills in students in the field of agriculture. Students will learn different writing styles and they will prepare research synopsis, research proposals and thesis in given writing style. At the completion of this course, students will be able to develop research project, write and develop scientific articles, papers & reports and cite and quote references in proper writing style.

Contents

1. Concepts of Research, reviewing of related literature, conducting literature searches
2. Selecting a research problem, identification and classification of variables
3. Developing research hypothesis
4. Use of Scientific Quotations, Illustrations, Statistics and Abbreviations
5. Different writing styles
6. Use of APA writing style
7. Quantitative and qualitative data collection, Use of SPSS software for data analysis
8. Writing research report
9. Conducting qualitative research and citing references
10. Project formulation process, Project cost & financing, Preparing PC-I
11. Scientific Report writing, parts of a scientific manuscript
12. Editing and proofreading of manuscripts

Practical

1. Each student will develop a research project and will prepare research proposal or synopsis for the same. He/ She will be required to write a scientific article on a given topic related to agricultural extension

Recommended Texts

1. Awan, J. A. (2003). *Scientific Presentations: Thesis, Synopsis, Seminar*. Faisalabad: Unitech Communications.
2. APA (2006). *Publication Manual of the American Psychological Association* (6th ed.). Washington, DC: American Psychological Association.
3. UNE (1999). *Style Guide.* NSW, Australia: The Teaching and Learning Center.

Suggested Readings

1. Forsyth. A. (2010). *A Guide for students preparing written thesis, research papers, or planning projects: working with a forsyth* (3rd ed.). California: SAGE Publications.
2. Booth, W., Gregory G. C., & Joseph M. W. (2008). *The craft of research* (3rd ed.). Chicago: University of Chicago Press.

AEXT-6418 Poverty Alleviation and Sustainable Development 3(3+0)

Poverty and un-sustainability are linked. The only feasible way out of current crisis is to integrate resources. The linkage among environment/agriculture, poverty and social capital are complex and, in many cases, poorly understood. The developing countries have been criticized for their inability to reduce poverty and contribute to sustainable agricultural development. There is a need for improving of social capital to integrate environment and people to alleviate poverty and receive to sustainable development. At the completion of this course, the students will be able to describe the basic concepts of poverty alleviation and sustainable development. Analyze the role of agricultural extension in poverty alleviation and evaluate the development efforts.

Contents

1. Definition of poverty its indicators and reasons
2. Technology, natural resources, income generating activities and rural poverty reduction
3. Employment, wages & the rural poor
4. Rural employment: pattern & trends, rural public works, Skills formation
5. Market prices & access to inputs, services and credit
6. Agricultural policy reforms
7. Capacity development of farm families to promote socio-economic conditions in agricultural development
8. Development of under privileged areas
9. Reducing poverty by enhancing the role of indigenous knowledge and technology
10. Enhancing pace of poverty reduction in farm families
11. Sustainable agriculture & rural development
12. Innovative approaches: Grameen Bank, Akhuwat Foundation etc. Factors affecting poverty alleviation in Pakistan

Recommended Texts

1. Ashok, K. (2010). *Extension Strategies for Agriculture and Rural Development*. India: Daya Publishing House.
2. Ison, R., & David, R. (2000). *Agricultural Extension and Rural Development: Breaking Out of Knowledge*. UK: Cambridge University Press.
3. Singh, R. S. (2005). *Poverty Alleviation in the Third World*. New Delhi, India: APH Publishing Corporation.

Suggested Readings

1. Sahibzada, M. (1999). *Poverty Alleviation in Pakistan: Present Scenario and Future Strategy*. Islamabad: Institute of Policy Studies.
2. Shepherd, A. (1998). *Sustainable Rural Development*. USA: McMillan Press.

AGEC-6523 Agribusiness, Marketing and Trade 3(3+0)

Students will be involved in learning activities that generally prepare them to apply the economic and business principles involved in the organization, operation, and management of the farm, ranch or agribusiness. Typical instructional activities include hands-on experiences with applying modern economic and business principles involved in the organization, operation, and management of agricultural businesses including the production and marketing of agricultural products and services and knowhow of new trends in international trade of agricultural commodities. After completing the course, students will be well equipped with the basic concepts of Agribusiness and Trade. Students should read content and complete course assignments prior to deadlines. Students are expected to actively participate in discussions and submit exercises in-time. Students are also expected to complete exams on the date and time allotted. It is their responsibility to be familiar with and understand all previously covered material prior to each new chapter.

Contents

1. Definition, concepts, Important features and scope of Agribusiness Management
2. Elements and Functions of management
3. Forms of business organizations
4. Agribusiness financial management
5. Agricultural Marketing; Marketing channels, functionaries and margins
6. Role of agri. marketing in economic development
7. Agricultural marketing problems
8. The changing world and interdependence
9. Basis of trade; gains from trade
10. Concept of absolute and comparative advantage; pattern of trade
11. Brief introduction of major trade agreements

Recommended Texts

1. Kohls, R.L., UhI, J.N., & Hurt, C. (2007). *Marketing of Agricultural Products* (10th ed.). New Jersey: Prentice Hall.
2. Salvatore, D. (2007). *International economics*. (9th ed.). New Jersey: Wiley Publisher.

Suggested Readings

1. Downey, W.D., & Erickson, S. P. (2002). *Agribusiness Management*. Singapore: McGraw Hill Education.
2. Hoekman, B. M., Mattoo, A., & English, P. (2002). *Development, Trade and the WTO-A Handbook*. Washington, DC: The World Bank.

AEXT-6419 Research Methods in Agricultural Extension 3(2+1)

Research is the second pillar of the golden triangle of success. The other two are education and extension. Research has a middle position and provides a linkage between education and extension. The golden triangle of success will not be considered as equilateral unless all three pillars are fulfilled. The purpose of this course is to introduce research concepts. Promotion of research culture in the country and strengthening present research activities are the needs of the hour. Only high standard research will provide answers to the problems of decreasing agricultural production and yield. The students will learn new and improved techniques of research through different environments. At the completion of this course, the students will be able to describe the concepts and types of research, ethics of doing research, research designs uses in extension education research, survey research designs, develop a research instrument, develop plan of work for conducting research, and apply research skills in real scenario to solve the problems of the farmers at grass root level.

Contents

1. Concepts of research, research ethics
2. Purposes of research
3. Types/kinds of research
4. Research process and its steps
5. Concepts of Qualitative and Quantitative research with reference to Agricultural Extension
6. Conducting qualitative research
7. Research designs used in social science research
8. Concept of sampling and sampling process
9. Developing a research synopsis
10. Research instruments (Questionnaire, interview schedule, interview guide etc.)
11. Data collection, analysis through SPSS and writing a research report
12. Different writing styles

Practical

1. Each student will develop a questionnaire/interview schedule/interview guide for data collection. The student(s) will collect data on limited scale, analyze and submit the research report

Recommended Text

1. Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices*, (2nd ed.). USA: University of South Florida.
2. McMillan, J. H. (2010). *Educational Research: Fundamentals for the Consumer* (5th ed.). USA: Harper Collins College Publishers.
3. O' Leary, Z. (2005). *Essential Guide to do Research*. New Delhi: SAGE Publishers.

Suggested Readings

1. Brennin, B. (2013). *Qualitative Research Methods for Media Studies* (1st ed.). UK: Simultaneous Publications.
2. Keith, F. P. (2009). *Introduction to Research Method in Education.* London: SAGE publishers.
3. Kumar, G.A.K., Mohanty, A.K., & Prasad, A.M. (2013). *Research Methods in Agricultural Extension.* Andhra Pradesh: National Institute of Agricultural Extension Management.

AEXT-6420 Program Evaluation in Agricultural Extension 3(2+1)

The main purpose of this course is to study the concepts of evaluation in agricultural extension programs. Evaluation is considered as standard of performance in any organization. There is always a room to evaluate the performance of any program or organization to validate that the program going well as it was planned initially and the goals, objectives, mission and vision of the program or organization have been accomplished. If the designed goals and objectives of the program are not achieved; then the program need to be reviewed and evaluation will tell the stakeholders whether the program will continue or may be shutdown. At the completion of this course, the students will be able to define basic concepts of evaluation, identify the types and forms of evaluation, analyze various evaluation techniques and develop plan of evaluation for a program or organization.

Contents

1. Concept, purposes, uses, and philosophy behind program evaluation
2. Evaluation process and its steps
3. Importance of evaluation
4. Types of evaluation
5. Qualitative v/s Quantitative evaluation
6. Developing a plan for evaluation
7. Evaluation techniques
8. Reporting evaluation results

Practical

1. The student(s) is required to submit an evaluation plan of any social/development program. The plan will then be presented before the class for critical analysis

Recommended Texts

1. Wholey, J. S., Harty, H. P., & Newcomer, K. E. (2004). *Handbook of Practical Program Evaluation.* USA: Jossey-Bass Publishers.
2. Worthen, B. R., Sanders, J. R., & Fitzpatrik, J. L. (2003). *Program Evaluation: Alternative approaches and practical guidelines* (3rd ed.). USA: Allyn & Bacon.

Suggested Readings

1. David, R., Bruce, T., & Deborah, P. (2013). *Program Evaluation: An introduction* (5th ed.). USA: Wads Worth publishers.
2. Mertens, D. M. & Wilson, T. (2012). *Program Evaluation Theory and Practice*. New York: Guilford Publications.

AEXT-6421 Food Security through Precision Agricultural Technology 3(+0)

Future of agricultural development and food security in the country depends on the adoption and diffusion of advanced and improved technologies like precision agriculture. The technologies must be environmentally friendly for the applications in local conditions. This course has been designed so that students will be able to understand the concepts of food security, demonstrate the role of agricultural extension in minimizing food insecurity through unavoidable role of precision agricultural technologies to ensure food security in Pakistan.

Contents

1. Food security: definition, concept, importance, issues and pillars
2. Global food system
3. Managing global environmental changes
4. Climate change and sustainable food security
5. Agricultural technologies in the realm of food security and natural resource scarcity
6. Rural poverty in relation to food insecurity
7. Sustainable agriculture and food security
8. Strategies for food security
9. Managing household food security
10. Food safety issues and security measures
11. Concepts of Precision Agricultural Technologies
12. Emerging role of Precision Agricultural Technologies in ensuring food security in Pakistan
13. Food security and safety situation in Pakistan
14. Role of agricultural extension in the dissemination of advanced technologies pertaining to food security and safety
15. Strategies for reforming agricultural extension for managing food insecurity issues
16. Training needs of extension agents for addressing rural poverty and food insecurity

Recommended Texts

1. Behnassi, M., Draggan, S., & Yaya, S. (2011). *Global Food Insecurity: Rethinking Agricultural and Rural Development: Paradigm and Policy.* UK: Springer Science Publishers.
2. Christoplos, I. (2010). *Mobilizing the Potential of Rural and Agricultural Extension*. Rome: FAO.

Suggested Readings

1. Ponniah, A., Puskur, R., Workneh, S., & Hoekstra, D. (2008). *Concepts and Practices in Agricultural Extension in Developing Countries: A Source Book.* Washington, D.C., USA: IFPRI (International Food Policy Research Institute).
2. Rivera, W. M. & Qamar, M. K. (2003). *Agricultural Extension, Rural Development and the food Security Challenge*. Rome: FAO.
3. Shetty, P. K., Ayyappan, S., & Swaminathan, M. S. (2013). *Climate Change and Sustainable Food Security.* Banglore: National Institute of Advanced Studies.

AEXT-6422 Research Project/Internship 4(0+4)

The students will be attached singly or in groups with the field staff of the Department of Agricultural (Extension), Nation Building Departments (NBDs), Non-Governmental Organizations (NGOs), etc. in addition, the students will pay study visits to various agricultural research stations and extension projects in the province/country with special reference to the following:

1. Field crop production and protection
2. Livestock and poultry management, Seed farms etc.
3. Fruits and vegetable production, preservation, processing (packages industry, cold storage, etc.) and protection
4. Manures/chemical fertilizers
5. Water management/irrigation department
6. Maintenance of official records
7. Agriculture credit, business and marketing cooperatives
8. Rural Support Programs/NGO's etc.

Project/Internship Report

Every student will write a comprehensive report based on his/her field experiences, according to the following guidelines and present individually in the class:

1. Introduction
2. Objectives of apprenticeship training program
3. Daily activity report
4. Extension activities undertaken during training
5. Future for extension work in the area
6. Problems faced by field staff (host institutes/department), farmers and internee
7. Relationship of Agricultural Extension service with other nation building departments, agencies and stakeholders
8. Suggestions for improvement of internship program
9. Suggestions for the improvement of Agricultural Extension service

Recommended Texts

1. FAO (2010). *Manuals of Agriculture (Extension Services*). Washington, DC: USAID.
2. Swanson, B. E. (1997). *Improving agricultural extension methods: a reference Manual*. Rome: FAO.

Suggested Readings

1. Keith, H., John, P., & John, S. (2002). *The Management of Student to Research Project*. (3rd ed.). Burlington. USA: One Grower publishing.
2. Mike, L. (2012). *A Beginner's Guide for doing your Education Research Project*. Washington, DC: SAGE Publications.
3. Mickhel, B. (2000). *Integrating Quantitative and Qualitative Research in Development Project*. Washington, DC: SAGE Publications.

MSc
(Hons)
AGRICULTURAL EXTENSION

AEXT-7101 Agricultural Extension Methods 3(2+1)

Extension methods are the devices used to create the situations in which meaningful communication takes place between the instructor and the learners. The primary purpose of extension methods is to provide communication so that the learner may see, hear and do the things to be learnt. Another purpose is to provide stimulation that causes the desired mental and or physical action on the part of the learner. The purpose of this course is to study, analyze and criticize and develop various extension teaching methods for adult learners in the field. At the completion of this course, the students will be able to identify specific extension-teaching method for specific group of respondents, SWOT analysis of extension teaching methodologies and programs, analyze the strengths and weakness of various extension-teaching methods to practice teaching methods in the field, and to identify ways of coordinating with local institutions in delivery of extension teaching programs.

Contents

1. Extension teaching methods
2. The merits and demerits of teaching methods
3. Applications of teaching methods as per needs of the clients
4. Teaching and learning styles of the stakeholders
5. Effects of various extension teaching methods
6. Different stages of adoption and diffusion process for farm and home practices
7. Demonstration method
8. Personal versus impersonal extension teaching methods
9. Significance of personal & impersonal extension methods
10. Critical analysis of alternative extension methods
11. Use of ICTs and advanced instructional technologies in agricultural extension methods

Practical

1 Students will plan any extension method
2 Analyze the situation for extension method
3 Apply given extension teaching method(s) in the simulated/real situation

Recommended Texts

1. Dubey, V.K. (2008). *Extension education and communication.* New Delhi: New Age Publishers.
2. Jalihal, K.A., & Veerabhadraiah, V. (2007). *Fundamentals of Extension Education and Management in Extension.* India: Concept Publisher.
3. Ray, G.L. (2006). *Extension Communication and Management*. New Delhi: Kalyani Publishers.

Suggested Readings

1. Bashir, E. (1997). *Extension Methods* (2nd ed.). Islamabad: National Book Foundation.
2. Mathialagan P. (2005). *Animal Husbandry and Livestock Extension*. Lucknow: International Book.

AEXT-7102 **Program Planning** **3(2+1)**

A successful program plan begins with a strong logic model that connects program goals to expected outcomes. Also, including stakeholders in the process—both local organizations and community leaders interested in the goals of the program—is a key to develop buy-in at the beginning of program development. This course has been designed so that students will be able to learn the concepts of program development, program planning, why planning is important for professionals and difference between planned and unplanned activities. The course also describes why all stakeholders need to participate in the planning process. At the completion of this course, the students will be able to analyze and synthesize the concepts, scope and role of program planning, analyze the role of change agents in program planning, differentiate between the long term and short term program planning and to describe various program planning models in used in agricultural extension.

Contents

1. Planning for social change
2. Planned versus un-planned change
3. Democratic versus autocratic program planning
4. Planning Extension Education Programs
5. Steps in program planning
6. Need assessment and its approaches
7. Involving grass-roots in the planning process
8. Role of change agents (Extension workers) in program planning
9. Identifying the gaps between planning theories and practices
10. Long-term, short-term, tactical, and strategic planning
11. Program planning models: review, analysis, and application

Practical

1. The students will plan and develop any program
2. Students will evaluate an agricultural extension education program for a typical Pakistani village/farming community and will make presentation

Recommended Texts

1. Caffarella, R.S., Daffron, S.R., & Cervero, R.M. (2013). *Planning of Programs for adult learners* (3rd ed.). New Jersey: Wiley Publishers.
2. Ray, G.L. (2006). *Extension Communication and Management.* New Delhi: Kalyani Publishers.

Suggested Readings

1. Jalihal, K.A. & Veerabhadraiah, V. (2007). *Fundamentals of Extension Education and Management*. India: Concept Publisher.
2. Timmreck, T.C. (2003). *Planning, Program Development, and Evaluation: A Handbook for Health Promotion, Aging, and Health Services.* UK: Jones & Bartlett Learning Publishers.

AEXT-7103 Human Resource Development 3(2+1)

Development of human resources is essential for any organization that would like to be dynamic and growth oriented. Unlike other resources, human resources have rather unlimited potential capabilities. The potential can be used only by creating a climate that can continuously identify, bring to surface, nurture and use the capabilities of people. Human Resources Development (HRD) system aims at creating such a climate. Several HRD techniques have been developed in recent years to perform the above task based on certain principles. Trained, organized and develop human resources is the basic need for the success of any organization at present time of competition across the world. Every organization seeks the services of highly qualified professionals. The purpose of this course is to emphasize on human growth and development for sustainable agricultural development. At the completion of this course, the students will be able to discuss concept and role of human resource development, organize training programs, manage training sessions evaluate training activities for development of human resources in agricultural extension system.

Contents

1. Concept of Human Resource Development (HRD)
2. Purpose of training, Types of training i.e. pre-service, in-service, and follow-up
3. Determining training needs
4. Organizing, supervising and managing training programs
5. Human relations training; identifying requirements
6. Training of Trainers
7. Selecting, planning, and implementing training programs
8. Duties and responsibilities of trainers
9. Evaluating the training programs, Performance appraisal
10. Job satisfaction
11. Career planning
12. Conflict management and resolution

Practical

1. Students will plan and conduct a training program for given situation

Recommended Texts

1. Keith D. (2004). *Human Behaviour.* (8th ed.). New York: McGraw Hill Publishers.
2. Swanson, R. A., & Holton, E. F. (2009). *Foundations of Human Resource Development* (2nd ed.). UK: Berrett-Koehler Publishers.
3. Werner, J. M., & DeSimone, R. L. (2008). *Human Resource Development* (5th ed.). USA: South-Western College Publications.

Suggested Readings

1. McGoldrick, J., Stewart, J., & Watson, S. (2002). *Understanding Human Resource Development: A Research-Based Approach.* USA: Routledge Publishers.

2. Wilson, J. P. (2005). *Human Resource development: Learning and Training for Individuals and Organizations.* London: Kogan Page Publishers.

AEXT-7104 Monitoring and Evaluation in Agricultural Extension 3(2+1)

The main purpose of this course is to study the concepts of evaluation in agricultural extension programs. Evaluation is considered as a standard of performance in any organization. There is always a room to evaluate the performance of any program or organization to validate that the program is going well as it was planned initially and the goals, objectives, mission and vision of the program or organization have been accomplished. If the designed goals and objectives of the program are not achieved; then the program need to be reviewed and evaluation will tell the stakeholders whether the program will continue or may be shutdown. The focus of this course is to highlight the evaluation practices in the world. On the completion of this course, the students will be able to synthesize and criticize the concepts, scope and role of monitoring and evaluation.

Contents

1. Basic principles and role of monitoring and evaluation
2. Evaluation standards
3. Concept, objectives, and types of monitoring and evaluation (formative and summative) Difference between outcome monitoring and outcome evaluation
4. Evaluation principles and frameworks
5. Evaluation process
6. Case studies & steps in conducting case studies
7. Multisite evaluation, its advantages and disadvantages
8. Participatory Monitoring and Evaluation
9. Determining the type and the sources of data to be collected for an evaluation study
10. Data collection methods
11. Designing instruments (evaluation questions), interview techniques
12. Testing reliability and validity of the instruments
13. Practical problems in data collection
14. Data analysis and interpretation
15. Writing monitoring and evaluation report
16. Utilization of evaluation results

Practical

1. The students will be required to review critically monitoring and evaluation reports
2. They have to identify strengths and weaknesses of the report(s)
3. Each student will select an extension program/project/activity for evaluation
4. The student(s) will plan and conduct evaluation
5. The student (s) will submit the report to the concerned teacher

Recommended Texts

1. Gudda, P. (2011). *A guide to project monitoring and evaluation;* Indiana: Author House Publishers.
2. Wholey, J.S., Hatry, H. P., & Newcomer, K.E. (2010). *Handbook of Practical Program Evaluation.* USA: Jossey-Bass Publishers.

Suggested Readings

1. Wholey, J. S., Harty, H. P., & Newcomer, K. E. (2004) *Handbook of Practical Program Evaluation.* USA: Jossey-Bass Publishers.

2. Worthen, B. R., Sanders, J. R., & Fitzpatrik, J. L. (2003). *Program Evaluation: Alternative approaches and practical guidelines* (3rd ed.). USA: Allyn & Bacon.

AEXT-7105 Communication Strategies in Agricultural Extension 3(2+1)

The world has embraced the largest revolution so far in the history of mankind called communication revolution. Everything has been tagged to communication. Communication provides the way to resolve mutual conflicts not only between two individuals, groups but also between the countries. Communication has lot more importance in the human growth and development. The main purpose of this course is review, synthesize the communication models and develop your own communication model based on your learning. At the end of this course, the students will be able to identify and critically analyze the communication process and models, analyze the components of an effective message, design and apply various communication methods and identify various barriers in communication process.

Contents

1. Defining communication process
2. Models of Communication
3. Variables in communication process
4. Source variables, receiver variables such as demographic analysis
5. Personality analysis, and interpersonal trust
6. Listening ability and feed-back and verbal message variables
7. The components of a persuasive message
8. Factors affecting persuasive message, structuring a persuasive message
9. Non-verbal message variables and difficulties in their understanding
10. Non-verbal communication
11. Characteristics and types of non-verbal communication
12. Functions of non-verbal communication as a global approach
13. Obstacles to effective communication
14. Horizontal and vertical communication
15. The structures of communication process
16. Face to face communication and small group communication
17. Public address communication and mass communication
18. Managing interpersonal conflicts
19. The ethics and politics of communication for innovations

Practical

1. Visits to various media centres
2. Holding discussions with media personnel
3. Participation of students in various communication situations
4. Presenting the results before the class

Recommended Texts

1. Chauhan, J. (2012). *Communication and Extension Management*. Kanpur, India: Anjali Prakashan.
2. DeFleur, M.L., Kearney, P., & Plax, T.G. (2013). *Fundamentals of Human Communication: Social Science and Every Day Life.* USA: McGraw-Hill Publishers.
3. Adler, B.A., & Proctor, R. F. (2008). *Communication: Goals and Approaches.* India: Wadsworth Cengage Learning Publishers.

Suggested Readings

1. Leeuwis, C., & Van den Ban, A. (2004). *Communication for rural innovation: Rethinking Agricultural Extension* (3rd ed.). USA: Wiley-Blackwell Publishers.

AEXT-7106 Advances in Research Methods 3(2+1)

Research is the second pillar of the golden triangle of success. The other two are education and extension. Research has a middle position and provides a linkage between education and extension. The golden triangle of success will not be considered as equilateral unless all three pillars are fulfilled. The purpose of this course is to introduce research concepts. Promotion of research culture and strengthening of research activities are the needs of the hour. Only high standard research will provide answers to the problems of declining agricultural production and yield. The students will learn new and improved techniques of research through different environments. At the completion of this course, the students will be able to identify research problem, analyze, synthesize and interpret research data, critically review the various methods of qualitative and quantitative research and apply different research designs to answer the questions to solve the problems of the stakeholders.

Contents

1. Selecting and defining a research problem
2. Conducting review of literature and computer search
3. Various types of research, Action research, how to state research problem
4. Introduction to research designs
5. Defining population and selecting samples
6. Choosing alternative methods for data collection
7. Determining reliability and validity of the research instrument
8. Selecting and applying appropriate statistical techniques for data analysis
9. Planning, developing and critically analysing research proposals
10. Ethical principles and constraints for planning, conducting and reporting research in Agricultural Extension
11. Qualitative research design, Sampling techniques
12. Methods of qualitative research
13. Taking field notes for observations and interviews
14. Strategies for analyzing interpreting synthesizing and reporting data, Data analysis on SPSS

Practical

1. The students will be engaged to prepare and present their brief research proposals and plan and conduct pilot studies

Recommended Texts

1. Bhattacherjee, A. (2012). *Social Science Research: Principles, Methods, and Practices,* (2nd ed.). USA: University of South Florida.
2. Creswell, J. W. (2007). *Study Guide for Educational Research: Planning, Conducting and evaluating Qualitative and Quantitative Research*. New Jersey, USA: Prentice Hall.
3. Gall, M.D., & Borg, W. R. (2006). *Educational Research: An Introduction* (8th ed.). New York: Longman.

Suggested Readings

1. Best, J.W., & Kahn, V. J. (2009). *Research in Education* (20th ed.). New Delhi: PHI Learning.
2. Kumar, G.A.K., Mohanty, A.K., & Prasad, A.M. (2013). *Research Methods in Agricultural Extension*. Hyderabad: National Institute of Agricultural Extension Management.
3. Field, A. (2009). *Discovering Statistics Using SPSS* (3rd ed.). USA: SAGE publications LTD.

AEXT-7107 Scientific and Technical Writing 3(2+1)

The research process allows you to gain expertise on a topic of your choice, and the writing process helps you remember what you have learned and understand it on a deeper level. Knowing how to write a good research proposal, paper, thesis or dissertation is a valuable skill that will serve the students well throughout their career. Whether developing a new product, studying the best way to perform a procedure, or learning about challenges and opportunities in the field of employment, one will use research techniques to guide his or her exploration. The students may even need to create a written report of the research findings. Since effective communication is essential to any company, employers seek to hire people who can write clearly and professionally. The purpose of this course is to develop technical writing ethics and skills in students in the field of agriculture. Students will learn different writing styles and they will prepare research synopsis, research proposals and thesis in given writing style. At the completion of this course, the students will be able to apply scientific writing skills in their fields, identify various formats of research report writing, develop report writing and presentation skills and present research reports at appropriate forums.

Contents

1. Writing as means of communication in professional and scientific fields
2. Parts (structure and contents) of a scholarly manuscript, from title to appendix
3. Differences between scientific and general writing
4. Writing a Research proposal or synopsis and thesis/dissertation
5. Technical articles and research papers
6. How to write a research paper?
7. Introduction to American Psychological Association (APA) writing manual for social science research
8. Council of Biological Editors (CBE) style manual

Practical

1. Every student will be required to write technical articles/reports on given topics
2. Present their topic in the class
3. Moreover, will critically evaluate and edit reports prepared by other students

Recommended Texts

1. Hofman, A. H. (2009). *Scientific Writing and Communication: Papers, Proposals, and Presentations.*USA: Oxford University Press.
2. APA. (2006). *Publication Manual of the American Psychological Association* (6th ed.). USA: American Psychological Association.
3. Council, S. E. (2006). *Scientific Style and Format: the Council of Science Editors Manual for Authors, Editors, and Publishers.* Chicago: CSE, Scientific Style and Format.

Suggested Readings

1. Wallwork, A. (2011). *English for writing Research Papers*. New York: Springer.

2. Gustavii, B. (2008). *How to write and illustrate scientific papers?* (2nd ed.). UK: Cambridge University Press.

AEXT-7108 Application of ICTs in Agricultural Extension 3(2+1)

Like in other disciplines, computer applications in agriculture have also increased so fast and there is need to develop computer skills among future agriculturists and academicians. Computer also provides modern communications tools at mass level. It is important for students that besides enhancing their skills in core courses of agriculture, they must improve and learn advance use of computer applications to be successful in educational and professional life ahead. The purpose of this course is to introduce advanced communication and decision-making tools used in agriculture for sustainable development. At the end of this course, students will be able to compare various ICTs methods for applying in agricultural teaching and research, to determine role of GPS, remotely sensed data and other precision data tools for decision making for farm management, Introduction to artificial intelligence in agriculture system.

Contents

1. Overview of technology used in extension programs
2. Teaching Aids like multimedia projects, computers and internet
3. Use of data bases for agriculture products
4. Computerized weather forecasting, using computerized map reading and interpretation
5. Color coding, spectroscopic study, satellite image reading
6. Remote sensing and geographical information systems (GIS) for agricultural extension education
7. Role of remote sensing, GPS, GIS and other softwares and tools for agricultural resource management, decision making at farm level
8. Theories related to communication technologies
9. Computerized mass media applications in agricultural extension education
10. Teleconferencing, e-conferencing, knowledge portal, e-office, e-agriculture, e-business etc
11. Use of mobile cell communication for agricultural development and business
12. Recent trends in ICT and use of artificial intelligence in agriculture
13. Future of ICT and precise decision making in Pakistan

Practical

1. Students will be given hands-on experience in above mentioned technologies. Visit to various ICT based agricultural organizations

Recommended Texts

1. Heywood, I.; Cornelis, S. & Carver, S. (2011). *An Introduction to Geographical Information Systems*. New York: Addison Wesley Longman.
2. Longley, P.A., Goodchild, M., Maguire, D., & Rhind, D. W. (2005). *Geographical Information Systems Principles, Techniques, Applications and Management* (2nd ed.). USA: John Wiley and Sons Publisher.

Suggested Readings

1. Grimshaw, D. J., & Kala. S. (2011). Strengthening *Rural Livelihoods: The impact of information and communication technologies in Asia*. India: Practical Application Publishing.
2. Mildorf, T., & Charvatjr, K. (2012). *ICT for agriculture, rural development and environment.* Czech Republic**:** Czech Centre for Science and Society, Wireless info.

AEXT-7109 **Special Problem** **1(1+0)**

The special problem is intended to instruct students on proper techniques for scientific research and methodologies. The students are expected to prepare directed assignment and collect information and material related to current research interest. Special problem means an assignment that is expected to be temporary and is designated as a special assignment by the academic supervisor in its sole discretion. The main purpose of special problem is to increase the learning capabilities of students. The more we use our brains, the more they develop. Students learn a lot more when they read or practice something by themselves. Similarly, the purpose of assignments is to increase the practical skills of students. The main objectives of special problem assigned to students are to enhance the knowledge of a subject, helps to develop writing skills and to enhance time management and organizing skills. It enhances your planning and organizing skills: The special problem make you do your work by prioritizing the needs and time frames. It helps you in completing all your tasks very peacefully instead of creating any panic. Scopes for improvement: Special problem writing work gives students a lot of scope to improve themselves.

AEXT-7110 **Seminar** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

STAT-7152 Statistical Methods for Social Research 3(3+0)

The purpose of this course is to impart knowledge of statistical techniques and software used to analyze the data. This course has been designed to improve the skills of the students for selecting appropriate tools for analysis of research data in social sciences and educational research. Statistics is an integral part of research not only in agricultural sciences but also in other disciplines of sciences, arts and social sciences. There is increasing demand of skillful human resources to tackle statistical datasets in all walks of life. At the end of this course, students will be able to learn the basics of descriptive and inferential statistics and the most commonly used statistical techniques in agricultural and extension educational research. The course is designed to give students an in-depth understanding of how these statistical techniques work. The focus will be on the applications of statistical analysis with the help of statistical softwares such as Excel, SPSS, R, SAS etc. Moreover, the focus will also be on learning interpretation of statistical results obtained from the computer softwares. So, these activities will improve the analytical and research skills of the students in the disciplines of agricultural and extension education.

Contents

1. Basics of Statistics, Importance of Statistics in Social Research
2. Scale of measurements
3. Graphical representation of data
4. Mean, median, mode, Variance, Standard deviation, CV, Quartiles, Quartile Deviation
5. Sampling and its types
6. Testing of Hypothesis about mean with Normal, t and F Distribution
7. Basic principles of experimental design, CRD, RCBD, and Latin Square Design used in educational research
8. Non-parametric Methods for testing of hypotheses
9. Correlation Analysis: Simple correlation, Multiple Correlation, Partial Correlation, Rank Correlation, Simple and Multiple regressions
10. Logistic Regression and Odd Ratios
11. Chi-Square test: Analysis of Count and Frequency data, Contingency Tables, Test of Independence

Recommended Texts

1. Agresti. A. (2002). *An Introduction to Categorical Data Analysis.* New York: Wiley.
2. Box, G.E.P., & Hunter, J.S. (1978). *Statistics for Experimenters*. New York: Wiley.
3. Chatterjee, S.; & Ali.S.H.(2004). *Regression Analysis by Examples.* (4th ed.). New York: Wiley.
4. Steel, R.G. D., Torrie, J.H., & Dicky, D.A. (1983). *Principles and Procedures of Statistics: A Biometerical Approach.* (3rd ed.). USA: McGraw Hill, New York, USA.
5. Mead, R. (1995). *The Design of Experiments.* Cambridge: Cambridge University Press.
6. Tabachnick, B. G., & Fidell, L. S. (1996). Using Multivariate Statistics. New York: HarperCollins College Publishers.

Suggested Readings

1. Cox D.R. (2000). *The Theory of the Design of Experiments*. USA: Chapman and Hall.
2. Gomez.K.A, & Gomez A.A. (1976). *Statistical procedures for agricultural research*. Lugana, Philippines: The international Rice Research Institute.
3. Jerrold H. Z. (2009). *Biostatistical Analysis*, (4th ed.). India: Dorling Kindersley.
4. Richard, A. J., & Wichern, D.W. (2007). *Applied multivariate statistical analysis*. (6th ed.). London: Pearson Education International.

PhD
AGRICULTURAL EXTENSION

AEXT-8101 Food Security Issues and Role of Agricultural Extension 3(3+0)

One important way of supporting food security is through agricultural extension programs. Agricultural extension is broadly defined as the process of development of agricultural knowledge and skills amongst farmers, aimed at increasing their productivity and realizing other desirable changes. Agricultural extension plays a role in improving farmers' productivity and incomes, thereby reducing poverty and increasing food security. The purpose of this course is to study and analyze and suggest remedies for emerging issues and trends in food security. At the end of this course, the students will be able to understand the concept of food security, review and will also evaluate the research-based role of agricultural extension in resolving food security issues and provision of timely solutions to mitigate the threat of food insecurity in Pakistan.

Contents

1. Challenges of 21st century related to rural development and agricultural extension
2. Defining and understanding community food security
3. Food security and global food system
4. Shift in global food systems
5. Managing global environmental changes
6. Food safety issues, past
7. Present and future of agricultural extension
8. Strategies for reforming agricultural extension for managing food insecurity issues
9. Relating rural poverty and food insecurity
10. Strategies to reduce food insecurity
11. Training needs of extension agents for addressing poverty and food insecurity
12. Managing household food security
13. Rural women and food insecurity
14. Climate change and sustainable food security

Recommended Texts

1. Christoplos, I. (2010). *Mobilizing the potential of rural and agricultural extension*; FAO, Rome-Italy.
2. Rivera, W. M., & Qamar, M. K. (2003). *Agricultural Extension, Rural development and the food security challenge.* Rome-Italy: FAO.
3. Shetty, P.K.; Ayyappan, S.; & Swaminathan, M. S. (2013) . *Climate change and sustainable food security.* Bangalore, India: National Institute of Advanced Studies.

Suggested Readings

1. Behnassi, M., S. D.; & Yaya, S. (2011). *Global food insecurity: rethinking agricultural and rural development paradigm and policy.* Springer Science Publishers.
2. Ponniah, A., Puskur, R.; Workneh, S.; & Hoekstra, D. (2008). *Concepts and practices in agricultural extension in developing countries: A source book.* Washington, DC: IFPRI

AEXT-8102 Gender Issues in Community Development 3(3+0)

The purpose of this course is to define the characteristics of women's activities, and that of gender hierarchy within community, and to consider strategies for gender-balanced community. To determine essential elements of community development, discuss socio-cultural constraints to gender mainstreaming, describe the role of women in community development, describes the status of women and men in relation to income generation and welfare of rural community. At the end of this course, the students will be able to define the given concepts of community development process.

Contents

1. Concept and process of development, and gender mainstreaming
2. Community development
3. Definition, concept, elements, and past and current programs
4. Essential elements in building a national program of community development
5. Methods of community development
6. Training of local leaders and personnel for community development
7. Monitoring and evaluation of community development programs
8. Gender role in community development
9. Socio-cultural constraints and obstacles to gender mainstreaming
10. Gender empowerment in Agricultural Extension
11. Role of Agricultural Extension in sustainable livelihoods with special reference to rural women

Recommended Texts

1. Adisa, R.S. (2012). *Rural development in the 21st century as a global necessity. In Rural Development – contemporary issues and practices*.Rijeka, Croatia: Int. Tech publishers.
2. McAreavey, R. (2009). *Rural Development Theory and Practice.* UK: Taylor and Francis Publishers.
3. Deji, O.F. (2012). *Gender and Rural Development: Advanced Studies*. Münster, Germany: LIT Verlag Münster Publishers.
4. Chambers, R. (2005). *Ideas for Development*. UK: Earthscan Publications Ltd.
5. Homan, M. S. (2010). *Promoting Community Change: Making it Happen in the Real World* (5th ed.). USA: Brooks/Cole Publishing Company.

Suggested Readings

1. Crush, J. (2005). *Power of Development.* Abingdon: Routledge Publishers.
2. Jerry W. R., & Gary, P.G. (2010). *Introduction to Community Development: Theory, Practice, and Service-Learning.* USA: SAGE Publishers.
3. Thomas, A. (2000). *Meanings and Views of Development,' in Poverty and Development into the 21st Century*. Oxford: Oxford University Press.
4. Rist, G. (2008). *Definitions of Development; in the History of Development*. London: Zed Books.

AEXT-8103 International Agricultural Extension Systems 3(2+1)

The purpose of this course is to study and compare different extension systems across the world. This kind of comparison provides the guidelines for improvement in local extension activities and gives an opportunity to bring the system at par with International standard operating procedures. At the end of this course, the students will be able to compare extension systems in selected countries, present the SWOT analysis of the different prevailing extension systems across the world and in the given country, and describe limitations of agricultural extension services.

Contents

1. Agricultural Extension in Bangladesh
2. Farmers' Association in Malaysia
3. Agricultural Development through the participation of small famers in Afghanistan
4. Farmers' Training and Functional literacy in India
5. Farmers Training programs in Asia with special reference to small farmers
6. Agricultural extension service in Japan with special reference to training of rural youth
7. SWOT analysis of the different extension system in the world
8. Farmers' education services in selected Asian countries
9. Agricultural extension system in developed countries i.e. USA, Canada, UK, China, etc.
10. Agricultural Knowledge Information System (AKIS)

Practical

1. The students will compare extension systems in different countries and present it in the class

Recommended Texts

1. Botha, N. (2004). *Contracting for Agricultural Extension: International Case Studies and Emerging Practices* (A book review from: Journal of Rural Studies). New York: Elsevier Publishers.
2. Ray, G.L. (2006). *Extension Communication and Management*. India: Kalyani Publishers.

Suggested Readings

1. Ponniah, A., Puskur, R.; Workneh, S.; & Hoekstra, D. (2008). *Concepts and practices in agricultural extension in developing countries: A source book.* Washington, D.C., USA: IFPRI (International Food Policy Research Institute).
2. Snapp, S. & Pound, B. (2007). *Agricultural Systems: Agro-ecology and Rural Innovation for Development*. USA: Academic Press.

AEXT-8104 Qualitative and Quantitative Research Methods 3(2+1)

Research is a core area in development and humanitarian programming. Some of the research activities are normally undertaken by various programs to promote evidence-based planning include assessments, surveys and evaluations. These activities employ qualitative and quantitative research methodologies. *Qualitative research* aims at generating an in-depth understanding of a specific program activity or event, rather than surface description of a large sample of a population. On the other hand, *quantitative research* focuses on gathering, analyzing and presenting numerical data and generalizing it across groups of people to explain a particular phenomenon. The aim of this course is to highlight the two important research methodologies used in research. The secondary purpose of this course is to study, critically analyze the advanced research techniques describing both aspects of research methodologies through consulting and coordinating other researchers within Pakistan and outside the country and develop new approaches for research in extension education.

Contents

1. Research: Research process, Research Cycle, Types of Scientific Research, Research Protocol
2. Conducting Quantitative Research in Social sciences
3. Introduction to Qualitative Research
4. Comparing Qualitative and Quantitative Research
5. Various Types of Qualitative Research
6. Quantitative Research Designs in Social Sciences
7. Preparation of Instrument for Survey research
8. Conducting surveys
9. Ethnography
10. Preparing and conducting interview checklist
11. Data collection procedure in qualitative research
12. Advantages of group interviews
13. Sampling techniques in Qualitative Research
14. Requirements in Qualitative Research
15. Interviewing as qualitative research
16. Ethical Guidelines in Qualitative Research
17. Strength and Weaknesses of Qualitative Research
18. Qualitative Analysis (grounded theory, content analysis, hermeneutic analysis)

Recommended Texts

1. Bhattacherjee, A. (2012). *Social science research: principles, methods and practices* (2nd ed.). USA: University of South Florida.
2. Babbie, E. (2008). *The basics of Social Research*. (4th ed.). USA: Thomson Learning Academic Resource Center.
3. Creswell, J. W. (2008). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches.* USA: SAGE Publications.

Suggested Readings

1. Berg, B.L. (2001). *Qualitative Research Methods for the Social Sciences*. (4th ed.)USA: Pearson Education Company.
2. Kumar, G.A.K., Mohanty, A.K., & Prasad, A.M. (2013). *Research Methods in Agricultural Extension.* Hyderabad: National Institute of Agricultural Extension Management.
3. Best, J.W., & Khan, J. V. (2009). *Research in Education* (20th ed.). New Delhi: PHI Learning Private LTD.

AEXT-8105 Extension Management and Administration 3(2+1)

For any organization or business to succeed and to attain all its goals, formidable administrative machinery must be in place. Aspects to consider include principles of administration and planning, supervision, staff motivation, discipline, and staff participation among others. The aim of this course is to explain the principles and processes of administration and planning as applied to extension work for the learner to appreciate the challenges facing Extension Administration and obtain essential skills of administration and planning. At the end of this course, the students will be able to define basic concepts of administration and supervision in extension education, to practice coordination between nation building departments, to apply basic principles of supervision in real life situation and to appraisal of various administrative tasks in extension.

Contents

1. Meaning and objectives of extension administration
2. The organization and administration of extension at different administrative tiers
3. Coordinative capacity of the Department of Agriculture (Extension) with the nation building departments, research organizations and related universities
4. Role of the different administrative heads (Agri. Extension) in planning and coordinating resources and delegation of authority
5. Meaning and objectives of supervision
6. Principles of supervision
7. Agricultural extension management
8. Theory X and Theory Y of management
9. Staff recruitment, placement, training programs, counseling, job description, ranks, promotion and salary adjustment
10. Effective team building
11. Leadership v/s management
12. Leadership theories and styles
13. Appraisal and improvement of administrative and supervisory activities

Recommended Texts

1. Berkley, J. D. (2008). *Leadership Handbook of Management and Administration*. Michigan: Baker Books Publishers.
2. Karthikeyan, C., Sendikumar, R.; & Jaganathan, D. (2007). *Textbook of agricultural extension management*. New Delhi: Atlantic Publishers.

Suggested Readings

1. Obinne, C.P.O. (2012). *Administration and program planning in Extension.* Makurdi, Nigeria: University of Agriculture, Department of Agriculture Extension & Communication.

AEXT-8106 Managing Learning Experiences in Agricultural Extension 3(3+0)

The purpose of this course is to develop teaching and supervising skills among graduate and post-graduate students to direct educational programs in non-formal educational settings for specific group of learners. The students will learn how to design a curriculum, instructional methods and technologies required for the educational programs. The students will prepare teaching plans, class schedules and teaching and scripts for each class. At the completion of this course, the students will be able to describe principles of learning, develop teaching plans, and selecting suitable teaching strategies for managing the learning process. The students will be able to develop their own teaching and learning model.

Contents

1. Determining the roles and responsibilities of educators
2. Delivery of educational programs, nature of the instructional process
3. Applying Principles of Learning
4. Planning a course of study for a class or clientele group, importance of planning
5. Pre-instructional planning such as Needs assessment, Resources available
6. Development of course plans such as courses of study, syllabi, and outlines
7. Learning Styles "Field Dependent/Field Independent, Sensory Learning Styles."
8. Writing Objectives "Learning domains."
9. Selecting teaching Strategy "methods/techniques suited for clientele groups."
10. Teaching for critical thinking.
11. Developing teaching plans "purpose of teaching plans, parts of a written teaching plan, content breakdown and sequence, specification for teaching strategy, selection of instructional support."
12. Developing interest approaches.
13. Learner motivation "Evidence of motivation/de-motivation, problems due to lack of motivation, increasing motivation."
14. Strategies in preparing and using interest approaches, adapting teaching for special needs clientele.
15. Identity of special needs clientele "Disadvantaged, Handicapped."
16. Selecting of teaching strategies

Class project

1. Students will prepare teaching plan and teach papers for individual critique at the end of the semester

Recommended Texts

1. Domjan, M.P. (2014). *The principles of learning and behavior* (7th ed.). Boston: Cengage Learning Publisher.
2. Seidel, R.J., Perencevich, K. C., Kett, L. S., & Robert, K. (2007). *From principles of learning to strategies for instruction.* Germany: Springer.

Suggested Readings

1. Blackburn, D. J. (1999). *Extension Handbook*. Guelph ,Ontario, Canada: University of Guelph.
2. Brock, P. A. (1997). *Educational Technology in the classroom*; Englewood cliffs. New Jersey: Educational Technology Publications.
3. Schunk, D.H. (2011). *Learning Theories: An Educational Perspective* (6th ed.). UK: Pearson Publishers.

AEXT-8107 Role of Agriculture in Rural Development 3(2+1)

The main purpose of this course is to highlight the relationship of agricultural extension work and rural development. This guide is primarily concerned with rural extension and with the livelihoods of farmers and their families. The concept of rural development must therefore be considered with reference to agriculture, since agriculture is the basis of the livelihood of most rural families. In the past two decades there has been increasing emphasis on rural development programs and projects, and recognition that the development of rural areas is just as important as the building up of urban, industrial complexes. Development must have two legs: urban industrialization and rural improvement. In rural areas all developmental activities depend on the development of agriculture in terms of crop production and technology adoption. All stakeholders of rural development and extension organizations are required to present a participatory model of work for the development of rural areas in the country. At the end of this course, the students will be able to define the concept of participatory approaches and their use in agricultural extension, and to implement various participatory approaches in agricultural extension.

Contents

1. Rural development
2. Definition and concepts
3. Basic elements of rural community development
4. Rural community development programs
5. Types of programs for rural community development
6. Essential elements in building a national program of community development
7. Rural development through extension education
8. Methods of community development
9. Training of local leaders and personnel for community development
10. NGOs and Rural Development
11. Evaluation of National Rural Support Program
12. Role of Agriculture in rural development
13. Role of Grameen Bank in the Development of Bangladesh rural community

Recommended Texts

1. Ponniah, A., Puskur, R., Workneh, S.; & Hoekstra, D. (2008). *Concepts and practices in agricultural extension in developing countries: A source book.* Washington, DC: IFPRI.
2. Atchoarena, D., & Gasperini, L. (2003). *Education for rural development: towards new policy responses.* Rome/Paris: FAO/UNESCO.
3. Foster, P., & Sheffield, J. R. (2005). *Education and Rural Development.* Abingdon, UK: Routledge Publishers.
4. Desai, V. (2008). The Role of Non-governmental Organizations (NGOs) *in The Companion to Development Studies*. London: Hodder Education.

Suggested Readings

1. McAreavey, R., (2008). *Rural Development Theory and Practice. A Critical Analysis.* Abingdon, UK: Routledge Studies in Development and Society.
2. Jerry, W. R., & Gary, P. G. (2010). *Introduction to Community Development: Theory, Practice, and Service-Learning.* USA: SAGE Publishers.
3. Ledwith, M., & Campling, J. (2005). *Community Development: A Critical Approach.* Bristol, UK:Policy Press.

AEXT-8108 Sustainable Rural Development 3(3+0)

There are very strong reasons why resources should now be put into rural development. More than half the people of the world and most of the people in developing countries (Asia, Africa and Latin America) live in rural areas and earn in part or all of their livelihoods from some form of agriculture. Most of these people are still very poor and dependent on agricultural practices that have benefited little from modern technology. They live in isolated and often inhospitable places, with little access to the resources they need to improve their agriculture. Many lead their lives barely at subsistence level. Solely in terms of numbers of people, there is a very strong case for giving high priority to rural development. At the completion of this course, the students will be able to understand, review, synthesis and develop operational model for sustainable rural development, sustainable livelihoods and natural resource management.

Contents

1. Concepts and definitions of sustainability and sustainable livelihoods
2. Linkage of sustainable livelihoods.
3. Rural poverty and rural development
4. Sustainable livelihood framework
5. Global change and sustainable development
6. Natural resource management
7. Rural society and sustainable development
8. Islamic perspectives on sustainable rural development
9. Islamic terms related to sustainability
10. Principles of sustainability (Islamic perspective)
11. Islamic values and sustainable rural development
12. North-South issues in sustainable rural development
13. Issues related to food security for sustainable rural development

Recommended Texts

1. Devereux, S., Vaitla, B., & Swan, S.H., (2008). *Seasons of hunger: Fighting cycles of quiet starvation among the world's rural poor*. London: Pluto Press.
2. Devereux, S. R., & Longhurst, R. (2011). *Seasonality, rural livelihoods and development*. UK: Routledge Publishers.
3. Helmore, K., & Singh, N. (2001). *Sustainable Livelihoods: Building on the Wealth of the Poor*. Connecticut, USA: Kumarian Press.

Suggested Readings

1. Ellis, F. (2000). *Rural Livelihoods and Diversity in Developing Countries*. Oxford: Oxford University Press.

2. Scoones, I. (1998). *Sustainable rural livelihoods: a framework for analysis*. Indiana University, Indiana: Institute of Development Studies.

AEXT-8109 **Special Problem** **1(1+0)**

The special problem is intended to instruct students on proper techniques for scientific research and methodologies. The students are expected to prepare directed assignment and collect information and material related to current research interest. Special problem means an assignment that is expected to be temporary and is designated as a special assignment by the academic supervisor in its sole discretion. The main purpose of special problem is to increase the learning capabilities of students. The more we use our brains, the more they develop. Students learn a lot more when they read or practice something by themselves. Similarly, the purpose of assignments is to increase the practical skills of students. The main objectives of special problem assigned to students are to enhance the knowledge of a subject, helps to develop writing skills and to enhance time management and organizing skills. It enhances your planning and organizing skills: The special problem make you do your work by prioritizing the needs and time frames. It helps you in completing all your tasks very peacefully instead of creating any panic. Scopes for improvement: Special problem writing work gives students a lot of scope to improve themselves.

AEXT-8110 **Seminar** **1(1+0)**

The seminar is intended to instruct students on proper techniques for presentation of scientific material. Each student is expected to prepare and present a scientific seminar and to submit written documentation supporting that seminar. A seminar is a form of academic instruction, either at an academic institution or offered by a commercial or professional organization. It has the function of bringing together small groups for recurring meetings, focusing each time on some particular subject, in which everyone present is requested to participate. Seminars provide a chance to interact with experts from the specific field. Discussing about the relevant topics of the particular subject, students tend to learn about the latest information and new skills related to the concerned subject. Seminars are important and beneficial for those who have difficulty learning in a typical classroom setting where reading and writing are required. There is often a sense of friendship associated with seminar attendance, because everyone is attending with a like interest in learning about a subject important to them. Attending a seminar has numerous benefits, including improving communication skills, gaining expert knowledge, networking with others and renewing motivation and confidence.

STAT-8132 Advanced Statistical Methods for Social Research 3(3-0)

The purpose of this course is to impart knowledge of statistical techniques and software used to analyze the data. This course has been designed to improve the skills of the students for selecting appropriate tools for analysis of research data in social sciences and educational research. Statistics is an integral part of research not only in agricultural sciences but also in other disciplines of sciences, arts and social sciences. There is increasing demand of skillful human resources to tackle statistical datasets in all walks of life. At the end of this course, students will be able to learn the basics of descriptive and inferential statistics and the most commonly used statistical techniques in agricultural and extension educational research. The course is designed to give students an in-depth understanding of how these statistical techniques work. The focus will be on the applications of statistical analysis with the help of statistical softwares such as Excel, SPSS, R, SAS etc. Moreover, the focus will also be on learning interpretation of statistical results obtained from the computer softwares. So, these activities will improve the analytical and research skills of the students in the disciplines of agricultural and extension education.

Contents

1. Basics of Statistics, Importance of Statistics in Social Research
2. Scale of measurements
3. Descriptive Statistics
4. Sampling and its types
5. Selecting an appropriate sampling technique and sample size
6. Correlation Analysis: Simple correlation, Multiple Correlation, Partial Correlation, Rank Correlation
7. Regression Analysis. Linear model, Generalized linear model, nonlinear model
8. Analysis of contingency tables with ordered variables
9. Kendall's coefficient of concordance
10. Nonparametric methods in social sciences
11. Introduction to Multivariate analysis
12. Hotelling T^2
13. Principal Component analysis
14. Factor analysis
15. Canonical correlation and cluster analysis
16. Data analysis through different statistical softwares

Recommended Texts

1. Cohen, J. Cohen, P., West, S.G., & Aiken, L. S. (2013). *Applied multiple regression/correlation analysis for the behavioral science.* UK: Routledge.
2. Howell, D. (2012). *Statistical methods for Psychology*. USA: Cengage Learning.
3. Hollander, M.. Wolfe, D.A.; & Chicken, E. (2013). *Nonparametric statistical methods.* USA: John Willey & Sons.
4. Rao, G.N. (2007). *Statistics for Agricultural Sciences*, (2nd ed.). Hyderabad, India: BS Publication.

Suggested Readings

1. Hinton, P.R. (2013). *Statistics explained: A guide for social sciences students*. UK: Routledge.
2. Hanushek, E.A., & Jackson, J. E. (1977). *Statistical methods for social scientists*. UK: Routledge.
3. Gravetter F., & Wallnau, L. (2013). *Essentials of statistics for the behavioral sciences*. USA: Cengage Learning.