Information Engineering

1. Von Neumann's computer architecture; central processing unit, memories, peripherals, relationships between them and their function.
2. Data and instructions representation in the computer.
3. Interrupts as means of memory and peripherals control.
4. Security and redundancy of data, coding of logical, numerical and textual information, creating composite data types using simple data types.
5. Boolean algebra, basic logic operations and their realization using logic circuits.
6. Analysis and synthesis of logic circuits. Combinational and sequential logic circuits.
7. Object, class of objects, collection of objects, relationships between objects. Object-oriented computational model. Object-oriented programming languages.
8. Software implementation using the rules of object-oriented programming. Rapid application development and event-driven programming.
9. Polymorphism in modern programming languages. Liskov's substitution principles. Implementation inheritance vs. Interface inheritance.
10. Advanced techniques of object-oriented design. Design patterns. Refactoring.
11. Special data structures. Queue, stack, tree – where and how to use them. Their implementation in structured and object-oriented languages.
12. Data look up and sorting algorithms and their implementation in structured and object-oriented languages.
13. Relational and object data models in the contemporary database systems and their relation.
14. Formal techniques of relational and object database design. Database normalization.
15. Querying in relational and object database systems. Principles of SQL and OQL query languages.
16. Operating system as a manager of processes and resources. Types of operating systems, data storage organization and file systems.
17. File systems of UNIX-like operating systems. Processes in UNIX-like operating systems.
18. Structured analysis and design, diagrams used for data modelling, diagrams used for functional modelling.
19. Information systems development life cycle, life cycle phases, life cycle types.
20. Modern approaches to software design. Agile methodologies, extreme programming.

Recommended literature

Sharp, J. Microsoft Visual C# Step by Step (9th Edition) (Developer Reference). Microsoft Press, 2017. ISBN 978-1509307760

Clements, A. Principles of Computer Hardware. Oxford University Press, 2006. ISBN 978-0199273133

Coronel, C., Morris, S.: Database systems, design, implementation and management. Cengage Learning EMEA, 2016. ISBN 978-1285196145

Nield T.: Getting Started with SQL: A Hands-On Approach for Beginners. O&#39;Reilly Media, 2016. ISBN 978-1491938614

Nisan, N., Schocken, S. The Elements of Computing Systems: Building a Modern Computer from First Principles, 2008. ISBN 978-0262640688.

Nyisztor, K.: UML and Object-Oriented Design Foundations: Understanding Object-Oriented Programming and the Unified Modeling Language, Independent Publication, 2018. ISBN 978-1980818496

Ambler S.W.: The Elements of UML™ 2.0 Style, Cambridge University Press, 2014. ISBN 9780511817533

Sommerville, Ian (2015). Software Engineering (10 ed.). Pearson Education. ISBN 978-0133943030

Nemeth, E., Snyder, G.: Unix and Linux system administration handbook (5th ed.), Addison-Wesley, 2017, ISBN 978-0134277554