

# INFORMATION SYSTEMS

SPS Certificate website: <https://sps.northwestern.edu/advanced-graduate-certificate/>

## Database & Internet Technologies, Advanced Graduate Certificate

The database and internet technologies certificate focuses on a set of skills that allows students to function in the roles of designer, analyst, project manager or administrator — not just in the current database development environment but also in future dynamic computing environments. It focuses on the modeling and design of relational database systems as well as the development of real-world applications based on best practices and sound design principles. Practical emphasis is placed on normalization procedures, user interfaces, client/server technologies, web e-commerce databases and database security issues. Coursework will expose students to commercially available database systems to verify database design, balance the program load between client and server, store large-scale data into data warehouses, exchange data between databases and process XML data flows.

## Information Systems Management, Advanced Graduate Certificate

Networking is one of the essential requirements of today's computing world. Networks are extremely complex systems consisting of many different platforms of hardware and software. Telecommunication world is one of the fastest changing technologies in today. We are experiencing trends of technology migration such as wireline access to wireless access, time division transmission to high speed optical transmission, text based data to multimedia applications, conventional voice communication to voice traffic over packet switching networks. Knowledge of data communications fundamentals, communication protocols, network architecture, LAN/WAN, emerging networking applications, wired line/wireless networking, performance measurements, network design, system testing/verification, project management skill is required to be successful in today's telecommunication and information technology world.

The curriculum of the professional graduate series in Information Systems Management introduces students to key information system technologies, IT strategy development, project management, and information technology management techniques that apply to the entire system life cycle. This certificate emphasizes management techniques and methodologies used to ensure the successful implementation and on-going operations of information technology capabilities in the business. Students will learn various approaches to develop IT strategies, manage technology project implementations, and frameworks to apply to the on-going management and operation of application and information technology portfolios. This certificate is designed for IT professionals that aspire to identify, build, and manage the on-going operations of strategic systems. This certificate is also for business professionals whose responsibilities include oversight of IT technology for their business function. Graduates of this certificate will gain a broad understanding of the key issues and challenges of managing information technology systems and be able to apply key frameworks, models, and management methodologies to facilitate IT strategies, system implementations, and on-going system operations.

## Information Systems Security & IT, Advanced Graduate Certificate

Securing and safeguarding data and information is an ever-increasing urgent concern, especially in a post-9/11 world. The information systems security certificate focuses on skills that allow students to design a secured system and make recommendations for the protection of sensitive corporate data in accordance with commerce and privacy regulations. Students learn how to secure network systems (LAN, WAN, wireless). Topics include VPN, firewalls, intrusion detection systems, cryptography, anti-virus, anti-spam and application security techniques. Students also learn the managerial and administrative aspects of security such as vulnerabilities, countermeasures, network security architectures, policy development and legal/regulatory issues, risk management and disaster recovery planning.

## Certificates Offered

- Database & Internet Technologies, Advanced Graduate Certificate (<https://catalogs.northwestern.edu/sps/certificates/graduate/information-systems/database-internet-technologies-advance-graduate-certificate/>)
- Information Systems Management, Advanced Graduate Certificate (<https://catalogs.northwestern.edu/sps/certificates/graduate/information-systems/information-systems-management-advance-graduate-certificate/>)
- Information Systems Security, Advanced Graduate Certificate (<https://catalogs.northwestern.edu/sps/certificates/graduate/information-systems/information-systems-security-advance-graduate-certificate/>)

## Information Systems Courses

### CIS 212-0 Introduction to Programming (1 Unit)

This course introduces core elements of object-oriented programming and teaches how to transfer those concepts into Java language. First, the basics of the Java language are given an overview: variable, conditionals, looping and user-defined methods. Classes/objects, data hiding/encapsulation, inheritance and aggregation as principles of object-oriented programming will be introduced through interactive lectures and labs. Note: Enrollment restricted to students who have completed CIS 110-CN. Instructor consent (permission number) is required for all other students.

### CIS 350-0 Strategic Information Systems (1 Unit)

This course examines current issues, themes, and research related to the strategic use of information systems in organizations at a high level. It focuses on the use of information and information technology for competitive advantage in businesses, organizations, and nonprofits. May not be audited or taken P/N.

### CIS 413-0 Telecommunication Networks (1 Unit)

This course provides an overview of telecommunications and data communications. Course work includes local area network (LAN) and wide area network (WAN) components such as switches, routers, telecommunication circuits, and protocols. Advanced topics such as information security, information assurance, advanced networking technologies, and others will be overviewed as well.

### CIS 413-DL Telecommunications Networks (1 Unit)

This course provides an overview of telecommunications and data communications. Course work includes local area network (LAN) and wide area network (WAN) components such as switches, routers, telecommunication circuits, and protocols. Advanced topics such as

information security, information assurance, advanced networking technologies, and others will be overviewed as well.

**CIS 414-0 Object-Oriented Programming (1 Unit)**

This course focuses on developing complex programs using an object-oriented language. Students write programs that utilize functions and methods for code modularization and arrays for solving problems. Information hiding, encapsulation, inheritance, polymorphism, exception handling, and other principles of object-oriented programming will be introduced.

**CIS 414-DL Object Oriented Programming (1 Unit)**

This course focuses on developing complex programs using an object-oriented language. Students write programs that utilize functions and methods for code modularization and arrays for solving problems. Information hiding, encapsulation, inheritance, polymorphism, exception handling, and other principles of object-oriented programming will be introduced.

**CIS 417-0 Database Systems Design & Implementation (1 Unit)**

This course covers the fundamentals of database design and management. Topics include the principles and methodologies of database design, database application development, normalization, referential integrity, security, relational database models, and database languages. Principles are applied by performing written assignments and a project using an SQL database system.

**CIS 417-DL Database Systems Design & Implementation (1 Unit)**

This course covers the fundamentals of database design and management. Topics include the principles and methodologies of database design, database application development, normalization, referential integrity, security, relational database models, and database languages. Principles are applied by performing written assignments and a project using an SQL database system.

**CIS 419-0 Web Application Development (1 Unit)**

This course focuses on the design and development of object-oriented web applications. The client-server model and 3-tier architecture are discussed and analyzed. Topics covered include object-oriented methodology, enterprise software application architecture, design patterns, Enterprise JavaBeans, database connectivity, and web and application server development and technologies such as servlets, JSP, XML, HTML, security, JDBC, RMI, and multithreading. (Required: CIS 414-0 or CIS 414-DL and CIS 417-0 or CIS 417-DL.)

**CIS 419-DL Web Application Development (1 Unit)**

This course focuses on the design and development of object-oriented web applications. The client-server model and 3-tier architecture are discussed and analyzed. Topics covered include object-oriented methodology, enterprise software application architecture, design patterns, Enterprise JavaBeans, database connectivity, and web and application server development and technologies such as servlets, JSP, XML, HTML, security, JDBC, RMI, and multithreading. (Required: CIS 414-0 or CIS 414-DL and CIS 417-0 or CIS 417-DL.)

**CIS 431-0 Database Administration (1 Unit)**

Provides students with advanced database administration and management concepts that are needed to perform the duties of a Database Administrator (DBA) in organizations that use relational database systems. Topics include: database organization and architecture, industry DBMS standards, system objects management, user roles and profiles, server installation and maintenance, backup/recover techniques, network configuration, and security management. (Required: CIS 417-0 or CIS 417-DL.)

**CIS 431-DL Database Administration (1 Unit)**

Provides students with advanced database administration and management concepts that are needed to perform the duties of a Database Administrator (DBA) in organizations that use relational database systems. Topics include: database organization and architecture, industry DBMS standards, system objects management, user roles and profiles, server installation and maintenance, backup/recover techniques, network configuration, and security management. (Required: CIS 417-0 or CIS 417-DL.)

**CIS 435-0 Practical Data Science Using Machine Learning (1 Unit)**

This course provides an overview of machine learning concepts, techniques, and tools with a practical emphasis on understanding large, complex datasets and building intelligent systems. Insights gleaned from data mining and machine learning can be used to optimize operational processes, identify new business opportunities, and support evidence-based decision making and digital marketing with applications in industries such as finance, retail, and healthcare. (Required: CIS 417-0 or CIS 417-DL and MSDS 430-DL.)

**CIS 435-DL Practical Data Science Using Machine Learning (1 Unit)**

This course provides an overview of machine learning concepts, techniques, and tools with a practical emphasis on understanding large, complex datasets and building intelligent systems. Insights gleaned from data mining and machine learning can be used to optimize operational processes, identify new business opportunities, and support evidence-based decision making and digital marketing with applications in industries such as finance, retail, and healthcare. (Required: CIS 417-0 or CIS 417-DL and MSDS 430-DL.)

**CIS 436-DL Big Data Management and Analytics (1 Unit)**

This course reviews concepts behind both centralized and distributed database systems, and relational and not-only-relational database systems. Discussion of open source and commercial solutions, with special attention being paid to large distributed database systems and data warehousing. The course introduces technologies and modeling methods for large-scale, distributed analytics. (Required: CIS 417-0 or CIS 417-DL. Recommended: CIS 435-0 or CIS 435-DL.)

**CIS 452-0 Fundamentals of Network Security (1 Unit)**

Fundamentals of Network Security helps students develop an understanding of computer network security and survivability principles. Course work includes the study of survivability, availability, threats, risk, and policy in a multi-user network. Additionally, students study technical solutions necessary to understanding and securing network information and communications; these include cryptography, firewalls, intrusion, anti-virus, anti-spam, wireless, VPN, host systems, network services, and network infrastructure. (Required: CIS 413-0 or CIS 413-DL.)

**CIS 452-DL Fundamentals of Network Security (1 Unit)**

Fundamentals of Network Security helps students develop an understanding of computer network security and survivability principles. Course work includes the study of survivability, availability, threats, risk, and policy in a multi-user network. Additionally, students study technical solutions necessary to understanding and securing network information and communications; these include cryptography, firewalls, intrusion, anti-virus, anti-spam, wireless, VPN, host systems, network services, and network infrastructure. (Required: CIS 413-0 or CIS 413-DL.)

**CIS 453-0 Advanced Cyber Security (1 Unit)**

This course provides a hands-on overview of comprehensive security issues and techniques throughout various areas of cyberspace. Both technical and managerial topics will be explored including: security controls and technologies, cybersecurity law, auditing and cybersecurity programs, risk assessment and mitigation. (Required: CIS 413-0 or CIS 413-DL.)

**CIS 453-DL Advanced Cyber Security (1 Unit)**

This course provides a hands-on overview of comprehensive security issues and techniques throughout various areas of cyberspace. Both technical and managerial topics will be explored including: security controls and technologies, cybersecurity law, auditing and cybersecurity programs, risk assessment and mitigation. (Required: CIS 413-0 or CIS 413-DL.)

**CIS 455-0 Business Continuity and Disaster Recovery (1 Unit)**

Provides an in-depth study of the technical solutions necessary to support disaster recovery and business continuity in an enterprise networking environment. Course work includes the study of Risk and Business Impact Assessment (BIA), responding to a disaster, disaster recovery strategies, business continuity planning, and creating a recovery plan. Additional discussions will focus on designing a disaster recovery solution and surveying appropriate and current technologies and techniques, including RAID, SAN, clustering, backup solutions, LAN/WAN designs, and environmental impact. (Required: CIS 413-0 or CIS 413-DL. Recommended: CIS 452-0 or CIS 452-0.)

**CIS 455-DL Disaster Recovery and Continuity (1 Unit)**

Provides an in-depth study of the technical solutions necessary to support disaster recovery and business continuity in an enterprise networking environment. Course work includes the study of Risk and Business Impact Assessment (BIA), responding to a disaster, disaster recovery strategies, business continuity planning, and creating a recovery plan. Additional discussions will focus on designing a disaster recovery solution and surveying appropriate and current technologies and techniques, including RAID, SAN, clustering, backup solutions, LAN/WAN designs, and environmental impact. (Required: CIS 413-0 or CIS 413-DL. Recommended: CIS 452-0 or CIS 452-0.)

**CIS 457-0 Management of Information Security (1 Unit)**

This course emphasizes the need for information technology security and control and provides reasonable working knowledge required to manage information technology security and risk. This is accomplished through a comprehensive survey of security threats, risk analysis, control techniques, and managerial issues associated with establishing and maintaining an information technology security plan. (Required: CIS 413-0 or CIS 413-DL. Recommended: CIS 452-0 or CIS 452-DL and CIS 455-0 or CIS 455-DL.)

**CIS 457-DL Management of Information Security (1 Unit)**

This course emphasizes the need for information technology security and control and provides reasonable working knowledge required to manage information technology security and risk. This is accomplished through a comprehensive survey of security threats, risk analysis, control techniques, and managerial issues associated with establishing and maintaining an information technology security plan. (Required: CIS 413-0 or CIS 413-DL. Recommended: CIS 452-0 or CIS 452-DL and CIS 455-0 or CIS 455-DL.)

**CIS 459-DL Innovation with Blockchain Technology (1 Unit)**

This course will introduce students to blockchain and the benefits it has to offer. Through lectures, academic writing, lab sessions, and projects, this course is intended to help students understand blockchain to make business decisions and design/develop solutions using blockchain. (Required: CIS 414-0, CIS 414-DL, or MSDS 430-DL.)

**CIS 460-0 Information Technology Management (1 Unit)**

This course introduces students to the key challenges and responsibilities of managing information technology and an information technology organization. Students gain knowledge of the various facets of managing information technology including how to develop an IT strategy aligned with business strategy. Topics covered include the IT solution lifecycle, IT service management, IT supplier management

and sourcing, ongoing IT technology operations, governance, business continuity, budgeting, benchmarking, and industry standard management frameworks such as ITIL and COBIT. (Required: CIS 413-0 or CIS 413-DL. Recommended CIS 452-0 or CIS 452-DL, 455-0 or CIS 455-DL, and CIS 457-0 or CIS 457-DL.)

**CIS 460-DL Information Technology Management (1 Unit)**

This course introduces students to the key challenges and responsibilities of managing information technology and an information technology organization. Students gain knowledge of the various facets of managing information technology including how to develop an IT strategy aligned with business strategy. Topics covered include the IT solution lifecycle, IT service management, IT supplier management and sourcing, ongoing IT technology operations, governance, business continuity, budgeting, benchmarking, and industry standard management frameworks such as ITIL and COBIT. (Required: CIS 413-0 or CIS 413-DL. Recommended CIS 452-0 or CIS 452-DL, 455-0 or CIS 455-DL, and CIS 457-0 or CIS 457-DL.)

**CIS 465-0 Information Technology Strategy (1 Unit)**

This course introduces effective frameworks and methods for developing information technology and systems strategies that focus on meeting enterprises business objectives and on leveraging IT to competitively extend business capabilities. Topics covered include business driver identification and business and IT alignment; key technology components of the IT strategy, including enterprise architecture, enterprise systems, SOA and other integration technologies, networks, and data management; portfolio management; sourcing and hosting alternatives; emerging technologies and entrepreneurship. (Required: CIS 413-0 or CIS 413-DL. Recommended CIS 452-0 or CIS 452-DL, 455-0 or CIS 455-DL, 457-0 or CIS 457-DL, and CIS 460-0 or CIS 460-DL.)

**CIS 465-DL Information Technology Strategy (1 Unit)**

This course introduces effective frameworks and methods for developing information technology and systems strategies that focus on meeting enterprises business objectives and on leveraging IT to competitively extend business capabilities. Topics covered include business driver identification and business and IT alignment; key technology components of the IT strategy, including enterprise architecture, enterprise systems, SOA and other integration technologies, networks, and data management; portfolio management; sourcing and hosting alternatives; emerging technologies and entrepreneurship. (Required: CIS 413-0 or CIS 413-DL. Recommended CIS 452-0 or CIS 452-DL, 455-0 or CIS 455-DL, 457-0 or CIS 457-DL, and CIS 460-0 or CIS 460-DL.)

**CIS 494-0 Project Management Concepts (1 Unit)**

This course introduces effective frameworks and methods for developing information technology and systems strategies that focus on meeting enterprises business objectives and on leveraging IT to competitively extend business capabilities. Topics covered include business driver identification and business and IT alignment; key technology components of the IT strategy, including enterprise architecture, enterprise systems, SOA and other integration technologies, networks, and data management; portfolio management; sourcing and hosting alternatives; emerging technologies and entrepreneurship.

**CIS 494-DL Project Management Concepts (1 Unit)**

This course introduces effective frameworks and methods for developing information technology and systems strategies that focus on meeting enterprises business objectives and on leveraging IT to competitively extend business capabilities. Topics covered include business driver identification and business and IT alignment; key technology components of the IT strategy, including enterprise architecture, enterprise systems, SOA and other integration technologies, networks,

and data management; portfolio management; sourcing and hosting alternatives; emerging technologies and entrepreneurship.

**CIS 495-0 IT Project Management (1 Unit)**

IT Project Management will teach working professionals with an IT background valuable skillsets related to real-world project management issues to help advance their career. Issues such as contemporary development methodologies, system architectures, IT team structure, and IT management functions will be discussed as well as developing personal capacities needed to lead and manage successful IT project teams. Students will also learn vital soft skills within an IT context such as team composition and leadership, conflict resolution and politics. (Required: CIS 494-0 or CIS 494-DL)

**CIS 495-DL IT Project Management (1 Unit)**

IT Project Management will teach working professionals with an IT background valuable skillsets related to real-world project management issues to help advance their career. Issues such as contemporary development methodologies, system architectures, IT team structure, and IT management functions will be discussed as well as developing personal capacities needed to lead and manage successful IT project teams. Students will also learn vital soft skills within an IT context such as team composition and leadership, conflict resolution and politics. (Required: CIS 494-0 or CIS 494-DL)

**CIS 496-0 IT Finance & Communication (1 Unit)**

This course is designed for those who want to sharpen their writing and communication skills for professional IT environments. Using a case study, students learn to apply measures of excellence in professional writing and communication in business environments, including audience analysis, persuasive writing, verbal and interpersonal communication, and document design and graphics. Writers gain experience writing individually and in collaborative environments, producing multiple drafts and receiving feedback from their peers and the instructor.

**CIS 496-DL Information Technology Business Writing and Communication (1 Unit)**

This online course is designed for those who want to sharpen their writing and communication skills for professional IT environments. Using a case study, students learn to apply measures of excellence in professional writing and communication in business environments, including audience analysis, persuasive writing, verbal and interpersonal communication, and document design and graphics. Writers gain experience writing individually and in collaborative environments, producing multiple drafts and receiving feedback from their peers and the instructor.

**CIS 497-DL Information Technology Finance (1 Unit)**

This course focuses on developing and managing an IT project budget as well as looks at the means of conveying information to ensure understanding and gain the cooperation of key partners in initiating positive IT financial initiatives.

**CIS 498-0 Information Systems Project (1 Unit)**

This course provides experience in the development of large multi-tier information systems. The project will cover all aspects of the software development life cycle (i.e., analysis, design, implementation, testing, deployment), as well as project management and software configuration management. Students will use Java, an object request broker, and a database management system to develop a three-tier application using a use-case-driven, iterative, and incremental methodology. (Required: CIS 413-0 or CIS 413-DL, CIS 414-0 or CIS 414-DL or MSDS 430-DL, and CIS 417-0 or CIS 417-DL. And must have completed 9 out of 11 units of credit.)

**CIS 498-DL Information Systems Project (1 Unit)**

This course provides experience in the development of large multi-tier information systems. The project will cover all aspects of the software development life cycle (i.e., analysis, design, implementation, testing, deployment), as well as project management and software configuration management. Students will use Java, an object request broker, and a database management system to develop a three-tier application using a use-case-driven, iterative, and incremental methodology. (Required: CIS 413-0 or CIS 413-DL, CIS 414-0 or CIS 414-DL or MSDS 430-DL, and CIS 417-0 or CIS 417-DL. And must have completed 9 out of 11 units of credit.)

**CIS 499-0 Independent Study (1 Unit)**

Independent Study.

**CIS 590-0 Capstone Research (1 Unit)**

Capstone Research.

**CIS 590-DL Capstone Research (1 Unit)**

Capstone Research.