Of information technology

Sample Scheme of Study for BS (IT)

4-year Programme (8 Semesters)

(134 Credit Hours)

Semester-wise 4-Year Plan

Semester 1	Cr. Hrs.	Semester 2	Cr. Hrs.
Introduction to ICT	2+1	Discrete Structures	3+0
Programming Fundamentals	3+1	Object Oriented Programming	2+1
Calculus and Analytical Geometry	3+0	Fundamentals of IT	3+0
Basic Electronics	2+1	University Elective I	3+0
English Composition & Comprehension	3+0	Communication Skills	3+0
		Pakistan Studies	2+0
	16		17

Semester 3	Cr. Hrs.	Semester 4	Cr. Hrs.
Digital Logic Design	2+1	Operating Systems	2+1
Data Structures and Algorithms	2+1	Introduction to Database Systems	2+1
Linear Algebra	3+0	Organizational Behaviour	3+0
Technical and Business Writing	3+0	Probability and Statistics	3+0
Islamic Studies/Ethics	2+0	Computer Communication and Networks	2+1

	Cr. Hrs.		Cr. Hrs.
University Elective II	3+0	University Elective III	3+0
	17		18

Semester 5	Cr. Hrs.	Semester 6	Cr. Hrs.
Web Systems and Technologies	2+1	University Elective V	3+0
University Elective IV	3+0	Systems and Network Administration	2+1
Introduction to Software Development	3+0	IT Elective II	3+0
IT Elective I	3+0	University Elective VI	3+0
Multimedia Systems and Design	2+1	IT Elective –III	3+0
Information Systems	3	Human Computer Interaction	2+1
	18		18

Semester 7	Cr. Hrs.	Semester 8	Cr. Hrs.
IT Capstone Part I (continued)	*	IT Capstone Part II	6
Technology Management	3	IT Elective VI	3
IT Elective IV	3	Professional Practices	3
Network Security	3	IT Elective VII	3
System Integration and Architecture	3		
IT Elective V	3		
	18		12

4. Revision of MS Program in Information Technology

The curriculum for the Master's program was thrashed out with diverse perspectives. Everybody agreed upon defining tracks consistently and suggesting courses accordingly. Finally, after incorporating the approved changes the structure of MS in IT with its complete design and details emerged as follows:

Structure of MS in Information Technology

Category or Area	Credit Hours
Core	12
Elective	12
Thesis/Project/Course work	6
Total Credit Hours	**30**

Core Area

S No	Course Title	Credit Hours
1	Advanced Database Management	3
2	Telecom Management	3
3	Information Security and Assurance	3
4	Information Technology Infrastructure	3

Elective Area

The committee argued at length the elective courses and recommended the following courses as suggestive list. Universities may add more courses on similar lines.

S No	Course Title	Credit Hours
1	Economics of Technology	3
2	IT Planning and Evaluation	3
3	IT Services Management	3
4	IT Project Management	3
5	E-Biz	3
6	IT Audit and Assessment	3
7	IT Policy, Laws, and Practice	3
8	IT Disaster Management	3

Thesis/Project/Course work

The committee, after long discussion, recommended that university should be given option for selecting thesis, project work, or course work. A minimum of 6 credit hours for thesis/project work/course work are recommended.

Course Contents

BS in Information Technology

Course Name: Introduction to Information and Communication Technologies

Course Structure: Lectures: 2 / Labs: 3	**Credit Hours:** 3

Prerequisites: None (first semester course)

Objectives: This course focuses on a breadth-first coverage of the use of computing and communication technologies to solve real life problems; including computing environments, general application software like word processing, visual presentation applications, tabular data manipulation, DBMS, WWW, Email management systems, Virus, Anti-Virus and Spam Protection; Introduction to the basic computing hardware (main building blocks), operating systems, data networks; software engineering and communication technology along with social and ethical issues. An introduction of the program of study in computing for which this course is being taught (CS, IT, SE etc.). The course attempts to provide every student a set of productivity tools that they will be able to use for the rest of their lives.

Course Outline: Number Systems, Binary numbers, Boolean logic, History computer system, basic machine organization, Von Neumann Architecture, Algorithm definition, design, and implementation, Programming paradigms and languages, Graphical programming, Overview of Software Engineering and Information Communication Technology, Operating system, Compiler, DBMS, Computer networks and internet, WWW, web mail applications, Computer graphics, AI, Viruses and Anti-Viruses, Use of office productivity tools, such as word processors, spreadsheets, presentation applications, etc., Social, Ethical, Professional and Legal Issues, and overview of the complete program of studies in computing and its structure.

Suggested Text Book:

Introduction to Computers by Peter Norton, 6th Edition, McGraw-Hill SiE, ISBN 0-07-059374-4.

Reference Material:

Computers: Information Technology in Perspective, 9/e by Larry Long and Nancy Long, Prentice Hall, 2002/ISBN: 0130929891.

An Invitation to Computer Science, Schneider and Gersting, Brooks/Cole Thomson Learning, 2000.

Information System Today by Leonard Jessup, Joseph Valacich.

Computers Today by Suresh K. Basandra.

Computer Science: An overview of Computer Science, Sherer.

Course Name: Fundamentals of Information Technology

Course Structure: Lectures: 3	**Credit Hours:** 3

Prerequisites: Introduction to Computing (recommended)

Course Objectives: To introduce students to the scope of the field of Information Technology, to give them a basic understanding of information, its organization, transmission, storage, retrieval and presentation, and to explore some of the computer based technologies used for these purposes.

Course Outline: Introduction to the academic discipline of IT as well as the general meaning of IT as per objectives given in the start of this program. Definitions of information, information technology as the use of computer based technology to organize, store, retrieve, transmit and present information, sender/receiver/channel model for information transfer. Information organization via databases, data modeling, and information management systems. Basic network ideas and models. Differences in human and machine processing of information, information transfer at the human/machine interface, modalities for information presentation, advantages and disadvantages of various presentation media. Challenging issues for today's information and communication technologies, issues in organizational need assessment and management of large scale information systems, along with social, legal and ethical issues related with each topic.

Suggested Text Book:

Cyganski, David, John A. Orr and Richard F. Vaz, Information Technology Inside and Outside, Pearson Education (LPE), 2001

Information Technology: Principles, Practices, and Opportunities (3rd Edition) (Hardcover), by James A. Senn (Author), Prentice Hall; 3 edition (December 1, 2003), ISBN-10: 0131436260

Reference Material:

Cyganski, David, John A. Orr and Richard F. Vaz, Information Technology Inside and Outside, Pearson Education (LPE), 2001

Ray, Ajoy Kumar and Tinku Acharya, Information Technology: Principles and Applications, Prentice-Hall India, 2004

Information Technology: Principles, Practices, and Opportunities (3rd Edition) (Hardcover), by James A. Senn (Author), Prentice Hall; 3 edition (December 1, 2003), ISBN-10: 0131436260

Introduction to Information Technology (Hardcover)

by Efraim Turban (Author), Rex Kelly Rainer (Author), Richard E. Potter (Author), Hardcover: 592 pages, Publisher: Wiley; 2 edition (July 12, 2002), ISBN-10: 0471073806

Course Name: Web Systems and Technologies

Course Structure: Lectures: 3	**Credit Hours:** 3

Prerequisites: Fundamentals of Information Technology (required)

Course Objectives:

This course will extend the WWW Technologies and Web Based Applications

This course will extend the WWW Technologies and Web Based Applications architecture, development, deployment and management concepts studied in the course of Fundamentals of Information Technology. The instructor is expected to cover an in-depth treatment of the web technology and applications related topics including web standards, protocols, web applications architecture, web services, search engine architectures, content management, web2, and semantic web, to explore some of the technologies used for display, data access and processing, and to give the students practice in integrating these to produce a functional web-based system.

Course Outline:

In-depth study of World Wide Web architectures, protocols and standards (HTTP, HTML, xHTML, CGI, XML, WML, cHTML, etc.), Web Technologies and Tools (such as scripting tools) for web application development and deployment (web servers, application servers, etc.), Web Based Applications including search engines and content management, management of large scale web based information systems, Web Services, Web2, Semantic Web, and Web3, principles of web site design, practical exercise in web site development.

Suggested Text Books:

Nuckles, Craig, Web Applications: Concepts and Real World Design, Wiley (India), 2006

Programming the World Wide Web (4th Edition) (Paperback), by Robert W. Sebesta (Author), Paperback: 752 pages, Publisher: Addison Wesley; 4th edition (August 17, 2007), ISBN-10: 0321489691

Reference Material:

Nuckles, Craig, Web Applications: Concepts and Real World Design, Wiley (India), 2006

Gosselin, Dan, et. al., The Web Warrior Guide to Web Design Technologies, Cengage Learning, 2003

Zak, Diane, et. al., The Web Warrior Guide to Web Programming, Cengage Learning, 2003

Leasure, T., Bob Leasure and James Leasure, The Web Warrior Guide to Web Database Technologies, Cengage Learning, 2003

Morrison, Mike and Joline Morrison, Database Driven Websites, 2/e, Cengage Learning, 2002

Web Wizard series for various technologies, Addison-Wesley

Jackson, J. C., Web Technologies: A Computer Science Perspective, Pearson (LPE), 2008

Programming the World Wide Web (4th Edition) (Paperback), by Robert W. Sebesta (Author), Paperback: 752 pages, Publisher: Addison Wesley; 4th edition (August 17, 2007), ISBN-10: 0321489691

Web Application Architecture: Principles, Protocols and Practices by Leon Shklar and Richard Rosen (Paperback - Oct 31, 2008), Paperback: 420 pages, Publisher: Wiley; 2 edition (October 31, 2008), ISBN-10: 047051860X

Web Engineering: The Discipline of Systematic Development of Web Applications by Gerti Kappel, Birgit Prýýll, Siegfried Reich, and Werner Retschitzegger (Paperback - Jul 5, 2006)

Course Name: Multimedia Systems and Design	

Course Structure: Lectures: 2, Lab: 3	**Credit Hours:** 3

Prerequisites: Fundamentals of Information Technology (required)

Objectives:.To introduce students to the complete process of multimedia system specification, design, testing, and prototyping, including the tools and techniques for integrating multimedia content (text, graphics, images, sound, animation, motion video and virtual reality) into a product, to present design principles and techniques to maximize the effectiveness of such products, and to give the students practice in the production using a variety of media and tools. Introduction to multimedia systems, multimedia applications and development tools.

Course Outline: Introduction to multimedia systems, software, hardware, various equipment, video and audio capture, annotation, storage and playback techniques, multimedia software development tools, multimedia applications, step-by-step procedure in developing multimedia systems: (specification, design, testing, and prototyping), multimedia standards, Student projects - developing multimedia systems in the laboratory.

Suggested Text Books:

Multimedia: Making it Work, Seventh Edition by Tay Vaughan (Paperback - Dec 20, 2006)

Shuman, James, Multimedia Concepts, Enhanced Edition, Cengage Learning, 2002

Lake, Susan and Karen Bean, Digital Multimedia: The Business of Technology, Cengage Learning, 2007

Reference Material:

Z. M. Li; M. S. Drew: Fundamentals of Multimedia. Prentice Hall 2004, ISBN: 0-13-127256-X

N. Chapman; J. Chapman: Digital Multimedia. (2nd ed.), Wiley 2004, ISBN: 0-470-85890-7

Villalobos, Ray, Exploring Multimedia for Designers, Cengage Learning, 2007

Course Name: System Integration and Architecture	
Course Structure: Lectures: 3 / Labs: 0	**Credit Hours:** 3

Prerequisites: Fundamentals of Information Technology (Required), Introduction to Software Development (Recommended)

Objectives: This course will prepare the students to understand the system levelrequirements of an organization and acquire the required information and communication resources, integrate and deploy these resources in the form of a system.

Course Outline:. system levelrequirements gathering and analysis, acquisition,

sourcing, integration, project management, testing and quality assurance, organizational context and architecture., intersystem's communication, data mapping and exchange, integrative coding, scripting techniques, software security and an overview of programming languages.

Suggested Text Books:

Enterprise Integration: An Architecture for Enterprise Application and Systems Integration (Paperback), by Fred A. Cummins (Author), Paperback: 496 pages, Publisher: Wiley; 1st edition (February 1, 2002), ISBN-10: 0471400106

Reference Material:

Course Name: Information Technology Architecture

Course Structure: Lectures: 3 / Labs: 0 | **Credit Hours:** 3

Prerequisites: System Integration and Architecture

Objectives: Objective of this course is to understand the Information Technology Architecture as a framework and a set of strategies for the utilization and management of information technology, composed of principles, policies, and standards that guide the engineering of an organization's IT systems and infrastructure in a way that ensures alignment with business needs. Students will be able to select and implement the computing platforms, software, networks, and related products that interconnect different systems and ensure their interoperability.

Course Outline:.

Business Architecture: Business Strategy, Business Support Functions and Processes; Information Architecture: Information Needs, Information Management Processes; Application Architecture: Guidelines for Design and Development of Business Applications, Policies, Standards, and Tools for Application Development; Infrastructure Architecture: Hardware, Software, and Communication Network for Information Storage, Transfer, Processing, Management; Security Architecture: Security Services, Security Framework; IT Management and Governance: Planning, Decision Making, Follow up, Assessment

Suggested Text Books:

Reference Material:

Enterprise Integration: An Architecture for Enterprise Application and Systems Integration (Paperback), by Fred A. Cummins (Author), Paperback: 496 pages, Publisher: Wiley; 1st edition (February 1, 2002), ISBN-10: 0471400106

Building Enterprise Information Architectures: Reengineering Information Systems, Melissa A. Cook

Constructing Blueprints for Enterprise IT Architectures, Benard H. Boar

Enterprise Architecture Planning, Steven H. Spewak, Steven C. Hill

Course Name: System & Network Administration

Course Structure: Lectures: 2/Labs: 1	**Credit Hours: 3**	**Semester: 5**

Suggested Prerequisites: Computer Communication and Networks**,** Operating Systems

Course Objectives: This course will give an overview of systems and network administration based on both Windows and Linux environments. The objective are common system administration tasks and practices and how to implement and maintain standard services like email, file sharing, DNS and similar. The course is primarily dealing with the Linux and Windows operating systems and especially with Linux-based servers and Window-based clients, but some information about the most fundamental differences between various Linux systems will be provided. In labs focus is on how to install, setup and maintain Linux server machine and to perform various system administration and security related tasks on those machines.

Course Outline: Brief introduction to the Networks, Homogenous and Heterogeneous networks, Issues involved in the setup of Heterogeneous networks, File systems, Configuration issues, Fundamentals of Linux user interface, Installation and administration of heterogeneous networks using Windows and Linux platforms. System installation, booting and halting the system, file systems and directory permission structures, print and disk quotas, device configuration and management, user account administration, security, client administration, disk maintenance, remote access, remote administration, the use of schedulers, the use of advanced scripting to ease system administration tasks, configuration management, template implementation and cross directory implementation.

Reference Material:

1. **Practice of System and Network Administration, the 2nd Edition by Thomas A, Limoncelli, Hogan, 2005.**

2. **Windows Administration Latest Edition, Microsoft Press**

3. **Linux Administration Guide Latest Edition**

Course Name: Network Security

Course Structure: Lectures: 3/Labs: 0	Credit Hours: 3	Semester: 7

Prerequisites: Computer Communication and Network

Course Outline:

Principles and Practices of network security, security threats and methods to avoid them, authentication applications, electronic mail security, electronic transaction security and digital signatures, IP security, web security, system security, intruders and viruses, firewalls, introduction to cryptographic algorithms, standard security protocols, cyber crime, policy and regulations.

Reference Material:

Cryptography and Network Security: Principles and Practice, 4/E, William Stallings, Prentice Hall, 2005.

Government Policy documents on security issues.

Course Name: Information Security

Course Structure: Lectures: 3/Labs: 0	Credit Hours: 3	

Prerequisites: Computer Communication and Network

Course Objective: This course provides a broad overview of the threats to the security of information systems, the responsibilities and basic tools for information security, and the levels of training and expertise needed in organizations to reach and maintain a state of acceptable security. It covers concepts and applications of system and data security. Areas of particular focus include secure network design, implementation and transition issues, and techniques for responding to security breaches.

Course Outline: Information Security Attacks & Vulnerabilities, Anatomy of Attack, Awareness and Management Commitment to Security, Security Policy, Information Security Network Architecture Design Rules, Rules for Selecting Security Hardware & Software, Physical Security Rules, Network Hardware Security, Operating System Security Rules, PC Operating Security Rules, Internet Security Rules, Application Security Rules, Software Validation and Verification Rules, Data Encryption Rules, Configuration Management Rules, Network Monitoring Rules, Maintenance and Troubleshooting Security Rules, Emergency Rules Attacks, An introduction to confidentiality, integrity, availability; authentication technologies and models, Controls and protection models, Security kernels, Secure programming, Information Auditing, Intrusion detection and response, Operational security issues, Physical security issues, Personnel security, Policy formation and enforcement, Access controls, Information flow, Legal, privacy and social issues, Identification and authentication in local and distributed systems; classification and trust modelling, Risks and vulnerabilities, Risk assessment, Database security, Encryption, Host-based and network-based security issues, Areas of particular focus include secure network design, implementation and transition issues, and techniques for responding to security breaches.

Reference Material:

Information Security Best Practices by George L. Stefanek, 2006.

Course Name: Communication Technologies

Course Structure: Lectures: 3/Labs: 0	Credit Hours: 3	

Prerequisites: None

Course Objective: Goals for the course include developing teaching strategies consistent with the constructivist philosophy of education that help new learners understand: how science & communication technology relate to society and the environment, how to use the processes of scientific inquiry and communication technological design, basic concepts from the major fields of science & communication technology.

Integral to the course is our objective to help student-teachers develop their commitment to students and student learning; furthering professional knowledge through ongoing professional learning; and the application of professional knowledge to professional practice and leadership in learning communities.

Course Outline: Introduction to Science & Technology, Interrelating Science, Communication Technology, Society and the Environment (STSE), Learning through Science & Technology, Communicating Science & Technology, Assessment for Learning in Science, Communication Technology, Science & Communication Technology for all Learners, Cross Curricular Connections, New Directions for Science & Technology Education, Maintaining Safe Learning Environments for Science & Communication Technology, Advance Topics in Communication Technology.

Reference Text:

1. Rees, C. and Halpern J. (2008) Readings for Science & Communication Technology.

2. Simon Haykin 4th Edition, Communication Systems.

Course Name: Information Security and Assurance		
Course Structure: Lectures: 3/Labs: 0	**Credit Hours: 3**	
Prerequisites: Network Security		

Course Objective: This course explores the issues of ethical challenges and legal issues that fact security practitioners. Understanding and evaluation the impact of legal and ethical issues on information security practice, privacy and security laws and regulations and assurance such as HIPAA, GLBA, Sarbanes-Oxley, Patriot Act, FISMA, CISRA and other. Techniques for planning, managing and implementing strategies based on these regulatory requirements will be discussed.

The protection of information assets underpins the commercial viability and profitability of all enterprises and the effectiveness of public sector organizations. Information security should not be left to chance but should be managed to ensure it provides efficient and effective safeguards for your organization's information assets.

Course Outline: Information Assurance, Historical Approaches to Information Security and Information Assurance, Define the System Boundaries, Perform Vulnerability and Threeat Analyses, Implement Threat Control Measures, Very Effectiveness of Threeat Control Measures, Conduct Accident/Incident Investigations.

Reference Text:

1. Information Security Management Handbook By Harold F. Tipton, Micki Krause

2. Information Assurance and Computer Security By Johnson P.Thomas, Mohamed Essaaidi

3. Computer Security Assurance using the common criteria by Merkow & Breithaupt

4. Practical Guide to Security Engineering and Information Assurance by Debra S.Herrmann

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