

**CURRICULUM
OF
AGRICULTURAL EXTENSION
EDUCATION**

**BS/BSc (Hons)
MS/MSc (Hons)**

(Revised 2015)



**HIGHER EDUCATION COMMISSION
ISLAMABAD**

CURRICULUM DIVISION, HEC

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CONTENTS

1.	Introduction	6
2.	Template for 4-Year BS/BSc. (Hons) in agricultural disciplines	8
3.	Scheme of studies for undergraduate courses in agricultural extension education	10
4.	Details of courses for undergraduate studies in agricultural extension education	11
5.	Semester wise break-up	29
6.	Scheme of studies for post-graduate courses in agricultural extension	30
7.	Detail of courses for post-graduate studies in agricultural extension	31
8.	Annexure A - G	47
9.	Recommendations	71

PREFACE

The curriculum, with varying definitions, is a plan of the teaching-learning process that students of an academic programme are required to undergo. It includes objectives and learning outcomes, course contents, scheme of studies, teaching methodologies and methods of assessment of learning. Knowledge in all academic disciplines is expanding and even new disciplines are also emerging, it is imperative that curriculum are developed and revised regularly.

University Grants Commission (UGC) was designated as the competent authority to develop, review and revise curricula beyond Class-XII vide Section 3, Sub-Section 2 (ii), Act of Parliament No. X of 1976 titled “**Supervision of Curricula and Textbooks and Maintenance of Standard of Education**”. With the repeal of UGC Act, the same function was assigned to the Higher Education Commission (HEC) under its Ordinance of 2002, Section 10, Sub-Section 1 (v).

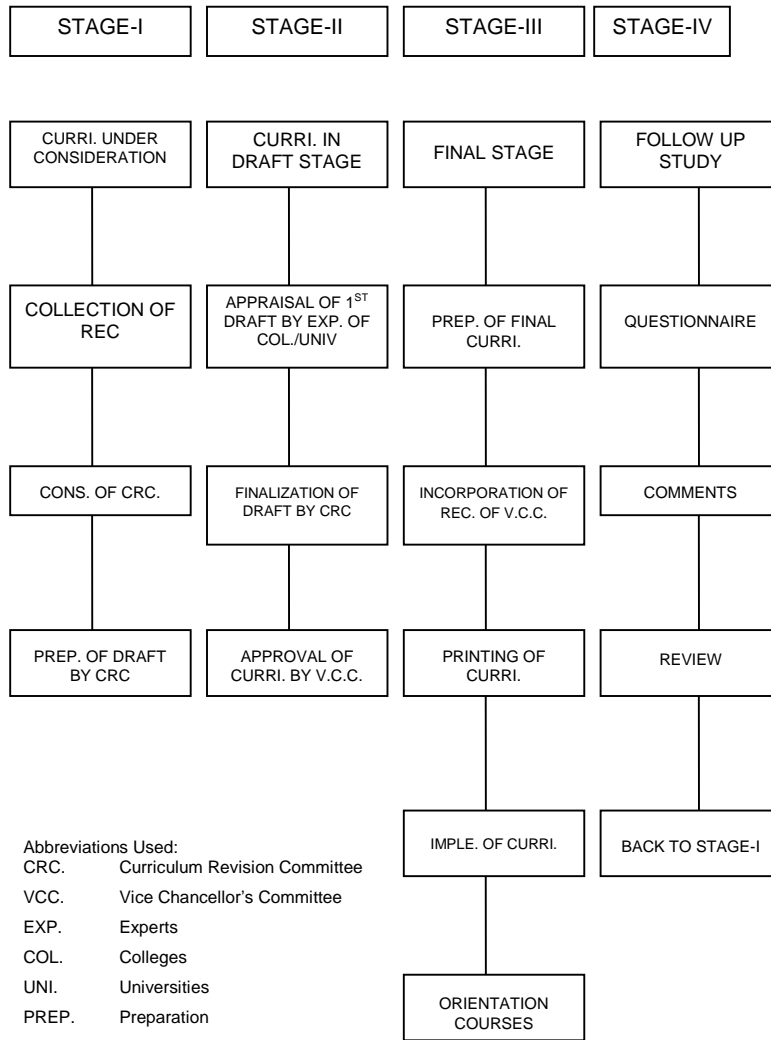
In compliance with the provisions, the Curriculum Division of HEC undertakes the revision of curricula after every three years through respective National Curriculum Revision Committees (NCRCs) which consist of eminent professors and researchers of relevant fields from public and private sector universities, R&D organizations, councils, industry and civil society nominated by their organizations.

In order to impart education at par with quality international standards, HEC NCRCs have developed unified templates as guidelines for the development and revision of curricula in the disciplines of Basic Sciences, Applied Sciences, Social Sciences, Agriculture and Engineering in 2007 and 2009.

It is hoped that this curriculum document, prepared by the respective NCRC's, would serve the purpose of meeting our national, social and economic needs, and it would also provide the level of competency specified in Pakistan Qualification Framework to make it compatible with international educational standards. The curriculum is also placed on the website of HEC (www.hec.gov.pk).

(Fida Hussain)
Director General (Academics)

CURRICULUM DEVELOPMENT PROCESS



CURRICULUM DEVELOPMENT

The final meeting of National Curriculum Revision Committee (NCRC) was held at University of Agriculture, Faisalabad from April 28-30, 2015 to finalize the 2nd draft of Agricultural Extension Education curriculum. The following experts attended the meeting:

Prof. Dr. Sher Muhammad Institute of Agricultural Extension and Rural Development, University of Agriculture, Faisalabad	Convener
Prof. Dr. Munir Ahmad Institute of Agricultural Extension and Rural Development, University of Agriculture, Faisalabad	Member
Prof. Mr. Amjad Ali Chairman, Department of Agricultural Extension, Baluchistan Agriculture College, Chaman Road, Baleli, Quetta	Member
Prof. Dr. Ejaz Ahmad Khan Chairman, Department of Agronomy/Botany, Gomal University, Dera Ismail Khan	Member
Prof. Dr. Khalid Nawab Chairman, Department of Agricultural Extension, Education & Communication, The University of Agriculture, Peshawar	Member
Prof. Dr. Muzammil Hussain Siddiqui Chairman, Department of Agronomy, Faculty of Agriculture, University of Poonch, Rawalakot, AJK	Member
Dr. Muhammad Riaz Chattha Director/Coordinator, Department of Agri. Extension, Agriculture Poly-technique Institute, National Agricultural Research Center (NARC), Park Road, Chak Shehzad, Islamabad	Member

Dr. Zaheer Uddin Mirani Associate Professor, Agricultural Extension Education Sind Agriculture University, Tando Jam	Member
Dr. Farhat Ullah Khan Assistant Professor, Department of Agricultural Sciences, Allama Iqbal Open University, Islamabad	Member
Dr. Muhammad Luqman Assistant Professor, University College of Agriculture, University of Sargodha, Sargodha	Member
Dr. Muhammad Waseem Assistant Professor, Faculty of Agriculture, Lasbela University of Agriculture, Water & Marine Sciences, Uthal, Lasbela, Balochistan	Member
Dr. Sajid Ali Assistant Professor, Institute of Agricultural Sciences, Quaid-e-Azam Campus, University of the Punjab, Lahore	Member
Mr. Muhammad Hamid Nawaz Khan Lecturer, Department of Agricultural Extension Education, University College of Agriculture & Environmental Sciences, Islamia University of Bahawalpur, Bahawalpur	Member
Dr. Badar Naseem Siddiqui Associate Professor & Chairman, Department of Agricultural Extension Faculty of Crop and Food Sciences, PMAS-Arid Agriculture University Rawalpindi	Member/Secretary

Template for 4-Year BSc (Hons) in Agricultural Disciplines

1. Compulsory Courses	Credit hours
Mathematics/Biology (2 courses)	6 (3-0) (2-1)
Statistics 1 & 2	6 (3-0) (3-0)
Computer/IT	3 (2-1)
Pakistan Studies	2 (2-0)
Islamic Studies	2 (2-0)
Communication Skills	3 (3-0)
English	3 (3-0)
Basic Agriculture	3 (2-1)
Sub-Total	28
2. Interdisciplinary Foundation Courses	(3 Cr. hr)
Agronomy	
Plant Breeding & Genetics	
Entomology	
Plant Pathology	
Food Technology	
Horticulture	
Soil Science	
Agriculture Economics	
Sub-Total	24
3. Supporting Courses {6-8 courses (3 Cr. hr) amongst below}	
Agriculture Extension	
Forestry & Range Management	
Animal Science	
Marketing & Agri. Business	
Rural Development	
Human Nutrition	
Agriculture Chemistry	
Agriculture Engineering	
Water Management	
Any other discipline recommended by the university	
Sub-Total	18-24
Sub-Total during the first four semesters	70-76
Semester 5, 6, 7 & 8	56-60
Project/Internship	04
Grand Total	130-140

1 credit of Theory = one contact hour per week for 16-18 weeks and 1
Practical/Lab hour = 3 contact hours per week for 16-18 weeks.
In case of non-availability of department of supporting courses, courses
from foundation courses can be opted.

**SCHEME OF STUDIES FOR UNDERGRADUATE
COURSES IN AGRICULTURAL EXTENSION EDUCATION**

AEE 301	Introduction to Agricultural Extension	3(2-1)
AEE 402	Introduction to Communication in Agricultural Extension	3(2-1)
AEE 501	Communication and Leadership Skills in Agricultural Extension	3(2-1)
AEE 502	Agricultural Journalism	3(2-1)
AEE 503	Introduction to Extension Education Methods	3(2-1)
AEE 504	Adult Learning	3(3-0)
AEE 505	History and Philosophy of Agricultural Extension	3(3-0)
AEE 506	Extension Programme Development	3(2-1)
AEE 507	Rural Development Programmes in Pakistan	3(3-0)
AEE 508	Rural Youth in Agricultural Development	3(2-1)
AEE 509	Agricultural Technology Transfer	3(2-1)
AEE 510	Poverty Alleviation and Sustainable Development	3(3-0)
AEE 601	Introduction to Cyber Extension	3(2-1)
AEE 602	Introduction to Programme Evaluation	3(2-1)
AEE 603	Human Resource Development	3(2-1)
AEE 604	Research Methods in Social Sciences	3(2-1)
AEE 605	Agricultural Advertising	3(2-1)
AEE 606	Biodiversity and Agricultural Extension	3(3-0)
AEE 607	Agricultural Extension and Gender Studies	3(3-0)
AEE 608	Distance Education	2(1-1)
AEE 609	Food Security and Agricultural Extension	3(3-0)
AEE 610	Internship	4(0-4)

AEE 402 INTRODUCTION TO COMMUNICATION IN 3(2-1)
AGRICULTURAL EXTENSION

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend the concept, process and scope of communication
- Analyse different forms and models of communication
- Identify different barriers to communication

Theory

Concept, purpose and scope of communication in agricultural extension. Communication process, elements and their role in effective communication. Principles of communication. Basic communication models. Forms of communication: interpersonal, intrapersonal and impersonal. Barriers to communication and measures to overcome these barriers.

Practical

The students will be involved in developing and critically analysing different extension messages. They will practice different forms of communication in the class.

Recommended Books

1. Memon, R. A. and E. Bashir (Eds.), 1995. Extension Methods. National Book Foundation, Islamabad.
2. Rosengren, K. E. 2000. Communication: An Introduction. Sage Publication, London, UK.
3. Shahid, M. I. 1996. Communication. Caravan Enterprises, Lahore, Pakistan.
4. Muhammad, S. 2005. Communication and Leadership Development. Unitech Communications, Faisalabad.

AEE 501 COMMUNICATION AND LEADERSHIP SKILLS 3(2-1)
IN AGRICULTURAL EXTENSION

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend various types of communication
- Demonstrate improved communication/leadership skills

Theory

Types of communication i.e. written, verbal, and non-verbal. Communication skills: Speaking, listening, writing and reading. Speaking

face-to-face communication. Preparing and delivering a speech. Conducting discussions and interviews. Conducting extension meetings. Improving facilitation skills. Listening---Reasons for poor listening. Tips for improving listening skills. Writing---Art of good writing. Writing for newspapers and magazines. Writing letters, reports and articles frequently required for the job of an extension worker. Reading---- Reasons for poor reading. Tips for developing effective reading skills. Use of audio-visual aids. Presentation skills. Leadership: concept, functions, styles and types. Roles and characteristics of leadership.

Practical

Micro-teaching---Students will plan and practice extension teaching in small groups. They will also maintain a practical notebook regarding preparation of instructional designs.

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 Books

1. Calvert, P. (Ed.) 2000. The Communicator's Handbook: Tools, Techniques and Technology (4th ed.). Maupin House Publishing, USA.
2. Chauhan, J. 2007. Agricultural Extension Education Communication in Agriculture, RBS College, Bichpuri, Agra, India.
3. Muhammad, S. 2005. Communication Skills & Leadership Development. Unitech Communications, Faisalabad.
4. Kalla, P. N. 2006. Communication Skills for Extension Workers. Agrotech Publishing Academy, Udaipur, India.
5. Ray, G. L. 2006. Extension Communication and Management. Kalyani Publishers, India.
6. Shriberg, B., R. Kumari, and A. Shirberg. 2011. Practicing Leadership: Principles and Applications. (3rd ed.). John Wiley, New York, USA.

AEE 502

AGRICULTURAL JOURNALISM

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Understand the concept of agricultural journalism
- Develop news, news stories, and articles
- Critically analyse various news stories and articles

Theory

Journalism: definition, types, importance, and history. Development of journalism: concept, scope, significance, roles, and functions. Application of journalism in agricultural extension. Fundamental elements of print and broadcast journalism. News editing and its significance. Preparation and reporting news for media. Column writing. Laws and code of ethics for the agricultural professional journalists involved in publishing. Review of some important world newspapers publishing agricultural news stories, articles, and related information. Introduction to e-journalism. Exposure to important agricultural news channels, websites, radio, and TV.

Practical

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

Recommended Books

1. Boone, K., T. Meisenbach, and M. Tucker. 2003. Agricultural Communications: Changes and Challenges. John Wiley-Blackwell Publishers, London.
2. Haq, M. Z. 2015. A Book on Agricultural Journalism: Krishi Sangbadikota Shikkhon. Independent Publisher, Dhaka, Bangladesh.
3. Harcup, T. 2009. Journalism: Principles and Practices. Sage Publishers.
4. Vivian, J. 2000. Media of Mass Communication (5th ed.). Allyn and Bacon, London.

AEE 503 INTRODUCTION TO EXTENSION EDUCATION METHODS 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Develop an instructional plan
- Understand the teaching-learning process
- Select and apply various extension methods under different situations

Theory

Teaching as a process of facilitating learning, developing an instructional plan for extension teaching. Classification of extension teaching methods: individual, group and mass contact methods. Merits and demerits of various extension methods. Critical analysis of various extension methods. Planning, conducting and follow up of various extension methods.

Practical

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.

Recommended Books

1. Anandajayasekeram, P. *et al.* 2008. Concepts and Practices in Agricultural Extension in Developing Countries: A Source Book. IFPRI, Washington DC, USA.
2. Memon, R. A. and E. Bashir. (Ed.). 1997. Extension Methods (2nd ed.). National Book Foundation, Islamabad.
3. Muhammad, S. 2005. Communication and Leadership Development. Unitech Communications, Faisalabad.
4. Ray, G. L. 2006. Extension Communication and Management. Kalyani Publishers, India.
5. Saravanan, R. (Ed.). 2008. Agricultural Extension-Worldwide Innovations. New India Publishing Agency, India.
6. Van den, Ban, A. W. and H.S. Hawkins, 1996. Agricultural Extension. (2nd ed.). John Wiley Blackwell, USA.

AEE 504

ADULT LEARNING

3(3-0)

Course Objectives

At the completion of this course, the students will be able to:

- Differentiate between active and passive learners
- Demonstrate the working knowledge of learning theories
- Evaluate the learners' achievements

Application of educational psychology in agricultural extension. Domains of learning: cognitive, affective and psychomotor. Levels of learning. Comparative analysis of active learners with passive learners. Bloom's taxonomy of adult learning. Farmers as adult learners; implications of physical, mental, emotional and social aspects for learning; personality types and their effect on learning and human relationship. Information processing models. Sensory input. Pattern recognition and various theories of pattern recognition. Theories of attention and motivation. Problems of adjustment and understanding human behaviour according to the changed conditions. Handling farmers/learners, problem-solving and decision- making strategies. Evaluation of learners' achievements.

Recommended Books

1. Reeve, J. M. 2014. Understanding, Motivations and Emotions (6th ed.). John Wiley & Sons Inc., USA.
2. Woolfolk, A. E. 2012. Educational Psychology. 12th ed. Amazon

- Publishers, Singapore.
3. Tennant, M. 2005. Psychology and Adult Learning. Routledge Publishers, UK.
 4. HEC. (nd). Teaching Learning Material for Training of Teachers of Higher Education. Module-1, Educational Psychology. Islamabad, Pakistan.

AEE 505 HISTORY AND PHILOSOPHY OF 3(3-0)
AGRICULTURAL EXTENSION

Course Objectives

At the completion of this course, the students will be able to:

- Explain the philosophical roots of agricultural extension education
- Describe the historical perspective of agricultural extension
- Analyse Islamic philosophy of extension education

Evolution of agricultural extension worldwide. Historical perspective of agricultural extension education in Pakistan. Past performance of various extension approaches. Emergence of private sector extension in Pakistan including input manufacturing and supply agencies, commercial banks, and NGOs. Philosophy and its branches. Philosophical foundations of agricultural extension education. Islamic bases and foundations of agricultural enterprises. Islamic philosophy of extension education.

Recommended Books

1. Anandajayasekeram, P., R. Puskur, S. Workneh and D. Hoekstra. 2008. Concepts and Practices in Agricultural Extension in Developing Countries: A Source Book. IFPRI, Washington DC, USA.
2. Cahn, S. M. (Ed.) 2009. Philosophy of Education: The Essential Texts. Routledge Publisher, UK.
3. Lewis, D. and N. Kanji. 2009. Non-Governmental Organizations and Development. Abingdon, Routledge Publisher, UK.

AEE 506 EXTENSION PROGRAMME DEVELOPMENT 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Understand the concept of programme development and PCs
- Describe principles of effective programme development
- Analyse various programme development models
- Plan an extension programme

Theory

Programme development: purpose, concept, scope, significance, assumptions, characteristics, and principles. Programme development approaches and models. Steps in programme development: situation analysis, needs assessment, statement of objectives, preparing plan of work, implementing work plan, monitoring and evaluation. An overview of the PCs (Planning Commission Proformae).

Practical

The students will conduct situational analysis and needs assessment. They will plan extension programs based on prioritized needs of extension clientele. They will also submit a PC-1 on the given programme/project.

Recommended Books

1. Bennett, C. and K. Rockwell, 1995. Targeting Outcomes of Programs. A Hierarchy for Targeting Outcomes and Evaluating their Achievement. Discovery Publishing House, New Delhi, India.
2. Boyles, 1984. Planning Better Programmes. McGraw Hill. New York, USA.
3. Caffarella, R. S. 2001. Planning Programs for Adult Learners. A Practical Guide for Educators, Trainers, and Staff Developers. (2nd ed.). Jossey Bass Publishers, USA.
4. Gupta, D. D. 2008. Extension Education: Core Contents and Emerging Area. Agribios. Jodhpur, India.
5. Ray, G. L. 2006. Extension Communication and Management. Kalyani Publishers, India.

AEE 507 RURAL DEVELOPMENT PROGRAMMES IN PAKISTAN 3(3-0)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend philosophy of rural development programmes
- Identify various rural development programmes
- Critically analyse government plans and policies related to rural development

Concept, philosophy, importance and objectives of rural development. Main approaches/programmes of rural development in Pakistan i.e. V-AID, Basic Democracies, Rural Works Programme, IRDP, Social Action Programme, People Works Programme, Tameer-e-Watan Programme, Khushhal Pakistan Programme, Village Cooperatives, Supervised Credit Scheme, participatory rural development projects, community based organizations. Current rural development programs: rural support and

rural development programs of NGOs, National Programme for Improvement of Water Courses, National Programme of Integrated Pest Management, Crop Maximization Programme. A critical analysis of current government plans and policies for rural development. Emerging trends of rural development in Pakistan.

Recommended Books

1. Ison, R. & Russell, D. (Eds.) 2004. Agricultural Extension and Rural Development: Breaking Out of Knowledge Transfer Traditions. Cambridge University Press, UK.
2. Lewis, D. and N. Kanji. 2009. Non-Governmental Organizations and Development. Abingdon, Routledge Publisher, UK,
3. Memon, R. A. and E. Bashir. (Eds.). 1997. Extension Methods (2nd ed.). National Book Foundation, Islamabad.
4. Narasaiah, M. L. 2003. Approaches to Rural Development. Discovery Publishing House, New Delhi, India.

AEE 508

**RURAL YOUTH IN AGRICULTURAL
DEVELOPMENT**

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Understand the meaning and philosophy of rural youth work
- Describe rural youth clubs/work in global perspective
- Develop guidelines for involving youth in agricultural extension
- Establish and manage youth clubs for agricultural development

Theory

Meaning, philosophy, and objectives of rural youth work. Characteristics, needs, and problems of rural youth in Pakistan. Participation of rural youth in agricultural development programmes. Review of youth organizations. Guidelines for organizing a youth programme. Identification of projects for the youth clubs. Participation of rural schools in dissemination of agricultural information.

Practical

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

Recommended Books

1. Curtis, K. 2008. Empowering Youth: How to Encourage Young Leaders to Do Great Things. Search Institute Press, Minneapolis, Minnesota, USA.
2. Swanson, B.E. et al (Eds.) 1997. Improving Agricultural Extension; A Reference Manual, FAO, Rome.

AEE 509 AGRICULTURAL TECHNOLOGY TRANSFER 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend the scope, importance and process of technology transfer
- Identify barriers to technology transfer
- Analyse issues in technology transfer

Theory

Definition, importance and process of technology transfer. Characteristics of promising agricultural technologies. Barriers to agricultural technology transfer. Diffusion and adoption process. Elements of Diffusion Process. Farmers' categories. Roger's theory of Innovation and Diffusion. Consequences of innovations. Technology adoption lifecycle. Innovation decision process. Business considerations of a farm enterprise and its technological aspects. Farm safety measures. Preparing feasibility reports of alternative farm enterprises. Recent technological developments in agriculture. Characteristics of technology generation, transfer and utilization sub-systems in Pakistan with special reference to agricultural development. Corporate farming and its issues.

Practical

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

Recommended Books

1. FAO. 2012. Organization for Economic Co-operation and Development. OECD Agriculture Out Look. Rome, Italy.
2. Janis, T. F. 2003. Technology Transfer Emerging Issues, High Impact Trends: Kluwer Academic Publishers, USA.
3. Rogers, E. M. 2003. Diffusion of Innovations. (5th ed.). The Free Press, New York, USA.

AEE 510 POVERTY ALLEVIATION AND SUSTAINABLE 3(3-0)
DEVELOPMENT

Course Objectives

At the completion of this course, the students will be able to:

- Describe the basic concepts of poverty alleviation and sustainable development
- Analyse the role of agricultural extension in poverty alleviation
- Evaluate the development efforts

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

Recommended Books

1. Ashok, K. (Ed.). 2010. Extension Strategies for Agriculture and Rural Development. Daya Publishing House, India.
2. Ison, R. and R. David. 2000. Agricultural Extension and Rural Development: Breaking Out of Knowledge. Cambridge University Press, UK.
3. Sahibzada, M. 1999. Poverty Alleviation in Pakistan: Present Scenario and Future Strategy. Institute of Policy Studies. Islamabad.
4. Shepherd, A. 1998. Sustainable Rural Development: McMillan Press, USA.
5. Singh, R. S. 2005. Poverty Alleviation in the Third World. APH Publishing Corporation, New Delhi, India.

AEE 601 INTRODUCTION TO CYBER EXTENSION 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Use software related to farm management
- Inculcate computer literacy among farming community
- Demonstrate computer skills

Theory

Introduction to the cyber extension. Basic concepts of cyber extension; cyber, cyber space, ICT. Cyber extension versus traditional agricultural extension. Importance and future of cyber extension in new millennium. Current status of cyber extension worldwide, cyber extension in Asia, connectivity in Asia, cyber extension in selected countries. Establishment of cyber extension centres in rural areas; reaching last mile through cyber, village information kiosks. Agri. extension through video conferencing. Kissan call centres. Use of cell phones for agri. extension. Global trends in agri. extension and potential role of ICTs. Virtual extension, Research

Recommended Books

1. David, R., B. Thyer, and D. Padgett. 2009. Programme Evaluation: An Introduction (5th ed.). Cengage Learning, USA.
2. Mertens, D. M and T. Wilson. 2012. Programme Evaluation Theory and Practice. Guilford Publications, New York, USA.
3. Wholey, J. S., H. P. Hatry and K. E. Newcomer, (Eds.). 2010. Handbook of Practical Program Evaluation (3rd ed.). Jossey Bass Publishers, USA.
4. Worthen, B. R., J. R. Sanders, and J. L. Fitzpatrick, 2003. Program Evaluation: Alternative Approaches and Practical Guidelines (3rd ed.). Allyn and Bacon, USA.
5. Patton, M. Q. 2014. Qualitative Research & Evaluation Methods. (4th ed.). Sage Publications, Inc., USA.

AEE 603

HUMAN RESOURCE DEVELOPMENT

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend the principles of HRD
- Develop/conduct the HRD programmes
- Evaluate HRD programmes

Theory

Concept, scope and role of human resource development in agricultural extension. Purposes of training. Types of training i.e. pre-service, in-service, and follow-up. Determining training needs, Organizing, supervising and managing training programmes. Training of trainers: selecting, planning, and implementing training programmes; duties and responsibilities of trainers. Evaluating the training programmes: performance appraisal, job satisfaction, career planning, conflict management and resolution.

Practical

Students will plan and conduct training programmes for given situations.

Recommended Books

1. Battu, N. R. 2008. Human Resource Development. APH Publishing Corporation, New Delhi, India.
2. Swanson, R. A. and E. F. Holton, 2009. Foundations of Human Resource Development (2nd ed.). Berrett-Koehler Publishers, USA.
3. Werner, J. M. and R. L. De Simone. 2008. Human Resource

- Development (5th ed.). South-Western College Publication, USA.
4. Wilson, J. P. 2005. Human Resource Development: Learning and Training for Individuals and Organizations. Kogan Page Publishers, UK.

AEE 604 RESEARCH METHODS IN SOCIAL SCIENCES 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Describe the concept and types of research
- Develop research instruments
- Develop plan of work for conducting research
- Apply research skills in real scenario

Theory

Concept and types of research: basic, applied, action, quantitative, qualitative and mixed method. Research process and its steps: identification of research problem, formulation of objectives, review of literature, defining research population, sampling and its techniques, reliability, validity, research instrument (questionnaire, interview schedule, interview guide etc.), data collection, analysis and writing a report.

Practical

Each student will develop a research synopsis, prepare questionnaire/interview schedule/interview guide for data collection. He/she will collect data on limited scale, analyse and submit the research report.

Recommended Books

1. Brennin, B. 2013. Qualitative Research Methods for Media Studies (1st ed.). Simultaneously Published, UK.
2. Creswell, J. W. 2008. Research Design: Qualitative, Quantitative and Mixed Methods Approaches (3rd ed.). Sage Publication Inc, Thousand Oaks, New Delhi, India.
3. Keith, F. P. 2009. Introduction to Research Method in Education. Sage Publishers, London, UK.
4. O' Leary, Z. 2005. Essential Guide to Doing Research, Sage Publications, New Delhi. India.
5. Seidman, I. 2006. Interviewing as Qualitative Research: A Guide for Researches in Education and Social Sciences (3rd ed.). Teachers College Press, New York, USA.

Course Objectives

At the completion of this course, the students will be able to:

- Understand the concept and significance of advertising in agriculture
- Comprehend various methods and techniques of advertising
- Demonstrate the advertising skills

Theory

Introduction, philosophy, origin and history of advertising. Purpose and techniques of advertisement. Consumer behaviour and psychology of advertising. Traditional and modern advertising methods. Effective strategies and models for advertising. Sale promotional activities in agriculture. Role of advertising in agriculture. Consequences of advertising. Various software used for preparing advertising material such as Corel Draw, Adobe, etc.

Practical

Students will prepare different advertisements by using related software for print and electronic media to promote agricultural products/technologies.

Recommended Books

1. Belch, G. and M. Belch. 2014. Advertising and Promotion: An Integrated Marketing Communications Perspective. McGraw Hill, New York, USA.
2. Chow, K. E., D. E. Baack and J. Peloza. 2012. Integrated Advertising, Promotion, and Marketing Communications, (Canadian ed.). Pearson Education, USA.
3. Danial, S. 2010. Principles of Advertising: A Systematic Syllabus of the Fundamental Principles of Advertising. The University Cooperative Co, Madison, USA.
4. Shimp, T. A. 2003. Advertising, Promotion & Supplemental Aspects of Integrated Marketing Communications. Thomson South-Western, New York, USA.
5. Tellis, G. J. 2004. Effective Advertising: Understanding When, How, and Why Advertising Works: Marketing for a New Century. Sage Publication, USA.

tools and techniques. Gender empowerment dimensions, women empowerment index in agriculture, women empowerment through extension education, approaches to women empowerment, national and international gender empowerment policies, Constraints and women's access to extension and advisory services. Gender mainstreaming in agricultural extension, Gender and agriculture value chains. Gender equality in agriculture. Gender sensitization in agriculture. Gender status in income generation.

Recommended Books

1. Catherine, L. M. H. 2003. Gender-Disaggregated Data for Agriculture and Rural Development Socio-Economic and Gender Analysis Programme, Guide for Facilitators, Seaga. FAO, Rome, Italy.
2. Dirk Willem Te Velde. 2001. Gender Mainstreaming in Agriculture and Rural Development: A Reference Manual for Governments and other Stakeholders. Common Wealth Secretariat. UK.
3. IFAD 2009. Gender in Agriculture: A Source Book, IFAD, FAO, The World Bank, Washington DC, USA.
4. Lerber, J. 2000. Paradoxes of Gender, Yale University Press, New Heaven, USA.
5. Pearson, R. 2000. Rethinking Gender Matters in Development in Poverty and Development into the 21st Century, Allen T. and A Thomas (Eds.). Oxford University Press, UK.

AEE-608

DISTANCE EDUCATION

2(1-1)

Course Objectives

At the completion of this course, the students will be able to:

- Understand and apply distance education
- Prepare the distance education material
- Evaluate and monitor various distance education programmes

Theory

Concepts of distance education, introduction and philosophy, development of educational technology system approach and instructional design/process as methodology of distance learning. Theoretical principles of distance education. Methods and operation of distance education. Group learning activities. Remedial activities, learners' guide. Quality control, self-monitoring process. Evaluating distance study.

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

AEE 610

INTERNSHIP

4(0-4)

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

- i. Field crop production and protection
- ii. Farm machinery/workshops
- iii. Livestock and poultry management
- iv. Agro-forestry
- v. Seed production and distribution
- vi. Fish farming
- vii. Fruit and vegetable production, preservation and processing
- viii. Manures/chemical fertilizers/organic farming and its certification
- ix. Soil reclamation and conservation
- x. Water management
- xi. Agriculture credit, business and marketing
- xii. Cooperatives

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

- i. Introduction
- ii. Objectives
- iii. Extension activities undertaken during training
- iv. Problems faced by field staff (host institutes/department), farmers and internee
- v. Relationship of agricultural extension service with other nation building departments, agencies and stakeholders.
- vi. Future plans for extension work in the area
- vii. Suggestions for improvement of internship programme

SEMESTER WISE BREAK-UP

5th Semester

AEE 501	Communication and Leadership Skills in Agricultural Extension	3(2-1)
AEE 503	Introduction to Extension Education Methods	3(2-1)
AEE 505	Philosophy of Agricultural Extension	3(3-0)
AEE 507	Rural Development Programmes in Pakistan	3(3-0)
AEE 509	Agricultural Technology Transfer	3(2-1)
	Total	15

6th Semester

AEE 502	Agricultural Journalism	3(2-1)
AEE 504	Adult Learning	3(3-0)
AEE 506	Extension Programme Development	3(2-1)
AEE 508	Rural Youth in Agricultural Development	3(2-1)
AEE 510	Poverty Alleviation and Sustainable Development	3(3-0)
	Total	15

7th Semester

AEE 601	Introduction to Cyber Extension	3(2-1)
AEE 603	Human Resource Development	3(2-1)
AEE 605	Agricultural Advertising	3(2-1)
AEE 607	Agricultural Extension and Gender Studies	3(3-0)
AEE 609	Food Security and Agricultural Extension	3(3-0)
	Total	15

8th Semester

AEE 602	Introduction to Programme Evaluation	3(2-1)
AEE 604	Research Methods in Social Sciences	3(2-1)
AEE 606	Biodiversity and Agricultural Extension	3(3-0)
AEE 608	Distance Education	2(1-1)
AEE 610	Internship	4(0-4)
	Total	15

**SCHEME OF STUDIES
FOR POST-GRADUATE COURSES
IN AGRICULTURAL EXTENSION**

AEE 701	Agricultural Extension Methods	3(2-1)
AEE 702	Programme Planning	3(2-1)
AEE 703	Supervised Field Experience	3(0-3)
AEE 704	Monitoring and Evaluation in Agricultural Extension	3(2-1)
AEE 705	Communication Strategies in Agricultural Extension	3(2-1)
AEE 706	Development of Training Programmes	3(2-1)
AEE 707	Scientific and Technical Writing	3(1-2)
AEE 708	Applications of ICTs in Agricultural Extension	3(2-1)
AEE 709	Human Resource Management	3(2-1)
AEE 710	Gender Mainstreaming for Community Development	3(2-1)
AEE 711	International Agricultural Extension Systems	3(2-1)
AEE 712	Adult and Continuing Education	3(3-0)
AEE 713	Management in Agricultural Extension	3(3-0)
AEE 714	Sustainable Rural Livelihoods	3(3-0)
AEE 715	Interviewing	3(2-1)
AEE 716	Advanced Research Methods	3(2-1)
AEE 717	Market-Led Agricultural Extension and Entrepreneurship	3(2-1)
AEE 718	Participatory Approach to Agricultural Extension & Rural Development	3(2-1)
AEE 719	Special Problem	1(0-1)
AEE 720	Seminar	1(0-1)
	Research and Dissertation	6-10(0-6/10)

DETAIL OF COURSES FOR POST-GRADUATE STUDIES IN AGRICULTURAL EXTENSION

AEE 701 AGRICULTURAL EXTENSION METHODS 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Identify and practice various extension teaching methods
- Analyse the strengths and weaknesses of various extension teaching methods
- Involve local institutions in extension teaching

Theory

Extension teaching methods, their merits, demerits, and applicability. Comparing individual, group and mass media extension methods on the basis of their advantages and disadvantages. Effects of various extension teaching methods at different stages of adoption of farm and home practices. Personal versus impersonal extension teaching methods and their significance. Critical analysis of alternative extension methods. Recent advances in agricultural extension methods. Ways of involving local institutions in extension teaching.

Practical

Students will plan, analyse, and apply given extension teaching method(s) in simulated situation.

Recommended Books

1. Bukhari, A. Z. 2006. Mass Media and Methods of Education. Anmol Publication, Islamabad, Pakistan.
2. Memon, R. A. and E. Bashir (Eds.). 1997. Extension Methods (2nd ed.). National Book Foundation, Islamabad.
3. Muhammad, S. 2005. Agricultural Extension: Strategies and Skills. Unitech Communications, Faisalabad.
4. Narula, U. 2007. Dynamics of Mass Communication: Theory and Practice. Atlantic Publishers and Distributors (Pvt.) Ltd., New Delhi, India.
5. Ramchandni, S. 2004. Modern Methods and Techniques of Teaching. Dominant Publishers and Distributors (Pvt.) Ltd., New Delhi, India.
6. Ray, G. L. 2006. Extension Communication and Management. Kalyani Publishers, India.

Course Objectives

At the completion of this course, the students will be able to:

- Understand the concept, scope and role of programme planning
- Analyse the role of change agents in programme planning
- Differentiate between long-term and short-term programme planning
- Apply various programme planning models in extension

Theory

Planning for social change. Planned versus un-planned change. Functions of planning. Democratic versus autocratic programme planning. Planning extension education programmes. Involving people at grass-roots level in the planning process. Role of change agents (extension workers) in program planning. Identifying the gaps between planning theories and practices. Long-term, short-term, tactical, and strategic planning. Programme planning models, their review, analysis, and application.

Practical

The students will be given assignments to plan an agricultural extension education programme for a typical Pakistani village/farming community and will make presentation.

Recommended Books

1. Boyle, P. G. 1981. Planning Better Program. McGraw-Hill. Book Company, New York. USA.
2. Caffarella, R. S., S. R. Daffron, and R. M. Cervero. 2013. Planning Programmes for Adult Learners (3rd ed.). John Wiley Publishers, USA.
3. Joseph, S., W. Harry, P. Hatry, E. N. Kathryn. 2010. Handbook of Practical Program Evaluation (3rd ed.). Jossy Bass, San Francisco, USA.
4. Ray, G. L. 2006. Extension Communication and Management. Kalyani Publishers, India.
5. Timmreck, T. C. 2003. Planning, Program Development, and Evaluation: A Handbook for Health Promotion, Aging, and Health Services. Jones and Bartlett Learning Publishers, USA.

AEE 703 SUPERVISED FIELD EXPERIENCE 3(0-3)

Course Objectives

At the completion of this course, the students will be able to:

- Observe and participate in real-life learning experience
- Develop on-the-job skills
- Develop and present field report

The students will be attached with experienced extension/development workers to learn on-the-job skills and gain experience in practical settings. Each student will observe/participate and report the activities carried out. The student(s) will be required to make a presentation in the class.

Recommended Books

1. Kamath, U. S. A. R. K. 2010. Thesis and Scientific Writing (Process, Form and Contents). Agrotech Publishing Academy, India.
2. Swanson, B. E. *et al.* 1997. Improving Agricultural Extension: A Reference Manual. FAO, Rome, Italy.

AEE 704 MONITORING AND EVALUATION IN 3(2-1)
AGRICULTURAL EXTENSION

Course Objectives

At the completion of this course, the students will be able to:

- Understand the concepts, scope and role of monitoring and evaluation
- Analyse the importance of evaluation for the future programmes
- Develop data collection instruments and analysis procedures for programme evaluation
- Prepare the evaluation reports

Theory

Evaluation: concept, objectives, process and types of monitoring and evaluation. Basic principles and role of monitoring and evaluation in agricultural extension. Evaluation standards. Participatory monitoring and evaluation. Determining the types and the sources of data collection for an evaluation study. Data collection methods. Designing data collection instruments, interview techniques. Practical problems in data collection, data analysis and interpretation. Writing monitoring and evaluation report. Utilization of evaluation results. Use of Nvivo software for evaluation.

Practical

The students will be required to review critically monitoring and evaluation

reports of development/research projects. They have to identify strengths and weaknesses of the report(s). Each student will select an extension programme/project/activity for evaluation. The student(s) will plan and conduct evaluation and submit the report.

Recommended Books

1. Glenaffric, 2007. Six Steps to Effective Evaluation: A Handbook for Program and Project Managers. Jisc. California, USA.
2. Gudda, P. 2011. A Guide to Project Monitoring and Evaluation. Author House Publishers, UK.
3. Wholey, J. S., H. P. Harty and K. E. Newcomer. (Eds.). 2004. Handbook of Practical Program Evaluation. Jossey Bass Publishers, USA.
4. Worthen, B. R., J. R. Sanders and J. L. Fitzpatrick. 2003. Program Evaluation; Alternative Approaches and Practical Guidelines (3rd ed.). Allyn and Bacon, USA.
5. Patton, M. Q. 2014. Qualitative Research & Evaluation Methods (4th ed.). Sage Publications, Inc. USA.
6. QSR. 2014. Nvivo 10 for Windows, Getting Started. QSR International, Australia.

AEE 705

**COMMUNICATION STRATEGIES IN
AGRICULTURAL EXTENSION**

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend communication process and models
- Analyse the components of an effective message
- Analyse and rectify barriers to communication
- Design persuasive messages

Theory

Analysis and application of various communication models. Variables in communication process: source variables, receiver variables (demographic analysis, personality analysis, interpersonal trust, listening ability and feed-back) and verbal message variables. The components of a persuasive message, factors affecting persuasive message, structuring a persuasive message. Non-verbal communication, functions of non-verbal communication, non-verbal communication as a global approach, non-verbal message variables and difficulties in their understanding. Obstacles to effective communication. Horizontal and vertical communication. The structures of communication process; face to face communication, small group communication, public address communication, mass communication.

Practical

Visits to various media centers and holding discussions with media personnel. The students will be required to prepare messages relating to different persuasive appeals and make presentation in the class. They will also be involved in non-verbal communication through role playing.

Recommended Books

1. Chauhan, J. 2012. Communication and Extension Management, Anjaliprakashan, Kanpur, India.
2. DeFleur, M. L., P. Kearney and T. G. Plax. 2013. Fundamentals of Human Communication: Social Science and Every Day Life. McGraw Hill Publishers, USA.
3. Devito, J. A. 2014. Human Communication: The Basic Course. (13th ed.). Addison- Wesley Longman, Inc., New York, USA.
4. Leeuwis, C., and A. Ven den Ban. 2004. Communication for Rural Innovation: Rethinking Agricultural Extension (3rd ed.). John Wiley-Blackwell Publishers, USA.
5. Ray, G. L. 2006. Extension Communication and Management. Kalyani Publishers, India.

AEE 706 DEVELOPMENT OF TRAINING PROGRAMMES 3(2-1)**Course Objectives**

At the completion of this course, the students will be able to:

- Plan and conduct training programmes
- Develop trainings' support materials
- Evaluate training programmes

Theory

Training: concept, strategies, purposes, principles and importance. Training needs assessment. Organization of training programmes: curriculum development, formulation of training objectives, identification and organization of contents. Training materials and techniques. Developing training support material. Developing and conducting effective trainings. Factors affecting efficiency of trainings. Evaluating training effectiveness.

Practical

Students will prepare different training modules for farmers/professionals.

Recommended Books

1. Beeby, M. E. 1996. Training Module: Deliver Effective Training. Crisp Publication Inc., USA.

- Understand the role of various ICTs in extension teaching
- Determine role of GIS and remote sensing in extension education
- Use given information technology for extension work

Theory

Overview of information and communication technologies (ICTs) used in extension education. Use of databases for agricultural products, computerized weather forecasting and usage, computerized map reading and interpretation, colour coding, spectroscopic study. Introduction to remote sensing and geographical information systems (GIS) for agricultural extension education. Role of remote sensing and GIS for agricultural resource management and rural development. Computerized mass media applications in agricultural extension education: teleconferencing, e-conferencing, knowledge portal, e-office, e-agriculture, e-business etc. Use of mobile communication for agricultural development and business. Recent trends and future of ICTs in Pakistan.

Practical

Student will be given hands-on training in various ICTs and submit comprehensive report and will present in the class.

Recommended Books

1. Campbell, J. B. 2011. Introduction to Remote Sensing (5th ed.). The Guilford Press. New York, USA.
2. Longley, P. A., M. F. Goodchild, D. J. Maguire and D. W. Rhind (Eds.). 2011. Geographical Information Systems: Principles, Techniques, Applications and Management. (Abridged Edition), Hoboken, USA.
3. Grimshaw, D. J. and S. Kala. 2011. Strengthening Rural Livelihoods: The Impact of Information and Communication Technologies in Asia. Practical Application Publishing Ltd., USA.
4. Heywood, I., S. Cornelis and S. Carver. 2011. An Introduction to Geographical Information Systems. Addison Wesley Longman Limited Publisher, New York, USA.

AEE 709

HUMAN RESOURCE MANAGEMENT

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Develop the job design and analysing skills
- Analyse the management styles
- Resolve group conflicts
- Understand behavioural change

Theory

Concepts of human resource management: administration, management, leadership, supervision, authority, role, staffing, communication, conflict resolution, control, motivation, negotiation, delegation, consultation and participation. Job design and analysis. Personnel recruitment, selection; training and development. Compensation and performance evaluation. Management theories. Organizational behaviour analysis. Dimensions of human behaviour. Behaviour style patterns. Process of behaviour modification. Group behaviour: group meetings, group conflicts and management. Strategic management. Effective leadership traits.

Practical

The students will be required to analyse various management styles using different techniques and participatory approaches. The students will identify job design, analyse recruitment and selection process of any organization.

Recommended Books

1. Cahn, D. D. and R. A. Abigail. 2013. Managing Conflict through Communication (5th ed.). Pearson, USA.
2. Malcolm S., E. Knowles and F. Holton. 2011. The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development (7th ed.). Burlington, Elsevier, Inc., Massachusetts, USA.
3. Michael A. 2006. A Handbook of Human Resource Management Practice, Kogan Page Publishers, USA.
4. Armstrong, M. and T. Stephen. 2014. Armstrong's Handbook of Human Resource Management Practice: Building Sustainable Organizational Performance Improvement (13th ed.). Kogan, USA.
5. Wayne, M. R. and M. N. Robert. 2005. Human Resource Management (International ed.). Pearson Prentice Hall, USA.

AEE 710 GENDER MAINSTREAMING FOR COMMUNITY DEVELOPMENT 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend process of community development
- Identify constraints to gender mainstreaming
- Analyse the role of gender in community development

Theory

Community development: definition, concept, elements, past and current programmes. Essential elements in building a national programme of

community development. Methods of community development. Training of local leaders and personnel for community development. Monitoring and evaluation of community development programmes. Gender role and constraints to gender mainstreaming in community development. Role of agricultural extension in sustainable livelihoods with special reference to gender.

Practical

Students will be assigned various projects related to community development and submit a comprehensive report.

Recommended Books

1. Adisa, R.S. (Ed.) 2012. Rural Development – Contemporary Issues and Practices. Tech Publishers, Rijeka, Croatia.
2. Deji, O. F. 2012. Gender and Rural Development: Advanced Studies. LIT Verlag Münster Publishers, Germany.
3. Homan, M. S. 2010. Promoting Community Change: Making it Happen in the Real World (5th ed.). Brooks/Cole Publishing Company, USA.
4. Jerry W., G. Robinson Jr., and P. Green. 2010. Introduction to Community Development: Theory, Practice, and Service-Learning. Sage Publishers, USA.

AEE 711 INTERNATIONAL AGRICULTURAL EXTENSION SYSTEMS 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Compare various extension systems in selected countries
- Analyse strengths and weaknesses of the extension systems
- Identify limitations of agricultural extension systems

Theory

Review of extension: systems in selected Asian countries: agricultural extension in Pakistan, agricultural extension in Bangladesh; Farmers' Association in Malaysia, agricultural development through participation of small farmers in Afghanistan; farmers' training and functional literacy in India; agricultural extension service in Japan with special reference to training of rural youth. Farmers' training programmes in selected developing countries with special reference to small farmers. Agricultural extension systems in developed countries i.e. USA, Canada, UK, China etc.

Practical

The students will review and critically analyse extension systems of given countries. They will also present the same in the class.

Recommended Books

1. Botha, N. 2004. Contracting for Agricultural Extension: International Case Studies and Emerging Practices: A Book Review from: Journal of Rural Studies. Elsevier Publishers, USA.
2. Ponniah, A., R. Puskur, S. Workneh and D. Hoekstra. 2008. Concepts and Practices in Agricultural Extension in Developing Countries: A Source Book. IFPRI (International Food Policy Research Institute), Washington DC, USA.
3. Rivera, W. M. 2001. Agricultural and Rural Extension Worldwide: Options for Institutional Reforms in Developing Countries. FAO, Rome, Italy.
4. Anandajayasekeram P, R. Puskur, S. Workneh and D. Hoekstra. 2008. Concepts and Practices in Agricultural Extension in Developing Countries: A source book. IFPRI (International Food Policy Research Institute), Washington DC, USA, and ILRI (International Livestock Research Institute), Nairobi.
5. Memon, R. A. and E. Bashir. (Eds.). 1997. Extension Methods (2nd ed.). National Book Foundation, Islamabad.

AEE 712 ADULT AND CONTINUING EDUCATION 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend principles of adult education
- Select and apply appropriate method(s) of adult education
- Monitor and evaluate adult education programmes

Theory

Adult learning versus continuing education. Significance of adult education with special reference to agricultural development. Psychology of adult learners. Review and challenges of adult and continuing programmes in Pakistan. Recent trends in adult and continuing education programmes. Principles involved in educating adults. Evaluating various methods of adults' teaching. Monitoring and evaluation of adult education programmes.

Practical

Students will design, present and submit report on assigned topics relating to adult and continuing educational programme.

Recommended Books

1. Caffarella, R. S., S. R. Daffron and R. M. Cervero. 2013. Planning Programs for Adult Learners: A Practical Guide (3rd ed.). Jossey Bass Publishers, USA.

AEE 714

SUSTAINABLE RURAL LIVELIHOODS

3(3-0)

Course Objectives

After the completion of this course, the students will be able to:

- Apply sustainable livelihood framework
- Compare and contrast various livelihood approaches
- Analyse the role of agricultural extension in sustainable rural livelihoods

Theory

Livelihoods: definitions, core concepts and sustainability of livelihoods. Livelihood approaches: sustainable, right based, sector-wise etc. Sustainable livelihoods framework: origin, objectives, vulnerability, context, livelihood assets (human, natural, social, financial and physical), policies, institutions, process, strategies and outcomes. Conducting rural livelihood analysis: rapid and participatory methods, and sample surveys. Livelihood diversification. Comparison of livelihood approaches adopted by various development organizations such as Food and Agriculture Organization (FAO), International Fund for Agricultural Development (IFAD), Department for International Development (DFID) etc. Agricultural development and rural livelihoods. Role of agricultural extension in poverty reduction and sustainable livelihoods.

Recommended Books

1. Baumgartner, R. and R. Hogger. 2004. In Search of Sustainable Livelihood Systems: Managing Resources and Change, Sage Publications, USA.
2. DFID. 2002. Sustainable Livelihoods Guidance Sheet. Department for International Development (DFID) London, UK.
3. John, A., D. David, P. Gibbon and A. Gulliver. 2001. Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World. FAO, Rome, Italy.
4. Redelift, M. R. 2005. Sustainability: Sustainable Development. Critical Concepts in Social Sciences. Routledge Publishers, UK.

AEE 715

INTERVIEWING

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend the interview process
- Design different research instruments
- Conduct different types of interviews

Theory

Interview as dyadic communication, its needs and importance in agricultural extension. Types of interviews: briefing, probing, selection, performance appraisal, discipline, counselling, persuasive, exit, press conference and broadcast. Directive and non-directive interviews. Structured, un-structured and semi-structured interviews. The interview process. Principles and techniques of structuring interviews. The interview guide and schedule. Types of questions, criteria for phrasing and sequence. Planning, conducting and interpreting various types of interviews. Interview as a tool in survey research. Advantages and limitations of interviews.

Practical

Students will plan and conduct interviews of different types in a simulated situation. They will also develop interview schedule and conduct interviews of farmers.

Recommended Books

1. Broadwell, M. M. 1990. Interviewing Skills. The New Supervisor (4th ed.). Addison Wesley Publishing Company, Inc., New York, USA.
2. McDowell, E. E. 1991. Interviewing Practices for Technical Writers. Baywood Publishing Company Inc., New York, USA.
3. Young, V. P. 2004. Scientific Social Surveys and Research. Prentice Hall of India (Pvt.), New Delhi, India.
4. Stewart, C. J. and W. B. Cash. 2010. Interviewing Principles and Practices. McGraw Hills, USA.
5. Yate, M. 2005. Hiring the Best: Manager's Guide to Effective Interviewing and Recruiting. Adams Media, USA.

AEE 716

ADVANCED RESEARCH METHODS

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Identify and synthesise research questions
- Collect, analyse and interpret research data
- Critically analyse various methods of qualitative and quantitative research
- Prepare research proposals

Theory

Selecting and synthesizing research problem. Hypotheses formulation. Conducting review of literature. Planning, developing, and critically analysing research proposals. Ethical principles and constraints for planning, conducting, and reporting research in agricultural extension.

Introduction to research designs. Defining population and selecting samples. Choosing alternative methods for data collection. Determining reliability and validity of the research instrument. Selecting and applying appropriate statistical techniques for data analysis. Qualitative research design. Types of qualitative research: observations, key informant interviews, focused group discussions, life histories etc. Data collection techniques and instruments used in qualitative research. Qualitative data analysis: grounded theory, content analysis, ethnography etc. Using SPSS and Nvivo for data analysis.

Practical

The students will prepare and present brief research proposals, plan, and conduct pilot studies.

Recommended Books

1. Babbie, E. R. 2013. The Practice of Social Research (13th ed.). Cengage Learning, USA.
2. Best, J. W., and J. Kahn. 2009. Research in Education (20th ed.). PHI Learning Private Ltd., USA.
3. Bhattacharjee, A. 2012. Social Science Research: Principles, Methods, and Practice (2nd ed.). University of South Florida, USA.
4. Creswell, J. W. 2008. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. Sage Publications, USA.
5. M. D. Gall, M. D., Gall, J. P. and Borg, W. R. 2006. Educational Research: An Introduction (8th ed.) Longman Inc., New York, USA.
6. George, D. and P. Mallery. 2013. IBM SPSS Statistics 21 Step by Step: A simple guide and reference (13th ed.). IBM Statistic Division, USA.
7. Jergensen, K. B. And L. E. Jensen. 2011. Introduction to Nvivo 9.0. Aarhus University, Denmark.

AEE 717 MARKET-LED AGRICULTURAL EXTENSION AND ENTREPRENEURSHIP 3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Understand the concept, need and importance of market-led extension
- Comprehend the concept of entrepreneurship
- Identify and establish profitable enterprises

Public versus private extension in Pakistan. Market led agricultural extension: need, issues challenges, dimensions, tools, approaches and emerging perspectives. Public private linkages in market led agricultural extension. Agricultural entrepreneurship: concept, characteristics, approaches, theories, need for enterprises development. Traits of

entrepreneurs: risk taking and management, leadership, decision making, planning, organizing, coordinating and marketing, Types of entrepreneurs. Introduction to business incubation centres. Stages of establishing enterprise: identification of sound enterprise, steps to be considered in setting up an enterprise, feasibility report, product selection, risk management and market analysis and legal requirements. Role of extension worker in establishing an enterprise.

Practical

Students will prepare agri. business idea, present and submit the report.

Recommended Books

1. Kaleel F. M. H. and J. Krisnamurthy. 2007. Market Led Extension: Dimensions and Tools. Agro Tech. Publication Academy, India.
2. Alsos, G. A., S. Carter, E. Ljunggren and F. Welter. 2011. The Handbook of Research on Entrepreneurship in Agriculture and Rural Development. Edward Elgar Publishing, India.
3. Vasant, D. 2007. Entrepreneurship-Principles and Practices, Thomson Publications, USA.
4. Riera, W. and G. Alex. 2004. Demand Driven Approaches to Agricultural Extension: Case Studies of International Initiatives. The World Bank, Washington DC, USA.
5. Qamar, M. K. 2011. Introducing Demand Driven Extension Approach in a Traditional Region: Case Study from Pakistan. FAO, Rome, Italy.

AEE 718

PARTICIPATORY APPROACH TO AGRICULTURAL EXTENSION & RURAL DEVELOPMENT

3(2-1)

Course Objectives

At the completion of this course, the students will be able to:

- Comprehend the philosophy of self-reliant participatory approach
- Learn and apply various participatory techniques
- Identify and analyse the barriers of participatory approach
- Establish rural development models using participatory approach

Theory

Rural development: basic elements and indicators. Rural poverty: concepts, causes, biases, problems and opportunities. The changing role of the professionals; sitting, asking, listening and learning from the poor. Self-reliant participatory development: concept, philosophy, objectives and basic principles. Participatory rural appraisal (PRA) and rapid rural appraisal (RRA). Participatory tools and techniques. Participatory teaching

ANNEXURE - A

English I (Functional English)

Objectives: Enhance language skills and develop critical thinking.

Course Contents:

Basics of grammar
Parts of speech and use of articles
Sentence structure, active and passive voice
Practice in unified sentence
Analysis of phrase, clause and sentence structure
Transitive and intransitive verbs
Punctuation and spelling

Comprehension

Answers to questions on a given text

Discussion

General topics and every-day conversation (topics for discussion to be at the discretion of the teacher keeping in view the level of students)

Listening

To be improved by showing documentaries/films carefully selected by subject teachers

Translation skills

Urdu to English

Paragraph writing

Topics to be chosen at the discretion of the teacher

Presentation skills

Introduction

Note: Extensive reading is required for vocabulary building

Recommended Books

1. **Functional English**
 - a) Grammar
 1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 1 (3rd ed.). Oxford University Press. 1997. ISBN 0194313492

2. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2 (3rd ed). Oxford University Press. 1997. ISBN 0194313506
- b) Writing
 1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 0 19 435405 7 Pages 20-27 and 35-41.
 - c) Reading/Comprehension
 1. Reading. Upper Intermediate. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 453402 2.
 - d) Speaking

English II (Communication Skills)

Objectives: Enable the students to meet their real life communication needs.

Course Contents:

Paragraph writing

Practice in writing a good, unified and coherent paragraph

Essay writing

Introduction

CV and job application

Translation skills

Urdu to English

Study skills

Skimming and scanning, intensive and extensive, and speed reading, summary and precise writing and comprehension

Academic skills

Letter/memo writing, minutes of meetings, use of library and internet

Presentation skills

Personality development (emphasis on content, style and pronunciation)

Note: documentaries to be shown for discussion and review

Recommended Books

Communication Skills

- a) Grammar

1. Practical English Grammar by A. J. Thomson and A. V. Martinet. Exercises 2 (3rd ed.). Oxford University Press 1986. ISBN 0 19 431350 6.
- b) Writing
1. Writing. Intermediate by Marie-Christine Boutin, Suzanne Brinand and Françoise Grellet. Oxford Supplementary Skills. Fourth Impression 1993. ISBN 019 435405 7 Pages 45-53 (note taking).
 2. Writing. Upper-Intermediate by Rob Nolasco. Oxford Supplementary Skills. Fourth Impression 1992. ISBN 0 19 435406 5 (particularly good for writing memos, introduction to presentations, descriptive and argumentative writing).
- c) Reading
1. Reading. Advanced. Brian Tomlinson and Rod Ellis. Oxford Supplementary Skills. Third Impression 1991. ISBN 0 19 453403 0.
 2. Reading and Study Skills by John Langan
 3. Study Skills by Richard York.

English III (Technical Writing and Presentation Skills)

Objectives: Enhance language skills and develop critical thinking

Course Contents:

Presentation skills

Essay writing

Descriptive, narrative, discursive, argumentative

Academic writing

How to write a proposal for research paper/term paper

How to write a research paper/term paper (emphasis on style, content, language, form, clarity, consistency)

Technical Report writing

Progress report writing

Note: Extensive reading is required for vocabulary building

Recommended Books

Technical Writing and Presentation Skills

- a) Essay Writing and Academic Writing
 - 1. Writing. Advanced by Ron White. Oxford Supplementary Skills. Third Impression 1992. ISBN 0 19 435407 3 (particularly suitable for discursive, descriptive, argumentative and report writing).
 - 2. College Writing Skills by John Langan. McGraw-Hill Higher Education. 2004.
 - 3. Patterns of College Writing (4th ed.) by Laurie G. Kirszner and Stephen R. Mandell. St. Martin's Press.
- b) Presentation Skills
- c) Reading
 - The Mercury Reader. A Custom Publication. Compiled by Northern Illinois University. General Editors: Janice Neulib; Kathleen Shine Cain; Stephen Ruffus and Maurice Scharon. (A reader which will give students exposure to the best of twentieth century literature, without taxing the taste of engineering students).

ANNEXURE - B

Pakistan Studies (Compulsory)

Introduction/Objectives

- Develop vision of historical perspective, government, politics, contemporary Pakistan, ideological background of Pakistan.
- Study the process of governance, national development, issues arising in the modern age and posing challenges to Pakistan.

Course Outline

1. Historical Perspective

- a. Ideological rationale with special reference to Sir Syed Ahmed Khan, Allama Muhammad Iqbal and Quaid-e-Azam Muhammad Ali Jinnah.
- b. Factors leading to Muslim separatism
- c. People and Land
 - i. Indus civilization
 - ii. Muslim advent
 - iii. Location and geo-physical features

2. Government and Politics in Pakistan

Political and constitutional phases:

- a. 1947-58
- b. 1958-71
- c. 1971-77
- d. 1977-88
- e. 1988-99
- f. 1999 onward

3. Contemporary Pakistan

- a. Economic institutions and issues
- b. Society and social structure
- c. Ethnicity
- d. Foreign policy of Pakistan and challenges
- e. Futuristic outlook of Pakistan

Recommended Books

1. Burki, Shahid Javed. *State & Society in Pakistan*, The MacMillan Press Ltd 1980.
2. Akbar, S. Zaidi. *Issue in Pakistan's Economy*. Karachi: Oxford University Press, 2000.

3. S. M. Burke and Lawrence Ziring. *Pakistan's Foreign policy: An Historical analysis*. Karachi: Oxford University Press, 1993.
4. Mehmood, Safdar. *Pakistan Political Roots & Development*. Lahore, 1994.
5. Wilcox, Wayne. *The Emergence of Bangladesh*, Washington: American Enterprise, Institute of Public Policy Research, 1972.
6. Mehmood, Safdar. *Pakistan Kayyun Toota*, Lahore: Idara-e-Saqafat-e-Islamia, Club Road, nd.
7. Amin, Tahir. *Ethno - National Movement in Pakistan*, Islamabad: Institute of Policy Studies, Islamabad.
8. Ziring, Lawrence. *Enigma of Political Development*. Kent England: Wm Dawson & Sons Ltd., 1980.
9. Zahid, Ansar. *History & Culture of Sindh*. Karachi: Royal Book Company, 1980.
10. Afzal, M. Rafique. *Political Parties in Pakistan*, Vol. I, II & III. Islamabad: National Institute of Historical and cultural Research, 1998.
11. Sayeed, Khalid Bin. *The Political System of Pakistan*. Boston: Houghton Mifflin, 1967.
12. Aziz, K. K. *Party, Politics in Pakistan*, Islamabad: National Commission on Historical and Cultural Research, 1976.
13. Muhammad Waseem, *Pakistan Under Martial Law*, Lahore: Vanguard, 1987.
14. Haq, Noor ul. *Making of Pakistan: The Military Perspective*. Islamabad: National Commission on Historical and Cultural Research, 1993.

**ISLAMIC STUDIES
(Compulsory)**

Objectives

This course is aimed at:

- 1 To provide basic information about islamic studies
- 2 To enhance understanding of the students regarding islamic civilization
- 3 To improve students skill to perform prayers and other worships
- 4 To enhance the skill of the students for understanding of issues related to faith and religious life.

Detail of Courses

Introduction to Quranic Studies

1. Basic concepts of Quran
2. History of Quran
3. Uloom-ul-Quran

Study of Selected Text of Holly Quran

1. Verses of Surah Al-Baqara related to faith (Verse No-284-286)
2. Verses of Surah Al-Hujrat related to Adab Al-Nabi (Verse No-1-18)
3. Verses of Surah Al-Mumanoon related to characteristics of faithful (Verse No-1-11)
4. Verses of Surah al-Furqan related to social ethics (Verse No.63-77)
5. Verses of Surah Al-Inam related to Ihkam (Verse No-152-154)

Study of Selected Text of Holly Quran

1. Verses of Surah Al-Ihzab related to Adab al-Nabi (Verse No.6, 21, 40, 56, 57, 58.)
2. Verses of Surah Al-Hashar (18,19,20) related to thinking, Day of Judgment
3. Verses of Surah Al-Saf related to Tafakar, Tadabar (Verse No-1,14)

Seerat of Holy Prophet (S.A.W) I

1. Life of Muhammad Bin Abdullah (Before Prophet Hood)
2. Life of Holy Prophet (S.A.W) in Makkah
3. Important lessons derived from the life of Holy Prophet in Makkah

Seerat of Holy Prophet (S.A.W) II

1. Life of Holy Prophet (S.A.W) in Madina
2. Important events of life of Holy Prophet in Madina
3. Important lessons derived from the life of Holy Prophet in Madina

Introduction to Sunnah

1. Basic concepts of Hadith

2. History of Hadith
3. Kinds of Hadith
4. Uloom –ul-Hadith
5. Sunnah & Hadith
6. Legal position of Sunnah

Selected Study from Text of Hadith

Introduction to Islamic Law & Jurisprudence

1. Basic concepts of islamic law & jurisprudence
2. History & importance of islamic law & jurisprudence
3. Sources of islamic law & jurisprudence
4. Nature of differences in islamic law
5. Islam and sectarianism

Islamic Culture & Civilization

1. Basic concepts of islamic culture & civilization
2. Historical development of islamic culture & civilization
3. Characteristics of islamic culture & civilization
4. Islamic culture & civilization and contemporary issues

Islam & Science

1. Basic concepts of islam & science
2. Contributions of Muslims in the development of science
3. Quran & science

Islamic Economic System

1. Basic concepts of islamic economic system
2. Means of distribution of wealth in Islamic economics
3. Islamic concept of riba
4. Islamic ways of trade & commerce

Political System of Islam

1. Basic concepts of islamic political system
2. Islamic concept of sovereignty
3. Basic institutions of Govt. in Islam

Islamic History

1. Period of Khlaft-E-Rashida
2. Period of Ummayyads
3. Period of Abbasids

Social System of Islam

1. Basic concepts of social system of Islam
2. Elements of family
3. Ethical values of Islam

Recommended Books

1. Hameed ullah Muhammad, "Emergence of Islam", IRI, Islamabad

- 2 Hameed ullah Muhammad, "Muslim Conduct of State"
- 3 Hameed ullah Muhammad, 'Introduction to Islam
4. Mulana Muhammad Yousaf Islahi,"
- 5 Hussain Hamid Hassan, "An Introduction to the Study of Islamic Law" leaf Publication Islamabad, Pakistan.
- 6 Ahmad Hasan, "Principles of Islamic Jurisprudence" Islamic Research Institute, International Islamic University, Islamabad (1993)
- 7 Mir Waliullah, "Muslim Jurisprudence and the Quranic Law of Crimes" Islamic Book Service (1982)
- 8 H. S. Bhatia, "Studies in Islamic Law, Religion and Society" Deep & Deep Publications New Delhi (1989)
- 9 Dr. Muhammad Zia-ul-Haq, "Introduction to Al Sharia Al Islamia" Allama Iqbal Open University, Islamabad (2001)

**COMPULSORY MATHEMATICS
COURSES FOR BS (4 YEAR)**

**(FOR STUDENTS NOT MAJORING IN
MATHEMATICS)**

1. MATHEMATICS I (ALGEBRA)

Prerequisite(s): Mathematics at secondary level

Credit Hours: 3 + 0

Specific Objectives of the Course: To prepare the students, not majoring in mathematics, with the essential tools of algebra to apply the concepts and the techniques in their respective disciplines.

Course Outline:

Preliminaries: Real-number system, complex numbers, introduction to sets, set operations, functions, types of functions. *Matrices:* Introduction to matrices, types, matrix inverse, determinants, system of linear equations, Cramer's rule.

Quadratic Equations: Solution of quadratic equations, qualitative analysis of roots of a quadratic equations, equations reducible to quadratic equations, cube roots of unity, relation between roots and coefficients of quadratic equations.

Sequences and Series: Arithmetic progression, geometric progression, harmonic progression. *Binomial Theorem:* Introduction to mathematical induction, binomial theorem with rational and irrational indices. *Trigonometry:* Fundamentals of trigonometry, trigonometric identities.

Recommended Books

1. Dolciani MP, Wooton W, Beckenback EF, Sharron S, *Algebra 2 and Trigonometry*, 1978, Houghton & Mifflin, Boston (suggested text)
2. Kaufmann JE, *College Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
3. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th ed.), 1986, PWS-Kent Company, Boston

2. MATHEMATICS II (CALCULUS)

Prerequisite(s): Mathematics I (Algebra)
Credit Hours: 3 + 0

Specific Objectives of the Course: To prepare the students, not majoring in mathematics, with the essential tools of calculus to apply the concepts and the techniques in their respective disciplines.

Course Outline:

Preliminaries: Real-number line, functions and their graphs, solution of equations involving absolute values, inequalities. *Limits and Continuity:* Limit of a function, left-hand and right-hand limits, continuity, continuous functions.

Derivatives and their Applications: Differentiable functions, differentiation of polynomial, rational and transcendental functions, derivatives.

Integration and Definite Integrals: Techniques of evaluating indefinite integrals, integration by substitution, integration by parts, change of variables in indefinite integrals.

Recommended Books

1. Anton H, Bevens I, Davis S, *Calculus: A New Horizon* (8th ed.), 2005, John Wiley, New York
2. Stewart J, *Calculus* (3rd ed.), 1995, Brooks/Cole (suggested text)
3. Swokowski EW, *Calculus and Analytic Geometry*, 1983, PWS-Kent Company, Boston
4. Thomas GB, Finney AR, *Calculus* (11th ed.), 2005, Addison-Wesley, Reading, Ma, USA

3. MATHEMATICS III (GEOMETRY)

Prerequisite(s): Mathematics II (Calculus)
Credit Hours: 3 + 0

Specific Objectives of the Course: To prepare the students, not majoring in mathematics, with the essential tools of geometry to apply the concepts and the techniques in their respective disciplines.

Course Outline

Geometry in Two Dimensions: Cartesian-coördinate mesh, slope of a line, equation of a line, parallel and perpendicular lines, various forms of equation of a line, intersection of two lines, angle between two lines, distance between two points, distance between a point and a line.

Circle: Equation of a circle, circles determined by various conditions, intersection of lines and circles, locus of a point in various conditions.

Conic Sections: Parabola, ellipse, hyperbola, the general-second-degree equation

Recommended Books

1. Abraham S, Analytic Geometry, Scott, Freshman and Company, 1969
2. Kaufmann JE, College *Algebra and Trigonometry*, 1987, PWS-Kent Company, Boston
3. Swokowski EW, *Fundamentals of Algebra and Trigonometry* (6th edition), 1986, PWS-Kent Company, Boston

4. COURSE FOR NON-MATHEMATICS MAJORS IN SOCIAL SCIENCES

<i>Title of subject:</i>	MATHEMATICS
<i>Discipline</i>	: BS (Social Sciences).
<i>Pre-requisites</i>	: SSC (Metric) level Mathematics
<i>Credit Hours</i>	: 03 + 00
<i>Minimum Contact Hours:</i>	40
<i>Assessment</i>	: written examination;
<i>Effective</i>	: 2008 and onward

Aims : To give the basic knowledge of Mathematics and prepare the students not majoring in mathematics.

Objectives : After completion of this course the student will be able to:

- Understand the use of the essential tools of basic mathematics;
- Apply the concepts and the techniques in their respective disciplines;
- Model the effects non-isothermal problems through different domains;

Contents :

1. **Algebra**

Preliminaries: Real and complex numbers, Introduction to sets, set operations, functions, types of functions. *Matrices:* Introduction to matrices, types of matrices, inverse of matrices, determinants, system of linear equations, Cramer's rule. *Quadratic equations:* Solution of quadratic equations, nature of roots of quadratic equations, equations reducible to quadratic equations. *Sequence and Series:* Arithmetic, geometric and harmonic progressions. *Permutation and combinations:* Introduction to permutation and combinations, *Binomial Theorem:* Introduction to binomial theorem. *Trigonometry:* Fundamentals of trigonometry, trigonometric identities. *Graphs:* Graph of straight line, circle and trigonometric functions.

2. **Statistics**

Introduction: Meaning and definition of statistics, relationship of statistics with social science, characteristics of statistics, limitations of statistics and main division of statistics. *Frequency distribution:* Organisation of data, array, ungrouped and grouped data, types of frequency series, individual, discrete and continuous series, tally sheet method, graphic presentation of the frequency distribution, bar frequency diagram histogram, frequency polygon, cumulative frequency curve. *Measures of central tendency:* Mean medium and modes, quartiles, deciles and percentiles. *Measures of dispersion:* Range, inter quartile deviation mean deviation, standard deviation, variance, moments, skewness and kurtosis.

Recommended Books

1. Swokowski. E. W., '*Fundamentals of Algebra and Trigonometry*', Latest Edition.
2. Kaufmann. J. E., '*College Algebra and Trigonometry*', PWS-Kent Company, Boston, Latest Edition.
3. Walpole, R. E., '*Introduction of Statistics*', Prentice Hall, Latest Edition.
4. Wilcox, R. R., '*Statistics for The Social Sciences*',

5. **MATHEMATICS FOR CHEMISTRY**

Credit Hours: 3

Prerequisites: Mathematics at Secondary level

Course Objectives

To prepare the students not majoring in mathematics with the essential tools of Calculus to apply the concepts and the techniques in their respective disciplines.

Course Outline

Preliminaries: Real Numbers and the Real Line, *Functions and their graphs:* Polynomial Functions, Rational Functions, Trigonometric Functions, and Transcendental Functions. Slope of a Line, Equation of a Line, Solution of equations involving absolute values, Inequalities. *Limits and Continuity:* Limit of a Function, Left Hand and Right Hand Limits, Continuity, Continuous Functions. *Derivatives and its Applications:* Differentiation of Polynomial, Rational and Transcendental Functions, Extreme Values of Functions. *Integration and Indefinite Integrals:*

Integration by Substitution, Integration by Parts, Change of Variables in Indefinite Integrals. Least-Squares Line.

Recommended Books

1. Thomas, Calculus, (11th ed.). Addison Wesley publishing company, 2005.
2. H. Anton, I. Bevens, S. Davis, Calculus, (8th ed.). John Willey & Sons, Inc. 2005.
3. Hughes-Hallett, Gleason, McCallum, et al, Calculus Single and Multivariable, (3rd ed.). John Wiley & Sons, Inc. 2002.
4. Frank A. Jr, Elliott Mendelsohn, Calculus, Schaum's Outline Series, (4th ed,) 1999.
5. E. W. Swokowski, Calculus and Analytic Geometry PWS Publishers, Boston, 1983.
6. John H. Mathews, Numerical Methods for Mathematics Science and Engineering, Prentice-Hall, Second Edition 1992.

6. MATHEMATICS FOR PHYSICS

Contents

1. Preliminary calculus

- Differentiation
Differentiation from first principles; products; the chain rule; quotients; implicit differentiation; logarithmic differentiation; Leibnitz' theorem; special points of a function; theorems of differentiation.
- Integration
Integration from first principles; the inverse of differentiation; integration by inspection; sinusoidal function; logarithmic integration; integration using partial fractions; substitution method; integration by parts; reduction formulae; infinite and improper integrals; plane polar coordinates; integral inequalities; applications of integration.

2. Complex numbers and hyperbolic functions

- The need for complex numbers
- Manipulation of complex numbers
Additions and subtraction; modulus and argument; multiplication; complex conjugate; division
- Polar representation of complex numbers multiplication and division in polar form
- de Moivre's theorem

Trigonometrical identities; finding the n th roots of unity; solving polynomial equations

- Complex logarithms and complex powers
- Applications to differentiation and integration
- Hyperbolic functions
Definitions; hyperbolic-trigonometric analogies; identities of hyperbolic functions; solving hyperbolic equations; inverses of hyperbolic functions; calculus of hyperbolic functions

3. Series and limits

- Series
- Summation of series
Arithmetic series; geometric series; arithmetico-geometric series; the difference method; series involving natural numbers; transformation of series
- Convergence of infinite series
Absolute and conditional convergence; convergence of a series containing only real positive terms; alternating series test
- Operations with series
- Power series
Convergence of power series; operations with power series
- Taylor series
Taylor's theorem; approximation errors in Taylor series; standard McLaurin series
- Evaluation of limits

4. Partial differentiation

- Definition of the partial derivative
- The total differential and total derivative
- Exact and inexact differentials
- Useful theorems of partial differentiation
- The chain rule
- Change of variables
- Taylor's theorem for many-variable functions
- Stationary values of many-variable functions
- Stationary values under constraints

5. Multiple integrals

- Double integrals
- Triple integrals
- Applications of multiple integrals
- Areas and volumes; masses, centers of mass and centroid Pappus' theorems; moments of inertia; mean values of functions

- Change of variables in multiple integrals
- Change of variables in double integrals

6. Vector algebra

- Scalars and vectors
- Addition and subtraction of vectors
- Multiplication by a scalar
- Basis vectors and components
- Magnitude of a vectors
- Multiplication of vectors
Scalar product; vector product; scalar triple product; vector triple product
- Equations of lines and planes
Equation of a line; equation of a plane
- Using vectors to find distances
Point to line; point to plane; line to line; line to plane
- Reciprocal vectors

7. Matrices and vector spaces

- Vectors spaces Basic vectors; the inner product; some useful inequalities
- Matrices
- The complex and Hermitian conjugates of a matrix
- The determinant of a matrix
Properties of determinants
- The inverse of a matrix
- The rank of a matrix
- Simultaneous linear equations
N simultaneous linear equations in N unknowns
- Special square matrices
Diagonal; symmetric and antisymmetric; orthogonal; Hermitian; unitary normal
- Eigen vectors and eigen values
of a normal matrix; of Hermitian and anti-Hermitian matrices; of a unitary matrix; of a general square matrix
- Determination of eigen values and eigen vectors Degenerate eigen values

8. Vector calculus

- Differentiation of vectors composite vector expressions; differential of a vector
- Integration of vectors
- Space curves

- Vector functions of several arguments
- Surfaces
- Scalar and vector fields
- Vector operators
- Gradient of a scalar field; divergence of a vector field; curl of a vector field
- Vector operator formulae
- Vector operators acting on sums and products; combinations of grad, div and curl
- Cylindrical and spherical polar coordinates
- Cylindrical polar coordinates; spherical polar coordinates

Annexure - E

Statistics-I

Credit 3 (2-1)

Definition and importance of statistics in agriculture, data different types of data and variables

Classification and tabulation of data, frequency distribution, stem-and-Leaf diagram, graphical representation of data histogram, frequency polygon, frequency curve.

Measure of central tendency, definition and calculation of arithmetic mean, geometric mean, harmonic mean, median quantiles and mode in grouped and un-grouped data.

Measure of dispersion, definition and calculation of range, quartile deviation, mean deviation, standard deviation and variance, coefficient of variation.

Practical

- a. Frequency distribution
- b. Stem-and-leaf diagram
- c. Various types of graphs
- d. Mean, geometric mean harmonic mean,
- e. Median, quartiles deviation, mean deviation.
- f. Standard deviation, variance, coefficient of variation,
- g. Skewness and kinesis

Recommended Books

1. Introduction to Statistical Theory Part- I by Sher Muhammad and Dr. Shahid Kamal (Latest Edition)
2. Statistical Methods and Data Analysis by Dr. Faquir Muhammad
3. A. Concise Course in A. Level Statistic with world examples by J. Crashaw and J. Chambers (1994)
4. Basic Statistics an Inferential Approach 2nd Ed. (1986) Fran II. Dietrich-II and Thomas J. Keans

Statistics-II**Credit 3 (2-1)**

Sampling: probability and non-probability sampling, simple random sampling stratified random sampling systematic sampling error, sampling distribution of mean and difference between two means. interference 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, test of association of attributes using X^2 (Chi-square) testing hypothesis about variance.

Practical

- a. Sampling random sampling
- b. Stratified random sampling.
- c. Sampling distribution of mean
- d. Testing of hypotheses regarding population mean
- e. Testing of hypotheses about the difference between population means
- f. Chi-square test
- g. Testing of Correlation Coefficient
- h. Fitting of simple linear regression
- i. One-way ANOVA
- j. Two-way ANOVA

Recommended Books

1. Introduction to Statistical Theory Part-II by Sher Muhammad and Dr. Shahid Kamal (Latest Edition)
2. Statistical Methods and Data Analysis by Dr. Faquir Muhammad
3. Principles and Procedures of Statistics A Bio-material approach, (2nd ed.). 1980 by R. G. D Steal and James H. Tarric
4. Statistical Procedures for Agricultural Research (2nd Ed.). (1980) by K. A. Gomez and A. A. Gomez

ANNEXURE - F

Introduction to Information and Communication Technologies

Course Structure: Lectures: 2 Labs: 1 **Credit Hours: 3**
Pre-requisite: None **Semester: 1**

Course Description

This is an introductory course on Information and Communication Technologies. Topics include ICT terminologies, hardware and software components, the internet and World Wide Web, and ICT based applications.

After completing this course, a student will be able to:

- Understand different terms associated with ICT
- Identify various components of a computer system
- Identify the various categories of software and their usage
- Define the basic terms associated with communications and networking
- Understand different terms associated with the Internet and World Wide Web.
- Use various web tools including Web Browsers, E-mail clients and search utilities.
- Use text processing, spreadsheets and presentation tools
- Understand the enabling/pervasive features of ICT

Course Contents

Basic definitions & concepts

Hardware: computer systems & components

Storage devices, number systems

Software: operating systems, programming and application software

Introduction to programming, databases and Information systems

Networks

Data communication

The internet, browsers and search engines

The internet: email, collaborative computing and social networking

The internet: e-commerce

IT security and other issues

Project week

Review week

Text Books/Reference Books

1. Introduction to Computers by Peter Norton, (6th International ed.). McGraw-Hill

2. Using Information Technology: A Practical Introduction to Computer & Communications by Williams Sawyer, 6th Edition, McGraw-Hill
3. Computers, Communications & information: A user's introduction by Sarah E. Hutchinson, Stacey C. Swayer

Fundamentals of Information Technology by Alexis Leon, Mathews Leon, Leon Press.

ANNEXURE - G

Functional Biology-I Credit Hours 3+0

Biological Methods

Principles of cellular life
Chemical basis
Structure and function
Principles of metabolism
Energy acquisition
Principles of inheritance
Mitosis and meiosis
Chromosomes
Observable inheritance patterns
DNA structure and function
RNA and proteins
Genes
Genetic engineering and biotechnology

Biodiversity

Fundamental concept of biodiversity
One or two examples of each of the following from commonly found organism
Prions
Viruses
Bacteria
Protistans
Algae
Fungi
Plants
Crops
Animals
Invertebrates
Vertebrates

Reading

1. Roberts, M.M., Reiss and G. Monger. 2000. Advanced Biology, Nelson.
2. Starr, C. and R. Taggart, 2001. Biology: The Unity and Diversity of Life Brooks and Cole.
3. Campbell, N.A., J.B. Reece, L.G. Mitchell and M.R, Taylor. 2001. Biology: Concepts and Connections. Prentice-Hall.

Functional Biology-II Credit Hours 3+0

Myths and realities of evolution

Microevolution
Speciation
Macroevolution

Level of organization
Plants
Tissues
Nutrition and transport
Reproduction
Growth and development

Animals
Tissue, organ system and homeostasis
Information flow and neuron
Nervous system
Circulation and immunity
Nutrition and respiration
Reproduction and development

Ecology and behavior
Ecosystems
Biosphere
Social interactions
Community interactions
Human impact on biosphere
Environment conservation

Reading

1. Roberts, M.M., Reiss and G.Monger. 2000. Advanced Biology, Nelson.
2. Starr, C, and R, Taggart, 2001. Biology: The Unity and Diversity of Life Brooks and Cole.
3. Campbell, N.A., J.B, Reece, L.G. Mitchell, M.R, Taylor. 2001. Biology: Concepts and Connections. Prentice-Hall.

Note

Universities may make necessary changes in the courses according to the requirement as decided by the Board of Studies.

Functional Biology-II Credit Hours 3+0

Myths and realities of evolution

Microevolution
Speciation
Macroevolution

Level of organization
Plants
Tissues
Nutrition and transport
Reproduction
Growth and development

Animals
Tissue, organ system and homeostasis
Information flow and neuron
Nervous system
Circulation and immunity
Nutrition and respiration
Reproduction and development

Ecology and behavior
Ecosystems
Biosphere
Social interactions
Community interactions
Human impact on biosphere
Environment conservation

Reading

1. Roberts, M.M., Reiss and G.Monger. 2000. Advanced Biology, Nelson.
2. Starr, C, and R, Taggart, 2001. Biology: The Unity and Diversity of Life Brooks and Cole.
3. Campbell, N.A., J.B, Reece, L.G. Mitchell, M.R, Taylor. 2001. Biology: Concepts and Connections. Prentice-Hall.

Note

Universities may make necessary changes in the courses according to the requirement as decided by the Board of Studies.

RECOMMENDATIONS

After thorough discussion, the participants of NCRC of Agricultural Extension formulated the following recommendations:

- The Higher Education Commission should provide financial help for conducting National Conferences of various stakeholders related to agricultural extension in all provinces of the country.
- Mobilizing the activities of Pakistan Association for the Advancement of Agricultural Extension Education (PAAEE).
- Uniform nomenclature for graduate and post-graduate levels at all degree awarding institutions of HEC should be adopted to avoid any inconvenience in this respect.
- Establishment of independent department/institute of Agricultural Extension Education at all the degree awarding institutions in agriculture.
- Strengthening the infrastructure and related facilities where ever these are lacking for smooth running of the department.
- Uniform policy for awarding qualification allowance should be adopted in all institutions of HEC throughout the country. The said recommendation should be communicated to all the provincial departments.
- HEC should provide latest data analysis software such as SPSS, Nvivo etc. and software for preparing advertising materials such as Adobe, Corel Draw etc. to the affiliated universities.
- Rural Development degree programme is being offered by various universities at undergraduate and post graduate levels, it is therefore, recommended to constitute NCRC meeting for developing curriculum of the same.