DEPARTMENT OF INFORMATION AND COMMUNICATION TECHNOLOGY

B.TECH (INFORMATION TECHNOLOGY) SYLLABUS (2022 ADMITTED)

III SEMESTER

MAT 2126 ENGINEERING MATHEMATICS – III [2 1 0 3]

ICT 2121   DATA STRUCTURES   [3 1 0 4]

Abstract

Introduction, Stacks, Queues and their applications, Sparse Matrix, Pointers and dynamic memory allocation, Linked Lists: Singly linked lists, Dynamically Linked Stacks and Queues, Polynomial representation and polynomial operations using singly linked list, Singly Circular Linked List, Doubly Linked Lists, Trees: Binary trees, Binary Search Trees, Threaded binary trees, Graphs: Depth First Search, Breadth First Search.

References

1. Behrouz A. Forouzan, Richard F. Gilberg, A Structured Programming Approach Using C,3rd Edition, Cengage Learning India Pvt. Ltd, India, 2007.

2. Ellis Horowitz, Sartaj Sahani, Susan Anderson and Freed, Fundamentals of Data Structures in C, 2nd Edition, Silicon Press, 2007.

3. Richard F. Gilberg, Behrouz A. Forouzan, Data structures, A Pseudocode Approach with C, 2nd Edition, Cengage Learning India Pvt. Ltd, India , 2009.

4.Tenenbaum Aaron M., Langsam Yedidyah, Augenstein Moshe J., Data structures using C, Pearson Prentice Hall of India Ltd., 2007.

5. Debasis Samanta, Classic Data Structures, 2nd Edition,

ICT 2122 OBJECT ORIENTED PROGRAMMING [3 1 0 4]

Abstract

Introduction to OOP, Java Programming Fundamentals, Data types & Operators, Control structures, strings, Introducing Classes, Objects and Methods, Inheritance: Inheritance basics, Constructors, Interfaces: Fundamentals, creating and implementing an interface, Packages: Fundamentals, packages and member access, Exception handling: Exception hierarchy and fundamentals, try block, multiple catch clauses, throw and throws, finally, user defined exceptions, Multithreaded Programming: Multithreading fundamentals, creating threads, thread priorities, synchronization, thread communication, Generics: Generic fundamentals, Generic class,

bounded types, wildcards, Generic methods, Generic restrictions, GUI Programming with Javafx: Introducing Javafx: Basic concepts, Application Skeleton, Using buttons and events, Exploring Javafx Controls, CERT Java Coding Standard: Rules and Recommendations..

References
1. Herbert Schildt and Dale Skrien, Java Fundamentals – A Comprehensive Introduction, 1ˢᵗ Edition, McGrawHill, 2015
2. Herbert Schildt, Java The Complete Reference, 10ᵗʰ Edition, Tata McGrawHill, 2017
3. Fred Long, Dhruv Mohindra, Ebook:CERT Oracle Secure Coding Standard for Java, Addison Wesley , 2013
4. Fred Long, Dhruv Mohindra, Ebook:Java Coding Guidelines: 75 Recommendations for Reliable and Secure Programs, Addison Wesley, 2014.
5. Bruce Eckel, Thinking in Java, (5e), Prentice Hall, 2013
6. Herbert Schield , Java A beginner's Guide, (6e), 2014
7. Dietel and Dietel, Java How to Program, (9e), Prentice Hall India, 2012
8. Steven Holzner, Java 2 Programming Black Book, DreamTech, India, 2005

ICT 2123 DIGITAL SYSTEMS AND COMPUTER ORGANIZATION [4 0 0 4]

Abstract

Introduction, Simplification of Boolean functions: K-map method, NAND and NOR implementation, Combinational logic, Design of Adders/Subtractors, Code converters, Multipliers, Magnitude Comparator, Decoders, Encoders, Multiplexers, De Multiplexers, Sequential logic : Counters and Shift Registers, Computer organization: Introduction, Execution unit, Control unit, Memory unit, Input and Output unit.

References
1. M. Morris Mano, Digital Design, 3ʳᵈ edition, Pearson education, 2002
2. Ronald J. Tocci, Neal S. Widmer and Greegory L Moss, Digital Systems: Principles and Applications (12e), Pearson Education India, 2017.
3. Donald D. Givonne, Digital Principles and Design,Tata McGraw-Hill edition 2003
4. Mohamed Rafiquazzaman and Rajan Chandra, Modern computer Architecture (3e), Galgotia publications Pvt. Ltd, 2015.
5. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5ᵗʰ edition, Elsevier, 2014

ICT 2124 PRINCIPLES OF DATA COMMUNICATION [3 0 0 3]

Abstract

Introduction to Data Communication, Signals, Basic properties of data communication system, Nyquist rate, Shannon Capacity, Signal encoding, Modulation schemes. Transmission media,Wired and wireless transmission, Error detection and correction, Cyclic redundancy check, Hamming code, Stop and wait flow control, Sliding window flow control, Automatic repeat request, High level data Link control, Multiplexing, Media Access Sub layer and LAN, Random access protocols, Bridges.

References

1. William Stallings, Data & Computer Communications (10e), Pearson Education Inc., Noida, 2017

2. Behrouz Forouzan, Introduction to data communication & networking (5e), Tata McGraw Hill, New Delhi-2017.

3. Alberto Leon Garcia and Indra Widjaja, Communication Networks (2e), Tata McGraw Hill, 2011.

4. Theodore S. Rappaport, Wireless Communications: Principles and Practice (2e), Pearson Education Inc, 2010.

ICT 2141 DATA STRUCTURES LAB [0 0 3 1]

Abstract

Application using arrays, String operations, Pointers, Recursive programs, Structure concepts, Stacks, Queues, Application of stacks, Arithmetic expression conversion and evaluation, Sparse matrix representation Singly linked lists and applications, Circular linked lists, Doubly linked lists, polynomial addition and multiplications using circular linked lists, Binary Tree: creation, deletion and traversal techniques, Binary search tree operations.

References

1. Behrouz A. Forouzan, Richard F. Gilberg, A Structured Programming Approach Using C, 3rd Edition, Cengage Learning India Pvt. Ltd, India, 2007.

2. Ellis Horowitz, Sartaj Sahni, Susan Anderson and Freed, Fundamentals of Data Structures in C, 2nd Edition, Silicon Press, 2007.

3. Richard F. Gilberg, Behrouz A. Forouzan, Data structures, A Pseudocode Approach with C, 2nd Edition, Cengage Learning India Pvt. Ltd, India, 2009.

ICT 2142 OBJECT ORIENTED PROGRAMMING LAB [0 0 3 1]

Abstract

Simple Java programs using control structures and Arrays, Programs using Classes, objects, methods, Programs on Constructors and static members, Programs using Inheritance, Packages, Interfaces and Generics, Programs using Exceptions and Multithreading, GUI based programs using Javafx.

References

1. Herbert Schildt and Dale Skrien, Java Fundamentals – A Comprehensive Introduction,1st Edition, McGrawHill, 2015
2. Herbert Schildt, The Complete Reference JAVA 2, 10th Edition, Tata McGrawHill, 2017
3. Dietel and Dietel, Java How to Program, 9th Edition, Prentice Hall India, 2012

ICT 2143: DIGITAL SYSTEMS LAB [0 0 3 1]

Abstract

Verification of Boolean algebra and De Morgan theorems, Simplification ofBoolean expressions using K-maps, Combinational logic circuit implementation – Binary parallel adder, BCD adder, Multiplier, Code converter, Comparator, 3 to 8 decoder, Magnitude comparator, Multiplexers, Sequential logic circuits- Flip flops, Conversion of flip-flops, Analyzing timing diagram using output waveforms, Asynchronous and Synchronous counters, Shift registers, Shift register counters, Sequence generators, Sequence detectors.

References

1. M. Morris Mano, Digital Design, Prentice Hall India, 3rd edition, Pearson education, 2002
2. Tocci R.J., Widmer N.S., Greegory L.M., Digital Systems: principles and Applications (12e), Pearson Education India, 2017.
3. Wakerly J.F., Digital Design Principles and Practices (4e), Pearson Education, 2014.

IV SEMESTER
MAT 2226 ENGINEERING MATHEMATICS – IV [2 1 0 3]

ICT 2221 DATABASE SYSTEMS [3 1 0 4]

Abstract

Database-System Applications, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Database Architecture, NoSQl, Data Sharding, Database Schemas, Keys, Relational Query Languages, Relational Operations, SQL Data Definition, SQL Data Types and Schemas, Integrity Constraints, Set Operations, Aggregate Functions, Overview of SQL Query Language, Basic Structure of SQL Queries, Join Expressions, Overview of the Design Process, The Entity-Relationship Model, Extended E-R Features, Reduction to Relational Schemas, Features of Good Relational Design, Atomic Domains and Normalization, File concepts, Indices Concept, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices, Transaction Concept, Failure Classification, Storage, Recovery and Atomicity, Recovery algorithm Lock-based protocols, deadlock handling, Timestamp based protocols, Validation based protocols.

References

1. Silberschatz, Korth, Sudarshan, Database System Concepts, 6th edition, McGrawHill,New York, 2011.
2. Pramod J Sadalage, Martin Fowler, NoSQL Distilled, Addison-Wesley, 2013
3. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, Fundamentals of Database Systems, 6th edition, Pearson Education, United States of America, 2011.
5. Thomas Connolly, Carolyn Begg, Database Systems – A Practical Approach to Design, Implementation and Management, 4th edition, Pearson Education, England, 2005.
6. Peter Rob, Carlos Coronel, Database Systems–Design, Implementation and Management, 10th edition, Course Technology, Boston, 2013.

ICT 2222 DESIGN AND ANALYSIS OF ALGORITHMS   [3 1 0 4]

Abstract

Fundamentals of Algorithms, Important Problem Types, Analysis of algorithm efficiency. Analysis Framework: Asymptotic Notations and Basic Efficiency Classes, Mathematical Analysis of Non-recursive and Recursive Algorithms. Brute force Techniques, Divide and Conquer, Decrease and Conquer: Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting. Transform and Conquer: Presorting, BST, Heapsort. Space and Time tradeoffs: Input Enhancement in String Matching. Dynamic Programming: Warshall's and Floyd's Algorithms, The Knapsack Problem. Greedy Techniques: Prim's, Kruskal's and Dijkstra's Algorithm, Huffman Trees. Coping with limitations of algorithmic power, P, NP, and NP-complete Problems, Backtracking: n–Queens problem, Hamiltonian Circuit Problem, Subset–Sum Problem. Branch and Bound: Assignment Problem, Knapsack Problem, TSP.

References

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition , Pearson Education, India, 2011.
2. Ellis Horowitz and Sartaj Sahni, Computer Algorithms/C++, 2nd Edition, University Press, India, 2007.
3. Thomas H. Cormen, Charles E. Leiserson, Ronal L, Rivest, Clifford Stein, Introduction to Algorithms, 2nd Edition, PHI, India, 2006

ICT 2223 EMBEDDED SYSTEMS [4 0 0 4]

Abstract

An overview of Computer Architecture, overview of ARM-Cortex- M Architecture, CISC versus RISC, The RISC and ARM design philosophy, ARM addressing modes, Data transfer instructions, Arithmetic and logical instructions, Shift and rotate instructions, Branch and conditional branch instructions, Function call and return, Stack, Recursive functions, Conditional execution, Assembly language programming, Input/output I/O) programming, Timer/counter programming, I/O interfacing : LED, LCD, Keyboard, Stepper motor, ADC, DAC, PWM, UART, Nested Vectored Interrupt Controller (NVIC), External hardware interrupts, IO interrupts.

References

1. Jonathan W.V., Embedded systems: Real-time interfacing to ARM Cortex-M microcontrollers, 8th Edition, ISBN: 978-1463590154 Createspace Independent Publishing Platform, July 2021.

2. Wilmshurst T., Fast and Effective Embedded System Design applying the ARM mbed, Elsevier, 2017.

3. Jonathan W.V., Embedded systems: Introduction to Arm(r) Cortex-M Microcontrollers, 6th Edition, ISBN: 978-1477508992, Createspace Independent publishing platform, Jan 2019.

4. UM10360, LPC 176x/5x User Manual, NXP Semiconductors, Rev. 3.1, 2014.

5. Joseph V., A definitive Guide to ARM Cortex-M3 and Cortex-M4 processors, 3rd Edition, Elsevier, 2014.

6. Muhammad A.M, Sarmad N., Sepehr N., Shujen C., ARM Assembly Language Programming & Architecture, 2nd Edition, Wiley, 2016.

ICT 2224 COMPUTER NETWORKS [4 0 0 4]

Abstract

Introduction to Computer Networks: Definition, Network Layer, Network Layer services, Interfacing :Bridges, IP addressing, Subnetting and Supernetting, IPv6 addressing, Delivery Forwarding, and Routing of IP Packets, Internet Protocol **-** Datagram, Fragmentation, Options, Checksum, Introduction to Routing Protocols, Interior and Exterior routing, Dynamic IP Routing Protocols - RIP, RIP Version 2, OSPF, Routing between peers :BGP, ARP and RARP, Internet Control Message Protocol, User Datagram Protocol, Transmission Control Protocol and Introduction to application layer, DNS, DHCP, FTP, SNMP.

References:

1. Behrouz A. Forouzan, TCP/IP Protocol Suite, 4th Edition, Tata McGraw Hill 2017.
2. Andrew S. Tanenbaum, Computer Network, 5th Edition Prentice Hall of India Pvt Ltd 2013.
3. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition Tata McGraw Hill 2013.
4. Leon Garcia and Widjala, Communication Networks, 2nd Edition, Tata McGraw Hill 2004.

ICT 2241 DATABASE SYSTEMS LAB [0 0 3 1]

Abstract
Data Definition Language, Basic database query operations, Nested subqueries, Join Operations, Views, Stored procedures, Functions, Trigger, Cursors, Data Access using JDBC-ODBC, Design and development of application based on database concepts.

References

1. Silberschatz, Korth, Sudarshan, Database System Concepts, 6th edition, McGrawHill, 2011.
2. Ivan Bayross, SQL, PL/SQL, 3rd edition, BPB Publications
3. G, Reese, Database Programming With JDBC And Java, 2nd edition, O'REILLY, 2000.

ICT 2242 EMBEDDED SYSTEMS LAB [0 0 3 1]

Abstract

Familiarization of data transfer from code segment to data segment and from data segment to data segment, Arithmetic operations, Logical instructions, Branch instructions, Code conversion from hexadecimal to decimal and decimal to hexadecimal, Packing and unpacking of ASCII digits, Sorting using selection sort and bubble sort techniques, Searching using linear and binary search techniques, Recursion, I/O interfacing of LEDs, LCD, keyboard, 7 segment display, ADC, PWM., I2C and RTC In addition to the above list of experiments, students are required to develop a mini project using mbed LPC1768board.

References

1. Jonathan W.V., Embedded systems: Real-time interfacing to ARM Cortex-M microcontrollers, 8th Edition, ISBN: 978-1463590154 Createspace Independent Publishing Platform, July 2021.

2. Wilmshurst T., Fast and Effective Embedded System Design applying the ARM mbed, Elsevier, 2017.

3. Jonathan W.V., Embedded systems: Introduction to Arm(r) Cortex-M Microcontrollers, 6th Edition, ISBN: 978-1477508992, Createspace Independent publishing platform, Jan 2019.

4. UM10360, LPC 176x/5x User Manual, NXP Semiconductors, Rev. 3.1, 2014.

5. Joseph V., A definitive Guide to ARM Cortex-M3 and Cortex-M4 processors, 3rd Edition, Elsevier, 2014.

6. Muhammad A.M, Sarmad N., Sepehr N., Shujen C., ARM Assembly Language Programming & Architecture, 2nd Edition, Wiley, 2016.

ICT 2243 NETWORK PROGRAMMING AND SIMULATION LAB [0 0 3 1]

Abstract

Socket programming- Files, Database, Multi Client Server Environment and Application Development. Packet Tracer: Introduction to CISCO Packet Tracer, Basic Configuration, simulation of Ethernet LAN protocol, token bus and token ring protocols, implementation of distance vector algorithm, link state routing algorithm and finding shortest path, DHCP and NAT.

References

1. Stevens R., Stephen A. R., Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2013.
2. Jesin A, Packet Tracer Network Simulator, 1st Edition, Packt Publishing, 2014.
3. Dr. M. O. Faruque Sarker, Sam Washington, Learning Python Network Programming, 1st Edition, Packt Publishing 2015.

V SEMESTER

HUM – 3022 ESSENTIALS OF MANAGEMENT [3 0 0 3]

ICT 3121 INFORMATION SECURITY [3 0 0 3]

Abstract

Introduction to Information and Network Security, Symmetric-Key Ciphers: Classical and Modern encryption techniques, Block ciphers, Advanced Encryption Standard, Uses block ciphers, Asymmetric-Key Cryptographic Ciphers, Principles of public key cryptosystems, Number theory concepts, Uses of primes, Message Integrity and Message Authentication, Cryptographic hash functions, Application of cryptographic hash functions, Digital Signature, Key Management, Entity Authentication, Transport Level Security, System Security concepts, Firewalls, Network Intrusion detection and prevention systems, SET, Multimedia Security , Advanced Encryption Concepts.

References

1. William Stallings, Cryptography and Network Security: Principles and Practice , 7th edition,Pearson Publications, 2016.

2. Charles P. Pfleeger, Shari Lawrence Pfleeger , Jonathan Margulies, Security in Computing, 5th edition, Prentice Hall, 2015.

3. Michael E. Whitman and Herbert J. Mattord, Principles of Information Security ,5th edition,Cengage Learning, 2015.

4. Mark Stamp, Information Security: Principles and Practice,2nd edition, John Wiley & Sons, 2011.

5. Behrouz A. Forouzan, Debdeep Mukhopadhyay, Cryptography and Network Security ,2nd Edition (Revised), Tata McGraw-Hill Education India, 2010.

6. Borko Furht, Darko Kirovski, Multimedia Encryption and Authentication Techniques and Applications ,1st edition, Taylor and Francis,2019.

7. Xun Yi, Russell Paulet, and Elisa Bertino, Homomorphic Encryption and Applications ,1st edition, Springer Publishing Company, Incorporated, 2014.

8. Brij B. Gupta, Mamta, Secure Searchable Encryption and Data Management,1st edition, Taylor and Francis,2021.

ICT 3122   PRINCIPLES OF OPERATING SYSTEMS   [4 0 0 4]

Abstract

Introduction to Operating systems, Operating System Services, Operating system Structure, System calls, Process management: Process concept, Threads, Inter-process communication, CPU Scheduling, Process synchronization, Handling deadlocks: Deadlock Characterization, Deadlock

Detection, Prevention, Avoidance and Recovery, Memory management: Main memory, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Virtual memory: Demand Paging, Page Replacement, Thrashing, Allocating Kernel Memory, Storage Management: File management, Disk scheduling, Case study on Unix based Operating system: Design Principles, Kernel Modules, Basic concepts of Real time operating systems: Classification of Real Time Systems, Microkernels, Scheduling.

References

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating System Concepts, 9th edition, Wiley, 2012.
2. William Stallings, Operating Systems: Internals and Design Principles,9th edition, Pearson, 2017.
3. Phillip A Laplante, Seppo J Ovaska, Real time systems design and analysis, 4th edition, Wiley, 2013.
4. Rajib Mall, Real time systems: Theory and Practice, 2nd edition, Pearson, 2009.

ICT 3123   SOFTWARE ENGINEERING   [3 0 0 3]

Abstract

Introduction to Software Engineering, Software Processes, Agile Software Development, Requirement Engineering, Requirements Modelling (Scenario-based), Requirements Modelling (Class-based), Requirements Modelling (Behavior, Patterns, and Web/Mobile Apps), Architectural Design, Design and Implementation, Review Techniques, Software Testing Strategies, Testing Conventional Applications: W&B, Testing Web Apps and Mobile Apps, Software Configuration Management, Product Metrics, Risk Management, Maintenance and Re-engineering.

References

1. Pressman R. S., Software Engineering A practitioner's approach, 8th Edition, McGraw Hill, 2019.

2. Somerville Ian, Software engineering, 10th Edition, Pearson Education, 2019.

3. Booch G., Rumbaugh J., Jacobson I., The Unified Modelling Language User Guide, 2nd Edition, Pearson, 2017.

4. Rajib Mall, Fundamentals of Software Engineering, 5th Edition, PHI Learning, 2018

Flexible Core – 1 (A1/B1/C1)

A1: ICT 3124 DATA STRUCTURES FOR DATABASES [3 0 0 3]

Abstract:

Overview of the Functionality of a Database Management System, Data Structures for Buffer Management, Data Structures for Disk Space Management: Record Organizations, Page Organizations, File Organization, Data Structures for Query Processing.

References:

1. E. F. Codd.Relational model of data for large, shared data banks, Commun. ACM 13, 6 (June 1970), 377–387.

2. Hammer, Joachim, and Markus Schneider, Data structures for databases,In Handbook of Data Structures and Applications, pp. 967-981. Chapman and Hall/CRC, 2018.

3. Hector Garcia-Molina,Jeffrey D. Ullman,Jennifer Widom, Database systems:The complete book (2e), Prentice Hall, Pearson publishers.

B1: ICT 3125 SOFTWARE PROJECT MANAGEMENT   [3 0 0 3]

Abstract

Embarking on a career in project management, Becoming an effective project manager, Organizational structure and culture, Fundamentals of project initiation, Defining project goals, scope, and success criteria, Working effectively with stakeholders, Beginning the planning phase, Building a project plan, Managing budgeting and procurement, Managing risks effectively, Organizing communication and documentation, Introduction to project execution, Quality management and continuous improvement, Data-informed decision-making, Leadership and influencing skills, Effective project communication, Closing a project.

References

1. Bob Hughes, Mike Cotterell and Rajib Mall, Software Project Management, 6th Edition, Tata McGraw Hill, 2017.
2. Robert K. Wysocki, Effective Software Project Management, 8th Edition, Wiley Publication, 2019.
3. Walker Royce, Software Project Management: A Unified Framework, Pearson, 2002.
4. Gopalaswamy Ramesh, Managing Global Software Projects, McGraw Hill Education (India), 2017.

C1: ICT 3126 THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE [3 0 0 3]

Abstract

Introduction, Mathematical Notations, Finite Automata: DFA, NFA, Regular Expression, Regular languages, Properties of regular languages, Context free languages, Chomsky normal form, Push down automata, context free grammars, Pumping lemma and its applications, Turing machines, TM computation, natural generalizations, Church-Turing hypothesis, Undecidability.

References

1. J Hopcroft, JD Ullman, R Motwani, Introduction to Automata Theory, Languages and Computation, 3rd Edition., Pearson, 2008.
2. Peter Linz, An Introduction to formal languages and automata, 6th Edition, Jones & Bartlett Learning, 2017
3. M Sipser, Theory of Computation, 1st Edition, Brooks-Cole, 2008.

OPEN ELECTIVE-I IPE 4302 CREATIVITY, PROBLEM SOLVING AND INNOVATION [3 0 0 3]

ICT 3141 INFORMATION SECURITY LAB [0 0 3 1]

Abstract

Pentesting with Metasploit-Buffer Overflow, Server Client Side Exploitation; USB forensics-Basics, USB write Blocking, USB impersonation; Network Pentesting - Pentesting Routers, Attacking SSH with Metasploit, Nmap, Medusa, Hydra, Ncrack, SNMP attacks, Bypassing Firewalls; WiFi Security-Cracking WLAN Encryption (WEP,WPA),Metasploit, Social Engineering; PCAP to XML and SQLITE ;Web Application Pentesting; Windows Forensics-Analyse File System, Capture Volatile data, Perform Memory Analysis, Analyse Malware; Traffic Analysis-Wireshark, Pyshark; Reverse Engineering- Heap Overflow, Stack Overflow; Social Engineering Attacks.

References

1. Corey P. Schultz, Bob Percianccante, Kali Linux Cook Book ,2nd edition , Packt Publishing, 2017.

2. Phillip L. Wylie, Kim Crawley, The Pentester BluePrint ,1st edition,Wiley,2020.

3. James Corley, Kent Backman, Michael Simpson., Hands on Ethical hacking and network Defense ,2nd edition, Delmar Cengage Learning; 2010.

4. Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy,1st edition , Syngress Media,U.S.,2010.

ICT 3142 PRINCIPLES OF OPERATING SYSTEMS LAB [0 0 3 1]

Abstract:

UNIX based operating system commands, executing shell scripts, inter process communication using system calls, implementing CPU scheduling algorithms, memory and deadlock management.

References

1. Blurn R.& Bresnahan C., Linux Command Line Shell Scripting Bible, 3rd edition, Wiley, 2015.
2. Silberschatz A., Galvin P.B.& Gagne G., Operating System Concepts, 9th edition, Wiley, 2012.

<h1 style="text-align:center">VI SEMESTER</h1>

HUM 3021 ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT [3 0 0 3]

<h3 style="text-align:center">Flexible Core – 2 (A2/B2/C2)</h3>

A2: ICT 3222 DISTRIBUTED DATABASE MANAGEMENT SYSTEM [3 0 0 3]

Abstract
Introduction to Distributed Databases, Distributed Database Systems Architecture, Multidatabase System Architecture , Distributed Database Design, Distributed Query Processing, Optimization of Distributed Queries, Distributed Concurrency Control, Optimistic Concurrency Control Algorithms , Distributed Data management, Web data management, Streaming data

References
1. M. Tamer Özsu, Patrick Valduriez, Principles of Distributed Database Systems, 2nd edition,, Pearson Education , 2012
2. Stefano Ceri (Author), Giuseppe Pelagatti (Distributed Databases:Principles and Systems, 1st edition, McGraw Hill Education, 2017.
3. Ozsu M T , Principles Of Distributed Database Systems, 3rd edition, Springer Exclusive(Cbs), 2012

<h2 style="text-align:center">B2: ICT 3223 SOFTWARE VERIFICATION AND VALIDATION [3 0 0 3]</h2>

Abstract

Introduction, Fundamentals of testing, Real time software failures, Software Defects, Reviews as a testing activity, Test Case Design Strategies, Black Box Approach to Test Case Design, White Box Approach to Test case Design, Levels of Testing, Test policies and plans, Test organization, Controlling and monitoring the testing process, Test Automation, Testing Tools.

References

1. Paul AmmannandJeff Offutt, Introduction to Software Testing, 2nd Edition, Cambridge University Press United States, December 2016.
2. Sommerville I, Software Engineering, 10th Edition, Pearson Education Limited Boston, 2016.
3. Ilene Burnstein, Practical Software Testing: A Process-Oriented Approach, 1st Edition, Springer New York, December 2010.
4. Srinivasan Desikan and Gopalaswamy Ramesh, Software Testing – Principles and Practices, 6th Impression, Pearson Education, 2008.
5. Ron Patton, Software Testing, 2nd Edition, Sams Publishing, Pearson Education, 2006.
6. Renu Rajani and Pradeep Oak, Software Testing-Effective Methods, Tools and Techniques, 2nd Edition, Tata McGraw Hill Education, 2017.

C2: ICT 3224   COMPILER CONSTRUCTION   [3 0 0 3]

Abstract

Introduction to compiling, Compiler Structure, Programming language basics, Syntax, Parsing, Lexical analysis, symbol tables, Input buffering, Tokens, Lexical analyser generator Lex, Syntax analysis, LR Parsing, Parson generators, Semantic Analysis, Syntax Tree, Parameter passing, Intermediate code generations, Types of intermediate forms, Code Optimization, analysis, Control Flow, Data Flow, Global Optimization, Loop Optimization, Peep Hole Optimization, Architecture dependent code improvement.

References

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2013

2. Kenneth C. Louden Compiler Construction: Principles and Practice, 1st Edition, Course Technology Inc, 2006

3. Michael L. Scott, Programming Language Pragmatics, 4th Edition, Elsevier, 2015

4. Andrew W. Appel, Modern Compiler Implementation in C/Java, 2nd Edition, Cambridge University Press, 2002

ICT 3221 DATA MINING [4 0 0 4]

Abstract

Introduction to Data mining, Data objects and attribute types, Statistical descriptions of data, Data visualization, measuring similarities and dissimilarities, Data pre-processing, Data warehouse modeling, Association rule mining techniques, Apriorialgorithm, improving efficiency of apriori, Pincer Search algorithm, FP Tree Growth algorithm, Classification techniques, Decision Tree Induction, Bayes Classification Methods, Techniques to Improve Classification Accuracy, Clustering techniques, Outlier detection, Data mining applications

References

1. Han J. and Kamber M., Data Mining: Concepts and Techniques, 3rd edition, Morgan Kaufmann Publishers, 2012.

2. Pujari A. K., Data Mining Techniques, 4th edition, Orient Blackswan, 2016.

3. Charu C Aggarwal, Data Mining, Springer Publisher, 2015

4. Charu C Aggarwal,Recommender Systems, Springer Publisher, 2016

5. Pang-N. T., Steinbach M., Anuj K., Vipin K., Introduction to Data Mining, Pearson Education, 2nd edition, Pearson 2018.

6. Bing L., Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, 2nd edition,, Springer, 2011.

ICT **: PROGRAM ELECTIVE-I [3 0 0 3]**

ICT **: PROGRAM ELECTIVE-II [3 0 0 3]**

*** **: OPEN ELECTIVE-2 [3 0 0 3]**

ICT 3241 ADVANCED TECHNOLOGY LAB [0 0 3 1]

Abstract

Introduction to the emerging technology used in the software industries, Understand the tools and techniques used to application development, Application user interface design, Backend database design. Implementation of mini project using emerging technology like Flutter, Android Studio, React Native.

References

1. David Griffiths, Head First Android Development: A Brain-Friendly Guide Shroff/O'Reilly; Second edition,2017
2. John Horton, Android Programming for Beginners - Second Edition: Build in-depth, full-featured Android 9 Pie apps starting from zero programming experience, 2nd Edition, Ingram short title; 2nd edition, 2018

ICT 3242 DATA MINING LAB [0 0 3 1]

Abstract

Pre-processing the raw-datasets using data mining software, Applying data mining techniques such as association rule mining, clustering, classification on the pre-processed data using software tools, performing extraction, transformation and loading to create a data warehouse, Implementation of Apriori algorithm, K-means, Decision tree, Design and development of Mini Project.

References

1. Han J. and Kamber M., Data Mining: Concepts and Techniques, 3rd edition, Morgan Kaufmann Publishers, 2012.

2. Pujari A. K., Data Mining Techniques,4th edition, Orient Blackswan, 2016.

3. Silberschatz A., Korth H. F., Sudarshan S., Database System Concepts, 6th edition, McGraw Hill Education, 2013.

ICT ****: PROGRAM ELECTIVE-III [3 0 0 3]

ICT ****: PROGRAM ELECTIVE-IV [3 0 0 3]

ICT ****: PROGRAM ELECTIVE-V [3 0 0 3]

ICT ****: PROGRAM ELECTIVE-VI [3 0 0 3]

ICT ****: PROGRAM ELECTIVE-VII [3 0 0 3]

ICT ****: OPEN ELECTIVE-3 [3 0 0 3]

Mini Project (Minor specialization)*
*Applicable to students who opted for minor specialization

VIII SEMESTER
ICT 4291   INDUSTRIAL TRAINING [0 0 0 1]
ICT 4292 PROJECT WORK/PRACTICE SCHOOL [0 0 - 12]
PROJECT WORK** (V - VIII SEM)
THEORY – 1** (V SEMESTER)
THEORY – 2** (VI SEMESTER)
THEORY – 3** (VII SEMESTER)
** Applicable to eligible students who opted for and successfully completed the B.Tech – honours requirements

MINOR SPECIALIZATIONS

I. COMPUTATIONAL INTELLIGENCE

ICT 4401 ARTIFICIAL INTELLIGENCE [3 0 0 3]

Abstract
Introduction; Searching State Space; Multiagent Search; Propositional Logic; First-Order Logic: Basics of FoL, Expert systems with FoL, Systematic inference procedures; Knowledge Representation: Ontological engineering, Reasoning systems for categories; Quantifying Uncertainty: Acting under uncertainity, Inference with full joint distributions; Probabilistic Reasoning: Knowledge representation in uncertain domain, Bayesian networks; Making Simple Decisions: Combining beliefs and desires under uncertainty, Decision-theoretic expert functions

References

1. Charu C Agarwal, Artificial Intelligence, Springer, 2021
2. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach (3e), Pearson 2015.
3. Wolfgang Ertel, Introduction to Artificial Intelligence (2e), Springer, 2018

ICT 4402   MACHINE LEARNING   [3 0 0 3]

Abstract
Introduction to Machine Learning, Mathematical Preliminaries, Supervised Learning-LMS, logistic regression, GDA, Naive Bayes, SVM, model selection, Learning theory-bias/variance tradeoff, union and Chernoff bounds, VC dimensions, Unsupervised learning-clustering, k-means, Gaussian mixture, factor analysis, PCA, ICA, Reinforcement learning-MDPs, Bellman equations, value and policy iteration, LQR, LQG, Q-learning, policy search, POMDPs, Explainability.

References

1. Kevin P Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar., Foundations of Machine Learning, MIT Press, 2012.
3. Daphne Koller and Nir Friedman, Probabilistic Graphical Models: Principles and Techniques, MIT Press, 2009.
4. Christopher M.Bishop., Pattern Recognition and Machine Learning (2e), Springer, 2013.
5. Richard S.Sutton and Andrew G.Barto, Reinforcement Learning, 2nd Edition, MIT Press, 2018

6. Solon Barocas, Moritz Hardt and Arvind Narayanan, Fairness and Machine Learning, failml.org, 2021
7.

ICT 4403 PATTERN RECOGNITION [3 0 0 3]

Abstract

Mathematical Preliminaries; Bayesian Decision Theory: Classifiers, Discriminnat function, Decision surfaces; Parameter Estimation Methods: MLE, MAP; Nonparametric Techniques for Density Estimation; Linear Discriminant Function: Generalized linear discriminant functions, Gradient descent procedures, Support vector machines; Non-metric Methods for Pattern Classification: Nominal data, Decision trees; Unsupervised Learning and Clustering: Mixture densities, Unsupervised Bayesian learning, Hierarchical clustering, Graph-theoretic methods; Sequential Pattern Recognition: HMMs

References

1. Richard O.Duda, Peter E.Hart, and David G.Stork, Pattern Recognition, 2nd Edition, Wiley, 2021
2. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Edition, Elsevier, 2014
3. Christopher M.Bishop., Pattern Recognition and Machine Learning, 2nd Edition, Springer, 2016.

ICT 4404 NEURAL COMPUTATION AND APPLICATIONS [3 0 0 3]

Abstract
Introduction; Perceptron: Perceptron convergence theorem, Batch perceptron algorithm; Model Building: Linear regression model, Relationship between regularized Least-squares estimation and MAP estimation; LMS Algorithm: Wiener filter, Least-mean-square algorithm, Statistical LMS learning theory; Multilayer Perceptron: Batch and on-line learning, BPA, XOR problem; Radial-Basis Function Networks: Cover's theorem, Interpolation problem, RBFN, Hybrid learning procedure for RBFN; Restricted Boltzmann Machines: Hopfield networks, Boltzmann machine, Restricted Boltzmann machines; Recurrent Neural Networks: Architecture of RNNs, Echo-state networks, LSTM, GRUs

References

1. Simon Haykin, Neural Networks and Learning Machines, Pearson, 2016
2. Charu C.Aggarwal, Neural Networks and Deep Learning, Springer, 2018
3. John A.Hertz, Anders S.Krogh, and Richard G.Palmer, Introduction to The Theory of Neural Computation, Taylor and Francis, 2020

II. COMPUTER GRAPHICS AND VISUALIZATION
ICT 4405   COMPUTER GRAPHICS   [3 0 0 3]

Abstract

Introduction: History of computer graphics and applications, Introduction to OpenGL, Graphics Output Primitives**:** line, circle and ellipse generating algorithm, polygon fill algorithm. Geometric transformations: Homogeneous coordinates, affine transformations (translation, rotation, scaling, shear, reflection), 2D & 3D Viewing: Line clipping, polygon clipping and projection, Lighting and Shading: Phong and Gouraud shading, Hidden surface removal: Z-Buffer, BSP trees, Ray Tracing, Curve surfaces: Bezier curves and surfaces, B-splines.

References:

1. Donald D. Hearn, Warren Carithers, M. Pauline Baker. Computer Graphics with OpenGL (Fourth Edition), Pearson Education, 2014.
2. Zhigang Xiang, Computer Graphics: Theory and Practice with OpenGL (Third Edition), Pearson Education, 2016.
3. Edward Angel, Interactive Computer Graphics- A top down approach using OpenGL (Sixth Edition), Pearson Education, 2012
4. Foley J. D., VanDam A., Feiner S. K., Hughes J. F., Computer Graphics, Principles and Practice (Third Edition), Addision-Wesley, 2014.
5. Peter Shirley, Steve Marschner and et al., Fundamentals of Computer Graphics (Fourth Edition), A K Peters/CRC Press, 2015.
6. F. S. Hill Jr. and S. M. Kelley, Computer Graphics using OpenGL (Third Edition), Pearson, 2007.

ICT 4406 DIGITAL IMAGE PROCESSING [3 0 0 3]

Abstract:

Introduction, components of image processing system, Spatial domain transformations, histogram processing, smoothing, sharpening spatial filters, Filtering in the frequency domain- Introduction to Fourier transform, image smoothing, image sharpening using frequency domain filters. Image restoration- Noise models, restoration using spatial filtering, periodic noise reduction by frequency domain filtering, Morphological image processing- Preliminaries, dilation and erosion, opening and closing, hit-or-miss transformation, basic algorithms, extension to gray-scale images, Image segmentation- Point, line, and edge detection, Thresholding, Region Segmentation Using Clustering and Superpixels, Graph Cuts, morphological watersheds, motion in segmentation.

References

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing (fourth edition), Pearson, 2017.

2. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis and Machine Vision (fourth edition), CENGAGE Learning, 2014.
3. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB (second edition),Mc Graw Hill India, 2010.
4. Gloria Bueno García, Oscar Deniz Suarez, José Luis Espinosa Aranda, Jesus Salido Tercero, Ismael Serrano Gracia, Noelia Vállez Enano, Learning Image Processing with OpenCV (first edition), Packt Publishing, 2015.

ICT 4407   AUGMENTED AND VIRTUAL REALITY   [3 0 0 3]

Abstract

Introduction of virtual and augmented reality, Definition and scope, Brief history 3 I's of VR a short history of early virtual reality, early commercial VR technology, VR becomes an industry, Components of a VR system, Displays in augmented reality multimodal displays, Audio displays Haptic, Tactile, and Tangible displays, Displays, Visual perception, Requirements and characteristics, Multiple models of I/O gesture interfaces 3D position trackers, Navigation and manipulation interfaces, Gesture interfaces. Output devices, Haptic display,Graphicsdisplays, Sound displays. Computer vision for AR, Natural feature tracking by detection, Incremental tracking, Simultaneous localization and mapping, Outdoor tracking, Computing architectures for VR, The rendering pipeline, Workstation-based architectures, Distributed VR architectures, Geometric modeling, Kinematics modeling, Physical modeling, Behavior modeling.

References:

1. Dieter Schmalstieg, Tobias Hollerer, Augmented Reality: Principles & Practice (1e), Addison-Wesley, 2016.
2. Steven M. LaValle. Virtual Reality. Cambridge University Press, 2017.
3. Burdea, G. C. and P. Coffet. Virtual Reality Technology (2e), Wiley-IEEE Press, 2006.
4. Tony parisi, Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile (1e), O'Reilly Media, 2015.
5. Steve Aukstakalnis, Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR (Usability) (1e), Addison-Wesley Professional, 2016.
6. Jonathan Linowes, Unity Virtual Reality Projects Paperback, Packt Publishing eBooks Account, September 2015.

ICT 4408   COMPUTER VISION   [3 0 0 3]

Abstract

Introduction to computer vision and its applications, Image formation, Liner Filtering, image transformations and Colour models, Edge Detection methods (Laplacian detectors and Canny edge detector), Points and patches, Harris corner detector, Histogram of Gradients, Difference of Gaussian detector, SIFT, Colour and Texture, Feature based alignment, least squares and RANSAC, Camera models, Camera calibration, Stereo vision, Stereo correspondence, Epipolar geometry, Optical flow, Lucas Kanade method, KLT tracking method, Mean shift method, Dense motion estimation, Support Vector Machines, Face detection and recognition, Bag of words, Deep learning.

References

1. Szeliski R., Computer Vision: Algorithms and Applications, Springer 2011.
2. David A. F. and Ponce J., Computer Vision: A Modern Approach (second edition), Pearson 2015.
3. Solem J. E., Programming Computer Vision with Python, O'Reilly, 2012.

III. DATA ANALYTICS

ICT 4409 INFORMATION RETRIEVAL [3 0 0 3]

Abstract

Boolean Retrieval Model, Index Construction: Blocked sort based indexing, Single Pass in memory indexing, Distributed indexing, Dynamic Indexing, Index Compression: Dictionary compression, postings compression, Vector Space Model, Parameter and zone indexes, Evaluation in IR, Result snippets, Relevance Feedback and Query Expansion, Latent Semantic Indexing, Web Search Basics, Near duplicates and shingling, Web Crawling and Indexes, Distributing indexes, Link Analysis, Page Rank.

References

1. Christopher D. Manning, PrabhakarRaghavan and HinrichSchütze, Introduction to Information Retrieval, Cambridge University Press, 2008.

2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, MIT Press, 2016.

3. David A. Grossman and OphirFrieder, Information Retrieval: Algorithms and Heuristics, Springer, 2004.

ICT 4410 BIG DATA ANALYTICS [3 0 0 3]

Abstract

Introduction, Big Data Concepts and Terminology, Big data and Hadoop, Understanding Hadoop feature, HDFS and MapReduce, Hadoop subprojects, Hadoop MapReduce examples. Spark and Big Data: Theoretical concepts and Core components of Spark, The Spark architecture, Spark SQL, Spark Streaming. NoSQL databases: Need for NoSQL, In-memory databases, Categories of NoSQL, Other NoSQL types and summary, working on NoSQL systems using MongoDB. Applications: Implementation of machine learning algorithms using MapReduce and Spark.

References:

1. Thomas Erl, Wajid Khattak, and Paul Buhler., Big Data Fundamentals, Concepts, Drivers & Techniques, 1st Edition, The Prentice Hall Service Technology Series, 2016.
2. Vignesh Prajapati., Big Data Analytics with R and Hadoop, Packt Publishing Ltd., 2013.
3. Nataraj Dasgupta., Practical Big Data Analytics, 1st Edition, Packt Publishing Ltd, 2018.
4. Anand Rajaraman and Jeffrey David Ullman., Mining of Massive Datasets, 2nd Edition, Cambridge University Press, 2011.
5. Matei Zaharia, Patrick Wendell, Andy Konwinski, Holden Karau., Learning Spark, 2nd Edition, O'Reilly Media, Inc., 2015.

ICT 4411 SOCIAL NETWORK ANALYSIS [3 0 0 3]

Abstract:

Introduction to social networks,Graph Concepts,Strong and Weak Ties, Community detection, Graph Partitioning,Networks in their surrounding contexts, Homophily, Spatial model of Segregation,Positive and negative relations,Information cascades, Baye's rule, Simple cascade model,Network effects, Diffusion, Cascades and clusters, Small world phenomena, Decentralized Search, Link Prediction

References:

1. David Easley and Jon Kleinberg,Networks, Crowds, and Markets: Reasoning About a Highly Connected World, Cambridge University Press, 2010.

2. Christina Prell,Social Network Analysis, SAGE Publications, 2012.

3. Song Yang, Franziska B Keller, Lu Zheng,Social Network Analysis, SAGE Publications, 2017.

4. Devangana Khokhar,Gephi Cookbook, Packt Publishing, 2015.

5. Jennifer Golbeck, Analyzing the Social Web, Morgan Kaufmann, 2013

ICT 4412 SEMANTIC WEB [3 0 0 3]

Abstract:

The Semantic Web Activity of W3C: Overview of techniques and standards, XML with Document Type Definitions and Schemas; Describing Web Resource: RDF data models, syntax, semantics, schema, RDFS, RDF Data structures, Containers and collections; Querying Semantic Web: SPARQL matching patterns, filters, querying schemas; Ontology and Information Systems: Use of ontologies, types, design principles, methodologies; Ontology Languages: OWL2, OWL2 profiles; Logic for the Semantic Web: Predicate and Description Logics; Ontology Reasoning: Monotonic rules, Rule interchange format, Semantic web rules languages, RuleML; Ontology Design and Management: Types, purposes, creating ontology manually, reusing existing, mapping.

References:
1. Grigoris Antoniou, Paul Groth, Frank van Harmelen, Rinke Hoekstra, A Semantic Web Primer, 3rd edition, The MIT Press, 2012.
2. Peter Szeredi, Gergely Lukacsy, Tamas Benko, and Zsolt Nagy, The Semantic Web Explained, Cambridge University Press, 2014
3. Liyang Yu, Introduction to the Semantic Web and Semantic Web Services, CRC Press, 2019
4. Elisa F.Kendall, Deborah L.McGuinness, Ying Ding, and Paul Groth, Ontology Engineering, Morgan & Claypool Publishers, 2019

IV. CYBER SECURITY

ICT 4413 CYBER FORENSICS AND CYBER LAWS[3 0 0 3]

Abstract

Introduction, Biometric fundamentals, technologies and benefits, Key processes, Application of biometrics, Incident reports, responses and preparation, Forensic technologies and systems, Forensic tools and digital evidences, Computer crimes and types, Cyber Criminal Mode and Manner of Committing Cyber Crime, Cyber laws, Information Technology Act 2000, Intellectual property, IP theft, Cyber ethics, International cyber laws, Policies and compliances, Compliances auditing.

References:

1. Nilakshi Jain, Dhananjay R. Kalbande, Digital Forensic: The Fascinating World of Digital Evidences, 1st edition,Wiley publishers, 2016.
2. Jin Xiong, Essential bioinformatics, 1st edition, Cambridge University Press, 2006.
3. Linda Volonino, Reynaldo Anzaldua and Jana Godwin, Computer Forensics: Principals and Practices, 1st edition, Pearson PrenticeHall, 2007.

4. Eoghan Casey, Digital Evidence and Computer Crime Academic Press, 2nd edition, Academic Press, 2004.
5. Jeff Kosseff, Cyber Security Law, 2ndedition, Wiley Publishers, 2019.

ICT 4414 ETHICAL HACKING[3 0 0 3]

Abstract

Introduction, Types, Terminologies and Laws, Footprinting, Social Engineering, Malware and Virus, Vulnerability Assessment, DDOS attacks, SQL injection, Sniffing and System Hijacking, Session Hijacking, Scanning and Enumeration, Web Servers attacks, Pentesting Report, Tools for each of attacks and Countermeasures.

References

1. Ric Messier, Certified Ethical Hacker Version 10- Study Guide ,10thedition, Sybex Wiely, 2019.
2. Corey P. Schultz, Bob Percianccante, Kali Linux Cook Book ,2nd edition , Packt Publishing, 2017.
3. Phillip L. Wylie, Kim Crawley, The Pentester BluePrint ,1st edition,Wiley,2020.
4. Christopher Hadnagy, Social Engineering: The Art of Human Hacking ,1stedition,Wiley, 2020.
5. James Corley, Kent Backman, Michael Simpson., Hands on Ethical hacking and network Defense 2nd edition, Delmar Cengage Learning; 2010.
6. John Erickson, Hacking: The art of exploitation ,2nd edition, No Starch Press,2008.
7. Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy,1stedition , Syngress Media,U.S.,2010.

ICT 4415 BLOCKCHAIN TECHNOLOGY   [3 0 0 3]

Abstract

Introduction to technology stack: Blockchain, protocol, understanding how blockchain works. Introduction to blockchain primitives, consensus model. Introduction to smart contracts and its development environment. Architecture of decentralized application using Ethereum and Hyperledger platforms. Introduction to Hyperledger.

References

1. Elad Elrom, The Blockchain Developer, Apress; 1st ed. Edition, 2019
2. Lorne Lantz, Daniel Cawrey, Mastering Blockchain, O'Reilly Media, Inc.2020.
3. Paul Vigma, Michael J. Casey, The Truth Machine: The Blockchain and the Future of Everything (1e), St Martin's Press, 2018.
4. Daniel Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps (1e), Apress, 2017.

5. Xun Brian Wu, Chuanfeng Zhang, Andrew Zhang, Hyperledger Cookbook, Packt Publishing Limited, 2019
6. David Hooper, Kevin Solorio, Hands–On Smart Contract Development with Solidity and Ethereum: From Fundamentals to Deployment, O′Reill, 2019.

ICT 4416   ARTIFICIAL INTELLIGENCE IN CYBER SECURITY   [3 0 0 3]

Abstract

Introduction. Role of ML and AI in Security: Rules-Based, Signature-Based, and Firewall Solutions Focusing on the Threat of Malicious Bots, Network Anomaly Detection with AI **:** Intrusion Detection Systems, Host Intrusion Detection Systems, Network Intrusion Detection Systems, Anomaly-driven IDS ,Web Applications Security using AI and ML, Privacy Issues, Case Studies, AI, ML and Managed Security Service Providers

References

1. Laurent Gil and Allan Liska Security With AI And Machine Learning, 1st Edition, O'Reilly Media, 2019.
2. Alessandro Parisi , Hands–On Artificial Intelligence for Cybersecurity, 1st Edition, Packt Publishing, 2019.
3. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, 1st Edition , Wiley, 2011.
4. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, 1st Edition, CRC Press, 2018.
5. Ishaani Priyadarshini, Rohit Sharma Artificial Intelligence and Cybersecurity Advances and Innovations, 1st Edition, CRC Press, 2022.
6. Soma Halder, Sinan Ozdemir Hands-On Machine Learning for Cybersecurity: Safeguard your system by making your machines intelligent using the Python ecosystem,1st Edition, Packt Publishing, 2018.

V SOFTWARE SYSTEM DESIGN

ICT 4417 ADVANCED SOFTWARE ENGINEERING [3 0 0 3]

Abstract:

Specialized process models: Component based and Aspect Oriented Development; Agile process; Formal model: Cleanroom strategy, formal concepts; Safety Engineering, Security engineering, Resilience Engineering, Software reuse, Component-based software engineering, Service-oriented software engineering, Systems engineering, Real-time software engineering, Emerging trends in software engineering and AI in software engineering.

References

1. Pressman R. S., Software Engineering-A practitioner's approach, 9th Edition, McGraw-Hill Publications, 2020.
2. Sommerville I. Software Engineering, 10th Edition, Pearson Education, 2017.
3. Ghezzi, Jazayeri M., and Mandrioli D., Fundamentals of Software Engineering, 2nd Edition, Pearson Education, 2016.
4. Wolfgang R., Understanding Petri Nets Modelling Techniques, Analysis, Methods, Case Studies, Springer-Verlag, 2013.
5. Barenkamp, M., Rebstadt, J. and Thomas, O., 2020., Applications of AI in classical software engineering., AI Perspectives, 2(1), pp.1-15.

ICT 4418   SOFTWARE ARCHITECTURE   [3 0 0 3]

Abstract

The Architecture Business Cycle, Software Processes, Reference Models, and Reference Architectures, Architectural Structures and Views, Understanding Quality Attributes, Functionality and Architecture, Architecture and Quality Attributes, Achieving Qualities, Tactics,Relationship of Tactics to Architectural Patterns, Designing the Architecture, Documenting Software Architectures, Reconstructing Software Architectures, Information Extraction, Database Construction, View Fusion, Transaction and Data Design, Architectural patterns.

References

1. Len B., Clements P, and Kazman R., Software Architecture in Practice, 3rd Edition, SEI Series in Software Engineering, 2013.
2. Buschmann F., Meunier R., Rohnert H., Sommerlad P., and Stal M., Pattern-Oriented Software Architecture, A System of Patterns (4e), John Wiley and Sons, 2008.
3. Cervantes H., Kazman R., Designing Software Architectures: A Practical Approach (1e), Addison-Wesley Professional, 2016.
4. Eric Dashofy, Nenad Medvidović, and Richard N. Taylor "Software Architecture:Foundations, Theory, and Practice", John Wiley, 2010.

ICT 4419 SOFTWARE QUALITTY MANAGEMENT [3 0 0 3]

Abstract

Introduction, software quality, factors, classification, components of the software quality assurance, error prevention and quality improvement, quality software development plans, reviews, verification and testing, software configuration management, software change control, management components of software project, product metrics, software quality standards assessments and certification.

References

1. Alan Gillies, Software Quality: Theory and Management, 3rd Edition, Lulu.com, 2011.
2. Daniel Galin, Software Quality Concepts and Practice, 1st Edition, Wiley, 2018.
3. Claude Y. Laporte, Alain April, Software Quality Assurance, 1st Edition, Wiley, 2017.
4. Ivan Mistrik, Richard M Soley, Nour Ali, John Grundy, Bedir Tekinerdogan, Software Quality Assurance, 1st Edition, O'Reilly Morgan Kaufmann, 2015.

ICT 4420 SOFTWARE CONSTRUCTION   [3 0 0 3]

 Abstract

Introduction to software construction; Creating High Quality Code-Design in construction, Working classes, High Quality Routines, Defensive Programming, The Pseudo code Programming Process; Variables, Data Types; Statements- OrganizingStraight Line Code, Using conditionals, Controlling loops, Unusual Control Structures, Table Driven Methods, General Control Issues; Code Improvements- Software Quality Landscape, Collaborative Construction, Developer Testing, Code Tuning Strategies and Techniques; Software Craftsmanship, Self-Documenting Code, Personal Character, Themes.

References

1. McConnell S., Code Complete: A practical Handbook for Software Construction (2e), Microsoft Press, 2004.
2. Meyer B., Object Oriented Software Construction (2e), Prentice Hall, 1997.
3. Martin R. C., Clean Code: A handbook of Agile Software Craftsmanship, Prentice Hall, Pearson Education, 2012.
4. Martin R. C., Clean Architecture: A Craftsman's Guide to Software Structure and Design (1e), Prentice Hall, 2017.

OTHER PROGRAM ELECTIVES

ICT 4441   CLOUD COMPUTING   [3 0 0 3]

Abstract

Introduction: Cloud computing delivery models and services, Challenges, Cloud Infrastructure: Amazon, Google, Microsoft Azure, Open Source Platforms, Services in Cloud: Service Oriented Architecture, REST, Cloud resource virtualization: Types of virtualization, Understanding hypervisors, Virtual Machines, Dockers Containers, Virtualization at Compute, Storage and Network level, Resource Management and Scheduling: Policies and Mechanisms, Scheduling, Business Continuity and Cloud management: Fault Tolerance, Replication Methods, Cloud Security: Virtual machine security, Access control and identity management, Cloud Tools: Eucalyptus, OpenNebula/OpenStack, CloudSim,

References

1. Dan C Marinescu, Cloud Computing Theory and Practice, 2nd Edition, 2017

2. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, 2nd Edition, McGraw Hill 2017

3. Sehgal, Naresh Kumar, and Pramod Chandra P. Bhatt, Cloud Computing: Concepts and Practices, 1st Edition, Springer, 2018

4. Barrie Sosinsky, Cloud Computing Bible, 1st Edition, Wiley Publishing Inc., 2011.
5. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, 1st Edition, McGraw Hill 2017
6. Mark C Chu-Carroll, Code in the Cloud, 1st Edition, Pragmatic Bookshelf, 2011.

ICT 4442   DEEP LEARNING   [3 0 0 3]

Abstract:

Introduction; Mathematical Preliminaries; Machine Learning Basics: Learning algorithms, Capacity, Under and Overfitting, Hyperparameter and validation set, Estimators, Bias and variance, Bayesian statistics, Supervised learning algorithms, Unsupervised learning algorithms; Deep Feedforward Networks: Gradient-based learning, Architecture Design, BPA; Regularization for Deep Learning: Parameter norm penalties, Dataset augmentation, Dropout; Optimization for Training Deep Models: Parameter initialization strategies, Approximate second-order methods; Convolutional Networks: Convolution operation, Pooling; Recurrent and Recursive Networks: RNNs, BiRNNs, Encoder-decoder sequence-to-sequence architecture, LSTM

References

1. Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press 2016
2. Simon Haykin, Neural Networks and Learning Machines, Pearson, 2018
3. Charu C Agarwal, Neural Networks and Deep Learning, Springer 2018
4. Francois Chollet, Deep Learning with Python, Manning, 2017
5. Seth Weidman, Deep Learning from Scratch, Shroff/O'Reilly, 2019

ICT 4443 EVOLUTIONARY COMPUTING AND SWARM INTELLIGENCE [3 0 0 3]

Abstract: Introduction, Optimization, Modelling and simulation problems, Search problems, Evolutionary computing, Natural versus artificial evolution, Global optimization and heuristic search algorithms,genetic algorithm, Fitness, selection and population management, Advanced operators and techniques in genetic algorithm, multi-objective optimization, combinatorial optimization, knowledge based techniques, parameters and parameter tuning, (1+1) EA, , $(\mu + \lambda)$ EA, run time analysis of (1+1) EA, swarm intelligence, particle swarm optimization, metaheuristics, ant colony optimization.

Reference

1. A.E. Eiben, J.E. Smith, Introduction to Evolutionary Computing, Second Edition, Springer, 2015
2. S.N.Sivanandam · S.N.Deepa, "Introduction to Genetic Algorithms", 2008
3. Andries P. Engelbrecht, Computational Intelligence: An Introduction . Second Edition, John Wiley & Sons Ltd, 2007
4. Xinjie Yu · Mitsuo Gen, Introduction Evolutionary Algorithms, Springer , 2010

ICT 4444 EXPLAINABLE ARTIFICICAL INTELLIGENCE [3 0 0 3]

Abstract

Introduction; Pre-model Interpretability and Explainability: EDA, Feature engineering; Model Visualization Techniques and Traditional Interpretable Algorithms: Model validation and evaluation, Classification model visualization, Traditional interpretable algorithms, Model Interpretability: Interpretable vs. explainable algorithms, Ensemble-based explainable machines, Rule-based techniques, Scoring system; Post-Hoc Interpretability and Explanations; Explainable Deep Learning: ; Intrinsic, Perturbation, Gradient/Backpropagation; Explainability in Different Applications Domains

References

1 Uday Kamath, and John Liu, Explainable Artificial Intelligence: An Introduction to Interpretable Machine Learning, Springer, 2021
2 Wojciech Samek, Grégoire Montavon, Andrea Vedaldi, Lars Kai Hansen, and Klaus-Robert Müller, Explainable AI: Interpreting, Explaining and Visualizing Deep Learning, Springer, 2019
3 Serg Masis, Interpretable Machine Learning with Python, Packt Publishing Ltd, 2021

ICT 4445   GAME THEORY AND APPLICATIONS[3 0 0 3]

Abstract

Introduction; Mathematical Preliminaries: Probability theory, Linear algebra, Linear programming, Mathematical analysis, and complexity classes; Non-Cooperative Game Theory: Extensive form games, Strategic form games, Dominant strategy equilibria, PSNE, MSNE, and Bayesian games; Cooperative Game Theory: Correlated strategies, Two person bargaining problem, Coalition games, Solution concept; Mechanism Design: Social choice function, Incentive compatibility theorem, Auctions.

References

1. Y Narahari, Game Theory and Mechanism Design, World Scientific, 2020
2. Vladimir Mazalov, Mathematical Game Theory and Applications, Wiley, 2014
3. Hans Peters, Game Theory: A Multi-Leveled Approach, 2nd Edition, Springer, 2015
4. Dario Bauso, Game Theoy with Engineering Applications, SIAM, Philadelphia, 2016

ICT 4446 HIGH PERFORMANCE COMPUTING [3 0 0 3]

Abstract

High performance computing ecosystem with architectures, classifications, forms, and limitations, High performance programming paradigms with pthreads/OpenMP for shared-memory architectures, MPI for distributed-memory architectures, CUDA/OpenCL for data parallel tasks, Data parallel computing by device query, thread organization and mapping, Memory and data locality optimization with the memory hierarchy, Parallel Programming Patterns with optimizations,Application Case Study from the Machine Learning (ML) perspective.

References

1. Kirk D. B. and Hwu W., Programming Massively Parallel Processors: A Hands-on Approach, 3rd Edition,Morgan Kaufmann Publishers Inc., 2016.
2. Robert Robey and Yuliana Zamora, Parallel and High Performance Computing, 1st Edition,Manning Publications, 2021.
3. Barlas G., Multicore and GPU Programming: An Integrated Approach, 2nd Edition, Morgan Kaufmann Publishers Inc., 2022.
4. Tolga Soyata, GPU Parallel Program Development Using CUDA, 1st Edition, CRC Press, 2018.
5. Gaster B., Howes L., Kaeli D. R., Mistry P., and Schaa D., Heterogeneous Computing with OpenCL, 2nd Edition, Morgan Kaufmann Publishers Inc., 2012.

ICT 4447 HUMAN COMPUTER INTERACTION [3 0 0 3]

Abstract

Contexts for HCI: Human, Computer, Interaction, Design Process: Interaction Design, Design Rules, Navigation Design, Principles of good design and designers: Usability, Guidelines, Golden Rules, User Support, Patterns, Accessibility, User Experience (UX) Design: UX Design Process, Visual Design Principles and processes, UI Design and Implementation, Usability Evaluation Techniques: Different measures for evaluation, Usability heuristics and the principles of usability testing, Cognitive models: Models and Architectures; Case Study: AR/VR and Multimedia, Tools: Unity, Figma.

References

1. Alan Dix, Janet E. Finlay, Gregory D. Abowd, and Russell Beale, Human-Computer Interaction, 3rd Edition, Pearson Education India, 2017.
2. Elvis Canziba, Hands-On UX Design for Developers, 1st Edition, Packt, 2018.

3. Samit Bhattacharya, Human-Computer Interaction: User-Centric Computing for Design, 1st Edition, McGraw-Hill, 2019.
4. Ben Shneiderman, Catherine Plaisant, Maxine Cohen and Steven Jacobs, Designing the User Interface: Strategies for Effective Human-Computer Interaction, 6th Edition, Addison-Wesely, 2017.
5. Jeffrey Rubin and Dana Chisnell. Handbook of Usability Testing: How to Plan, Design, and Conduct Effective Tests. 2nd Edition, Wiley, 2014.
6. Yvonne Rogers, Helen Sharp and Jenny Preece, Interaction Design: Beyond Human - Computer Interaction, 5th Edition, John Wiley & Sons Inc, 2019.

ICT 4448 INTERNET OF THINGS [3 0 0 3]

Abstract

Introduction to M2M communication and IoT, An emerging industrial structure for IoT, IoT system architecture, IoT reference model, IoT deployment and operational view, IoT physical devices and endpoints, Communication and networking protocols: MQTT and AMQP protocols, IoT enabling technologies: RFID, WSN,SCADA etc., Analytics for the IoT, Applying the geospatial analytics to IoT data, Real world design constraint, Technical design constraint, Future internet design for various IoT use cases such as smart cities, smart environments, smart homes, smart health etc.

References

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, David Boyle., From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence,2nd Edition,Elsevier 2018.

2. Andrew Minteer, Analytics for the Internet of Things (IoT), 1st Edition, Packt publishing Ltd, 2017.

3. Arshdeep Bahga, Vijay Madisetti, Internet of Things-A Hands on Approach, 1st Edition, Orient Blackswan Private Limited 2015.

4. Oleg Roderick, Nicholas Marko, David Sanchez and Arun Aryasomajula, 1st Edition, Internet of Things and Data Analytics Handbook, Wiley-Blackwell, 2017.

5. Yatish Patil, Azure IoT Development Cookbook, 1st Edition, Packt publishing Ltd, 2017.

6. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 1st Edition, 2012.

ICT 4449 MOBILE COMPUTING [3 0 0 3]

Abstract:

Introduction to Mobile Wireless Communication, 5G Roadmap, Internet of Things and Context-Awareness, 5G Architecture, RAN Internals, Spectrum Utilization, OFDMA, NOMA,

5G Frame Structure, Beamforming, Massive MIMO, Network Deployment Types, Mobility management, Coordinated multi-point, Network Functions Virtualization, Software-Defined Networking, Network Slicing, Multi-access Edge Computing, Machine-type communications, Device-to-Device Communications.

References

1. Afif Osseiran, Jose F. Monserrat, and Patrick Marsch, 5G Mobile and Wireless Communications Technology, Cambridge University Press 2016.
2. Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, John Wiley & Sons, Ltd, 2015.
3. Saro Velrajan, An Introduction to 5G Wireless Networks: Technology, Concepts and Use-cases, 2016.
4. Larry Peterson and OMguz Sunay, 5G Mobile Networks: A Systems Approach, Morgan & Claypool 2020.
5. Harri Holma, Takehiro Nakamura, and Antti Toskala, 5G Technology 3GPP New Radio, JohnWiley & Sons Ltd, 2020.
6. Patrick Marsch, Ömer Bulakçı, Olav Queseth, and Mauro Boldi, 5G System Design Architectural and Functional Considerations and Long Term Research, John Wiley & Sons Ltd, 2018.

ICT 4450 SOFTWARE RELIABILITY [3 0 0 3]

Abstract

Need and concepts of software reliability; Software reliability models-classification, limitations and issues; model disagreement and inaccuracy, predictive accuracy, recalibration; The operational profile, concepts and development procedures, test selection; Testing for reliability measurement; Software testing; operational profiles – difficulties, estimating reliability, time/structure based software reliability; Fundamentals of measurement product metrics – measurement of internet product attributes, size and structure , measurement of quality; Reliability growth model.

References

1. Patric D. connor, Practical Reliability Engineering, 5th Edition, John Wesley & sons, 2012.

2. Norman E .Fenton, James Beiman, Software metrics-A rigorous and practical approach, 3rd Edition, Chapman & Hall/CRC Innovations in Software Engineering and Software Development Series, 2014.

3. John D. Musa, Software Reliability Engineering, 2nd Edition, Tata McGraw Hill, 2005.

4. Shigeru Yamada, Software Reliability Modeling: Fundamentals and Applications (Springer Briefs in Statistics), 2014 Edition, Springer, 2014

5. Michael Lyu, Handbook of Software Reliability Engineering, IEEE Computer Society Press, ISBN: 0-07-039400-8, 1996.

ICT 4311   COMPUTER GRAPHICS AND ANIMATION [3 0 0 3]

Abstract

Overview of Graphic Systems,:Graphics hardware, devices software Graphics output Primitives:Line,circle, ellipses generating algorithms; Geometrical transformations, Two dimensional and 3 dimensional views, animation,Graphics Programming using open GL.

References

1. Donald D. Hearn, Warren Carithers, M. Pauline Baker. Computer Graphics with OpenGL, 4th edition, Pearson Education, 2014.
2. Zhigang Xiang,Computer Graphics: Theory and Practice with OpenGL, 3rd edition,PearsonEducation,2016.
3. Edward Angel,Interactive Computer Graphics- Atop downapproach using OpenGL, 6th edition, Pearson Education, 2012.
4. Foley J. D.,VanDamA., Feiner S. K., Hughes J. F.,Computer Graphics, Principles and Practice, 3rd edition, Addision-Wesley, 2014.
5. Peter Shirley, Steve Marschner and et al., Fundamentals of Computer Graphics, 4th edition, A K Peters/CRC Press, 2015.
6. F. S. Hill Jr., and S. M. Kelley, Computer Graphics using OpenGL, 3rd edition,Pearson, 2007.

ICT 4312 DESIGN AND DEVELOPMENT OF WEB APPLICATIONS [3 0 0 3]

Abstract

Front-End Web UI frameworks and Tools: Bootstrap 4, CSS and JavaScript component, Node.js, NPM and task runners, Front-End Web Development with React: JavaScript ES6, Reactstrap for Bootstrap 4-based responsive UI design, react router, Flux architecture, redux, REST API, Front-End JavaScript Framework with Angular: Typescript, Angular material, Flex-layout for responsive design, components, Data binding, Angular router, Angular animation support and Angular testing, Server-side development with NodeJS, Express and MongoDB

References

1. Shama Hoque, Full-Stack React Projects: Modern web development using React 16, Node, Express, and MongoDB, Ingram Publishers, 2018
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, 1st ed. Edition, 2018
3. Frank Zammetti, Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker, 1st ed. Edition, 2020

ICT 4313 FUNDAMENTALS OF DATA STRUCTURES AND ALGORITHMS [3 0 0 3]

Abstract

Introduction to algorithms, Arrays: Elementary operations, Applications, Performance Analysis, Sparse matrix representation, Transpose of sparse matrix, Stacks operations, Arithmetic expression conversion and evaluation using stack, Queue Operations, Singly linked Lists, Circular lists, Doubly linked lists, Trees, Binary Tree traversals and different operations, Binary search Tree, Heaps, Graph Abstract type: Representations and elementary operations, Sorting and searching techniques, Analysis of algorithm.

References

1. Horowitz E., Sahni S., Mehta D., Fundamentals of Data Structures in C++, 2nd edition, Golgotia Publications, 2008.
2. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 4th edition, Pearson Education, 2014.
3. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Fundamentals of Data structures in C, 2nd edition, Silicon Press, 2008

ICT 4314 MACHINE LEARNING TOOLS AND TECHNOLOGIES [3 0 0 3]

Abstract

Basics, Data types, Attribute types, Mathematical preliminaries, Visualization tools, Preprocessing and visualization techniques, Supervised learning algorithms:Linear, Logistic, Perceptron, Naïve Bayes, k-Nearest Neighbor, Decision trees, Random forest; Ensemble techniques, performance metrics, Unsupervised learning: K-Means, Dimensionality reduction techniques, implementation of supervised and unsupervised models

References

1. Mohri M., Rostamizadeh A., and Talwalkar A.,Foundations ofMachineLearning, 2nd Edn, MIT Press, 2018.

2. Aurélien Géron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, Concepts, Tools and Techniques to build Intelligent Systems, 2nd Edn., O'Reilly Media, Inc., 2019.

3. Stephen Marsland's, Machine Learning: An Algorithmic Perspective, 2nd edition, (Chapman & Hall), CRC Press, Taylor and Francis,2015

ICT 4315 NETWORKING WITH TCP/IP[3 0 0 3]

Abstract

Introduction to Networking and brief History of Internet, OSI and TCP/IP Reference Models, Network Layer, IP Addresses, Internet Protocol (IP) Datagram, Fragmentation, Options, Address Translation, Internet Control Message Protocol, Intra and Inter domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP, User Datagram and Transmission Control Protocol, Application Layer Protocols, The Web and HTTP, DNS: Services Provided by the DNS

References

1. Behrouz A. Forouzan, TCP/IP Protocol Suite, 4th Edition, Tata McGraw Hill 2017.
2. Andrew S. Tanenbaum, Computer Network, 5th Edition Prentice Hall of India Pvt Ltd 2013.
3. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition Tata McGraw Hill 2013.
4. Leon Garcia and Widjala, Communication Networks, 2nd Edition, Tata McGraw Hill 2004.
5. James F. Kurose, Computer Networking A top-Down Approach Featuring the Internet, 6th Edition, Pearson Education Inc 2013.

ICT 4316 FUNDAMENTALS OF CYBER SECURITY [3 0 0 3]

Abstract

Introduction to Information, Network and System Security, Encryption techniques, Message Integrity and Message Authentication, Digital Signature, Key Management, User Authentication. Web security model: Browser security model including same-origin policy, Client-server trust boundaries, Session management, authentication: Single sign-on, HTTPS and certificates. Application vulnerabilities and defenses: SQL injection, XSS, CSRF. Client-side security: Cookies security policy, HTTP security extensions, Plugins, extensions, and web apps, Web user tracking, Server-side security tools, e.g. Web Application Firewalls (WAFs) and fuzzers. Cybercrime, Cybercrime investigation, Laws and ethics

References

1. Mayank Bhushan, Fundamentals of cybersecurity, BPB publications, 2017
2. Raef Meeuwisse, Cyber Security for Beginners, 2015
3. Rolf Oppliger, Security Technologies for the World Wide Web, 2nd edition,Artech House, 2002.
4. Seth Fogie, Jeremiah Grossman, Robert Hansen and Anton Rager, XSS Attacks: Cross Site Scripting Exploits and Defense, Syngress, 2007.
5. Justin Clarke et.al.,SQL Injection Attacks and Defense, 2nd edition, Syngress, 2012. DafyddStuttard, and Marcus Pinto, The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws,2nd edition, Wiley, 2011.

ICT 4317   GAME THEORY AND APPLICATIONS[3 0 0 3]

Abstract

Introduction; Mathematical Preliminaries: Probability theory, Linear algebra, Linear programming, Mathematical analysis, and complexity classes;Non-Cooperative Game Theory: Extensive form games, Strategic form games, Dominant strategy equilibria, PSNE, MSNE, and Bayesian games; Cooperative Game Theory: Correlated strategies, Two person bargaining problem, Coalition games, Solution concept; Mechanism Design: Social choice function, Incentive compatibility theorem, Auctions.

References

1. Y Narahari, Game Theory and Mechanism Design, World Scientific, 2020
2. Vladimir Mazalov, Mathematical Game Theory and Applications, Wiley, 2014
3. Hans Peters, Game Theory: A Multi-Leveled Approach, 2nd Edition, Springer, 2015
4. Dario Bauso, Game Theory with Engineering Applications, SIAM, Philadelphia, 2016