

K L UNIVERSITY

DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

PhD ENTRANCE SYLLABUS

BASICS OF DIGITAL SYSTEMS

Number Systems & Codes: Review of Number systems, Classification of codes, Binary, BCD, Excess – 3, Gray, Error detection & Correction and Alphanumeric codes. **Boolean Algebra:** Boolean postulates, theorems, logic gates, implementation of logic gates using universal gates, Boolean functions – standard and canonical forms, simplification of Boolean functions using theorems, K – map simplification (up to 5 variables), Quine Mc-Cluskey method (up to 5 variables). **Combinational Logic Functions:** General design procedure for Combinational logic circuits, Design and applications of Binary Adders and Subtractors, Comparators, Encoders, Decoders, Multiplexers and De-multiplexers, Design of BCD to 7 Segment Decoder, Code converters, Parity Generator and Checker, BCD Adder / Subtractor, Carry look ahead adders. **Sequential Logic Functions– I:** Flip Flops, excitation tables, conversion of flip flops, Analysis of sequential logic functions, state reduction and state assignment techniques, Mealy and Moore models, Design of sequential logic functions. **Sequential Logic Functions–II:Counters:** Modulus of a counter, Asynchronous or ripple counters, synchronous counters, design of counters. **Shift registers:** Bi-directional Shift register, Universal shift register, Sequence Generator, Sequence Detector. **Algorithmic State Machine (ASM) Charts:** Salient features of ASM chart, Timing considerations, Control implementation, Design with multiplexers.

COMPUTER ORGANIZATION

Register transfer & micro-operations: Register Transfer Language, Register Transfer, Bus & memory Transfers, Arithmetic Micro-operations, Logic Micro Operations, Shift Micro-operation, Arithmetic Logic Shift Unit. **Basic computer organisation and design:** introduction codes, Computer Registers, Computer instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output and interrupt, Design of Basic Computer, Design of accumulator Logic, **micro programmed control:** Control Memory, Address Sequencing, Micro-Program example, Design of Control Unit. **Central processing unit:** General registers Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced instruction Set Computer (RISC). **Computer arithmetic:** Addition and Subtraction, Multiplication Algorithms, Division Algorithms , Floating-point Arithmetic Operations. **Memory organization:** Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory.**input-output organization:** Peripheral Devices, input-Output interface, Asynchronous Data Transfer, Modes of Transfer, Priority interrupt, Direct Memory Access (DMA), input –output Processor

MICRO-PROCESSORS & MICRO-CONTROLLERS

8086 Microprocessor: Introduction to Microprocessor, Intel Microprocessor families, 8086 Microprocessor architecture, Register Organization, Pin Description, Physical Memory Organization, Modes of operation. **8086 Instruction set & Assembly Language programming:** Addressing modes, Instruction set, Assembler directives, simple Programs, Procedures and Macros, 8086 Interrupts. **8051 Microcontroller:** Microcontroller families, 8051 Architecture, Signal Description, Register organization, Internal RAM, Special Function Registers, Interrupt control flow, Timer/Counter Operation, Serial Data Communication, and RS-232C Standard. **8051 Programming & Interfacing:** Addressing modes, Instruction set, Simple Programs involving Arithmetic and Logical Instructions, Timers/Counters, Serial Communication & Interrupts. **Interfacing:** Matrix Key Board, Stepper Motor, LCD's, DAC & ADC. **Introduction to ARM Processor:** Architecture, Registers, Pipe Line, Interrupts, Architecture revisions, ARM Instructions, LPC 2148 Architecture, GPIO.

EMBEDDED SYSTEMS

ES Basics: Introduction to Embedded Systems: Definition, Comparison with Loaded Systems, Challenges of Embedded systems, Application of Embedded Systems. Hardware fundamentals and devices: CHIPS, GATES, PCB, Power and decoupling, Timing Diagrams, Signal loading related issues, Clocks, Flip Flops, Memories, Micro Processors, PINS, ports, Address Resolution, Address Decoding within Micro Processors, Micro Processors VS Micro Controllers, Busses and Bus Handling, DMA, UART and RS232, PAL, FPGA, Timers, Counters, Pulse width Modulators for speed control, LCD Controllers, Key Pad Controllers, Stepper motor controllers, A/D Converters, Introduction to Temp Sensors, Flow Control devices, Humidity Control devices, Speed Control devices. Interfacing: Communication basics, Basic Terminology, Basic Protocol concepts, I/O Addressing: Port Based Addressing, Bus Based addressing, Memory mapped I/O, Standard I/O, Interfacing Micro Processors through Interrupts and DMA, Arbitration Techniques, Multi Bus Architecture Serial Communication and Protocols: I2C, CAN, Fire-wire, USB, Parallel Communication and protocols: PCI Bus, ARM Bus, Wireless Communication and Protocols: IrDA, Blue Tooth, 802.11g. ES Software Processing Platform: Micro Processor Architecture both CISC and RISC, Interrupt Processing, Shared data problem, Interrupt Latency, Software Architectures: Round Robin, Round Robin with Interrupts, Function Queue Scheduling, RTOS, and selecting architecture. Real Time Operating Systems: Tasks and Task data, Scheduler, Reentrancy, Semaphores, Semaphore Problems, Message Queues, Mail Boxes, Pipes, Timer Functions, Event Handling, Memory Management, Interrupt Processing, and Power saving Functions. Introduction to μ cos and VxWorks. Analysis, Design and Software Development: Analysis and designing Embedded Systems using RTOS: Overview, General Design Principles, Hardware and software CO design in Embedded Systems, Encapsulating Semaphores and Queues, Real Time Scheduling Considerations, Software development process and tools Testing and Debugging Techniques, Testing and Debugging Tools.

C -PROGRAMMING

Scalar Types and Input/output: Character set, Declaration, Integer types, Boolean type, Character type, Pointer type, Real floating-Point types, The pointer type, Typedefs, Initialization, Introduction to formatted input and output: the printf(), scanf() function. **Operators and Expressions:** Assignment, Arithmetic operators, Implicit type conversions, Precedence and associativity of operators, Relational, Logical, Compound assignment, Increment and Decrement, Cast operators type conversions, size of operator, Conditional operators. Comma operator, bitwise operators. **Statements and Control Flow:** Flow charts for Algorithm Development, simple and compound statements, Null and Expression statements, Selection statements, Repetition statements, Jump statements. Pseudo code for Procedures and algorithm development. **Functions:** Function Definition, Function prototypes, calling functions, Standard C Header files and libraries, Mathematical functions, and Recursive functions. **Arrays:** Declaration of Arrays, How arrays are stored in memory, Initialization of arrays , Processing Data in Arrays, Passing Arrays to Functions, Introduction to Vectors and Matrices. **Pointers:** Pointer variables, pointer Arithmetic, Pointer to arrays, Dynamic allocation of 2D arrays. **File Processing:** Opening and closing files, reading and writing sequential files and random access files. **Structures, Enumerations, Unions:** Structures, Enumerations, Unions, **Formatted Input and Output:** Formatting output for functions in the printf() family: Printing Integers, Floating point Numbers, Characters and Strings. Formatting input for functions in the scanf() family: Input an Integer, floating point Number, Characters and Strings. **Storage classes.** Global and local variables, storage classes, External functions and variables.

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. I/O Streams- file, byte streams, character streams, Exception Handling: Exception Handling fundamentals, Types of Exceptions, Usage of try and catch, throw, throws and finally keywords, Multithreading.

COMPUTER NETWORKS & SECURITY

SYLLABUS:

Introduction. Overview of networking using the Internet as an example, history and development of computer networks, networks topologies, LANs and WANs, OSI reference model, Internet TCP/IP Protocol Stack. Client/server paradigm, End-to-end communication:

packet switching and circuit switching. **Link layer:** Link layer services, error detection and correction, Sliding Window, Stop and Wait protocols. **MAC Layer:** Aloha, CSMA, CSMA/CD, CSMA/CA protocols. Examples: Ethernet, including Gigabit Ethernet and WiFi (802.11). Token Ring and to Bluetooth, WiMax. **Network layer:** Network layer services, IP packet switching, IP addresses- Subnetting, Classless addressing, Network Address Translation, Internet Protocol, IPv6, ARP, DHCP, ICMP, Routing algorithms: Distance vector, Link state, Metrics, RIP, OSPF, BGP, multicast, Inter-domain routing congestion control algorithms**Transport layer:** Ports, UDP, principles of reliable data transfer, TCP(handshake, windowing, congestion control) Connection establishment and termination, TCP variants, Use of TCP/IP protocol suite as running example, securing TCP (SSL) **Application layer.** Service requirements, WWW, HTTP, electronic mail, DomainName System, P2P, socket programming. Network Security :Introduction to symmetric and public key cryptography, Algorithms .