# 14. IS 2009 COURSE SPECIFICATIONS

In this section, we provide high-level course descriptions for IS 2009, including the seven core courses and a subset of the electives discussed above. Each course is described with a catalog description and a scope statement followed by a topic list. Finally, the explanations and expectations for each course are discussed.

The courses included are as follows:

**Core Courses**

IS 2009.1 Fundamentals of Information Systems
IS 2009.2 Data and Information Management
IS 2009.3 Enterprise Architecture
IS 2009.4 IS Project Management
IS 2009.5 IT Infrastructure
IS 2009.6 Systems Analysis and Design
IS 2009.7 IS Strategy, Management and Acquisition

**Elective Courses**

Application Development
Business Process Management
Enterprise Systems
Fundamentals of Human-Computer Interaction
IT Audit and Controls
IT Innovation
IT Security and Risk Management

**Title: Fundamentals of Information Systems**
**Core Course**

**Catalog description**

Today, information systems are an integral part of all business activities and careers. This course is designed to introduce students to contemporary information systems and demonstrate how these systems are used throughout global organizations. The focus of this course will be on the key components of information systems - people, software, hardware, data, and communication technologies, and how these components can be integrated and managed to create competitive advantage. Though the knowledge of how IS provides a competitive advantage students will gain an understanding of how information is used in organizations and how IT enables improvement in quality, speed, and agility. This course also provides an introduction to systems and development concepts, technology acquisition, and various types of application software that have become prevalent or are emerging in modern organizations and society.

**Learning objectives**

1. Students will learn how and why information systems are used today and be able to explain the technology, people, and organizational components of information systems.
2. Students will understand globalization and the role information systems has played in this evolution.
3. Students will learn how businesses are using information systems for competitive advantage vs. competitive necessity.
4. Students will understand the value of information systems investments as well as learn to formulate a business case for a new information system, including estimation of both costs and benefits.
5. Students will learn of the major components of an information systems infrastructure and how to mitigate risks as well as plan for and recover from disasters.
6. Students will learn how information systems are enabling new forms of commerce between individuals, organizations, and governments.
7. Students will learn of emerging technologies that enable new forms of communication, collaboration, and partnering.
8. Students will learn how various types of information systems provide the information needed to gain business intelligence to support the decision making for the different levels and functions of the organization.
9. Students will learn how enterprise systems foster stronger relationships with customers and suppliers and how these systems are widely used to enforce organizational structures and processes.
10. Students will learn how organizations develop and acquire information systems and technologies.
11. Students will learn how to secure information systems resources, focusing on both human and technological safeguards.
12. Students will learn how information systems raise ethical concerns in society and how information systems influence crime, terrorism, and war.

**Topics**

- Characteristics of the Digital World
- Information systems components
  - Hardware
  - Software
  - Data
  - Networks
  - Facilities
  - Personnel
  - Services
  - Partners
- Information Systems in Organizations
  - Characteristics of IS professionals
  - IS career paths
  - Cost/value information
  - Quality of information
  - Competitive advantage of information
  - IS and organizational strategy
  - Value chains and networks
- Globalization
  - What is globalization?
  - Technology enabled change
  - Digital divide
  - Global information systems strategies
- Valuing information systems
  - How information systems enable organizational processes
  - Making a business case for information systems
  - Productivity paradox of information systems
  - Investment evaluation
    - Multi-criteria analysis
    - Cost-benefit analysis
  - Identifying and implementing innovations
- Information Systems infrastructure
  - Hardware
  - Software
  - Collaboration and communication technologies
  - Data and knowledge
  - Faculties
  - Services
  - Personnel
  - Partnerships
- The Internet and WWW
  - E-business
    - B-to-C
    - B-to-B
  - Intranets, Internet, Extranets
  - E-government
  - Web 2.0
    - Technologies: e.g., Wikis, Tags, Blogs, Netcasts, self-publishing

        - New forms of collaboration: social networking, virtual teams, viral marketing, crowdsourcing
- Securing information systems
    - Threats to information systems
    - Technology-based safeguards
    - Human-based safeguards
    - Information systems security planning and management
- Gaining business intelligence from information systems
    - Organizational decision making, functions, and levels
        - Executive, managerial, and operational levels
        - Systems to support organizational functions and decision making
    - Information and knowledge discovery
        - Reporting systems
        - Online analytical processing
        - Data, text, and web mining
        - Business analytics
    - Application systems
        - Executive, managerial, and operational support systems
        - Decision support systems
        - Functional area information systems
        - Collaboration technologies
        - Intelligent systems
        - Knowledge management systems
    - Information visualization
        - Visual analytics
        - Dashboards
        - Geographic information systems
- Enterprise-wide information systems
    - Enterprise resource planning
    - Supply chain management
    - Customer relationship management
- Developing and acquiring information system resources
    - Systems development lifecycle
    - Alternative development approaches
    - External acquisition
    - Outsourcing
    - End-user development
- Information systems ethics and crime
    - Information privacy, accuracy, property, and accessibility
    - Computer crime
    - Cyberwar / cyberterrorism

**Discussion**

- Information systems have become pervasive in organizations in society. It is crucial for students to gain a comprehensive understanding of what information systems are, and how they are being used to facilitate organizational processes and societal change.
- Students must understand the various types of issues involved in building, acquiring, managing, and safeguarding information systems. They must also have

an understanding of various types of systems and how they aid organizational decision making, business processes, collaboration, partnerships, and so on.

- Students with practical end-user knowledge will study systems theory and quality concepts as an introduction to information technology concepts and information systems development. Structure and functions of computers, telecommunications, and other infrastructure components will be examined.
- The concept that information is of significance in stating and attaining organizational goals will be used as the basis for exploring the need for various types of information systems. Information systems will be introduced as a method for not only processing information, but as a method for enhancing communication and collaboration within and outside the organization. The dynamic nature of organizations and the necessity for growth and re-design of the organization as well as its information systems will be presented and used as the motivator for understanding information systems development methodologies and approaches for technology acquisition.
- The development path for entry level to senior information systems professionals will be explained. Professional ethical expectations and obligations will be reviewed. The necessity for personal and interpersonal communications skills will be discussed.

**Title: Data and Information Management**
**Core Course**

**Catalog Description**

This course provides the students with an introduction to the core concepts in data and information management. It is centered around the core skills of identifying organizational information requirements, modeling them using conceptual data modeling techniques, converting the conceptual data models into relational data models and verifying its structural characteristics with normalization techniques, and implementing and utilizing a relational database using an industrial-strength database management system. The course will also include coverage of basic database administration tasks. In addition to developing database applications, the course helps the students understand how large-scale packaged systems are highly dependent on the use of DBMSs. Building on the transactional database understanding, the course also provides an introduction to data and information management technologies that provide decision support capabilities under the broad business intelligence umbrella.

**Learning Objectives**

1. Students will learn to understand the role of databases and database management systems in managing organizational data and information.
2. Students will learn to understand the historical development of database management systems and logical data models.
3. Students will learn to understand the role of information requirements specification processes in the broader systems analysis & design context.
4. Students will learn to use at least one conceptual data modeling technique (such as entity-relationship modeling) to capture the information requirements for an enterprise domain.
5. Students will learn to link to each other the results of data/information modeling and process modeling.
6. Students will learn to design high-quality relational databases.
7. Students will learn to understand the purpose and principles of normalizing a relational database structure and to design a relational database so that it is at least in 3NF.
8. Students will learn to implement a relational database design using an industrial-strength database management system, including the principles of data type selection and indexing.
9. Students will learn to use the data definition, data manipulation, and data control language components of SQL in the context of one widely used implementation of the language.
10. Students will learn to perform simple database administration tasks.
11. Students will learn the concept of database transaction and apply it appropriately to an application context.
12. Students will learn to understand the basic mechanisms for accessing relational databases from various types of application development environments.
13. Students will learn to understand the role of databases and database management systems in the context of enterprise systems.
14. Students will learn to understand the difference between on-line transaction processing (OLTP) and on-line analytic processing (OLAP), and the relationship between these concepts and business intelligence, data warehousing and data mining.

15. Students will learn to create a simple data warehouse ("data mart").
16. Students will learn to understand how structured, semi-structured, and unstructured data are all essential elements of enterprise information and knowledge management. In this context, the students will learn the principles of enterprise search.

**Topics**

- Database approach
- Types of database management systems
- Basic file processing concepts
- Conceptual data model
  - Entity-relationship model
  - Object-oriented data model
  - Specific modeling grammars
- Logical data model
  - Hierarchical data model
  - Network data model
  - Relational data model
    - Relations and relational structures
    - Relational database design
      - Mapping conceptual schema to a relational schema
      - Normalization
- Physical data model
  - Indexing
  - Data types
- Database languages
  - SQL: DDL, DML, and DCL
- Data and database administration
- Transaction processing
- Using a database management system from an application development environment
- Use of database management systems in an enterprise system context
- Business intelligence
  - On-line analytic processing
  - Data warehousing
  - Data mining
  - Enterprise search

**Discussion**

- The course still has a strong focus on traditional data management: conceptual data modeling (using ER modeling as the primary technique), logical data modeling using the relational data model (including ER – relational conversion and normalization), and physical database implementation and manipulation using SQL.
- It is essential that the information requirements specification processes are firmly linked to the organizational SA&D processes and that students understand the role of conceptual data modeling as an integral part of the process of making sense of the domain.

- The focus on the physical data model and the DBA-level work on database implementation has been reduced to give more time on improved understanding of the role of databases in the enterprise application context and various business intelligence topics, including enterprise search. Still, the students should understand the basic nature of the DBA tasks and be able to make intelligent decisions regarding DBMS choice and the acquisition of DBA resources.
- It is critically important that the students will fully understand how dependent various large-scale packaged systems (including ERP systems) are on relational databases and how strongly success in maintaining them and in supporting their use in organizations is dependent on understanding data structures and data manipulation with SQL.
- The course should provide a practical understanding of how relational databases are used to support web-based applications.

**Title: Enterprise Architecture**[1]
**Core Course**

**Catalog description**

This course explores the design, selection, implementation and management of enterprise IT solutions. The focus is on applications and infrastructure and their fit with the business. Students learn frameworks and strategies for infrastructure management, system administration, content management, distributed computing, middleware, legacy system integration, system consolidation, software selection, total cost of ownership calculation, IT investment analysis, and emerging technologies. These topics are addressed both within and beyond the organization, with attention paid to managing risk and security within audit and compliance standards. Students also hone their ability to communicate technology architecture strategies concisely to a general business audience.

**Learning objectives**

1. Students will learn a variety of frameworks for enterprise architecture analysis and decision making.
2. Students will learn to evaluate the total cost of ownership and return on investment for architecture alternatives.
3. Students will learn techniques for assessing and managing risk across the portfolio of the enterprise.
4. Students will learn to evaluate and plan for the integration of emerging technologies.
5. Students will learn how to administer systems, including the use of virtualization and monitoring, power and cooling issues. [Question: does this belong here?]
6. Students will learn how to manage proliferating types and volume of content.
7. Students will learn to plan for business continuity.
8. Students will learn the benefits and risks of service oriented architecture.
9. Students will learn the role of audit and compliance in enterprise architecture.

**Topics**

- Service oriented architecture
- Enterprise architecture frameworks
- Systems integration
- Enterprise resource software
- Monitoring and metrics for infrastructure and business processes
- Green computing
- Virtualization of storage and systems
- The role of open source software
- Risk management
- Business continuity

[1] Acknowledgement: This material is largely based on work by Dr. Bill Schiano, Bentley University.

- Total cost of ownership and return on investment
- Software as a service
- Content management
- Audit and compliance
- System administration
- IT control and management frameworks
- Emerging technologies

**Discussion**

- The course can be structured at varying levels of technical depth
- The course can be a relatively easy way to introduce newer technologies into the curriculum, e.g. Web 2.0.
- This course operates at a higher level of abstraction than a typical infrastructure course, and it includes significant coverage of business issues related to an enterprise's technology architecture.
- This is the context in which the students are introduced to modern enterprise IT concepts, such as SoS, green computing, and SaaS.
- This course would also cover the topics related to IT control and management frameworks (COBIT, ITIL, etc.)

**IT Infrastructure**
**Core Course**

**Catalog Description**

This course provides an introduction to IT infrastructure issues for students majoring in Information Systems. It covers topics related to both computer and systems architecture and communication networks, with an overall focus on the services and capabilities that IT infrastructure solutions enable in an organizational context. It gives the students the knowledge and skills that they need for communicating effectively with professionals whose special focus is on hardware and systems software technology and for designing organizational processes and software solutions that require in-depth understanding of the IT infrastructure capabilities and limitations. It also prepares the students for organizational roles that require interaction with external vendors of IT infrastructure components and solutions. The course focuses strongly on Internet-based solutions, computer and network security, business continuity, and the role of infrastructure in regulatory compliance.

**Learning objectives**

1. The students will learn to understand key principles of data representation and manipulation in computing solutions.
2. The students will learn to understand the principles underlying layered systems architectures and their application to both computers and networks.
3. The students will learn to understand the differences and similarities between the core elements of an IT infrastructure solution, such as clients, servers, network devices, wired and wireless network links, systems software, and specialized security devices.
4. The students will learn to understand how IT infrastructure components are organized into infrastructure solutions in different organizational environments.
5. The students will learn to understand the principles underlying service virtualization.
6. The students will learn to understand through practical examples how protocols are used to enable communication between computing devices connected to each other.
7. The students will learn to configure an IT infrastructure solution for a small organization, including a network based on standard technology components, servers, security devices, and several different types of computing clients.
8. The students will learn to apply the core concepts underlying IP networks to solve simple network design problems, including IP subnetting.
9. The students will learn to understand the role and structure of the Internet as an IT infrastructure component.
10. The students will be able to understand the components and structure of a large-scale organizational IT infrastructure solution at a level that allows them to utilize it effectively and negotiate with vendors providing design and implementation solutions.
11. The students will learn to understand the opportunities that virtual computing service provision models, such as cloud computing, create for organizations.
12. The students will learn to analyze and understand the security and business continuity implications of IT infrastructure design solutions.
13. The students will learn to understand the environmental and resource consumption impacts of IT infrastructure decisions.

**Topics**

- Core computing system architecture concepts
- Core computing system organizing structures
- Core technical components of computer-based systems
- Role of IT infrastructure in a modern organization
- Operating systems
  - Core operating systems functionality
  - Internal organization of an operating system
  - Types of devices that require and utilize operating systems
  - Multitasking and multithreading
  - File systems and storage
  - User interfaces
  - Operating system configuration
  - Securing an operating system
  - Virtualization of computing services
- Networking
  - Types of networks
  - Core network components
  - TCP/IP model
  - Physical layer: wired and wireless connectivity
  - Data link layer: Ethernet
  - Network layer: IP, IP addressing and routing
  - Transport layer: TCP
  - Application layer: Core Internet application protocols
  - Network security and security devices
  - The Internet as a key networking platform
  - Network device configuration
- Organizing storage on organizational networks
- Data centers
- Securing IT infrastructure
  - Principles of encryption and authentication
  - Component level security: clients, servers, storage network devices, data transport, applications
  - Perimeter security: firewalls
  - Using public networks for secure data transport: VPNs
- Ensuring business continuity
- Grid computing
- Cloud computing, computing as a service
- System performance analysis and management
- Purchasing of IT infrastructure technologies and services

**Discussion**

- This course recognizes that Information Systems programs are increasingly preparing students for organizational roles that do not require in-depth skills in designing or configuring hardware and systems software solutions. The key focus is on helping the students

understand the infrastructure issues at a level that is required for effective work as business and systems analysis.

- The course also forms the foundation for further study related to both computer architecture and communication networks. Specifically, it is important to recognize that many technically focused IT risk management, security, and forensics jobs require more in-depth understanding of technology issues than this single course can provide.
- Whenever possible, it is recommended that this course uses hands-on laboratory work and practical exercises to teach the complex concepts that are often too abstract to grasp without practical examples.

**Title: Information Systems Project Management**
**Core Course**

**Catalog description**

This course discusses the processes, methods, techniques and tools that organizations use to manage their information systems projects. The course covers a systematic methodology for initiating, planning, executing, controlling, and closing projects. This course assumes that project management in the modern organization is a complex team-based activity, where various types of technologies (including project management software as well as software to support group collaboration) are an inherent part of the project management process. This course also acknowledges that project management involves both the use of resources from within the firm, as well as contracted from outside the organization.

**Learning objectives**

1. Students will learn to initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects.
2. Students will learn foundations of project management, including its definition, scope, and the need for project management in the modern organization.
3. Students will learn the phases of the project management lifecycle.
4. Students will learn how to manage project teams, including the fundamentals of leadership and team motivation.
5. Students will learn how to manage project communication, both internal to the team, and external to other project stakeholders.
6. Students will learn how to initiate projects, including project selection and defining project scope.
7. Students will learn the techniques and tools for managing project schedules.
8. Students will learn how to manage project resources, including human resources, capital equipment, and time.
9. Students will learn how to manage project quality, including the identification of the threats to project quality, techniques for measuring project quality, and the techniques for ensuring project quality is achieved.
10. Students will learn how to manage project risk, including the identification of project risk, and the techniques for ensuring project risk is controlled.
11. Students will learn how to manage the project procurement process, including understanding external acquisition and outsourcing, as well as the steps for managing external procurement.
12. Students will learn to manage project execution, including monitoring project progress and managing project change, and appropriately documenting and communicating project status.
13. Students will learn how to control projects, through information tracking, and cost and change control techniques.
14. Students will learn to close projects, including administrative, personnel, and contractual closure.
15. Students will learn to understand the mechanisms for dealing with legal issues in complex project contexts.

**Topics**

- Introduction to Project Management
  - Project management terminology
  - Project failures and project successes
  - Unique features of IT projects
  - What is project management?
- The Project Management Lifecycle
  - What is the project management lifecycle?
  - Project management and systems development or acquisition
  - The project management context
  - Technology and techniques to support the project management lifecycle
  - Project management processes
- Managing Project Teams
  - What is a project team?
  - Project team planning
  - Motivating team members
  - Leadership, power and conflict in project teams
  - Managing global project teams
- Managing Project Communication
  - Managing project communication
  - Enhancing team communication
  - Using collaboration technologies to enhance team communication
- Project Initiation and Planning
- Managing Project Scope
  - Project initiation
  - How organizations choose projects
  - Activities
  - Developing the project charter
- Managing Project Scheduling
  - What is project scheduling?
  - Common problems in project scheduling
  - Techniques for project scheduling
- Managing Project Resources
  - What are resources?
  - Types of resources (human, capital, time)
  - Techniques for managing resources
- Managing Project Quality
  - What is project quality?
  - What are the threats to project quality?
  - How can we measure project quality
  - Tools for managing project quality
- Managing Project Risk
  - What is project risk?
  - What are the threats to project risk?
  - Tools for managing project risk
- Managing Project Procurement
  - Alternatives to systems development
  - External acquisition
  - Outsourcing

    - Steps in the procurement process
    - Managing the procurement process
- Project Execution, Control & Closure
    - Managing project execution
    - Monitoring progress and managing change
    - Documentation and communication
    - Common problems in project execution
- Managing Project Control & Closure
    - Obtaining information
    - Cost control
    - Change control
    - Administrative closure
    - Personnel closure
    - Contractual closure
    - Project auditing

**Discussion**

- The core course in information systems project management is primarily focused on initiating, planning, executing, controlling, and closing information systems projects. Project charters, schedules, resource assignments, communication, risk and quality control plans, as well as an understanding of leadership and group processes are all tools which can enhance effective project management. This course will teach the student methods that allow them to manage projects resources, including those internal and external to the organization.
- The course specification intentionally leaves discussion regarding specific methods and approaches unanswered. While there are common techniques to project management institutions, programs will still have the ability to make local decisions regarding specific tools and techniques based on the capabilities of their faculty, their available resources, and the needs of the companies hiring the students.
- Using a course project to teach the concepts in this course is highly recommended.

**Title: Systems Analysis & Design**
**Core Course**

**Catalog description**

This course discusses the processes, methods, techniques and tools that organizations use to determine how they should conduct their business, with a particular focus on how computer-based technologies can most effectively contribute to the way business is organized. The course covers a systematic methodology for analyzing a business problem or opportunity, determining what role, if any, computer-based technologies can play in addressing the business need, articulating business requirements for the technology solution, specifying alternative approaches to acquiring the technology capabilities needed to address the business requirements, and specifying the requirements for the information systems solution. The course specifically acknowledges the fact that in many cases technology capabilities are purchased from outside the organization either through the use of packaged systems or consulting resources.

**Learning objectives**

1. Students will learn to understand the types of business needs that can be addressed using information technology-based solutions.
2. Students will learn to initiate, specify, and prioritize information systems projects and to determine various aspects of feasibility of these projects.
3. Students will learn to use at least one specific methodology for analyzing a business situation (a problem or opportunity), modeling it using a formal technique, and specifying requirements for a system that enables a productive change in a way the business is conducted. Within the context of this methodology, students will learn to write clear and concise business requirements documents and convert them into technical specifications.
4. Students will learn to communicate effectively with various organizational stakeholders to collect information using a variety of techniques and to convey proposed solution characteristics to them.
5. Students will learn to manage information systems projects using formal project management methods.
6. Students will learn to articulate various systems acquisition alternatives, including the use of packaged systems (such as ERP, CRM, SCM, etc.) and outsourced design and development resources.
7. Students will learn to systematically compare the acquisition alternatives.
8. Student will learn to incorporate principles leading to high levels of security and user experience from the beginning of the systems development process.
9. Students will learn to design high-level logical system characteristics (user interface design, design of data and information requirements).

**Topics**

- Identification of opportunities for IT-enabled organizational change
- Business process management
- Analysis of business requirements
    - Business process modeling
    - Information requirements
- Structuring of IT-based opportunities into projects

- Project specification
- Project prioritization
- Analysis of project feasibility
- Fundamentals of IS project management in the global context
- Using globally distributed communication and collaboration platforms
- Analysis and specification of system requirements
    - Data collection methods
    - Methods for structuring and communicating requirements
    - Factors affecting user experience
    - User interface design
    - System data requirements
    - Factors affecting security
    - Ethical considerations in requirements specification
- Different approaches to implementing information systems to support business requirements
    - Packaged systems; enterprise systems
    - Outsourced development
    - In-house development
- Specifying implementation alternatives for a specific system
- Impact of implementation alternatives on system requirements specification
- Methods for comparing systems implementation approaches
- Organizational implementation of a new information system
- Different approaches to systems analysis & design: structured SDLC, unified process/UML, agile methods

**Discussion**

- The focus of the core course in systems analysis & design is primarily focused clearly on analyzing and documenting business requirements as well as converting these requirements into detailed systems requirements and high-level design specifications (e.g., mock-ups of forms, reports, HCI, and so other user interface components), not on internal design or system implementation design. The course content is will explicitly be built on the assumption that most organizational systems are built based on various types of packaged systems, system components, or implemented by using outsourced development capabilities (whether on- or off-shore). The course will teach the student methods that allow them to specify requirements precisely and communicate effectively with both business stakeholders and developers, but it will not include material related to the design or /implementation of the technical structure of the system.
- The course specification intentionally leaves discussion regarding specific methods and approaches unanswered. Institutions have to make these decisions regarding the capabilities of their faculty and the needs of the companies hiring the students. It is, however, important that the course will provide some exposure to the structured SDLC, object-oriented analysis and design (some Unified Process variant using UML as a grammar) and agile methods.
- Using a course project is highly recommended.
- The course specifically emphasizes the importance of incorporating security issues and user experience from the earliest stages of the process.

- The course includes the first exposure to project management concepts and practice. The importance of this element will depend on the extent to which project management is covered elsewhere in the curriculum.

**Title: IS Strategy, Management & Acquisition**
**Core Course**

**Catalog description**

This course explores the issues and approaches in managing the information systems function in organizations and how the IS function integrates / supports / enables various types of organizational capabilities. It takes a senior management perspective in exploring the acquisition, development and implementation of plans and policies to achieve efficient and effective information systems. The course addresses issues relating to defining the high-level IS infrastructure and the systems that support the operational, administrative and strategic needs of the organization. The remainder of the course is focused on developing an intellectual framework that will allow leaders of organizations to critically assess existing IS infrastructures and emerging technologies as well as how these enabling technologies might affect organizational strategy. The ideas developed and cultivated in this course are intended to provide an enduring perspective that can help leaders make sense of an increasingly globalized and technology intensive business environment.

**Learning objectives**

1. Student will learn the various functions and activities within the information systems area, including the role of IT management and the CIO, structuring of IS management within an organization, and managing IS professionals within the firm.
2. Students will learn how to view an organization through the lens of the information systems used to enable core and supportive business processes as well as those that interface with suppliers and customers.
3. Students will learn the concepts of information economics at the enterprise level.
4. Students will gain insight into how IS represents a key source of competitive advantage for firms.
5. Students will learn how to structure IS-related activities to maximize the business value of IS within and outside the company.
6. Students will get an understanding of existing and emerging information technologies, the functions of IS and its impact on the organizational operations.
7. Students will learn the issues and challenges associated with successfully and unsuccessfully incorporating IS into a firm.
8. Students will learn how strategic decisions are made concerning acquiring IS resources and capabilities including the ability to evaluate the different sourcing options.
9. Students will learn how to apply information to the needs of different industries and areas.

**Topics**

- The IS function
- IS strategic alignment
- Strategic use of information
- Impact of IS on organizational structure and processes

- IS economics
- IS planning
- Role of IS in defining and shaping competition
- Managing the Information Systems function
    - IS leadership: The role of the CIO and IS management
    - Structuring the IS organization
    - Hiring, retaining, and managing IS professionals
    - Managing a mixed set of internal and external resources
- Financing and evaluating the performance of Information Technology investments and operations
- Acquiring Information Technology resources and capabilities
    - Acquiring infrastructure capabilities
    - Sourcing Information Systems services
    - Sourcing Information Systems applications
- Using IS governance frameworks
- IS risk management
    - Managing business continuity
    - Managing security and privacy

**Discussion**

- The core course in IS Strategy, Management and Acquisition will take a high-level approach to the management and acquisition of IS-resources within the firm.
- The course will deliver the student specific strategies used in firms today to help form the basis of IS strategic management. Based on this knowledge student will then be asked to apply said strategies to management issues within an IS context.
- Specifics on what frames of strategic thinking are used in this course are left unanswered. Institutions may have certain capabilities or constraints that can be optimized to offer the best thinking for the companies that are hiring their graduates. Also, there are different regional issues that need to be addressed in order to match the current thinking with specific IS strategies.
- Using a case study methodology is highly recommended for this course as it will help the students strategically identify issues in a real-world setting. In general, it is essential that the pedagogical approaches chosen for this course will carefully consider the fact that the issues covered are at a higher level of abstraction than what the students are used to based on their practical experience in organizations.

**Title: Application Development**
**Elective Course**

**Catalog description**

The purpose of this course is to introduce the students to the fundamental concepts and models of application development so that they can understand the key processes related to building functioning applications and appreciate the complexity of application development. Students will learn the basic concepts of program design, data structures, programming, problem solving, programming logic, and fundamental design techniques for event-driven programs. Program development will incorporate the program development life cycle: gathering requirements, designing a solution, implementing a solution in a programming language, and testing the completed application.

**Learning objectives**

Students will:

- have awareness of programming concepts
- be able to create programs that relate to a specific domain
- test programs with sample data
- understand core program control structures

**Topics**

Program design
Program development lifecycle
Requirements determinants and analysis
Modular design
Techniques for modeling program structures
Programming concepts
- Variables
- Literals
- Types
- Expressions
- Procedures
- Functions
- Parameters
- Operators and operations
- Decision logic
- Looping
- Subprocedures
- Passing parameters

Coding
Unit testing
Control structures
- Sequential
- Conditional
- Iterative

Input/Output (I/O) design
- Text-based
- Graphical user interface (GUI)

Data structures
- Primitive data types, composite data types, arrays
- Memory management
- Sequential and random file processing

Database access
Development approaches
- Object-oriented
- Procedural
- Declarative
- Rapid application
- Structured

Application integration
Prototyping
Overview and history of programming languages

**Discussion**

The course benefits from computer lab resources either in class or available for licensing on individual students' computers. The choice of language should reflect commonly used languages and tools with the expectation that learning any language will generalize to other languages. For this reason it may be best to concentrate on one language to develop depth rather than breadth across several languages.

**Title: Business Process Management**
**Elective Course**

**Catalog description**

In this course students will be introduced to key concepts and approaches to business process management and improvement. The main focus of this course is both understanding and designing business processes. Students will learn how to identify, document, model, assess, and improve core business processes. Students will be introduced to process design principles. The way in which information technology can be used to manage, transform, and improve business processes is discussed. Students will be exposed to challenges and approaches to organizational change, outsourcing, and inter-organizational processes.

**Learning objectives**

Students will:

- Learn how to model business processes
- Learn how to benchmark business processes performance
- Learn how to assess business processes performance
- Learn how to design business process improvements
- Understand the role and potential of IT to support business process management
- Understand the challenges of business process change
- Understand how to support business process change
- Understand different approaches to business process modeling and improvement
- Understand the challenges and risks concerning business process outsourcing
- Learn to use basic business process modeling tools
- Learn to simulate simple business processes and use simulation results in business process analysis

**Topics**

Overview

- Challenges in managing business processes
- Approaches to business process management & improvement

Understanding organizational processes

- Business process definition and classification
- Identifying core processes
- Modeling processes
- Documenting processes

Process Assessment

- Measuring performance
- Benchmarking
- Statistical techniques for process measurement

Process Improvement

- Process design guidelines and principles
- Continuous process improvement

- Change management

Using IT for process management and improvement

- Business process improvement and modeling software
- Tools of business process simulation
- ERP Systems

Organizational issues in business process management

- Understanding the customer
- Business process outsourcing
- Managing processes that cross organizational borders

**Discussion**

- The course description does not identify specific approaches and methods for business process management and improvements, such as BPR, TQM, or Six Sigma. This will allow instructors and institutions to decide which specific approaches to cover.
- The demonstration of leading ERP systems such as SAP is highly recommended.
- The use of case studies for discussion and reflection in this course is highly recommended.
- The use of group project in this course is highly recommended.
- The organization of an SAP Practicum can be considered.

**Title: Enterprise Systems**
**Elective Course**

**Catalog description**

This course is designed to provide students with an understanding of the theoretic and practical issues related to the application of Enterprise Systems within organizations. The main focus of this course is to demonstrate how Enterprise Systems integrate information and organizational processes across functional areas with a unified system comprised of a single database and shared reporting tools. Enterprise systems, by their multi-dimensional integrative nature, offer the depth of functionality and breadth of integration to demonstrate how global operations of organizations are managed. Thus, students will gain an appreciation of the scope of Enterprise Systems and the motivation for implementing them. [Optional: Example software will be used to illustrate how Enterprise Systems work. An integrated project, which requires the application of conceptual as well as technical (software) skills of students, will be required.]

**Learning objectives**

Students will learn to:

1. Understand the fundamentals of Enterprise Systems and issues associated with their implementation.
2. Evaluate the costs and benefits of implementing an Enterprise System.
3. Understand how enterprise systems integrate functional areas into one enterprise-wide information system.
4. Explain how "best practices" are incorporated in Enterprise Systems.
5. Recognize how an organizational process often spans different functional areas.
6. Describe the role of Enterprise Systems in carrying out processes in an organization.
7. Learn to integrate key concepts from functional-oriented courses, such as accounting, marketing, and organizational behavior, to promote the development of integrative skills.
8. Explain how integrated information sharing increases organizational efficiencies.
9. Identify, describe, and evaluate the major Enterprise System software providers and their packaged systems.
10. Understand current trends related to Enterprise Systems.

**Topics**

- Business processes and business process integration
- Making the case for acquiring and implementing Enterprise Systems
- Analyzing business requirements for selecting and implementing an Enterprise System
- Selection of Enterprise Systems software
- Challenges associated with the implementation of global Enterprise Systems applications
- Organizational change
- Strategic alignment
- User commitment
- Communications
- Training
- Job redesign
- Governance of processes and data
- Post-implementation issues

- Enterprise System processes
- Order processing
- Purchasing
- Production logistics
- Accounting
- Planning & Control
- Human resource functions
- How Enterprise Systems support e-business

**Discussion**

- The course specification intentionally leaves Enterprise System software unspecified. Institutions have to make the decision of whether and how to provide students with experience with actual Enterprise System software. It is, however, preferable that the course include exposure to and hands-on use of one of the two large Enterprise System vendors in the market place, SAP or Oracle, or one of the several smaller vendors such as SSA Global, Microsoft (Axapta, Great Plains and Solomon), Intuit, or Minicom, to name a few. The importance of actual use is clear. Enterprise System software is in place in a majority of large organizations and increasing in use in small and medium sized organizations.
- A group project is highly recommended to assess both practical/applied aspects and the conceptual/theoretical content of the course. For example, a group project could require students to study a real-world organization and evaluate the suitability of SAP R/3 or another software solution. This evaluation would then be compared with other Enterprise System software products in terms of product functionality, support and flexibility for configuration and customization, architecture and technology compatibility, web-based functionality, ease of interfacing with other legacy systems, and implementation costs. If software resources permit, the group could then design and configure a simple workable integrated Enterprise System, using SAP R/3 for example, that demonstrates the integration of information from several modules, such as accounts receivable, sales, manufacturing/production, procurement, accounts payable, or general ledger. Student groups would analyze the functional areas in a real-world organization and map them into SAP R/3. Students would create an enterprise structure, relevant master data in the software, transactions that demonstrate integration of core processes, and provide documentation. Students thereby apply specialist skills and knowledge drawn from other traditional disciplines to an actual organization and demonstrate the development of skills such as analytical skills, communication, critical thinking, problem solving, and teamwork.
- The course provides a pedagogical basis for a change in the delivery of education from a functional orientation to a process orientation, leading to the integration of curriculum across functions.

**Title: Introduction to Human-Computer Interaction**
**Elective Course**

**Catalog description**

This course provides an introduction to the field of human-computer interaction (HCI). HCI is an interdisciplinary field that integrates cognitive psychology, design, computer science and others. Examining the human factors associated with information systems provide the students with knowledge to understand the factors that influence usability and acceptance of IS. This course will examine human performance, components of technology, methods and techniques used in design and evaluation of IS. Societal impacts of HCI such as accessibility will also be discussed. User-centered design methods will be introduced and evaluated. This course will also introduce students to the contemporary technologies used in the empirical evaluation methods.

**Learning objectives**

1. Students will learn to design, implement and evaluate effective computer interfaces.
2. Students will learn the concepts of user differences, user experience and collaboration as well as how to design contextually.
3. Students will learn the basic cognitive psychology issues involved in HCI.
4. Students will learn the different devices used for input and output and the issues / opportunities associated with these devices.
5. Students will learn how to interact with the software design process in order to create computer interfaces.
6. Students will learn the role of theory and frameworks in HCI.
7. Students will learn a number of design techniques.
8. Students will learn the contemporary techniques used in evaluating computer interfaces.

**Topics**

- Relevance of HCI
- Principles in HCI design
  - Ergonomic engineering
  - Cognitive engineering
  - Affective engineering
- User-Centered Design
  - Users
    - Capabilities
      - Conceptual models
      - Metaphors
      - Mental models
    - Individual differences
    - Learning
    - Errors
    - Training
- Special HCI Issues Related to
  - Users
    - Children
    - Elderly

        - Accessibility
        - Gender
    - Organizations
    - Society
    - Task Analysis
- Devices
    - PCs
    - Industrial devices
    - Consumer devices
    - Mobile devices
- Development
    - Introduction to projects
    - Prototyping
    - Contextual inquiry
    - Usability engineering
- Evaluation Methods
    - Heuristics
    - Cognitive evaluation
    - Usability testing
    - Questionnaires
    - Research design

**Discussion**

- This course is not about developing basic interactive technologies (such as input/output devices), but rather, it briefly introduces these technologies, and then focuses on developing human-centered organizational information systems that support users' organizational tasks. Human physical, cognitive, and affective characteristics are discussed, as are organizational tasks and context. Such discussions are oriented toward achieving a good fit between human, technology, and tasks within the organizational and business context.

- This course in HCI will take the student through the HCI life-cycle (analysis, design, testing and implementation) in order to be competent in all aspects of HCI practice. This includes understanding the theory perspective of HCI research, the current methods in design and testing and the final implementation of the project. For this reason fundamental SA&D skills will have to be injected into the course or prerequisites will have to be met.

- A project based approach is highly recommended for this course. This includes implementing several hands-on skills either in a laboratory or through self-paced learning at home. This will help students develop the full range of skills that is needed for HCI work.

- It is important that students understand that various concepts and techniques outlined in this class draw upon a multitude of disciplines (e.g., cognitive psychology, consumer behavior, etc.). By gaining a solid understanding of various core theories that inform HCI design, the student can then translate this knowledge into building working prototypes in a broad range of contexts.

**Title: IT Audit & Controls**
**Elective Course**

**Catalog description**

This course introduces the fundamental concepts of the information technology audit and control function. The main focus of this course is on understanding information controls, the types of controls and their impact on the organization, and how to manage and audit them. The concepts and techniques used in information technology audits will be presented. Students will learn the process of creating a control structure with goals and objectives, audit an information technology infrastructure against it, and establish a systematic remediation procedure for any inadequacies. The challenge of dealing with best practices, standards, and regulatory requirements governing information and controls is addressed.

**Learning objectives**

1. Understand the role and objectives of the information technology audit.

2. Learn to develop an appropriate information technology audit process.

3. Learn to identify risks to the confidentially, integrity, and availability of information and processes.

4. Describe the risks inherent in various types of information systems ranging from manual, basic accounting, to advanced operational information and knowledge for decision making.

5. Understand how to design and implement assurance procedures and control measures to effectively manage risks.

6. Understand best practices, standards, and regulatory requirements governing information and controls. Gain the ability to measure the degree of compliance with them.

7. Understand the role of auditing in systems development, including the review of the development process and participation in systems under development.

8. Understand data forensics and how to secure and preserve evidence.

9. Learn to develop disaster recovery and business continuity plans.

**Topics**

- The need for information technology audit & controls
- Information technology risks – Business Process and Business Continuity
    - Protection of information assets
    - Business process evaluation and risk management
    - Systems development and maintenance activities
    - Disaster recovery and business continuity
- Auditing ethics, guidelines, and standards of the profession

  - Control Objectives for Information and related Technology (COBIT)
  - ISACA
  - Val IT
- Undertaking an information system audit
  - Internal audit and external audit
- Controls over information and processes
  - Physical and environmental controls
  - Network controls
  - System software controls
  - Database controls
  - Application controls
  - Internet and e-commerce controls
  - Installation and operational controls
  - Change controls
  - Access controls
  - Encryption, authentication and non-repudiation
  - End-user controls
  - Software licensing controls
  - Governance
- Controls Assessment
  - Separation of duties
  - Delegation of authority & responsibility
  - System of authorizations
  - Documentation & records
  - Physical control over assets & records
  - Management supervision
  - Independent checks
  - Recruitment & training

**Discussion**

- The use of case studies, professional standards, and sample audit software programs are encouraged to exemplify concepts covered.

**Title: IS Innovation and New Technologies**
**Elective Course**

**Catalog description**

New IS technologies are being used to change how organizations communicate both internally and as well as with external partners. These technologies have been integrated into an exciting academic discipline that is integral to all business activities. This course is designed to introduce students to new and innovative technologies and examine how these powerful systems have fundamentally reshaped modern organizations along with our society. Using online collaborative technologies that were developed in the context of social networking and online communities, corporations are reengineering both internal business processes and those related to customers, suppliers, and business partners. Developing innovative ways to communicate and collaborate can lead to new business opportunities, and new efficiencies. This course investigates the technologies, methods and practices of developing new innovations such as online communities, and how this knowledge and these skills are applied to re-engineer business processes. For example, how products, services and information systems are developed, and how geographically disperse virtual teams collaborate.

**Learning objectives**

1. Students will learn how IS plays a role in the world around them and the business world.
2. Students will learn how technologies are increasing the ability of organizations to globalize business processes and to extend their reach to global customers.
3. Students will learn the process and techniques used to innovate IS technologies.
4. Students will learn of where businesses have used IS technologies to innovate and reengineer business processes.
5. Students will learn the concepts associated with network effects.
6. Students will how the web as a platform enhances creativity, information sharing and functionality.
7. Students will learn the role of web technologies such as online communities in the business world, and how they deliver value.
8. Students will learn about the popular community-oriented tools, such as online social networking tools.
9. Students will learn the economics involved with digital goods and services.
10. Students will learn how to deal with the challenges associated with new technologies and innovation.

**Topics:**

- Globalization
- Conversation about the commoditization of IT
- Technologies that have shaped the electronic world
- Process of IS innovation
    - Diffusion
    - Innovation cycles
- Strategic importance of the web as a platform
    - Web services
    - Collective intelligence

- Peer-to-peer networking
- Social networking

- Web 2.0 tools
  - RSS
  - Podcasts
  - Wikis
  - Blogs
  - Mash-ups
- Information organization
  - Categorization
  - Taxonomies
  - Tagging
- Virtual Teams
- Economics of digital goods and services
  - Ecommerce distribution
    - The Long Tail
    - Wikinomics
    - The Free Economy
- Search space
  - How search works
  - How search is monetized
  - Strategic importance of search
- Knowledge Management
- Future trends

**Discussion**

- It is essential for the health of the IS discipline to actively recruit IS students. This course will focus on topics designed to excite students about the IS discipline. Specifically, this course will look at how IS is used in the world around the student and how IS can be utilized to create powerful applications. This is done by delivering topics that will gain traction with the target audience. In turn, by exposing students to a variety of business views of IS the students would better understand the possibilities within the field.
- This course is different from the introduction to IS as it does not provide a comprehensive overview of IS, rather topics are selected that may peak students' interest in IS. The topics are a means to delivering an understanding of the IS field.
- It is critically important that we expose students to how IS is impacting the world around them and more specifically how IS functions in the business world.
- This course should include hands on demonstrations and projects that allow students to manage these online tools; understand the importance of information flows and provide the strategic importance of such systems.

**Title: IT Security and Risk Management**
**Elective Course**

**Catalog description**

This course provides an introduction to the fundamental principles and topics of Information Technology Security and Risk Management at the organizational level. Students will learn critical security principles that enable them to plan, develop, and perform security tasks. The course will address hardware, software, processes, communications, applications, and policies and procedures with respect to organizational IT Security and Risk Management.

**Learning objectives**

Students will:

- Understand the fundamental principles of Information Technology Security.
- Understand the concept of threat, evaluation of assets, information assets, physical, operational, and information security and how they are related.
- Understand the need for the careful design of a secure organizational information infrastructure.
- Understand risk analysis and risk management.
- Understand both technical and administrative mitigation approaches.
- Understand the need for a comprehensive security model and its implications for the security manager.
- Gain an understanding of security technologies.
- Gain an introductory understanding of basic cryptography, its implementation considerations, and key management.
- Learn to design and guide the development of an organization's security policy.
- Learn to determine appropriate strategies to assure confidentiality, integrity, and availability of information.
- Learn to apply risk management techniques to manage risk, reduce vulnerabilities, threats, and apply appropriate safeguards/controls.

**Topics**

- Introduction to Information Security
- Inspection
  - Resource Inventory
  - Threat Assessment
  - Identifying Vulnerabilities
  - Assigning Safeguards
- Protection
  - Awareness
  - Access
  - Identification
  - Authentication
  - Authorization
  - Availability
  - Accuracy
  - Confidentiality

- Accountability
- Administration
- Detection
  - Intruder Types
  - Intrusion Methods
  - Intrusion Process
  - Detection Methods
  - Monitoring Systems
- Reaction
  - Incident Determination
  - Incident Notification
  - Incident Containment
  - Assessing Damage
  - Incident Recovery
  - Automated Response
- Reflection
  - Incident Documentation
  - Incident Evaluation
  - Legal Prosecution
- Risk Assessment Frameworks
  - COSO Integrated Control Framework
  - CoBiT – ISACA
  - Australia/New Zealand Standard – Risk Management
  - ISO Risk Management – Draft Standard
- Security Engineering
  - Protocols
  - Passwords
  - Access Controls
  - Cryptography
- Physical Aspects
  - Biometrics
  - Physical Tamper Resistance
  - Security Printing and Seals
- Security in Connected Systems and Networks
  - Distributed Systems
  - Telecom System Security
  - Network Attack and Defense
  - Protecting E-Commerce Systems
- Policy and Management Issues
  - Copyright and Privacy Protection
  - E-Policy

**Discussion**

- This course is intended as a first course in Information Assurance at the undergraduate level. This course will be a pre-requisite for additional information and network security courses for an Information Security track in the undergraduate program.

- The course description does not prescribe the specific approaches and methods for inspection, protection, detection, reaction, reflection, risk assessment and mitigation. This will allow instructors and institutions to decide which specific approaches to cover.
- The use of case examples for discussion and reflection in this course is highly recommended.
- It is recommended to include an applied project for a potential client in which students conduct a risk assessment of a part of the client's IT infrastructure.