SPPU B.E./B.Tech CSE Sem 6 syllabus

Systems Programming & Operating System

310251: Systems Programming and Operating System

Credit 04

Unit I Introduction 09 Hours
Introduction: Components of System Software: Text editors, Loaders, Assemblers, Macro processors, Compilers, Debuggers. Machine Structure, Machine language and Assembly Language. Assemblers: General design procedure, design of two pass assembler

Unit II Macro Processor, Linker and Loader 09 Hours
Macro Processor: Macro instructions, Features of macro facility, Design of two-pass, single pass and nested macro processor. Loaders: Loader schemes: Compile and go, General Loader Scheme, Absolute loaders, subroutine linkages, relocating loaders, direct linking loaders, overlay structure. Design of an absolute loader, Design of direct linking loader. Linkers: Relocation and linking concepts, Design of linker, self relocating programs, Static and dynamic link libraries, use of call back functions. Case Study: Loading phases using Java.

Unit III Language Translator 09 Hours
Role of lexical analysis -parsing & Token, patterns and Lexemes & Lexical Errors, regular definitions for the language constructs & strings, sequences, Comments & Transition diagram for recognition of tokens, reserved words and identifiers, examples Introduction to Compilers and Interpreters: General Model of Complier, Program interpretation, Comparison of compiler and Interpreter, Use of Interpreter and components of Interpreter. Case Study: Overview of LEX and YACC specification and features.

Unit IV Operating Systems 09 Hours

Operating Systems: Introduction to different types of operating Real Time Operating Systems, System Components, OS services, System structure- Layered Approach.
Process Management: Process Concept- Process states, Process control block, Threads, Process
Scheduling: Types of process schedulers, Types of scheduling: Preemptive, Non preemptive.
Scheduling algorithms: FCFS, SJF, RR, Priority,
Deadlocks: Methods of handling deadlocks, Deadlock prevention, avoidance and detection, Recovery from deadlocks.
Case Study: Process Management in multi-cores OS.

Unit V Memory Management 09 Hours

Memory management: Review of Programming Model of Intel 80386, Contiguous and non- contiguous, Swapping, Paging, Segmentation, Segmentation with Paging. Virtual Memory:

Background, Demand paging, Page replacement scheme- FIFO, LRU, Optimal, Thrashing.
Case Study: Memory Management in multi-cores OS.

Unit VI I/O Management 09 Hours

I/O Management: I/O Devices, Organization of I/O function, I/O Buffering, Disk Scheduling- Disk Scheduling policies like FIFO, LIFO, STTF, SCAN, C-SCAN.

File Management: Concept, Access methods, Directory Structure, Protection, File System implementation, Directory Implementation, Allocation methods, Free Space management.
Case Study: I/O and File Management in multi-cores OS
Case Study: Light weight and heavy weight OS: Linux, Tizen

Books:

Text:

1. John Donovan, “System Programming”, McGraw Hill, ISBN 978-0--07-460482-3.
2. Silberschatz, Galvin, Gagne, "Operating System Principles", 9th Edition, Wiley, ISBN 978- 1-118-06333-0

References:

1. Dhamdhere D., "Systems Programming and Operating Systems", McGraw Hill, ISBN 0 - 07 - 463579 – 4

2. Randal Bryant and David O'Hallaron, “Computer Systems: A Programmer's Perspective” , Pearson, ISBN 10: 0-13-610804-0
3. Stallings W., "Operating Systems", 6th Edition, Prentice Hall, ISBN-978-81-317-2528-3.
4. John. R. Levine, Tony Mason and Doug Brown, “Lex and Yacc”, O'Reilly, 1998, ISBN: 1- 56592-000-7

Web Technology

310254: Web Technology

Credit 03

Unit I Web Development Process, Front End Tools 07 Hours
Introduction to web technology, internet and www, Web site planning and design issues, HTML: structure of html document , HTML elements: headings, paragraphs, line break, colors & fonts, links, frames, lists, tables, images and forms, Difference between HTML and HTML5. CSS: Introduction to Style Sheet, Inserting CSS in an HTML page, CSS selectors, XML: Introduction to XML, XML key component, Transforming XML into XSLT, DTD: Schema, elements, attributes, Introduction to JSON.

Unit II Client Side Technologies 08 Hours
JavaScript: Overview of JavaScript, using JS in an HTML (Embedded, External), Data types, Control Structures, Arrays, Functions and Scopes, Objects in JS, DOM: DOM levels, DOM Objects and their properties and methods, Manipulating DOM, JQuery: Introduction to JQuery, Loading JQuery, Selecting elements, changing styles, creating elements, appending elements, removing elements, handling events.

Unit III Server Side Technologies 08 Hours
Introduction to Server Side technology and TOMCAT, Servlet: Introduction to Servlet, need and advantages, Servlet Lifecycle, Creating and testing of sample Servlet, session management. JSP: Introduction to JSP, advantages of JSP over Servlet , elements of JSP page: directives, comments, scripting elements, actions and templates, JDBC Connectivity with JSP.

Unit IV Server Side Technologies 07 Hours
PHP: Introduction to PHP, Features, sample code, PHP script working, PHP syntax, conditions & Loops, Functions, String manipulation, Arrays & Functions, Form handling, Cookies & Sessions, using MySQL with PHP, WAP & WML, AJAX: Introduction,

Working of AJAX, AJAX processing steps, coding AJAX script.

Unit V Client and Server Side Frameworks 07 Hours
Angular JS : Overview, MVC architecture, directives, expression, controllers, filters, tables, modules, forms, includes, views, scopes, services, dependency injection, custom directives, Internationalization, Introduction to NodeJS. Struts: Overview, architecture, configuration, actions, interceptors, result types, validations, localization, exception handling, annotations.

Unit VI Web Services 08 Hours
Web Services: Overview, types of WS, difference between SOAP and REST, EJB: types of EJB, benefits, Architecture, EJB technology, JNDI lookup, Introduction to Content Management System(CMS) ,Wordpress / Joomala, Advanced Technology: Bootstrap, JSF, Spring.

Books:
Text:
1. Achyut Godbole & Atul Kahate, ”Web Technologies: TCP/IP to Internet Application Architectures”, McGraw Hill Education publications, ISBN, 007047298X, 9780070472983
2. Ralph Moseley & M. T. Savaliya, “Developing Web Applications”, Wiley publications, ISBN 13 : 9788126538676

References:
1. Adam Bretz & Colin J Ihrig, “Full Stack Javascript Development with MEAN”, SPD, ISBN-13: 978-0992461256
2. Giulio Zambon, “ Beginning JSP, JSF and Tomcat”, Apress Publication, ISBN-10:
1430246235; ISBN-13: 978-1430246237
3. Jeremy McPeak& Paul Wilton,” Beginning JavaScript”, Wrox Publication, ISBN-13: 978- 0470525937
4. Black Book, “Struts 2”, Dreamtech Press, ISBN 13, : 9788177228700
5. Black Book, “ JDBC 4.2, Servlet 3.1 & JSP 2.3”, Dreamtech Press, ISBN-13: 978-8177228700
6. Sandeep Panda, “Angular JS: Novice To Ninja”, SPD, First Edition 2014, ISBN-13: 978- 0992279455
7. B. V. Kumar, S. Sangeetha, S. V. Subrahmanya,, “J2EE Architecture, an illustrative gateway to enterprise solutions”, Tata McGraw Hill Publishing Company. ISBN: 9780070621633
8. Brian Fling, “Mobile Design and Development”, O'REILLY, ISBN: 13:978-81-8404-817-9
9. Robin Nixon, “Learning PHP, Mysql and Javascript with JQuery,

CSS & HTML5", O'REILLY, ISBN: 13:978-93-5213-015-3
10. Allan Cole, Raeiva Jackson Armitage Brandon R. Jones Jeffrey Way, "Build Your Own Wicked Wordpress Themes", SPD, ISBN: 978-93-5213-154-9
11. Ed Burnette, "Hello , Android Introducing Google' Mobile Development Platform", SPD, ISBN: 13:978-93-5213-085-6

Design and Analysis of Algorithms

310250: DESIGN AND ANALYSIS OF ALGORITHMS

Credit 04

Unit I Fundamentals 09 Hours
The Role of Algorithms in Computing - What are algorithms, Algorithms as technology, Evolution of Algorithms, Design of Algorithm, Need of Correctness of Algorithm, Confirming correctness of Algorithm – sample examples, Iterative algorithm design issues.

Unit II Models and Design 09 Hours
Functional Model – Features, Recursive processes, Scope rules, Tail recursion, Checking correctness of Iterative process. Imperative Model – Basics, Specifications and Prototyping, Stepwise Refinement, Proof Rules – Basics, For loops, Goto and Exit loops, Functions and Procedures, Problem Solving using Greedy strategy - Knapsack problem, Huffman code generation algorithm.

Unit III Abstract Algorithms 09 Hours
Dynamic Programming, Divide and Conquer, Greedy strategy, Branch-n-Bound, Natural Algorithms –Evolutionary Algorithms and Evolutionary Computing, Introduction to Genetic Algorithm, Simulated Annealing, Artificial Neural Network and Tabu Search.

Unit IV Complexity Theory 09 Hours
Complexity theory – Counting Dominant operators, Growth rate, upper bounds, asymptotic growth, O, Ω, ?, o and ω notations, polynomial and non-polynomial problems, deterministic and non-deterministic algorithms, P-class problems, NP-class of problems, Polynomial problem reduction NP complete problems- vertex cover and 3-SAT and NP hard problem - Hamiltonian cycle.

Unit V Amortized Analysis 09 Hours

Amortized Analysis – Binary, Binomial and Fibonacci heaps, Dijkstra's Shortest path algorithm, Splay Trees, Time-Space tradeoff, Introduction to Tractable and Non-tractable Problems, Introduction to Randomized and Approximate algorithms, Embedded Algorithms: Embedded system scheduling (power optimized scheduling algorithm), sorting algorithm for embedded systems.

Unit VI Multithreaded and Distributed Algorithms 09 Hours
Multithreaded Algorithms - Introduction, Performance measures, Analyzing multithreaded algorithms, Parallel loops, Race conditions. Problem Solving using Multithreaded Algorithms - Multithreaded matrix multiplication, Multithreaded merge sort.
Distributed Algorithms - Introduction, Distributed breadth first search, Distributed Minimum Spanning Tree.
String Matching- Introduction, The Naive string matching algorithm, The Rabin-Karp algorithm

Books:
Text:
1. Parag Himanshu Dave, Himanshu Bhalchandra Dave, "Design And Analysis of Algorithms", Pearson Education, ISBN 81-7758-595-9
2. Gilles Brassard, Paul Bratley, "Fundamentals of Algorithmics", PHI, ISBN 978-81-203- 1131-2

References:
1. Michael T. Goodrich, Roberto Tamassia , "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley, ISBN 978-81-265-0986-7
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press; ISBN 978-0-262-03384-8
3. Horowitz and Sahani, "Fundamentals of Computer Algorithms", University Press, ISBN: 978 81 7371 6126, 81 7371 61262
4. Rajeev Motwani and Prabhakar Raghavan, "Randomized Algorithms", Cambridge University Press, ISBN: 978-0-521-61390-3
5. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press,ISBN:0-521-67035-7

Software Modeling and Design

310253: Software Modeling and Design

Credit 04

Unit I Introduction 07 Hours
Introduction to software design, design methods- procedural / structural and object oriented, Requirement Vs Analysis Vs Architecture Vs Design Vs Development 4+1 Architecture, case study of transferring requirement to design, UP, COMET use case based software life cycle, Introduction to UML -Basic building blocks, Reusability, Use case modeling, Use case template Case study – Transferring requirements into design using advanced tool

Unit II Static Modelling 08 Hours
Analysis Vs Design, Class diagram- Analysis - Object & classes finding analysis & Design- design classes, refining analysis relationships, Inheritance & polymorphism, Object diagram, Component diagram- Interfaces & components, deployment diagram, Package diagram

Unit III Dynamic Modelling 07 Hours
Interaction & Interaction overview diagram, sequence diagram, Timing diagram, Communication diagram, Advanced state machine diagram, Activity diagram

Unit IV Architecture Design 08 Hours
Introduction to Architectural design, overview of software architecture, Object oriented software architecture, Client server Architecture, Service oriented Architecture, Component based Architecture, Real time software Architecture

Unit V Design patterns 07 Hours

Introduction to Creational design pattern – singleton, Factory ,Structural design pattern- Proxy design pattern, Adapter design pattern, Behavioral – Iterator design pattern, Observer design pattern

Unit VI Testing 08 Hours
Introduction to testing, Error, Faults, Failures, verification and validation, Whit Box Testing, Black Box Testing, Unit testing, Integration testing, GUI testing, User acceptance Validation testing, integration testing, scenario testing, performance testing. Test cases and test plan. Case studies expected for developing usability test plans and test cases.
Note: Instructor should frame appropriate case studies/ mini-project (different case study for a group of 6-8 students) on unit-I to unit-V. The case study framed for unit-I may be continued/carry forward for next units if necessary. The same case studies/mini-projects should be tested using appropriate testing tool (preferably open source like

Selenium). Draw UML diagrams for mini project.

Books:

Text Books:

1. Jim Arlow, Ila Neustadt, “UML 2 and the unified process –practical object-oriented analysis and design” Addison Wesley, Second edition, ISBN 978-0201770605
2. Hassan Gomaa, “Software Modeling and Design- UML, Use cases, Patterns and Software Architectures” Cambridge University Press, 2011, ISBN 978-0-521-76414-8
3. Srinivasan Desikan, Gopalaswamy Ramesh, “Software testing-Principles and practices” Prentice Hall, 2007, ISBN 9788177581218

References Books:

1. Eric J. Braude, “Software Design: from Programming to Architecture”, J. Wiley, 2004, ISBN 978-0-471-20459-6
2. Gardy Booch, James Rambaugh, Ivar Jacobson, “The unified modeling language user guide” , Pearson Education, Second edition, 2008, ISBN 0-321-24562-8

Embedded Systems and Internet of Things

310252: Embedded Systems and Internet of Things

Credit 04

Unit I Introduction to Embedded System and Internet of Things 09 Hours

Embedded Systems: Application Domain and Characteristic of Embedded System, Real time systems and Real time scheduling, Processor basics and System-On-Chip, Introduction to ARM processor and its architecture. IoT: Definition and characteristics of IoT, Internet of Things: Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications

Unit II Embedded IoT Platform Design Methodology 09 Hours

Purpose and requirement specification, Process specification, Domain model specification, information model specification, Service specifications, IoT level specification, Functional view specification, Operational view specification, Device and component integration,

Application development

Unit III Pillars of Embedded IoT and Physical Devices 09 Hours
Horizontal, verticals and four pillars of IoT, M2M: The internet of devices, RFID: The internet of objects, WSN: The internet of transducer, SCADA: The internet of controllers, DCM: Device, Connect and Manage, Device: Things that talk, Connect: Pervasive Network, Mangae: To create business values. IoT Physical Devices and Endpoints: Basic building blocks of and IoT device, Exemplary device: Raspberry Pi, Raspberry Pi interfaces, Programming Raspberry Pi with Python, Beagle board and Other IoT Devices.

Unit IV IoT Protocols and Security 09 Hours
Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards, Protocols – IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee Architecture, Network layer, APS layer. IoT Security: Vulnerabilities of IoT, Security Requirements, Challenges for Secure IoT, Threat Modeling, Key elements of IoT Security: Identity establishment, Access control, Data and message security, Non-repudiation and availability, Security model for IoT.

Unit V Web of Things and Cloud of Things 09 Hours
Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing, Cloud Middleware, Cloud Standards – Cloud Providers and Systems, Mobile Cloud Computing, The Cloud of Things Architecture.

Unit VI IoT Physical Servers, Cloud Offerings and IoT Case Studies 09 Hours
Introduction to Cloud Storage Models, Communication API, WAMP: AutoBahn for IoT, Xively Cloud for IoT, Python Web Application Framework: Djanjo, Amzon Web Services for IoT, SkyNet IoT Messaging Platform. Case Studies: Home Intrusion Detection, Weather Monitoring System, Air Pollution Monitoring, Smart Irrigation.

Books:
Text:
1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515

2. Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”, CRC Press, 2012. ISBN : 9781439892992
3. Dieter Uckelmann, Mark Harrison, Florian Michahelles, “Architecting the Internet of Things”, Springer, 2011. ISBN: 978-3-642-19156-5
4. Lyla B. Das, “Embedded Systems: An Integrated Approach” Pearson , ISBN: 9332511675, 9789332511675.

References:

1. David Easley and Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning About a Highly Connected World”, Cambridge University Press, 2010, ISBN:10: 0521195330
2. Olivier Hersent, Omar Elloumi and David Boswarthick, “The Internet of Things: Applications to the Smart Grid and Building Automation”, Wiley, 2012, 9781119958345
3. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012, ISBN:978-1-119-99435-0
4. Barrie Sosinsky, “Cloud Computing Bible”, Wiley-India, 2010.ISBN : 978-0-470-90356-8
5. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, Wiley, 2014, ISBN: 978-1-118-43063-7
6. Christopher Hallinan, “Embedded Linux Primer”, Prentice Hall, ISBN:13: 978-0-13-167984-9