

Curricula/Syllabi of BS Information Technology for Punjab University Affiliated Colleges

Scheme Of Studies / Semester-Wise Workload

5 th Semester					
Sr.	Code	Course Title	Course Type	Prerequisite	Cr. Hrs.
1	CC-311	Operating Systems	Computing Core	Data Structures and Algorithms	3
2	CC-311L	Operating Systems Lab	Computing Core	Data Structures and Algorithms	1
3	CC-312	Information Security	Computing Core		3
4	DI-322	Web Technologies	Domain Core	Programming Fundamentals	3
5	DI-322L	Web Technologies Lab	Domain Core	Programming Fundamentals	1
6	SI-341	Software Requirements Engineering	IT Supporting	Software Engineering	3
7	EI-331	Design and Analysis of Algorithms	IT Elective	Data Structures and Algorithms	3
8	HQ-005	Translation of Holy Quran	Quran and Sunnah	Translation of Holy Quran	0
Total Credit Hours: 17					

Course Title	Operating Systems
Course Code	CC-311
Credit Hours	3
Category	Computing Core
Prerequisite	CC-213: Data Structures and Algorithms
Co-Requisite	None
Follow-up	DI-323: System and Network Administration
Course Description	Introduction: Operating systems basics, system calls, process concept and scheduling, inter-process communication, multithreaded programming, multithreading models, threading issues. Process Scheduling: Algorithms, thread scheduling, multiple-processor scheduling, synchronization, critical section, synchronization hardware, synchronization problems, deadlocks, detecting and recovering from deadlocks. Memory Management: swapping, contiguous memory allocation, segmentation & paging, virtual memory management, demand paging, thrashing, memory-mapped files. File Systems: file concept, directory and disk structure, directory implementation, free space management, disk structure and scheduling, swap space management. System Protection: Virtual machines, operating system security.
Text Book(s)	1. A. Silberschatz, P. B. Galvin, G. Gagne, Operating Systems Concepts, 9 th Edition, Wiley, 2012, ISBN: 1118063333.
Reference Material	1. Andrew S. Tanenbaum, Herbert Bos, Modern Operating Systems, 4th Edition, Pearson, 2014, ISBN: 013359162X. 2. William Stallings, Operating Systems: Internals and Design Principles, 9th Edition, Pearson, 2017, ISBN: 0134670957.

Course Title	Operating Systems Lab
Course Code	CC-311L
Credit Hours	1
Category	Computing Core
Prerequisite	CC-213: Data Structures and Algorithms
Co-Requisite	None
Follow-up	DI-323: System and Network Administration
Course Description	<p>Interacting with Linux Operating System: Virtualization and Hypervisors, Linux distributions. Installing Linux on Sun Virtual Box. Linux File hierarchy standard. File System Architecture: Schematic view of a standard UNIX file system. Describe the contents of boot block, super block, inode block, and data blocks. File System Mounting: Introduction to the concept of file system mounting. Linux configuration files related to file system mounting. Linux commands like mount, umount, lsblk, blkid. Maintaining integrity of the file system using Linux commands like fsck, e2fsck, fsck.fat, fsck.nfs. File Permissions: standard file permissions. Use of chmod and chown commands. Setting the default file permissions on a newly created file using the umask command. Special File Permissions: Concept and use of Saved SUID bit on files. Concept and use of Saved SGID bit on files and directories. Concept and use of Sticky bit on files and directories. Device files: Seven File Types in Linux and the concept of device files. Describes the contents of /dev/ directory. Terminal Attributes: Overview of Terminal Devices and a comparison between disk and terminal files. Examine current attributes of the terminal driver on a Linux machine and change them using the stty command. Hard and Soft Links: the use of hard and soft links on all UNIX based systems. Differences between hard and soft links. Use of Linux command ln to create hard and soft links. Managing services using systemd: Introduction to Linux system daemon. Overview of systemd unit files, specially Target Unit Files and Service Unit Files. Shell commands to manage services using systemctl. Writing/running a basic service of your own. Booting process of a Linux system: A discussion on five phases of Linux Operating system: BIOS / UEFI Initialization, Master Boot Record, Boot Loader, Kernel Initialization, init or systemd Process.</p> <p>Linux System Programming: Linux System Call Interface, Use of GNU gcc compiler on Linux terminal, Format of a program file on disk and its components. Viewing contents of a program file using objdump and readelf commands. Process Creation and Termination: getpid(), getppid(), fork(), exit(), wait() and execl() system calls. File management in Linux. Concept of PPFDT. Concept of input, output and error redirection. Inter Process Communication: Linux IPC tools, Pipes, FIFOS and Sockets. Use of pipes and fifos on a Linux terminal. Signals: Signal delivery and execution of a signal handler. Synchronous and Asynchronous signals. Standard and Realtime signals. Sending signals to running processes using kill command. Signal disposition of some important signals like SIGHUP, SIGINT, SIGKILL, SIGPIPE, SIGALARM, SIGTERM, SIGQUIT, SIGILL, SIGFPE, SIGSEGV, SIGSTOP, SIGTSTP, SIGCHLD, SIGCONT. Threads and Scheduling: Writing multi-threaded C programs using library calls from the POSIX pthread library like pthread_create(), pthread_join(), and pthread_exit(). Use of Linux schedtool command to query and change different CPU scheduling</p>

	parameters like scheduling policy, nice value, static priority, CPU affinity, Thread synchronization using pthread_mutex_t variable and pthread_mutex_lock() and pthread_mutex_unlock() library calls, Use of Linux tools like mkfs, mke2fs, mkntfs, mkfs.fat, mkfs.minix to put a file system on a partition
Text Book(s)	1. Sarwar and Koretsky, Unix: The Text Book, 3rd edition, ISBN-13: 978-1-4822-3358-2.
Reference Material	

Course Title	Information Security
Course Code	CC-312
Credit Hours	3
Category	Computing Core
Prerequisite	None
Co-Requisite	None
Follow-up	None
Course Description	Information security foundations, security design principles; security mechanisms, symmetric and asymmetric cryptography, encryption, hash functions, digital signatures, key management, authentication and access control; software security, vulnerabilities and protections, malware, database security; network security, firewalls, intrusion detection; security policies, policy formation and enforcement, risk assessment, cybercrime, law and ethics in information security, privacy and anonymity of data.
Text Book(s)	1. M. Whitman and H. Mattord, Principles of Information Security, 6th edition.
Reference Material	1. William Stallings, Computer Security: Principles and Practice, 3rd edition. 2. Dieter Gollmann, Computer Security, 3rd edition. 3. William Easttom, Computer Security Fundamentals, 3rd edition.

Course Title	Web Technologies
Course Code	DI-322
Credit Hours	3
Category	Domain Core
Prerequisite	CC-112: Programming Fundamentals
Co-Requisite	None
Follow Up	Enterprise Systems
Course Description	Introduction: Web Applications, TCP/IP Application Services. Web Servers: Basic Operation, Virtual hosting, Chunked transfers, Caching support, Extensibility. SGML, HTML5, CSS3. XML Languages and Applications: Core XML, XHTML, XHTML MP. Web Services: SOAP, REST, WML, XSL. Operations, Processing HTTP Requests, Processing HTTP Responses, Cookie Coordination, Privacy and P3P, Complex HTTP Interactions, Dynamic Content Delivery. Server Configuration. Server Security. Web Browsers Architecture and Processes: Active Browser Pages: JavaScript, DHTML, AJAX. JSON. Approaches to Web Application Development: Programing in any Scripting language. Search Technologies, Search Engine Optimization. XML Query Language, Semantic Web, Future Web Application Framework.
Text Book(s)	<ol style="list-style-type: none">1. Paul J. Deitel and Harvey Deitel, Java How to Program, 11th Edition, Pearson, 2017, ISBN-10: 0134743350, ISBN-13: 978-0134743356.2. Marty Hall and Larry Brown, Core Servlets and JavaServer Pages, 2nd Edition, Pearson, 2017, ISBN-10: 8131701638, ISBN-13: 978-8131701638.
Reference Material	

Course Title	Web Technologies Lab
Course Code	DI-322L
Credit Hours	1
Category	Computing
Prerequisite	CC-112: Programming Fundamentals
Co-Requisite	None
Follow Up	None
Course Description	Implementation on compiler of all the concepts/topics discussed in the course which includes, Introduction to Java, Variables, data types, Control Structures, Methods, Classes, Interfaces, Method Overloading and Overriding, Revision of Object oriented programming courses in Java, GUI development, Event Handling, Database Connectivity, Exception Handling, File handling, HTML, CSS, Java Script, Server side Programming in Java, Http Request and Response, Servlets, Servlet Life Cycle, Java Beans, MVC.
Text Book(s)	<ol style="list-style-type: none">1. Paul J. Deitel and Harvey Deitel, Java How to Program, 11th Edition, Pearson, 2017, ISBN-10: 0134743350, ISBN-13: 978-0134743356.2. Marty Hall and Larry Brown, Core Servlets and JavaServer Pages, 2nd Edition, Pearson, 2017, ISBN-10: 8131701638, ISBN-13: 978-8131701638.
Reference Material	

Course Title	Software Requirements Engineering
Course Code	SI-341
Credit Hours	3
Category	IT Supporting
Prerequisite	CC-212: Software Engineering
Co-Requisite	None
Follow-up	None
Course Description	<p>Introduction: Requirements Engineering. Software Requirements: Classification of requirements, Requirements process, Levels/layers of requirements, Requirement characteristics, and Analyzing quality requirements. Software requirements in the context of systems engineering: Requirement evolution, Requirement traceability, Requirement prioritization, Trade-off analysis, Risk analysis and impact analysis, Requirement management, Interaction between requirement and architecture. Requirement elicitation: Elicitation sources and techniques. Requirement specification and documentation: Specification sources and techniques, Requirements validation and techniques. Management of Requirements: Introduction to Management, Requirements management problems, Managing requirements in various organizations including acquisition, supplier and product-oriented organizations, Requirements engineering for agile methods.</p>
Text Book(s)	<ol style="list-style-type: none"> 1. Wiegers K. & Beatty J., Software Requirements, 3rd edition. Microsoft Press, 2013. 2. Elizabeth Hull, Ken Jackson and Jeremy Dick., Requirements Engineering, 3rd edition, Springer-Verlag London Limited, 2011.
Reference Material	<ol style="list-style-type: none"> 1. Chemuturi M., Requirements Engineering and Management for Software Development Projects, Springer New York, 2013.

Course Title	Design and Analysis of Algorithms
Course Code	EI-331
Credit Hours	3
Category	Technical Elective
Prerequisite	CC-213: Data Structures and Algorithms
Co-Requisite	None
Follow Up	None
Course Description	Role of Algorithm in Computing, Analyzing Algorithms, Designing Algorithms, Growth of Functions, Asymptotic Notations, Sorting Algorithms, Time Complexity of Recursive Algorithms, Dynamic Programming, Greedy Algorithms, String Matching, Graphs, DFS, BFS, Minimum Spanning Trees, Shortest Path Algorithms, NP Completeness, Polynomial Time Algorithm, Polynomial Time verification.
Text Book(s)	1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, 3 rd Edition, The MIT Press, 2009, ISBN-10: 0262033844, ISBN-13: 978-0262033848.
Reference Material	

Course Title	Translation of Holy Quran
Course Code	HQ-005
Credit Hours	0
Category	Quran and Sunnah
Prerequisite	HQ-004: Translation of Holy Quran
Course Description	<p>Surah Maryam to Surah Al-Furqan (سورة مريم تا سورة الفرقان): Translation of Verses into English or Urdu language (آیات کا انگریزی یا اردو زبان میں ترجمہ), Meaning of Qur'anic words into English or Urdu language (انگریزی یا اردو زبان میں قرآنی الفاظ کے معانی).</p> <p>Attached pronouns (ضمائر متصلہ): Use attached pronouns with word and give their meanings (لفظ کے ساتھ ضمائر متصلہ لگائیں اور ان کے معانی بتائیں).</p>