Database and Web Developers/Engineers

Course Overview: Encompass entry level, technical, and professional careers related to the design, development and support of hardware, software, multimedia, and systems integration services.

Career Goal (O*NET Code): (15-1099) - Database administrators use software to store and organize data, such as financial information and customer shipping records. They make sure that data are available to users and are secure from unauthorized access.

Student Name:_____

Grade: _____

School: _____

SUGGESTED COURSEWORK

EXTENDED LEARNING EXPERIENCES

			Suggested Coursework	
Middle School	8th	**HS Courses:**	(Local districts may list high school credit courses here)	
High School	9th	**Courses*:**	English I — World Geography — Fine Arts / Algebra I or Geometry — Foreign Language I / Biology — Physical Education or Athletics	
		Career-Related Electives:	Principles of Information Technology	
	10th	**Courses:**	English II — World History — Elective / Geometry or Algebra II — Foreign Language II / Chemistry — Elective	
		Career-Related Electives:	Digital & Interactive Multimedia	
	11th	**Core Courses:**	English III — United States History — Elective / Algebra II or Pre-Calculus — Foreign Language III ** / Physics — Professional Communications or Speech	
		Career-Related Electives:	Web Technologies	
	12th	**Core Courses:**	English IV — Government/Economics / Pre-Calculus or Calculus — Elective / 4th Science — Elective	
		Career-Related Electives:	Research in IT Solutions	

Curricular Experiences*:
Business Professionals of America
Future Business Leaders of America
SkillsUSA
Technology Student Association

Career Learning Experiences:
Apprenticeship
Career Preparation
Internship
Job Shadowing

Extracurricular Experiences:
Academic Decathlon
Computer Tutor
Language Immersion Programs
School Newspaper
Student Council
UIL Academic Competitions
Yearbook

Service Learning Experiences:
Boy Scouts of America
Campus Service Organizations
Community Service Volunteer
Girl Scouts of the USA
Peer Mentoring / Peer Tutoring

COLLEGE CREDIT OPPORTUNITIES -- High School

Students should take Advanced Placement (AP), International Baccalaureate (IB), dual credit, Advanced Technical Credit (ATC), or locally articulated courses (Tech Prep), if possible. List those courses that count for college credit on your campus.

How to Become a Database Administrator
Database administrators (DBAs) usually have a bachelor's degree in an information- or computer- related subject. Before becoming an administrator, these workers typically get experience in a related field.

**Carrer Options
(Sample of reported job titles)**

Professional Associations:
• Association for Computing Machinery
• Institute of Electrical and Electronics Engineers Computer Society
• Computing Research Association
• National Workforce Center for Emerging Technologies
• National Center for Women and Information Technology
• Association for Computing Machinery
• Institute of Electrical and Electronics Engineers Computer Society
• Computer Research Association
• National Workforce Center for Emerging Technologies
• National Center for Women and Information Technology

		Postsecondary	
Postsecondary	**Texas Southmost College**	**South Texas College**	**Texas State Technical College**
	Computer Web Development (CERT)	Computer and Internet Specialist Certificate (CERT)	Computer Science & Software Development (AAS)
	Computer Web Development (AAS)	Computer Science (AS)	
		The University of Texas at Brownsville	**The University of Texas - Pan American**
		Computer Science (BS)	Computer Science (BS)
		Computer Science (MS)	Computer Science (MS)
		Business Administration (MBA)	Business Administration (MBA)
			Information Technology (MS)

• Database Administrators (DBA)
• Database Analyst
• Database Administration Manager
• Database Coordinator
• Database Programmer
• Information Systems Manager
• Management Information Systems Director (MIS Director)
• Programmer Analyst
• System Manager
• Webmaster
• Web Designer
• Web Developer

* Students must meet local & state high school graduation requirements. ** Required course for the Distinguished Graduation Plan (in addition to other measures). *** Based on campus availability. Students may select other elective courses for personal enrichment purposes.

This plan of study serves as a guide, along with other career planning materials, for pursuing a career path and is based on the most recent information as of 2009. All plans meet high school graduation requirements as well as college entrance requirements.

TEA Industry Cluster	Computer/IT
SOC Code	15-1099
Identified by	TIP Strategies; TWC LMCI
Projected Growth (2018)	16 %
BISD Magnet School Available	Yes

Source: Demand Occupations by Cluster, updated *June 27, 2012*

Description

What Database Administrators Do

Database administrators use software to store and organize data, such as financial information and customer shipping records. They make sure that data are available to users and are secure from unauthorized access.

Duties
Database administrators typically do the following:

- Identify user needs to create and administer databases
- Ensure that the database operates efficiently and without error
- Make and test modifications to the database structure when needed
- Maintain the database and update permissions
- Merge old databases into new ones
- Backup and restore data to prevent data loss

Database administrators, often called DBAs, make sure that data analysts can easily use the database to find the information they need and that the system performs as it should. DBAs sometimes work with an organization's management to understand the company's data needs and to plan the goals of the database. Database administrators often plan security measures, making sure that data are secure from unauthorized access. Many databases contain personal or financial information, making security important. Database administrators are responsible for backing up systems in case of a power outage or other disaster. They also ensure the integrity of the database, guaranteeing that the data stored in it come from reliable sources.

Many database administrators are general-purpose DBAs and have all these duties. However, some DBAs specialize in certain tasks that vary with the organization and its needs. Two common specialties are as follows:

System DBAs are responsible for the physical and technical aspects of a database, such as installing upgrades and patches to fix program bugs. They typically have a background in system architecture and ensure that the database in a firm's computer systems works properly.
Application DBAs support a database that has been designed for a specific application or a set of applications, such as customer service software. Using complex programming languages, they may write or debug programs and must be able to manage the aspects of the applications that work with the database. They also do all the tasks of a general DBA, but only for their particular application.

What Information Security Analysts, Web Developers, and Computer Network Architects Do

Information security analysts, web developers, and computer network architects all use information technology (IT) to advance their organization's goals. Security analysts ensure a firm's information stays safe from cyberattacks. Web developers create websites to help firms have a public face. Computer network architects create the internal networks all workers within organizations use.

Duties
Information security analysts plan and carry out security measures to protect an organization's computer networks and systems. Their responsibilities are continually expanding as the number of cyberattacks increase.
Information security analysts typically do the following:

- Research the latest information technology security trends
- Monitor their organization's networks for security breaches and investigate a violation when one occurs
- Help plan and carry out an organization's way of handling security
- Develop security standards and best practices for their organization
- Install and use software, such as firewalls and data encryption programs, to protect sensitive information
- Recommend security enhancements to management or senior IT staff
- Help computer users when they need to install or learn about new security products and procedures

Information security analysts must continually adapt to stay a step ahead of cyberattackers. They must stay up to date on the latest methods attackers are using to infiltrate computer systems and on IT security. Analysts need to research new security technology to decide what will most effectively protect their organization. This may involve attending cybersecurity conferences to hear firsthand accounts of other professionals who have experienced new types of attacks.

IT security analysts create their organization's disaster recovery plan, a procedure that IT employees follow in case of emergency. The plan lets an organization's IT department continue functioning. It includes preventative measures such as regularly copying and transferring data to an offsite location. It also involves plans to restore proper IT functioning after a disaster. Analysts continually test the steps in their recovery plans.

Because information security is important, analysts usually report directly to upper management. Many information security analysts work with an organization's Chief Technology Officer (CTO) to design security or disaster recovery systems. For more information on chief technology officers, see the profile on computer and information systems managers.

Computer network architects, or *network engineers*, design and build data communication networks, including local area networks (LANs), wide area networks (WANs), and intranets. These networks range from a small connection between two offices to a multinational series of globally distributed communications systems. Network architects must have thorough knowledge of an organization's business plan to design a network that can help the organization achieve its goals.
Computer network architects typically do the following:

- Create a plan and layout for a data communication network
- Present the plan to management and explain why it is in the organization's best interest to pursue it
- Decide what hardware, such as routers or adaptors, and software, such as network drivers, will be needed to support the network
- Determine how cables will be laid out in the building and where other hardware will go
- Research new technology to determine what would best support their organization in the future
- Consider information security when designing a network

Architects often work with their organization's Chief Technology Officer (CTO) to predict the highest need for new networks. They spend most of their time planning these new networks. Some network architects work in the field, supervising engineers and workers who build the networks an architect has designed. Network architects are often experienced staff and have 5 to 10 years of experience working in network administration or with other IT systems.

Web developers design and create websites. They are responsible for the look of the site. They are also responsible for the site's technical aspects, such as performance and capacity, which are measures of a website's speed and how much traffic the site can handle. They also may create content for the site.
Web developers typically do the following:

- Meet with their clients or management to discuss the needs of the website and the expected needs of the website's audience and plan how it should look
- Create and debug applications for a website
- Write code for the site, using programming languages such as HTML or XML
- Work with other team members to determine what information the site will contain
- Work with graphics and other designers to determine the website's layout
- Integrate graphics, audio, and video into the website
- Monitor website traffic

When creating a website, developers have to make their client's vision a reality. They work with clients to determine what sites should be used for, including ecommerce, news, or gaming. The developer has to decide which applications and designs will fit the site best.

The following are some types of web developers:

Web architects or programmers are responsible for the overall technical construction of the website. They create the basic framework of the site and ensure that it works as expected. Web architects also establish procedures for allowing others to add new pages to the website and meet with management to discuss major changes to the site.
Web designers are responsible for how a website looks. They create the site's layout and integrate graphics; applications, such as a retail checkout tool; and other content into the site. They also write web-design programs in a variety of computer languages, such as HTML or JavaScript.
Webmasters maintain websites and keep them updated. They ensure that websites operate correctly and test for errors such as broken links. Many webmasters respond to user comments as well.

Training Opportunities Linked to Those Jobs
(Degree Types and Colleges/Universities**)**

How to Become a Database Administrator
Database administrators (DBAs) usually have a bachelor's degree in an information- or computer- related subject. Before becoming an administrator, these workers typically get experience in a related field.

Education
Most database administrators have a bachelor's degree in management information systems (MIS) or a computer-related field. Firms with large databases may prefer applicants who have a Master of Business Administration (MBA) with a concentration in information systems. An MBA typically requires 2 years of schooling after the undergraduate level.

Database administrators need an understanding of database languages, the most common of which is SQL. Most database systems use some variation of SQL, and a DBA will need to become familiar with whichever language the firm uses.

Certification
Certification is a way to demonstrate competence and may provide a jobseeker with a competitive advantage. Certification programs are generally offered by product vendors or software firms. Some companies may require their database administrators to be certified in the product they use.

Work Experience
Most database administrators do not begin their careers in that occupation. Many first work as database developers or data analysts. A database developer is a type of software developer who specializes in creating databases. The job of a data analyst is to interpret the information stored in a database in a way the firm can use. Depending on their specialty, data analysts can have different job titles, including financial analyst, market research analyst, and operations research analyst. After mastering these fields, they may become a database administrator. For more information, see the profiles on software developers, financial analysts, market research analysts, and operations research analysts.

Important Qualities
Analytical skills. DBAs must be able to monitor a database system's performance to determine when action is needed. They must be able to evaluate complex information that comes from a variety of sources.
Communication skills. Most database administrators work on teams and must be able to communicate effectively with developers, managers, and other workers.
Detail oriented. Working with databases requires an understanding of complex systems, in which a minor error can cause major problems. For example, mixing up customers' credit card information can cause someone to be charged for a purchase he or she didn't make.
Logical thinking. Database administrators use software to make sense of information and to arrange and organize it into meaningful patterns. The information is then stored in the databases that these workers administer, test, and maintain.
Problem-solving skills. When problems with a database arise, administrators must be able to diagnose and correct them.

How to Become an Information Security Analyst, Web Developer, or Computer Network Architect
Most information security analysts, web developers, and computer network architects have a bachelor's degree in a computer-related field. Information security analysts and computer network architects usually need experience in a related occupation, and additional knowledge of web programming languages can help web developers.

Education
Information security analysts usually need at least a bachelor's degree in computer science, programming, or a related field. As information security continues to develop as a career field, many schools are responding with information security programs to prepare students for the job. These programs may become a common path for entry into the occupation.

Employers of information security analysts sometimes prefer applicants who have a Master of Business Administration (MBA) in information systems. Programs offering the MBA in information systems generally require 2 years of study beyond the undergraduate level and include both business and computer-related courses.

Computer network architects usually need at least a bachelor's degree in computer science, information systems, engineering, or a related field. Employers of network architects sometimes prefer applicants to have a Master of

Business Administration (MBA) in information systems. These programs generally require 2 years of study beyond the undergraduate level and include both business and computer-related courses.

Educational requirements for web developers vary with the setting they work in and the type of work they do. Requirements range from a high school diploma to a bachelor's degree. An associate's degree may be sufficient for webmasters who do not do a lot of programming.

However, for web architect or other, more technical, developer positions, some employers prefer workers who have at least a bachelor's degree in computer science, programming, or a related field.

Web developers need to have a thorough understanding of HTML. Many employers also want developers to understand other languages, such as JavaScript or SQL, as well as have some knowledge of multimedia publishing tools, such as Flash. Throughout their career, web developers must keep up to date on new tools and computer languages.

Some employers prefer web developers who have both a computer degree and have taken classes in graphic design, especially when hiring developers who will be heavily involved in the website's visual appearance.

Work Experience
Information security analysts generally need to have previous experience in a related occupation. Many employers look for people who have already worked in fields related to the one in which they are hiring. For example, if the job opening is in database security, they may look for a database administrator. If they are hiring in systems security, a computer systems analyst may be an ideal candidate.

Network architects generally need to have previous experience in a related occupation. They usually have at least 5 to 10 years of experience working in network administration or with other information technology (IT) systems.

Important Qualities

Analytical skills. Information security analysts must carefully examine computer systems and networks to determine if they have been compromised. Computer network architects have to examine data networks and decide how to best connect the networks based on the needs and resources of the organization.
Concentration. Web developers must sit at a computer and write detailed code for long periods.
Creativity. Web developers are often involved in designing the appearance of a website and must make sure that it looks innovative and up to date.
Customer-service skills. Webmasters have to respond politely and correctly to user questions and requests.
Detail oriented. Because cyberattacks can be difficult to detect, information security analysts pay careful attention to their computer systems and watch for minor changes in performance. Computer network architects create comprehensive plans of the networks they are creating with precise information describing how the network parts will work together. When web developers write in HTML, a minor error could cause an entire webpage to stop working.
Ingenuity. Information security analysts try to outthink cybercriminals and invent new ways to protect their organization's computer systems and networks.
Leadership skills. Many computer network architects direct teams of engineers who build the networks they have designed.
Organization skills. Computer network architects who work for large firms must coordinate many different types of communication networks and make sure they work well together.
Problem-solving skills. Information security analysts uncover and fix flaws in computer systems and networks.
Teamwork. Workers in all three of these occupations must be able to work with different types of employees to accomplish their goals.

Texas Southmost College	South Texas College	Texas State Technical College	University of Texas at Brownsville	University of Texas - Pan American
Computer Web Development (CERT)	Computer and Internet Specialist Certificate (CERT)	Computer Science & Software Development (AAS)	Computer Science (BS)	Computer Science (BS)
Computer Web Development (AAS)	Computer Science (AS)		Computer Science (MS)	Computer Science (MS)
			Business Administration (MBA)	Information Technology (MS)
				Business Administration (MBA)

Local Employers

Access Consulting	**Brownsville**		**J E Saenz & Assoc Inc**	**Brownsville**
Ambiotec Environmental Conslnt	**Harlingen**		**Members First Credit Union**	**Harlingen**
American Home Patient Inc	**Harlingen**		**Quality Data Imaging**	**Brownsville**
Cobblestone Engineering Inc	**Harlingen**		**Southmost Management Corp**	**Brownsville**
Garcia Middle School	**Brownsville**		**University of Texas**	**Brownsville**

Career Options
(Specific Job Types)

- Database Administrators (DBA)
- Database Analyst
- Database Administration Manager
- Database Coordinator
- Database Programmer
- Information Systems Manager

- Management Information Systems Director (MIS Director)
- Programmer Analyst
- System Manager
- Webmaster
- Web Designer
- Web Developer

Salary Ranges

Wages for **Database Administrators**

Location	Pay Period	2011				
		10%	25%	Median	75%	90%
United States	Hourly	$20.36	$26.85	$36.15	$46.46	$56.19
	Yearly	$42,300	$55,800	$75,200	$96,600	$116,900
Texas	Hourly	$19.60	$26.34	$36.48	$45.50	$54.83
	Yearly	$40,800	$54,800	$75,900	$94,600	$114,000

Location	Pay Period	2011				
		10%	25%	Median	75%	90%
Brownsville-Harlingen, TX MSA	Hourly	—	—	—	—	—
	Yearly	—	—	—	—	—
McAllen-Edinburg-Mission, TX MSA	Hourly	$19.93	$24.46	$30.20	$35.57	$43.46
	Yearly	$41,500	$50,900	$62,800	$74,000	$90,400

The wage occupation *Information Security Analysts, Web Developers, and Computer Network Architects* aggregates data for these 3 occupations:
Computer Network Architects ----- Information Security Analysts ----- **Web Developers**

Location	Pay Period	2011				
		10%	25%	Median	75%	90%
United States	Hourly	$20.56	$28.03	$37.49	$48.83	$60.03
	Yearly	$42,800	$58,300	$78,000	$101,600	$124,900
Texas	Hourly	$22.12	$29.72	$38.74	$49.39	$60.02
	Yearly	$46,000	$61,800	$80,600	$102,700	$124,800
Brownsville-Harlingen, TX MSA	Hourly	$16.41	$19.61	$26.47	$39.45	$48.29
	Yearly	$34,100	$40,800	$55,100	$82,100	$100,400
McAllen-Edinburg-Mission, TX MSA	Hourly	$12.49	$16.41	$22.58	$35.96	$50.20
	Yearly	$26,000	$34,100	$47,000	$74,800	$104,400

Professional Associations linked to the Careers

For more information about database administrators, visit
Association for Computing Machinery
Institute of Electrical and Electronics Engineers Computer Society
Computing Research Association

For information about an education in information technology (IT), visit
National Workforce Center for Emerging Technologies

For information regarding opportunities for women pursuing IT careers, visit
National Center for Women and Information Technology

For more information about computer careers, visit
Association for Computing Machinery
Institute of Electrical and Electronics Engineers Computer Society
Computer Research Association

For more information about an education in information technology (IT), visit
[National Workforce Center for Emerging Technologies](#)

For information about opportunities for women pursuing IT careers, visit
[National Center for Women and Information Technology](#)

Sources

The information provided in this document was collected from the following sources:

- Occupational Outlook Handbook (http://www.bls.gov/ooh/)
- O*NET OnLine (http://www.onetonline.org/)
- Texas CARES (http://www.texascaresonline.com/)
- CareerOneStop (http://www.careeronestop.org/)