Biju Patnaik University of Technology, Odisha B.E./B.Tech CSE Sem 6 syllabus

Compiler Design

RCS6C002 Compiler Design

Module I: Introduction: Overview and Phases of compilation. Lexical Analysis: Non-Deterministic and Deterministic Finite Automata (NFA & DFA), Regular grammar, Regular expressions and Regular languages, Design of a Lexical Analyzer as a DFA, Lexical Analyzer generator. Syntax Analysis: Role of a Parser, Context free grammars and Context free languages, Parse trees and derivations, Ambiguous grammar. Top Down Parsing: Recursive descent parsing, LL (1) grammars, Non-recursive Predictive Parsing, Error reporting and Recovery. Bottom Up Parsing: Handle pruning and shift reduces Parsing, SLR parsers and construction or SLR parsing tables, LR(1) parsers and construction of LR(1) parsing tables, LALR parsers and construction of efficient LALR parsing tables, Parsing using Ambiguous grammars, Error reporting and Recovery, Parser generator

Module II: Intermediate Code Generation: DAG for expressions, Three address codes - Quadruples and Triples, Types and declarations, Translation of Expressions, Array references, Type checking and Conversions, Translation of Boolean expressions and control flow statements, Back Patching, Intermediate Code Generation for Procedures.

Module III: Code Generation: Factors involved, Registers allocation, Simple code generation using STACK Allocation, Basic blocks and flow graphs, Simple code generation using flow graphs. Code Optimization: Objective, Peephole Optimization, and Concepts of Elimination of local common sub- expressions, Redundant and un-reachable codes, Basics of flow of control optimization.

Module IV: Run Time Environment: Storage Organizations, Static

and Dynamic Storage Allocations, STACK Allocation, Handlings of activation records for calling sequences. Syntax Directed Translation: Syntax Directed Definitions (SDD), Inherited and Synthesized Attributes, Dependency graphs, Evaluation orders for SDD, Semantic rules, Application of Syntax Directed Translation. Symbol Table: Structure and features of symbol tables, symbol attributes and scopes.

Books:

[1] Compilers – Principles, Techniques and Tools, A. V. Aho, M. S. Lam, R. Sethi, J. D. Ullman, 2nd Ed., Pearson. 2007
[2] Modern Compiler Design, D. Galles, 1st Ed., Pearson Education,2004
[3] Advanced Compiler Design & Implementation, S. S. Muchnick, Morgan Kaufmann, 1997

Software Engineering

RCS6C001 Software Engineering

Module I: Software Process Models: Software Product, Software crisis, Handling complexity through Abstraction and Decomposition, Overview of software development activities, Process Models, Classical waterfall model, iterative waterfall model, prototyping mode, evolutionary model, spiral model, RAD model, Agile models: Extreme Programming, and Scrum.

Module II: Software Requirements Engineering: Requirement Gathering and Analysis, Functional and Non-functional requirements, Software Requirement Specification (SRS), IEEE 830 guidelines, Decision tables and trees. Structured Analysis & Design: Overview of design process, High-level and detailed design, Cohesion and coupling, Modularity and layering, Function–Oriented software design: Structured Analysis using DFD Structured Design using Structure Chart, Basic concepts of Object Oriented Analysis & Design. User interface design, Command language, menu and iconic interfaces.

Module III: Coding and Software Testing Techniques: Coding, Code Review, documentation. Testing: - Unit testing, Black-box Testing, White-box testing, Cyclomatic complexity measure, coverage analysis, mutation testing, Debugging techniques, Integration testing, System testing, Regression testing. Software Reliability and Software

Module IV: Maintenance: Basic concepts in software reliability, reliability measures, reliability growth modelling, Quality SEI CMM, Characteristics of software maintenance, software reverse engineering, software reengineering, software reuse. Emerging Topics: Client-Server Software Engineering, Service-oriented Architecture (SOA), and Software as a Service (SaaS)

Books:

[1] Fundamentals of Software Engineering, Rajib Mall , 5th Ed, PHI, 2018.
[2] Software Engineering, A Practitioner's Approach, Roger S. Pressman , 8th Ed, TMG Hill. 2019
[3] Software Engineering, I. Sommerville, 9th Ed., Pearson Education, 2011

Wireless Sensor Networks

RCS6D002 Wireless Sensor Networks

Module-I: Introduction: Definitions and Background, Challenges and Constraints, Applications. (Structural Health Monitoring, Habitat Monitoring, Smart Transportation, Health Care, Pipeline Monitoring, Precision Agriculture, Active Volcano, Underground Mining, Tracking Chemical Plumes).Node Architecture: The Sensing Subsystem, the Processor Subsystem, Communication Interfaces, Prototypes, Operating Systems: Functional Aspects, Non-functional Aspects, and Prototypes.

Module-II: Basic Architectural Framework: Physical Layer: Basic Components, Source and Channel Encoding, Modulation, signal Propagation. Medium Access Control: Wireless MAC Protocols, Characteristics of MAC Protocols in Sensor Networks, Contention-Free MAC Protocols, Contention-Based MAC Protocols, Hybrid MAC Protocols. Network Layer: Routing Metrics, Flooding and Gossiping, Data- Centric Routing, Proactive Routing, On-Demand Routing, Hierarchical Routing, Location-Based Routing, QoS-Based Routing Protocols

Module-III: Node and Network Management: Power Management: Local Power Management Aspects, Dynamic Power Management and Conceptual Architecture. Time Synchronization: Clocks and the Synchronization Problem, Time Synchronization in WSN, Basics of Time Synchronization, Time Synchronization Protocols. Localization: Ranging Techniques, Coarse-grained and

Fine-grained node localization, Range-Based Localization, Range-Free Localization, Event-Driven Localization

Module-IV: Security: Challenges of Security in WSN, Security Attacks in Sensor Networks, Protocols and Mechanisms for Security, Introduction to IEEE 802.15.4 and Zig Bee Security. Sensor Network Databases: Sensor Database Challenges, Querying the physical environment, Query interfaces, High-level database organization, In-network Aggregation, Data Centric Storage, Distributed and Hierarchical aggregation. Introduction to discrete event network simulators.

Books:

[1] Fundamentals of Wireless Sensor Network: Theory and Practice: Waltenegus Dargie and Christian Poellabauer, Wiley Publication, 2010
[2] Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas , Morgan Kaufmann Series in Networking 2004

Control System

Control System

Module I: Industrial Control examples. Mathematical models of physical systems. Control hardware and their models. Transfer function models of linear time-invariant systems. Feedback Control: Open-Loop and Closed-loop systems. Benefits of Negative Feedback. Block diagram algebra. Signal Flow Graph and Mason's Gain formula.

Module II: Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorem. Design specifications for second- order systems based on the time-response. Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Module III: Relationship between time and frequency response, Polar plots, Bode plots. Nyquist stability criterion. Relative stability using Nyquist stability criterion – gain and phase margins. Closed-loop frequency response: Constant M Circle, Constant N Circle, Nichols Chart.

Module IV: Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems.

Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Tuning of PID controllers, Lead and Lag and Lag-Lead compensator design.

Module V: Concepts of state variables. State space model. Diagonalization of State Matrix. Solution of state equations. Eigenvalues and Stability Analysis. Concept of controllability and observability. Pole-placement by state feedback. Discrete-time systems. Difference Equations. State-space models of linear discrete-time systems. Stability of linear discrete-time systems.

Books:

[1] I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.
[2] K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991
[3] M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997.
[4] B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.