I  Preamble:
The Academic Council in its fifteenth meeting approved the M Sc (ICT-ARD) Curriculum Review Committee Report, and directed that the revised curriculum contained therein should be followed with effect from the 2010 batch and onwards. The present document contains the official description of the course structure for the Master of Science (ICT in Agriculture and Rural Development)- M Sc (ICT-ARD)- program for the 2010 batch and onwards.

II.  Goals and Objectives
The objective of the program is to prepare graduates to work in government and non-governmental organisations as professionals who will be able to use ICT as a means for developing innovative solutions to existing and emerging challenges in areas of agriculture, rural development, rural entrepreneurship, rural marketing and services for sustained livelihood security. Some of the focussed objectives to meet this overall goal are:

1. Understanding rural development processes through
   a. Appreciation of the genesis of development orientation of people, organisations and the society
   b. Role of rural sector organisations
   c. Rural development practices

2. Exposure to and management of rural resources and services through
   a. Rural production practices and systems (agriculture, non-farm sector)
   b. Rural business
   c. Rural economics and finance with the role of sector organisations and supporting institutions
   d. Rural technologies (including ICT) and their role in managing resources

3. ICT and its role in managing rural development practices
   a. ICT and its components
   b. Information systems
   c. Simulation, modeling and deployment of information systems

4. Integration of ICT for rural development
   a. GIS and rural services
   b. Managing databases
   c. Governance systems for rural services (e-Governance and m-Governance)
   d. E-organisations (rural organisations) and sustainable development practices
   e. ICT and citizen empowerment

These objectives will be accomplished through imparting appropriate proficiencies/competencies in ICT and development concepts, technologies, analytical tools and techniques (qualitative and quantitative) to perform managerial tasks with a management perspective.
III  Teaching Philosophy and Pedagogy

- Focus on a holistic approach to decision making and problem solving.
- Integrated approach.
- Strong emphasis on ethics and values.
- Emphasis on group work and team building.
- Academic rigor and continuous evaluation.
- Strong support through faculty advisors.
- Active collaboration between the Institute and sector organisations through internship and placement.

A comprehensive array of pedagogical tools such as lectures, case studies, role plays, project presentations and simulations are used to facilitate effective learning.

IV  Evaluation and Grading

A rigorous system of continuous evaluation is followed and the assessment events include quizzes, tests, assignments, in-semester and end-semester exams, individual/group project work, presentations and/or panel discussions.

V  Course Curriculum

<table>
<thead>
<tr>
<th>Semester – I</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Practical</th>
<th>Credit</th>
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<tr>
<td>Systems Approaches to Sustainable Development</td>
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<td>Organisational Theory</td>
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<td>Remote sensing and GIS</td>
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| Internship                    |          |          | 16        | 8      |
| **Total**                     |          |          | 08        |        |

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VI Course Description

Semester – I

Development Theory and Practices (Core 3-0-0-3): Basic concepts and measurement of development, development paradigms; contemporary issues in development, sustainable livelihoods perspective, food and livelihood security, agriculture and its role in development; development planning with special reference to agricultural development planning; globalisation, WTO agreement on agriculture, and its implications for Indian agriculture. The course also focuses on understanding fluctuations in the levels of income, employment, and production and policy responses to these fluctuations.

Outcome: The student is expected to understand the present developmental context within which the Indian agriculture and rural development is located in terms of policies and prescriptions. The student is also expected to understand the process of planning in the realm of rural development; introduced to the global trends in the agriculture.

Quantitative Analysis I (Core 3-0-2-4): This course reviews basic mathematical, statistical and optimisation methods. Topics covered quantitative data analysis and problem solving through logical reasoning; descriptive statistics – graphical presentation of data; basic probability concepts; standard probability distributions; sampling and sampling distributions; confidence intervals; basic elements research design and hypothesis testing; regression analysis; and time-series analysis.

Rural Finance (Core 3-0-0-3): Two components: Finance and rural finance. Finance includes financial statements, ratio analysis, capital expenditure decisions, and capital structure theories. Rural finance discusses the role of finance in development and growth, financial institutions (current status and critique), financial reforms, micro-finance, contract and commodity farming, ICT and rural finance.

Outcome: Students would be expected to understand the role of finance in rural development, current financial situation in rural India, the practical issues involved with investment in rural areas, and the operationalising of micro finance theory in this course.

Technical Communication Skills (Core 2-0-2-3): The course is designed to serve as a basic introduction to technical writing for those who work in scientific and technical fields to improve their communication and analytical skills. It reviews the fundamentals of written communication with particular attention paid to grammatical structure, sentences and paragraph construction, and common modes of writing. Attention is focused on literature reviews, scientific papers, graphics, report writing, poster presentations, and oral paper presentations.

Outcomes: Students will learn methods, tools, and techniques to improve their technical written and verbal communication skills.
Information Systems Modeling (Core 3–0–2–4): The course aims to train students in modeling language(s) and apply them for managing business and development systems. The business and development models may include farm and non-farm production, processes, information management and processing. The inputs will be drawn from courses like Production and Operations Management, Project Management, Development Theory and Practices, MIS, Managerial Economics and Rural Finance.

The course looks at the principles of analysis, design and implementation to develop models. Application Development Life Cycles and software engineering principles will also be included. Concepts and notations of Unified Modeling Language (UML) are used to construct models. The topics covered include visual modeling and UML, identification of actors, use cases, activity diagram, identification of classes, relationships, behavior and structure, inheritance, analysing object behavior, designing the system architecture, domain specific model to enable rapid implementation of new, industry-specific applications over diverse platforms by capturing current situation and perspectives in India, development of ontology, and multi-lingual framework.

Outcome: The course will enable students to: Learn concepts of information systems, basic principles of object-oriented and UML approach, understand phases involved in development of agricultural information system, develop of modules of agricultural information systems, and understand the methodology for effective planning to implement agricultural information systems.

Computer Basics (0–1–2–2): The course introduces basic computer skills required to operate a computer, use of software packages, operating systems, networks, internet, and handling of devices. Topics include: principles and fundamentals of computers, networks, and peripherals as tools to: understand the applications and limitations of computer technology, search processes and data retrieval using search engines, downloading, uploading, Networking, development of simple web sites using HTML, XML, and tools.

Semester – II

Quantitative Analysis II (Core 3–0–2–4): Linear algebra, matrices, ordinary differential equations, linear and nonlinear equation systems.

Database Management Systems (Core 3–0–2–4): The course aims to provide necessary skill to the student to conceptualise and analyse business and development scenarios and create databases to fruitfully utilise them for effective decision making. The thrust area of this course is to equip the student to appreciate development oriented databases. Major inputs may come from courses like Business and Systems Development Modeling, MIS, Development Theory and Practices.

The course will include topics like evolution of database management systems, Entity Relationship Modeling and Design, Relational Data Model and Relational Algebra, Structured Query Language, Transaction Processing, Concurrency Control and Recovery, Database architectures (for example Client Server and Distributed databases) and their applications in business and development practices.

Research Methodology (Core 3–0–0–3): The course will cover conventional and participatory research concepts, methods, tools and techniques to find solutions to rural development problems. Part I of the course covers problem identification and formulation, hypothesis, research design, measurement (questionnaire design and interviews), validity, evaluation
Part II deals with principles and practices of participation, tools and techniques of gathering, analysing and sharing information for micro-planning. Outcome: The students may gain some insight on conducting a research project. The students may be able to initiate the process of resource mapping and planning at macro and micro levels in any of the fields like agriculture, rural areas, finance, credit, supply chain management and human resources.


**Organisational Theory (Core 3–0–0–3):** The course will include organisational theory, dimensions of organisational structure and organisational issues in order to provide students the exposure to evolution of organisations, power and control, environment, organisational change and effectiveness.

**Remote Sensing and GIS (Core 3–0–2–4):** To introduce the fundamentals and basic concepts of remote sensing, satellite imaging and geographic information systems and apply them to solve agricultural problems. Topics covered are: Remote Sensing and Image Processing, GPS, GIS Data Modeling, Geographical Information Systems, Issues and Concerns in Land and Water Management, The GIS Approach, Application of GIS. Outcome: The students to gain knowledge in GIS applications and relationships with land and water management systems.

**Internship (0–0–16–8)**

It will include 7–8 weeks of village stay component to expose the students to rural realities. A mini-project may be a part of the village stay component.

**Semester – III**

**Modeling and Simulation of Bio–Economic Systems (Core 3–0–2–4):** This course introduces students to the concept of systems, systems analysis, models, mathematical modeling and simulation with emphasis on agricultural systems to develop skills of modeling and simulation of linear Bio–Economic using ordinary differential equations, difference equations and special purpose simulation software. Emphasis will be on agricultural and food engineering systems. Exposure to concept of systems, skills in modeling and simulation will enable students to appreciate growing application of ICT in management of farming, post-harvest operations, processing of food.

**Production and Operations Management (Core 3 – 0 – 2 – 4):** Role of production functions; types of production systems; work measurement; methods of improvement; location and
Management Information Systems (Core 3-0-2-4): This course is an integrative course and is expected to draw inputs from organisational theory, information systems (systems approach to sustainable development), Production and operations management, project management, development theory and practices, ICT Infrastructure Management, managerial economics and rural finance.

The course will discuss theory behind information systems integration, forms of MIS like expert systems, decision systems, and ERP. It will cover “fitness” exercises between MIS and the organisational objectives through architectural analyses. "Balanced MIS" would cover issues related to deployment of Information systems and Information Technology infrastructure. It shall involve practical sessions to build applications in an integrated environment to have enterprise level systems.

ICT Infrastructure: Implementation and Applications (Core 3-0-2-4): This course intends to include definition of infrastructure, its impact on policies and environment at global, national, and organisations level. It would define the rationale behind treating ICT as an infrastructure and their relationship in managing developmental issues. Components of ICT as infrastructure would be covered such as networks, communications, and databases. Through this course students should be able to conceptualise, plan, design and analyse capacity of ICT components in an organisation (capacity planning includes bandwidth, mode, medium of connectivity, data storage and retrieval, web infrastructure (internet and intranet setup) etc.). (For example: LAN, WAN, VAN, SAN and/or NAS) etc with databases, applications and services.

Outcome: Students should be able to conceptualise, plan, design and assess wired and wireless networks, network components, networks products devices like info-kiosks, touch screen devices, PDAs. Students should also be able to prepare project plans for ICT infrastructure or assess if the infrastructure already planned.

Elective I (3-0-0-3)

Elective II (3-0-0-3):

Elective Courses' Description

The following list is intended to be illustrative and not exhaustive. Elective courses would be developed following the institutional processes in keeping with faculty strength and the working needs of the field.

Precision Farming (3-0-0-3): This course introduces the basics of precision farming and provides hands–on learning experience through projects and lab exercises using modeling and simulation. Data from soil, elevation, hydrological and remote sensing maps along with aerial photographs along with farmer’s knowledge, detailed sensorial based maps, climatological data, soil survey department fertiliser tests of the region per crop and per soil type, fertiliser
advice, etc are used to determine short, medium and long distance variations using geo-statistics. The course involves use of tools and techniques like multivariate analysis, GPS software, mapping software among others (on-line management sensors, variable rate technology for precision application).

**Citizen-led Development Practices (3-0-0-3):** Citizen’s participation has long been a subject of active discussions in the field of development. However, gaps exist between expectations and reality in citizen participation in practice. It is important to identify issues that require attention in overcoming the gap. The course deals with understanding citizen led practices for local level decentralised planning, monitoring and reporting of development projects; Institutional framework for participatory approaches with ICT at its backend towards overcoming the gaps.

**E- (M-) governance for Development (3-0-0-3):** E- (M-) governance is looked upon as a means to change the very concept of governance resulting in empowerment of the citizens and increased transparency in public dealings by the governments; increased efficiencies in delivery of public goods is an inherent underlying assumption, but various studies shows that projects taken up under the E- (M-) governance Program are not doing well or falling short of expectations. This course provides an understanding of the need of e-governance, global and Indian perspective; evolution E- (M-) governance in India; E- (M-) governance services and citizen services; discussion on E- (M-) governance models, policies and implications.

**Supply Chain Management (3-0-0-3):** The course will build on the concepts and principles taught in the courses i.e. Production and operations management, Information Systems Modeling, Database Management Systems, Rural Finance and Rural Economics, Systems Approach to Sustainable Development, Development Theory and Practices, and ICT Infrastructure Management. It will be an integrative Course. Supply chain building blocks, Supply chain performance measures using Markov chains and queuing networks and Decisions, Supply chain inventory management, Mathematical programming models for supply chain planning, design, and optimisation. Best practices in supply chain solutions. ICT and Supply chain: Internet-enabled supply chains - m-commerice, e-marketplaces, e-procurement, e-logistics, e-fulfillment and customer relationship management. Stakeholder analyses in managing supply chain network. Outcome: Students should be able to conceptualise supply chain models given a situation in rural (farm and non-farm) setup. They should be able to comprehensively plan, identify and develop measurement systems for such models and suggest ICT interventions. They should be able to develop application software suitably to showcase the application of concepts, especially measurement systems and simulations.

**Systems, Policies and Implications (3-0-0-3):** The course gives critical evaluation of some major national policies, including national policy on food (that includes Minimum support price, subsidies for farmers, marketing support, spread of technology), NREGA, PDS, WTO and agriculture, policies on resource management (mainly concentrating on water). The idea is to give basic knowledge to the students about the prevailing policies framework, the underlying economic logic and the challenges and roadblocks.

**Project Management (3-0-0-3):** Project life cycle; peculiarities of agribusiness and development projects and their differences form core of this course. Project monitoring and control; network techniques like PERT; and appreciation of project management software will
be imparted through this course. The course also brings out the differences in approach to management between commercial projects and social development programs. Outcome: The student will come out with a reasonable knowledge of Project Management to be able to appreciate the work profile of a Project Manager. The Student would become familiar with the common Project Management Terminology.

Semester – IV

Industry/Research Project and Thesis (0-0-32-16)

VII Admission Eligibility and Intake

A graduate having a Bachelor degree in science or engineering, preferably in any of the following disciplines, is eligible to apply:

a. Basic Sciences
b. Agriculture and Allied Sciences
c. Agricultural Engineering
d. Bio-Sciences and Engineering
e. Fisheries
f. Forestry
g. Environmental Sciences
h. Computer Science/Engineering
i. Information Science/Technology

Graduates with a four-year professional degree or graduates with 15 years (10+2+3) of formal education having one year of full-time relevant work experience are eligible. Graduates should have minimum 60% aggregate marks or an equivalent GPA from a recognised university/institution.

The intake for the program will be 20.

DA-IICT, Gandhinagar
10 March 2010