UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

CS : Computer Science & Engineering

FOURTH SEMSTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
CS2K 401	Engineering Mathematics IV	3	1	-	50	3	100
CS2K 402	Systems Programming	3	1	-	50	3	100
CS2K 403	Theory of Computation	3	1	-	50	3	100
CS2K 404	Electronic Circuits & Systems	3	1	-	50	3	100
CS2K 405	Computer Organization & Design	3	1	-	50	3	100
CS2K 406	Hardware Systems Design	3	1	-	50	3	100
CS2K 407(P)	**Data Structures Lab**	-	-	3	50	3	100
CS2K 408(P)	**Digital Electronics Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

CS2K 401 : ENGINEERING MATHEMATICS IV

(common with IT2K 401)

3 hours lecture and 1 hour tutorial per week

Module I: Fourier transforms (13 hours)

Fourier integrals and Fourier transforms - Fourier integral as the limit of a Fourier series - Fourier integral approximations and the Gibbs phenomenon - properties of Fourier transforms - applications of Fourier integrals and transforms - singularity functions and their Fourier transforms - Fourier integral to the Laplace transformation

Module II: Probability distributions (13 hours)

Random variables - introduction - discrete random variables - probability distributions - continuous random variables - probability density functions - mathematical expectation - the expected value of a random variable - moments - moment generating function - special probability distributions - binomial distribution - geometric distribution - hypergeometric distribution - Poisson distribution - special probability densities - uniform density - gamma, exponential and chi-square distributions - normal distribution - normal approximation to binomial distribution

Module III: Jointly distributed random variables (13 hours)

Joint distribution functions - independent random variables - covariance and variance of sums of random variables - joint probability distribution of functions of random variables - limit theorems - stochastic processes - conditional probability and conditional expectation

Module IV: Markov chains and Poisson process (13 hours)

Markov chains: introduction - Chapman-Kolmogorov Equations - classification of states - limiting probabilities - exponential distribution and Poisson process - introduction - exponential distribution - properties of exponential distribution - Poisson process - counting processes - definition of Poisson process - interarrival and waiting time distributions - further properties of Poisson processes

Text books

1. *Wylie C.R. & Barrett L.C., Advanced Engineering Mathematics , McGraw Hill*
2. *Freund J.E., Mathematical Statistics , Prentic e Hall of India*
3. *Ross, S.M. Introduction to Probability Models , Academic Press*

Reference books

1. *Nagarath. I.J, & Gopal M., Systems Modeling and Analysis , Tata McGraw Hill*
2. *Kreyszig E., Advanced Engineering Mathematics , John W iley*
3. *Johnson R.A., Miller & Freund's Probability and Statistics for Engineers, Prentice Hall of India*
4. *Karlin S. & Tailor H., A First Course in Stochastic Processes , Academic Press*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CS2K 402 : SYSTEMS PROGRAMMING

(common with IT2K 402)

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)

Background - system software machine architecture - the simplified instructional computer - traditional machines - RISC machines - *assemblers* - basic assembler functions - machine dependent and machine independent - assembler features - *assembler design* - assembler design options - implementation examples - AIX Assembler

Module II (13 hours)

Loaders and linkers - basic loader functions - machine dependent and machine independent loader features - loader design options and implementation examples - *macro processors* - basic macro processor functions - machine-independent macro processor features - macro processor design options and implementation examples

Module III (15 hours)

Introduction to operating systems - basic principles - batch processing - multiprogramming - timesharing systems and real-time systems - parallel and distributed systems - *computer system structure* - computer system operation - I/O structure - structure - storage hierarchy - hardware protection - general system architecture - *operating system structure* - system components - OS services - system calls - system structure - virtual machines

Module IV (9 hours)

General overview of the UNIX operating system - history of UNIX - system structure - user perspective - services - hardware assumptions - U*nix architecture* - system concepts - kernel data structures - system administration process (concepts only)

Text books

1. *Beck L.L., System Software - An introduction to Systems Programming , Addison Wesley*
2. *Bach M.J., The Design of the Unix Operating System , Prentice Hall India*

Reference books

1. *Dhamdhere D.M., Systems Programminmg & Operating Systems , Tata M cGraw Hill*
2. *Godbole S., Operating Systems , Tata McGraw Hill*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 f rom each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choic e to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CS2K 403 : THEORY OF COMPUTATON

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Preliminaries - review of proof techniques - mathematical induction - countable and uncountable sets - basic concepts of languages - automata and grammar - regular languages: regular expressions - finite deterministic and non deterministic automata - regular grammar - equivalence between various models (Kleene's theorem) - Boolean closure properties - homomorphism, substitution - decision algorithms - Myhill Nerode theorem and DFA state minimization - pumping lemma and proof for existence of non-regular languages

Module II (16 hours)

Context free languages - equivalence of CFG and PDA - normal forms (CNF and GNF) - closure properties of CFL's - DCFL's and their properties - ambiguous CFL's - decision procedures - CYK algorithm - pumping lemma and proof for existence of non context - free languages - context sensitive languages - equivalence of LBA and CSG - Turing machines: TM computations - equivalence of standard TM with multitape - two-way infinite tape and nondeterministic TMs - Turing acceptable, Turing decidable and Turing enumerable language classes - equivalence of type 0 grammars with TM's - Church's thesis - Chomsky Hierarchy

Module III (12 hours)

Computability - closure properties of recursive and recursively enumerable languages - Undecidability - halting problem - reductions - post correspondence problem - unsolvable problems about CFLs - *computational complexity* - time and space bounded simulations - classes P and NP - NP- completeness - Cook's theorem - bounded tiling problem - integer programming - travelling salesman problem

Module IV (12 hours)

Propostional calculus - validity and satisfiability - normal forms - compactness theorem - resolution - NP- completeness of satisfiability - *predicate calculus* : normal forms and Herbrand's expansion theorem - Skoklem Loweheim theorem - Unsolvability of satisfiablility - resolution

Text book

Lewis H.R.& Papadimitriou C.H., Elements of the Theory of Computation , Prentice Hall of India

Reference books

1. *Hopcroft J. E. & Ullman J. D., Introduction to Automata Theory, Languages and Computation , Narosa*
2. *Linz: P., An Introduction to Formal Languages & Automata , Narosa*
3. *Martin J. C., Introduction to Languages & the Theory of Computation , Tata McGraw Hill*
4. *Savage J.E., Models of Computation, Exploring th e Power of Computing , Addison Wesley*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 quest ions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 qu estions A and B of 15 marks from module IV with choice to answer any one

CS2K 404 : ELECTRONIC CIRCUITS & SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Diode switch, clipping and clamping circuits - transistor switch - bistable multivibrator - schmitt trigger - monostable and astable multivibrator - miller and bootstrap sweep generators

Module II (13 hours)

Logic levels - concepts of SSI, MSI, LSI and VLSI - logic families: NOT gate, TTL, ECL, CMOS logic - interfacing - comparison of logic families - TTL and MOS flip-flops

Module III (13 hours)

Memories: basic concepts - read only memories - programmable ROMs - static and dynamic random access memories - memory expansion - magnetic bubble memories - magnetic surface storage devices - CD-ROMs - special memories - sample and hold circuit - D/A converters - A/D converters - timing circuits

Module IV (13 hours)

Communication systems - need for modulation - external and internal niose - noise figure definition - amplitude modulation and demodulation - frequency and phase modulation - noise and FM - FM demodulation - TRF and superheterodyne receivers - radiation and propagation of electromagnetic waves

Text books

1. *Millman J. & Taub H., Pulse, Digital & Switch ing Waveforms , McGraw Hill*
2. *Taub H. & Schilling D., Digital Integrated Electronics , McGraw Hill*
3. *Kennedy G., Electronic Communication Systems , Tata McGraw Hill*

Reference books

1. *Nagarath I.J. , Electronics Analog & Digital, Prentice Hall India*
2. *Floyd T.L. , Digital Fundamentals, Universal Book Stall*
3. *Schilling D.L. & Belove C. , Electronic Circuits: Discrete & Integrated, McGraw Hill*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CS2K 405 : COMPUTER ORGANISATION & DESIGN

(common with IT2K 405)

3 hours lecture and 1 hour tutorial per week

Module I (14 hours)

Computer abstraction and technology: programming aspects – internals - historical perspective - measuring performance - relating the metrics - evaluating, comparing and summarizing performance - case study: SPEC95 benchmark - instructions - operations and operands of the computer hardware - representing instructions - making decision - supporting procedures - beyond numbers - other styles of addressing - starting a program - case study: 80x86 instructions

Module II (12 hours)

Computer arithmetic - signed and unsigned numbers - addition and subtraction - logical operations - constructing an ALU - multiplication and division - floating point - case study: floating point in 80x86

Module III (11 hours)

The processor: building a data path - simple and multicycle implementations - microprogramming - exceptions - case study: pentium pro implementation

Module IV (15 hours)

Memory hierarchy - caches - cache performance - virtual memory - common framework for memory hierarchies - case study - Pentium pro memory hierarchy - input/output - I/O performance measures - types and characteristics of I/O devices - buses - interfaces in I/O devices - design of an I/O system

Text book

Pattersen D.A. & Hennesy J.L., Computer Organisation & Design: The Hardware/ Software Interface , Harcourt Asia

Reference books

1. *Heuring V.P. & Jordan H.F., Computer System Design & Architecture , Addison Wesley*
2. *Hamacher, Vranesic & Zaky, Computer Organisation , McGraw Hill*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CS2K 406 : HARDWARE SYSTEMS DESIGN

(common with IT2K 406)

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Historical background of microprocessors - inside the PC*:* motherboard - graphic adapters and monitors - drive controllers - floppy and hard disk drives - streamers and other drives - parallel interfaces and printers - serial interfaces and modems - network adapters and LANs - CMOS RAM and real clock - keyboard, mouse and other rodents - the power supply - operating system - BIOS and memory organisation - *8086/8088 hardware specification* : clock generator - bus buffering and latching - bus timing - Ready and wait states - minimum and maximum modes - advanced processors - features of 80386, 80486 and Pentium processors

Module II (13 hours)

Microprocessor architecture: real mode and protected mode memory addressing - memory paging - addressing modes - data addressing - program memory addressing - stack memory addressing -

data movement instructions - arithmetic and logic instructions - program control instructions - programming the microprocessor: modular programming - using keyboard and display - data conversions - disk files - interrupt hooks

Module III (13 hours)

Memory interface: memory devices - address decoding, 8 bit (8088), 16 bit (8086), 32 bit (80486) and 64 bit (Pentium) memory interfaces - dynamic RAM. I/O interface - port address decoding - PPI, 8279 interface - 8254 timer interface - 16550 UART interface - ADC/DAC interfaces

Module IV (13 hours)

Interrupts: interrupt processing - hardware interrupts - expanding the interrupt - 8259A programmable interrupt controller - DMA: DMA operation - 8237 DMA controller - shared bus operation - disk memory systems - video displays - bus interface: ISA bus - EISA and VESA buses - PCI bus

Text book

Brey B.B. , The Intel Microprocessors 8086 to Pentium: Architecture, Programming and Interface , Prentice Hall of India

Reference books

1. *Messmer H.P., The Indispensable PC Hardware Book , Addison Wesley*
2. *Ray K. & Bhurchandi K.M., Advanced Microprocessors & Peripherals , Tata McGraw Hill*
3. *Hall D.V., Microprocessors & Interfacing: Programming & Hardware , Tata McG raw Hill*
4. *Miller K., An Assembly Language Introduction to Computer Architecture using the Intel Pentium , Oxford University Press*
5. *Bigelow S.J., Troubleshooting, Maintaining & Repairing PCs , Tata McGraw Hill*

Sessional work assessment

Assignments	*2x10 = 20*
2 tests	*2x15 = 30*
Total marks	*= 50*

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

CS2K 407(P) : DATA STRUCTURES LAB

[common with IT2K 407 (P)]

3 hours practicals per week

1. *Stack and queue* : implementation using arrays and linked lists
2. *Searching methods* : binary search and hashing
3. *Sorting* : recursive implementation of quick sort and merge sort
4. *Binary search tree* : implementation with insertion, deletion and traversal

5. *Infix expression evaluation* : using expression tree
6. *Graph Search Algorithms* : DFS and BFS on a connected directed graph
7. *Minimal Spanning Tree* : Implementation of Kruskal's and Prim's Algorithms
8. *Shortest Path Algorithms* : Dijkstra and Floyd Warshall Algorithms
9. *Disjoint Set operations* : union and find using rank and path compression
10. *Applications of heap* : priority queue and heap sort

Reference books

1. *Cormen T.H., Lieserson C.E. & Rivest R.L., Introduction to Algorithms , Prentice Hall of India*
2. *Sahni S., Data structures, Algorithms & Applications in C++ , McGraw Hill*

Sessional work assessment

Lab practicals & record = 30
2 tests 2x10 = 20
Total marks = 50

CS2K 408 (P) : DIGITAL ELECTRONICS LAB

3 hours practicals per week

1. Verification of truth tables of AND, OR, NOT, NAND, NOR and XOR gates, use for gating digital signals
2. TTL characteristics
3. Verification of the postulates of Boolean algebra and DeMorgan's theorem using logic gates
4. Half and full adders, half and full subtractors
5. Digital comparator, parity generator and checker, and code converter
6. Characteristics and operations of RS, gated RS, D, T, and JK master slave flipflops
7. Multiplexer and demultiplexer using gates
8. Shift register, ring counter, and twisted ring counter
9. Decade counter and variable modulo asynchronous counter
10. Astable multivibrator and schmitt trigger using gates, astable and monostable multivibrator and frequency divider using 555

Reference books

1. *Nagarath J., Electronics Analog & Digital , Prentice Hall India*
2. *Millman & Halkias, Integrated Electronics , Tata McGraw Hill*

Sessional work assessment

Lab practicals & record = 30
2 tests 2x10 = 20
Total marks = 50