

SNDT Women's University I*I Course Content

SNDT Women's University, Mumbai under its Masters of Computer Applications (MCA) degree program of the University's P.G Department of Computer Science has introduced Information Integrity course as a 3rd (final) year elective. The first offering of the course was in 5th semester starting from 24th June 2005 to 12th Dec 2005. Professor Vijay Mandke, Research Leader, CIIR (Course Instructor) conducted the course.

The course objective/outline is as follows.

1. Course Background

Information Integrity course aims at advanced level analytical introduction to the knowledge area of integrity of information system and of information there from.

Integrity deviation is as result of errors. At one level, concerns for data security and data integrity have their origin in impact of data errors on databases. While security involves ensuring that users (direct as well as indirect) are *allowed* to do the things they want to do, integrity involves ensuring that the things they are trying to do are *correct*. Indeed, integrity, unlike security, is applicable even in a single-user system (it is always desirable to avoid errors); and is far more relevant when the system is shared.

At another level, the on rush of convergent technology has accentuated the issue of consequences of incorrect operation giving rise to the question of errors resulting in loss of integrity. At the first level this issue is due to dangers of mechanistic failure, service disruptions, failure of computer hardware, etc, which are stochastic in nature. At the second level, the issue is the failure of system equipment that is controlled directly by the computer and, therefore, is dependent upon the correct functioning of the computer hardware and its software.

At the third, and higher, level there is the issue of system failure due to incorrect information. These consequences relate to indirect consequences of production (origination, evaluation and processing) of incorrect information (implications of delay included). These considerations are of relevance in a wide range of systems, applications and components such as: medical imaging, patient records systems, accounting systems, automated tools that are used in the design of safety-related equipment, computer packages such as databases, finite element analysis utilities, word processors, hardware of computers used to run these packages, etc. Faults here, which are cause and consequence of information errors, lead to loss of Information Integrity at any stage of the *SDLC* model and its use; thereby having adverse event and system failure implications. This makes Information Integrity (I*I) implications inclusive of above mentioned functional integrity implications and presents it (Information Integrity) as all encompassing system requirement.

2. Course content:

Growing importance of information; Information Integrity - concepts and definitions; Need for an Information Economics Framework; Overview of existing integrity concepts

and mechanisms; Defining error, modeling information error, system's view of Information Integrity; Business IS view comprising multistage decision process and as information origination process in the presence of uncertainty; Information envelope, implications for DBMS, elements of information origination process; Uncertainties therein, and their error implications and loss of Information Integrity; Information Integrity risk; Inadequacy of existing integrity mechanisms, criticality of Information Integrity for efficient and economic processing of information in IS view; Usefulness-Usability-Integrity paradigm; I*I attributes and their quantifiers; Introduction to System Dynamics Modeling and Computer Simulation Language - Tool for I*I Technology Development; Analytical view of Integrity Information System (IIS), Cost benefit analysis of Information Integrity; Comparison of Integrity IS with Traditional IS and Quality IS; Design basis for I*I Processes, , Examples illustrating I*I Process applications from engineering, business systems, service applications such as finance, healthcare, etc., Systems view of I*I Technology.

3. Lecture outline with topics and no. of lectures

Topic	No. of Lectures
Growing importance of information, Information Integrity – concepts and definitions; Need for an Information Economics Framework; Overview of existing integrity concepts and mechanisms;	6
Defining error, information error from not formalizing environment as major factor in enterprise wide supply chain management decisions, system's view of Information Integrity; Business process IS view comprising multistage decision process and as continuous individual information origination (evaluation and processing) situation;	8
Information envelope, implications for DBMS, elements of information origination process; Uncertainties and their error implications and loss of Information Integrity; Information Integrity risk, Inadequacy of existing integrity mechanisms, criticality of Information Integrity for efficient and economic processing of information in IS view; Usefulness-Usability-Integrity paradigm; I*I attributes - Accuracy, Consistency, Reliability, I*I Attribute Quantifiers;	8
Introduction to System Dynamics Modeling and Computer Simulation Language - Tool for I*I Technology Development –I, System Dynamics Approach for Large, Complex Real World Problems, Problem Identification and its System Conceptualization, Introduction to the Computer Simulation Language;	5
Introduction to System Dynamics Modeling and Computer Simulation Language - Tool for I*I Technology Development –II: Computerization of System Dynamic Model, Model Formulation, Model Testing and Further Development, Policy Analysis and Recommendation.	5
Cost benefit analysis of Information Integrity; Descriptive statement of mathematical equations for information value and for improvement of Information Integrity; Integrity IS, its comparison with Traditional IS and Quality IS;	5

I*I Technology – a System’s View, Design basis for I*I Processes for Achieving Information Origination, Evaluation and Processing Integrity under the implications of interdependent environmental factors, for Achieving Information Recognition Integrity, for Achieving Information Origination Integrity for Opportunity & Constraining Spaces, and for Achieving Information Origination Integrity for Strategic factors characterized by Conflicting Goals; etc.	4
Examples illustrating I*I Process applications from engineering, business systems, service applications such as education, healthcare, etc.	4
Total	45

4. **Suggested texts and reference materials**

- i. Susanne Kelly and Mary Ann Allison, “The Complexity Advantage”, A Business Week Book, McGraw Hill, 1999.
- ii. Information Integrity Projects Bank, CIIR Document for Limited Circulation, October 2001,
- iii. Anders Tallberg, “An Economic Framework for Information Integrity”, Library, Swedish School of Economics and Business Administration, P.O. Box 479, 00101 Helsinki, Finland, 1999.
- iv. R.G. Coyle, “Management of System Dynamics”, John Wiley & Sons, London, U.K., 1977.
- v. George P. Richardson and Alexander L. Pugh III, “Introduction to System Dynamics Modeling”, System Dynamics Series, PEGASUS Communications, 1999.
- vi. V. Rajaraman, and V. V. Mandke, Editors, “Information Integrity: Issues and Approaches”, Proc. Of Discussion meeting at Jawaharlal Nehru Center For Advanced Scientific Research, June 1995.
- vii. Further, course will also refer to latest research papers in the area published through 1997 – 2006.
- viii. Web site www.centerforinformationintegrityresearch.org

5. **Opportunities and Benefits**

Study of Information Integrity course offers following opportunities and benefits:

- Developing the understanding of implications of rise of convergence technology on business processes in complex and changing market environments,
 - o Which in turn is effecting Software and it’s Life cycle,
- Studying concepts underlying information system design in the presence of external and internal environmental uncertainties, namely:
 - o Shift from Collective to Individual Design Decision: *IS* view of a business system, of an engineering system,
 - o Shift from information *economics* to *information* economics,
 - o Implications of uncertainty in *IS* view – System failure from Complex Errors,
 - o Need for Information Evaluation – Introduction to Information Integrity,
 - o Information Integrity Risk,
 - o Systems approach to error reduction- Basis for I*I Technology Design,
- Modeling databases to achieve effectiveness and efficiency,

- Application development with the help of simulators,
- Exposure to the following software:
 - o Vensim,
 - o Stella.

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