RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
Credit Based Grading System
Computer Science and Engineering VI-Semester
CS-6001 Advanced Computer Architecture

RATIONALE:

The purpose of this subject is to cover the underlying concepts and techniques used in Advance Computer Architecture. The Syllabus discusses principles of parallel algorithms design and different parallel programming models

PREREQUISITE

The students should have general Idea of Computer Organization. In addition, a familiarity with Memory organization, Computational models is required.

Unit-I

Flynn's Classification, System Attributes to Performance, Parallel computer models Multiprocessors and multicomputer, Multivector and SIMD Computers. Data and resource dependences, Hardware and software parallelism, Program partitioning and scheduling, Grain size and latency, Control flow, data flow and Demand driven mechanisms. Static interconnection networks, Dynamic interconnection Networks: Bus Systems, Crossbar Switch, Multiport Memory, Multistage and Combining Networks

Unit- II

Instruction set architecture, CISC Scalar Processors , RISC Scalar Processors, VLIW architecture, Memory Hierarchy, Inclusion, Coherence and Locality, Memory capacity planning. Interleaved memory organization- memory interleaving, pipelined memory access, Bandwidth and Fault Tolerance. Backplane Bus System :Backplane bus specification, Addressing and timing protocols, Arbitration transaction and interrupt.

Unit-III

Linear pipeline processor, Nonlinear pipeline processor, Instruction pipeline design, Mechanisms for instruction pipelining, pipeline hazards, Dynamic instruction scheduling – score boarding and Tomosulo's algorithm, Branch handling techniques, Arithmetic Pipeline Design, Static arithmetic pipeline, Multifunctional arithmetic pipelines. Superscalar pipeline design, Super pipeline processor design.

Unit-IV

Cache coherence, Snoopy protocols, Directory based protocols. Message routing schemes in multicomputer network, deadlock and virtual channel. Vector Processing Principles, Vector Instruction types, Vector-access memory schemes. Vector supercomputer architecture, SIMD organization: distributed memory model and shared memory model. Principles of Multithreading: Multithreading Issues and Solutions, Multiple-Context Processors

Unit-V

Parallel Programming Models, Shared-Variable Model, Message-Passing Model, Data-Parallel Model, Object-Oriented Model, Functional and Logic Models, Parallel Languages and Compilers, Language Features for Parallelism, Parallel Programming Environment, Software Tools and Environments.

Suggested Reading:

1. Kai Hwang, "Advanced computer architecture", TMH. 2013 - 14

2. J.P.Hayes, "computer Architecture and organization"; MGH.

3. V.Rajaranam & C.S.R.Murthy, "Parallel computer"; PHI Learning.

4. Kain,"Advance Computer Architecture: - A System Design Approach", PHI Learning

5. M.J Flynn, "Computer Architecture, Pipelined and Parallel Processor Design"; Narosa Publishing.

6. Hwang and Briggs, "Computer Architecture and Parallel Processing"; MGH.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
Credit Based Grading System
Computer Science and Engineering VI-Semester
CS-6002 Principles of Programming Languages

RATIONALE:-
The purpose of this subject is to cover the underlying concepts and techniques used in Programming Languages. It provides general idea related to operating & Programming environment.

PREREQUISITE:-
The students should have general idea about programming language . In addition, a familiarity with Elementary and Structured Data Types is needed for better understanding.

UNIT-I
Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms – Imperative, Object Oriented, functional Programming , Logic Programming. Programming Language Implementation – Compilation and Virtual Machines, programming environments. Issues in Language Translation: Syntax, Semantics, Stages, analysis and synthesis, Parse Tree, CFG and BNF grammar.

UNIT-II
Data types: Introduction, primitive, character, user defined, array, associative, record, union, Pointer and reference types, design and implementation uses related to these types. Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants, variable initialization. Sequence control with Expressions, Conditional Statements, Loops, Exception handling.

UNIT-III
Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, design issues for functions overloaded operators, co routines.

UNIT-IV

Abstract Data types: Abstractions and encapsulation, introductions to data abstraction, Static and Stack-Based Storage management. heap based storage management. Garbage Collection. object oriented programming in small talk, C++, Java, C#, PHP, Perl . Concurrency: Subprogram level concurrency, semaphores, monitors, massage passing, Java threads, C#threads.

UNIT – V
Exception handling, Exceptions, exception Propagation, Exception handler in C++ and Java.
Logic Programming Language: Introduction and overview of logic programming, basic elements of prolog, application of logic programming. Functional Programming Languages: Introduction, fundamentals. Introduction to 4GL.

Suggested Reading:
1. Tucker, "Programming Languages: Principles and paradigms ", Tata McGraw –Hill.
2. Cavlo Ghezzi & Mehdi Jazayeri " Programming Languages Concepts", Willey India
3. Sebesta,"Concept of programming Language", Pearson Edu
4. Terrance W Pratt, "Programming Languages: Design and Implementation" Pearson Edu.
5 Louden, "Programming Languages: Principles & Practices" , Cengage Learning 6 E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley

List of Practical's –

1. Design of lexical Analyzer using lex/flex.

2. Case study of working of virtual machine .

3. Memory Implementation of 2D and 3D Array .

4. Design a web page in PHP .

5. Implementation of pointers in C++.

6. Write a program in Java to implement exception handling.

7. Write a program in C++ to implement different parameter passing Methods.

8. Write a program in Java to implement concurrent execution of a job using threads.

9. Implement different types of functions used in Prolog .

10. Implement Inheritance, Encapsulation & Polymorphism in C#.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
Credit Based Grading System
Computer Science and Engineering VI-Semester
CS-6003 Software Engineering & Project management

RATIONALE:
The purpose of this subject is to cover the underlying concepts and techniques used in Software Engineering & Project Management. Some of these techniques can be used in software design & its implementation.

PREREQUISITE:-

The students should have at least one year of experience in programming a high-level language and databases. In addition, a familiarity with software development life cycle will be useful in studying this subject.

Unit I: The Software Product and Software Process
Software Product and Process Characteristics, Software Process Models: Linear Sequential Model, Prototyping Model, RAD Model, Evolutionary Process Models like Incremental Model, Spiral Model, Component Assembly Model, RUP and Agile processes. Software Process customization and improvement, CMM, Product and Process Metrics

Unit II: Requirement Elicitation, Analysis, and Specification
Functional and Non-functional requirements, Requirement Sources and Elicitation Techniques, Analysis Modeling for Function-oriented and Object-oriented software development, Use case Modeling, System and Software Requirement Specifications, Requirement Validation, Traceability

Unit III: Software Design

The Software Design Process, Design Concepts and Principles, Software Modeling and UML, Architectural Design, Architectural Views and Styles, User Interface Design, Function-oriented Design, SA/SD Component Based Design, Design Metrics .

Unit IV: Software Analysis and Testing

Software Static and Dynamic analysis, Code inspections, Software Testing, Fundamentals, Software Test Process, Testing Levels, Test Criteria, Test Case Design, Test Oracles, Test Techniques, Black-Box Testing, White-Box Unit Testing and Unit, Testing Frameworks, Integration Testing, System Testing and other Specialized, Testing, Test Plan, Test Metrics, Testing Tools. , Introduction to Object-oriented analysis, design and comparison with structured Software Engg.

Unit V: Software Maintenance & Software Project Measurement
Need and Types of Maintenance, Software Configuration Management (SCM), Software Change Management, Version Control, Change control and Reporting, Program Comprehension Techniques, Re-engineering, Reverse Engineering, Tool Support. Project Management Concepts, Feasibility Analysis, Project and Process Planning, Resources Allocations, Software efforts, Schedule, and Cost estimations, Project Scheduling and Tracking, Risk Assessment and Mitigation, Software Quality Assurance (SQA). Project Plan, Project Metrics.

Practical and Lab work

Lab work should include a running case study problem for which different deliverables at the end of each phase of a software prevelopment life cycle are to be developed. This will include modeling the requirements, architecture and detailed design. Subsequently the design models will be coded and tested. For modeling, tools like Rational Rose products. For coding and testing, IDE like Eclipse, Net Beans, and Visual Studio can be used.

Suggested Reading:

1. Pankaj Jalote ,"An Integrated Approach to Software Engineering", Narosa Pub, 2005

2. Rajib Mall, "Fundamentals of Software Engineering" Second Edition, PHI Learning

3. R S. Pressman ,"Software Engineering: A Practitioner's Approach", Sixth edition 2006, McGraw-Hill.

4. Sommerville,"Software Enginerring",Pearson Education.

5. Richard H.Thayer,"Software Enginerring & Project Managements", Wiley India

6. Waman S.Jawadekar,"Software Enginerring", TMH

7. Bob Hughes, M.Cotterell, Rajib Mall " Software Project Management", McGrawHill.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL
Credit Based Grading System
Computer Science and Engineering VI-Semester
CS-6004 Computer Networking

RATIONALE:-
The purpose of this subject is to cover the underlying concepts and techniques used in Computer Networking. This syllabus provides a comprehensive introduction to computer network, network architecture and protocols.

PREREQUISITE:-
The students should have thorough exposure in Analog and Digital Communication and Data Communications. Knowledge of Topology and protocol will help in better understanding

Unit –I
Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISO-OSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Network standardization. Queuing Models: Little's Theorem, Queuing System: M/M/1, M/M/m, M/M/∞**, M/M/m/m, M/G/1**

Unit-II
Data Link Layer: Need, Services Provided, Framing , Flow Control, Error control. Data Link Layer Protocol: Elementary & Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Bit oriented protocols: SDLC, HDLC, BISYNC, LAP and LAPB. Protocol verification: Finite State Machine Models & Petri net models.

Unit-III
MAC Sublayer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted-ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols: Adaptive Tree Walk, URN Protocol, High Speed LAN: Fast Ethernet, Gigabit Ethernet, FDDI, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Unit-IV
Network Layer: Need, Services Provided , Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing, Congestion Control Algorithms: General Principles of Congestion control, Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram subnets. IP protocol, IP Addresses, Comparative study of IPv4 & IPv6, Mobile IP.

Unit-V
Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Session layer: Authentication, Authorization, Session layer protocol (PAP, SCP, H.245). Presentation layer: Data conversion, Character code translation, Compression, Encryption and Decryption, Presentation layer protocol (LPP, Telnet, X.25 packet Assembler/Disassembler).Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

References:

1. Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks" Pearson Education.

2. Dimitri Bertsekas, Robert Gallager, "Data Networks", PHI Publication, Second Edition.

3. Kaveh Pahlavan, Prashant Krishnamurthy, "Networking Fundamentals", Wiley Publication.

4. Uyless Black, "Computer Networks", PHI Publication, Second Edition.

5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", McGraw Hill.

List of Experiments:

1. Study of Different Type of LAN& Network Equipments.

2. Study and Verification of standard Network topologies i.e. Star, Bus, Ring etc.

3. LAN installations and Configurations.

4. Write a program to implement various types of error correcting techniques.

5. Write a program to Implement various types of framing methods.

6. Study of Tool Command Language (TCL).

7. Study and Installation of Standard Network Simulator: N.S-2, N.S-3.OpNet,QualNet etc .

8. Study & Installation of ONE (Opportunistic Network Environment) Simulator for High Mobility Networks .

9. Configure 802.11 WLAN.

10. Implement & Simulate various types of routing algorithm.

11. Study & Simulation of MAC Protocols like Aloha, CSMA, CSMA/CD and CSMA/CA using Standard Network Simulators.

12. Study of Application layer protocols- DNS, HTTP, HTTPS, FTP and TelNet

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Computer Science and Engineering VI-Semester

CS-6005 Elective-II (1) Internet of Things
Unit 1:

Introduction: Definition, Characteristics of IOT, IOT Conceptual framework, IOT Architectural view, Physical design of IOT, Logical design of IOT, Application of IOT.

Unit 2:

Machine-to-machine (M2M), SDN (software defined networking) and NFV(network function virtualization) for IOT, data storage in IOT, IOT Cloud Based Services.

Unit 3:

Design Principles for Web Connectivity: Web Communication Protocols for connected devices, Message Communication Protocols for connected devices, SOAP, REST, HTTP Restful and Web Sockets. Internet Connectivity Principles: Internet Connectivity, Internet based communication, IP addressing in IOT, Media Access control.

Unit 4:

Sensor Technology , Participatory Sensing, Industrial IOT and Automotive IOT , Actuator, Sensor data Communication Protocols ,Radio Frequency Identification Technology, Wireless Sensor Network Technology.

Unit 5:

IOT Design methodology: Specification -Requirement, process, model, service, functional & operational view.IOT Privacy and security solutions, Raspberry Pi & arduino devices. IOT Case studies: smart city streetlights control & monitoring.

Reference Book:
1. Rajkamal,"Internet of Things", Tata McGraw Hill publication
2. Vijay Madisetti and Arshdeep Bahga, "Internet of things(A-Hand-on-Approach)" 1st Edition ,Universal Press
3. Hakima Chaouchi "The Internet of Things: Connecting Objects", Wiley publication.
4. Charless Bell "MySQL for the Internet of things", Apress publications.
5. Francis dacosta "Rethinking the Internet of things:A scalable Approach to connecting everything", 1st edition, Apress publications 2013.
6. Donald Norris"The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black", McGraw Hill publication.

CS-6005 Elective-II (2) Mobile Application Development

RATIONALE:-
The purpose of this subject is to cover the underlying concepts and techniques used in Mobile Communication. This syllabus provides a comprehensive introduction to Mobile Application development on various platforms.

PREREQUISITE:-
The students should have thorough exposure in Analog and Digital Communication and Data Communications. Knowledge of Computer network will be useful.

Unit-I Mobile Communication Fundamentals
Introduction, issues in mobile communications, Wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, handoffs, channel allocation in cellular systems, CDMA, GPRS, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, Mobile IP, WAP: Architecture, protocol stack, applications.

Unit-II Mobile Applications Development Frameworks and Tools
Introduction of Mobile Applications, Types and Benefits of a Mobile App, Mobile Platforms, deployment on Apple iOS with versions, Android, Windows phone application using development platforms: worklight, kendo, Appcon, Xcode, Xpage, Architecture of Mobile Software Applications, N-Tier Client–Server Frameworks and Tools, Java, BREW, Windows CE, WAP, Symbian EPOC, Publishing Frameworks, Mobile User Interface Design, Building Generic User Interfaces, mobile apps in the cloud.

Unit-III Mobile Agents and Peer-to-Peer Architectures for Mobile Applications
Mobile Agents for Mobile Computing, Applications of Mobile Agents to Mobile Applications and Implementation Tools, Techniques for Agent-Based Software, Peer-to-Peer Applications for Mobile Computing, security and fault tolerance.

Unit-IV Synchronization and Replication of Mobile Data
Taxonomy of Replication and Synchronization, Data Replication and Synchronization for Mobile Applications, SyncML, WebDAV, Mobile Agents, Replication, and Synchronization, Location Information Modeling, Problems with Building Location-Based Applications, Utilizing Location-Based Services with Mobile Applications, UML-Based Development Cycle for Mobile Applications, Architectural Patterns for Mobile Applications.

Unit-V Testing Mobile Applications, Validating the Mobile Use Cases before Development, The Effect of the Dimensions of Mobility on Software Testing, Stress Testing and Scalability Issues, Testing Location-Based Functionality, Android as your mobile platform, installation, Configuring of Eclipse and the Android SDK, Additional SDK Components, application layout and Android app development, Android user interface elements, Android Virtual Device, Connection to Google play.

References :
1.Reza b'far, Mobile computing Principles Designing and developing Mobile applications with Uml and xml, Cambridge University press.
2.Jeff Mcwherter, Scott Gowell, Professional Mobile application development, Wrox, John Wiley & Sons, Inc..
3.Richard Rodger, Beginning mobile application Development in the cloud, John Wiley & Sons, Inc.
4.J. Schiller, Mobile Communication , Addison Wesley.

Course Objective
Acquaint the students with the basic concepts of Intellectual Property Rights; and sensitize the students with the emerging issues in IPR and the rationale for the protection of IPR.

UNIT I Introduction
Introduction and Justifications of IPR, Nature of IP, Major forms of IP- *Copyright, Patent, Trade Marks Designs, Geographic indication, layout design of Semi conductors, Plant varieties, Concept & Meaning of Intellectual Property.*
Major international documents relating to the protection of IP - *Berne Convention, Paris Convention, TRIPS.* The World Intellectual Property Organization (WIPO).

UNIT II Copyright
Meaning and historical development of copyright , Subject matter , Ownership of copyright, Term of copyright, Rights of owner, Economic Rights, Moral Rights. Assignment and licence of rights, Infringement of copyright, Exceptions of infringement, Remedies, *Civil, Criminal, Administrative*, Registration Procedure.

UNIT III Patents
Meaning and historical development,. Criteria for obtaining patents, Non patentable inventions, Procedure for registration, Term of patent, Rights of patentee, Compulsory licence, Revocation, Infringement of patents, Exceptions to infringement, Remedies, Patent office and Appellate Board.

UNIT IV – Trade Marks, Designs & GI
Trade Marks: Functions of marks, Procedure for registration, Rights of holder, Assignment and licensing of marks, Infringement, Trade Marks Registry and Appellate Board.
Designs: Meaning and evolution of design protection, Registration, Term of protection, Rights of holder, unregistered designs.
Geographical Indication: Meaning and evolution of GI, Difference between GI and Trade Marks, Registration, Rights, Authorised user.

UNIT V Contemporary Issues & Enforcement of IPR
IPR & sustainable development, The Impact of Internet on IPR. IPR Issues in biotechnology, E-Commerce and IPR issues, Licensing and enforcing IPR, Case studies in IPR

Course Outcome:
1.Students will be able to understand Primary forms of IPR
2.Students will be able to asses and critique some basic theoretical justification for major forms of IP Protection
3.Students will be able to compare and contrast the different forms of IPR in terms of key differences and similarities.
4.Students will be able understand the registration procedures related to IPR.
5.Students will be exposed to contemporary issues and enforcement policies in IPR.

References:
1. P. Narayanan, Intellectual Property Law, Eastern Law House
2. . Neeraj Pandey and Khushdeep[Dharni, Intellectual Property Rights, PHI, 2014
3. N.S Gopalakrishnan and T.G. Agitha, Principles of Intellectual Property, Eastern Book Co. Lucknow, 2009.
4. Anand Padmanabhan, Enforcement of Intellectual Property, Lexis Nexis Butterworths, Nagpur, 2012.
5. Managing Intellectual Property The Strategic Imperative, Vinod V. Sople, PHI.
6. Prabuddha Ganguli, " Intellectual Property Rights" Mcgraw Hill Education, 2016.

RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA BHOPAL
Credit Based Grading System Computer Science and Engineering VI-Semester
CS-6007 Creativity and Entrepreneurship Development

Course Objective:

Understand and use tools for generating entrepreneurial ideas and problem solving. Understand and use tools for the selection of ideas.

Understand and gain the skills that are needed to implement ideas in today's society

Understand Entrepreneurship's part in process that includes idea generation and implementation.

Understand the concept of Entrepreneurship and its place in today's society

Course Outcomes:

Recognize an opportunity for a user group and frame an appropriate design challenge that addresses the need for the user.

Practice observation, interview and empathy skills to evolve a thorough understanding of the needs of the user.

Share and integrate team leanings.

Generate, develop and describe creative ideas that address the design challenge.

Syllabus:

1. The concept of Entrepreneurship, its history and its place in society.
2. The concept of Entrepreneurship and its relation to concept of innovation.
3. Creative processes for idea generation and problem solving.
4. Business plan.
5. Role of creativity, innovation and business research.
6. Entrepreneurship opportunities in contemporary business environment.

Reference Books :

1. Dollinger M.J. "Entrepreneurship strategies and resources," 3rd edition Pearson Education New Delhi.
2. Panda, Shiba charan "Entrepreneurship development", Anmol publication New Delhi.
3. Richard Blundel & Nigel locket, "Exploring Entrepreneurship : practices & perspectives Oxford.
4. Charles E. Banford & Garry D. Bruton, "Entrepreneurship – A small business Approach, Mcgrawhill Education.
5. P. Narayana Reddy, "Entrepreneurship" : Text and cases, Cengage learning
6. Rajeev Roy, "Entrepreneurship" Oxford.