# 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

SIXTH SEMESTER

| Code | Subject | Hours/Week | | | Sessional Marks | University Examination | |
|---|---|---|---|---|---|---|---|
| | | L | T | P/D | | Hrs | Marks |
| CS2K 601 | Design & Analysis of Algorithms | 3 | 1 | - | 50 | 3 | 100 |
| CS2K 602 | Database Management Systems | 3 | 1 | - | 50 | 3 | 100 |
| CS2K 603 | Graph Theory & Combinatorics | 3 | 1 | - | 50 | 3 | 100 |
| CS2K 604 | Computer Networks | 3 | 1 | - | 50 | 3 | 100 |
| CS2K 605 | Compiler Design | 3 | 1 | - | 50 | 3 | 100 |
| CS2K 606 | Elective II | 3 | 1 | - | 50 | 3 | 100 |
| CS2K 607(P) | **Systems Lab** | - | - | 3 | 50 | 3 | 100 |
| CS2K 608(P) | **Mini Project** | - | - | 3 | 50 | - | - |
| **TOTAL** | | **18** | **6** | **6** | **400** | **-** | **700** |

**Elective II**

CS2K 606A - Stochastic Processes
CS2K 606B - Distributed Systems
CS2K 606C - Unified Software Development
CS2K 606D - Image Processing
CS2K 606E - Linear System Analysis
CS2K 606F - Information Theory & Coding

## CS2K 601 : DESIGN & ANALYSIS OF ALGORITHMS

3 hours lecture and 1 hour tutorial per week

**Module I (13 hours)**

*Analysis:* RAM model - cost estimation based on key operations - big Oh - big omega - little Oh - little omega and theta notations - recurrence analysis - master's theorem - solution to recurrence relations with full history probabilistic analysis - linearity of expectations - worst and average case analysis of quick-sort - merge-sort - heap-sort - binary search - hashing algorithms - lower bound proofs for the above problems - amortized analysis - aggregate - accounting and potential methods - analysis of Knuth-Morris-Pratt algorithm - amortized weight balanced trees

**Module II (13 hours)**

*Design:* divide and conquer - Strassen's algorithm, o(n) median finding algorithm - dynamic programming - matrix chain multiplication - optimal polygon triangulation - optimal binary search trees - Floyd-Warshall algorithm - CYK algorithm - greedy - Huffman coding - Knapsack, Kruskal's and Prim's algorithms for mst - backtracking - branch and bound - travelling salesman problem - matroids and theoretical foundations of greedy algorithms

**Module III (13 hours)**

*Complexity:* complexity classes - P, NP, Co-NP, NP-Hard and NP-complete problems - cook's theorem (proof not expected) - NP-completeness reductions for clique - vertex cover - subset sum - hamiltonian cycle - TSP - integer programming - approximation algorithms - vertex cover - TSP - set covering and subset sum

**Module IV (13 hours)**

*Probabilistic algorithms:* pseudo random number generation methods - Monte Carlo algorithms - probabilistic counting - verifying matrix multiplication - primality testing - miller rabin test - integer factorization - Pollard's rho heuristic - amplification of stochastic advantage - applications to cryptography - interactive proof systems - les vegas algorithms - randomized selection and sorting - randomized solution for eight queen problem - universal hashing - Dixon's integer factorization algorithm

**Text books**

1. Corman T.H., Lieserson C.E. & Rivest R.L., *Introduction to Algorithms* , Prentice Hall India, Modules I, II and III
2. Motwani R. & Raghavan P., *Randomized Algorithms,* Cambridge University Press, Module IV

**Reference books**

1. Basse S., *Computer Algorithms: Introduction to Design And Analysis* , Addison Wesley
2. Manber U., *Introduction to Algorithms: A Creative Approach* , Addison Wesley
3. Aho V., Hopcraft J.E. & Ullman J.D., *The Design And Analysis of Computer Algorithms* , Addison Wesley

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
| Total marks | = 50 |

**University examination pattern**

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

## CS2K 602 : DATABASE MANAGEMENT SYSTEMS

(common with IT2K 602)

3 hours lecture and 1 hour tutorial per week

**Module I (12 hours)**

*Introduction* : characteristics of database approach - advantages of using DBMS - database concept and architecture - data models - schemes - instances - data independence - database languages and interfaces - database modeling using entity - relationship (ER) - entity sets attributes and keys - relationships - type role and structural constraints - weak entity types - enhanced entity-relationship (EER) and object modeling - sub classes - super classes and inheritance - specialization and generalization - modeling of union types

**Module II (10 hours)**

*File organization and storage:* secondary storage devices - RAID technology - operations in files - heap files and sorted files - hashing techniques - types of single level ordered index, multi-level indexes - B - trees and $B^+$ trees - indexes on multiple keys - other types of indexes

**Module III (14 hours)**

*Database design:* functional dependencies - normal forms - general definition of second and third normal forms - boyce-codd normal form - multi valued dependencies and fourth normal form - join dependencies and fifth normal form - inclusion dependencies - practical database design tuning - database design process relational model concepts - relational algebra operations - queries in SQL - insert - delete and update statements in SQL views in SQL

**Module IV (16 hours)**

*Transaction processing:* desirable properties of transactions, schedules and recoverability - serializability of schedules concurrency control - locking techniques - time stamp ordering multi version concurrency control - granularity of data items - database recovery techniques based on deferred up data and immediate updating - shadow pages - ARIES recovery algorithm - database security and authorization - security issue access control based on granting/revoking of privileges introduction to statistical database security

**Text book**

1. Elmasri & Navathe, *Fundamentals of Database Systems* , Addison Wesley

**Reference books**

1. Ramakrishnan R. & Gehrke J., *Database Management Systems* , McGraw Hill
2. O'neil P. & O'neil E., *Database Principles, Programming, and Performance* , Harcourt Asia, Morgan Kaufman
3. Silberschatz A., Korth H.F., & Sudarshan S., *Database System Concepts* , Tata McGraw Hill
4. Ullman J.D., *Principles of Database Systems* , Galgotia Publications
5. Date C.J., *An Introduction to Database Systems* , Addison Wesley

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|---|---|
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| Tests | 2x15 = 30 |
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**University examination pattern**

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

## CS2K 603 : GRAPH THEORY & COMBINATORICS

3 hours lecture and 1 hour tutorial per week

**Module I (13 hours)**

Introduction to graphs - definitions - subgraphs - paths and cycles - matrix representation of graphs - Euler tours - chinese postman problem - planar graphs - Euler's formula - platonic bodies

- applications of kuratowski's theorem - hamiltonian graphs - graph colouring and chromatic polynomials - map colouring

**Module II (14 hours)**
Trees - definitions and properties - rooted trees - trees and sorting - weighted trees and prefix codes - biconnected components and articulation points - Kruskal's and Prim's algorithms for minimal spanning trees - Dijkstra's shortest path algorithm - bellman-ford algorithm - all-pairs shortest paths - Floyed-Warshall algorithm - the max-flow min-cut theorem - maximum bipartite matching

**Module III (11 hours)**
Fundamental principles of counting - permutations and combinations - binomial theorem - combinations with repetition - combinatorial numbers - principle of inclusion and exclusion - derangements - arrangements with forbidden positions

**Module IV (14 hours)**
Generating functions - partitions of integers - the exponential generating function - the summation operator - recurrence relations - first order and second order - nonhomogeneous recurrence relations - method of generating functions

**Text book**

1. Grimaldi R.P., *Discrete and Combinatorial Mathematics: An Applied Introduction* , Addison Wesley

**Reference books**

1. Clark J. & Holton D.A., *A First Look at Graph Theory* , Allied Publishers (World Scientific)
2. Corman T.H., Leiserson C.E. & Rivest R.L., *Introduction to Algorithms* , Prentice Hall India
3. Mott J.L., Kandel A. & Baker T.P., *Discrete Math ematics for Computer Scientists And Mathematicians* , Prentice Hall of India
4. Liu C.L., *Elements of Discrete Mathematics* , McGraw Hill
5. Rosen K.H., *Discrete Mathematics and Its Applications* , McGraw Hill

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
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**University examination pattern**

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

## CS2K 604 : COMPUTER NETWORKS

(common with IT2K 604)

3 hours lecture and 1 hour tutorial per week

**Module I (13 hours)**
Computer networks - local area networks - wired LANs - Ethernet - token ring - token bus - wireless LAN protocols - high speed and bridged LANs - fast Ethernet - IEEE 802.12 - FDDI - bridges

**Module II (13 hours)**

Wide area networks - characteristics - packet switched networks - circuit switched networks - ISDN - private networks - internetworking - architecture - internetworking issues - Internet protocol standards - IP and IPv6

**Module III (13 hours)**

Transport protocols - user datagram protocol - transmission control protocol - protocol specification - transport layer - service definition

**Module IV (13 hours)**

Session layer - presentation layer - data encryption - presentation protocol - remote operations service element - commitment - concurrency and recovery - TCP/IP application protocol - directory service

**Text book**

Halsall F., *Data Communication, Computer Networks and Open Systems* , Addison Wesley

**Reference books**

1. Peterson L.L. &Davie B.S., *Computer Networks, A systems approach* , Harcourt Asia
2. Keshav S., *An Engineering Approach to Computer Networking* , AWL
3. Andrew S. Tanenbaum, *Computer Networks* , PHI
4. Leon-Garcia A. & Widjaja I., *Communication Networks* , Tata McGraw Hill
5. Bertsekas & Gallagar, *Data Networks* , PHI

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Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## CS2K 605 : COMPILER DESIGN

(common with IT2K 606D)

3 hours lecture and 1 hour tutorial per week

**Module I (10 hours)**

Introduction - analysis of the source program - phases of a compiler - compiler construction tools - lexical analysis - role of the lexical analyser - specification of tokens - recognition of tokens - lexical analyzer generators

**Module II (15 hours)**

Syntax analysis: role of the parser - context-free grammars - top-down parsing - bottom-up parsing - operator precedence parsing - LR parsers (SLR, canonical LR, LALR) - parser generators

**Module III (13 hours)**

Syntax-directed translation - syntax-directed definitions - S-atributed definitions - L-attributed definitions - bottom-up and top-down translation - type checking - type systems - specification of a type checker - run-time environments - source language issues - storage organization - storage allocation strategies - access to non-local names - parameter passing - symbol tables

**Module IV (14 hours)**

Intermediate code generation - intermediate languages - declarations - assignment statements - Boolean expressions - procedure calls - introduction to code optimization - sources of optimization - introduction to data-flow analysis - introduction to code generation - issues in the design of a code generator - the target machine - a simple code generator

**Text book**

Aho A.V., Sethi R. & Ullman J.D. *Compilers: Principles, Techniques and Tools,* Addison Wesley

**Reference books**

1. Aho A.V. & Ullman J.D. *Principles of Compiler Design* , Narosa
2. Muchnick S.S., *Advanced Compiler Design Implementation* , Harcourt Asia (Morgan Kaufman)
3. Holub A.I., *Compiler Design in C* , Prentice Hall India
4. Appel A.W., *Modern Compiler Implementation in C* , Cambridge University Press

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
| Total marks | = 50 |

**University examination pattern**

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

## CS2K 606A : STOCHASTIC PROCESSES

(common with IT2K 606A)

3 hours lecture and 1 hour tutorial per week

**Module I (13 hours)**

Markov chains and poisson processes (a brief revision) - continuous time Markov chains - definition -transition probability function - Chapman - Kolmogorov equations - rate matrix - Kolmogorov forward and backward equations - computing the transition probabilities - limiting probabilities - pure birth process - birth and death process - M/ M/ 1 queue

**Module II (13 hours)**

Renewal theory and its applications - the renewal process N(t) - distribution of N(t) - renewal function - renewal equation - limit theorems and their applications - elementary renewal theorem (without proof ) - applications of renewal theorem - central limit theorem of renewal processes (without proof) - renewal reward processes - regenerative processes - delayed renewal processes - alternating renewal processes

**Module III (13 hours)**

Queueing theory I: introduction - preliminaries - cost equations - Little's formula - steady state probability - exponential models - single server exponential queueing system - single server exponential - system having finite capacity - a queueing system with bulk service - network of queues - open systems - closed systems - the system M/G/1 - preliminaries - work and cost identity - applications of work to M/G/1 - busy periods - discussion of M/D/1 model and $M/E_k/1$ model

**Module IV (13 hours)**

Queueing theory II: variations on the M/G/1 - the M/G/1 with random sized batch arrivals - priority queues - the model G/M/1 - the G/M/1 busy and idle periods - multi server queues - Erlang loss system - the M/M/k queue -the G/M/k queue - the M/G/k queue - $M/G/\infty$ queue

**Text book**

Ross S.M., *Introd uction to Probability Models,* Sixth edition, Harcourt Asia Pvt. Ltd. and Academic Press, Chapter 6- sections6.1, 6.2, 6.3, 6.4, 6.5, 6.8; Chapter 7 - sections 7.1, 7.2, 7.3, 7.4, 7.5; Chapter 8 - Sections 8.1 to 8.5 for module 3 and the remaining for module 4

**Reference book**

Medhi J., *Stochastic Processes* , Wiley Eastern Ltd.

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
| Total marks | = 50 |

**University examination pattern**

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

## CS2K 606B : DISTRIBUTED SYSTEMS

(common with IT2K 606B)

3 hours lecture and 1 hour tutorial per week

**Module I (10 hours)**

Operating system fundamentals - distributed system concepts and architectures - major design issues - distributed computing environments (DCE)

**Module II (13 hours)**

Concurrent processes and programming - threads and processes - client server model - time services language mechanisms for synchronization - concurrent programming languages

**Module III (13 hours)**

Interprocess communication and coordination - message passing communication - request/reply communication - transaction communication - name and directory services - distributed mutual exclusion - leader election

**Module IV (16 hours)**

Distributed process scheduling - static process scheduling, dynamic load sharing and balancing - distributed process implementation - real-time scheduling - concepts of distributed file systems - distributed shared memory - distributed computer security

**Text book**

Chow R. & Johnson T., "*Distributed Operating Systems and Algorithms* ", Addison Wesley

**Reference books**

1. Sinha P.K., "*Distributed Operating Systems Concepts and Design* ", PHI
2. Tanenbaum S., "*Distributed Operating Systems* ", Pearson Education.
3. Coulouris G., Dollimore J. & Kindberg T., "*Distributed Systems Concepts And Design* ", Addison Wesley
4. Singhal M. & Shivaratri, "*Advanced Concepts in Operating Systems, Distributed Databases And Multiproces sor Operating Systems* ", 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 each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## CS2K 606C : UNIFIED SOFTWARE DEVELOPMENT

(common with IT2K 606C)

3 hours lecture and 1 hour tutorial per week

**Module I (13 hours)**

The unified process - use-case driven - architecture-centric - iterative and incremental - life of the unified process - the four Ps - people - project - product - and process in software development -

process tools - use cases - capturing - analysis - design and implementation - architectures - use cases - steps - description - iterative and incremental development - risks

**Module II (12 hours)**
Requirements - purpose and role - domain and business models - capturing the requirements as use cases - artifacts - workers - workflow - analysis - role of analysis - artifacts - workers - workflow

**Module III (12 hours)**
Design role of design - artifacts - workers - workflow - implementation - role of implementation - artifacts - workers - workflow - test - role of testing - artifacts - workers - workflow

**Module IV (15 hours)**
Iteration workflow - phases - planning risks - use-case prioritization - resources needed - assessment - inception - phases inception iteration - execution of the workflows - business case - assessment - elaboration - phases - elaboration iteration - execution of the workflows - business case - assessment - construction - phases - construction iteration - execution of the workflows - business case - assessment - transition - phases - activities - business case - assessment - making the unified process work

**Text book**

1. Jacobson I., Booch G., & Rumbaugh J., *The Unified Software Development Process* , Addison Wesley

**Reference books**

1. Kruchten P., *The Rational Unified Process: An Introduction* , Addison Wesley
2. Bahrami A., *Object-Oriented System Develop ment using the Unified Modeling Language* , McGraw Hill
3. Oestereich B., *Developing Software with UML,* Addison Wesley
4. Shaw M. & Garlan D., *Software Architecture* , Prentice Hall India

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
| Total marks | = 50 |

**University examination pattern**

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

## CS2K 606D : IMAGE PROCESSING

(common with EE2K 606D)

3 hours lecture and 1 hour tutorial per week

**Module I (20 hours)**
*Introduction* - digital image representation - fundamental steps in image processing - elements of digital image processing systems - *digital image fundamentals* - elements of visual perception - a simple image model - sampling and quantization - basic relationship between pixels - image geometry - image transforms - introduction to Fourier transform - discrete Fourier transform - some properties of 2-fourier transform (DFT) - the FFT - other separable image transforms - hotelling transform

**Module II (12 hours)**
*Image enhancement* - point processing - spatial filtering - frequency domain - color image processing - *image restoration* - degradation model - diagonalization of circulant and block circulant matrices - inverse filtering - least mean square filter

**Module III (10 hours)**
*Image compression* - image compression models - elements of information theory - error-free compression - lossy compression - image compression standards

**Module IV (10 hours)**
*Image reconstruction from projections* - basics of projection - parallel beam and fan beam projection - method of generating projections - Fourier slice theorem - filtered back projection algorithms - testing back projection algorithms

**Text book**
Rafael C., Gonzalez & Woods R.E., *Digital Image Processing* , Addison Wesley
**Reference books**
1. Rosenfeld A. & Kak A.C., *Digital Picture Processing* , Academic Press
2. Jain A.K, *Fundamentals of Digital Image Processing* , Prentice Hall, Englewood Cliffs
3. Schalkoff R. J., *Digital Image Processing and Computer Vision* , John Wiley
4. Pratt W.K., *Digital Image Processing* , John Wiley

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
| Total marks | = 50 |

**University examination pattern**
Q I - 8 short type questions of 5 marks each, 2 from each module
Q II - 2 questions of 15marks each from module I with choice to answer any one
Q III - 2 questions of 15marks each from module II with choice to answer any one
Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## CS2K 606E : LINEAR SYSTEMS ANALYSIS

(common with AI2K/CE2K/CH2K/EC2K/IC2K/IT2K 606E)

3 hours lecture and 1 hour tutorial per week

**Module I: System concepts and modelling of systems (11 hours)**
Systems - subsystems - elements - systems approach - classification of systems - static and dynamic systems - linear and nonlinear systems - distributed and lumped systems - time invariant and time varying systems - stochastic and deterministic systems - system modeling and approximations - superposition principle - homogeneity and additivity - modelling of electrical systems - active and passive elements - resistance inductance and capacitance - dynamic equations

using Kirchhoff's current and voltage laws - RL, RC and RLC circuits and their dynamic equations - block diagrams and signal flow graphs - masons gain formula

**Module II: Modelling of non-electrical systems (11 hours)**
Modelling of translational and rotational mechanical systems - differential equations for mass spring dashpot elements, D'alembert's principle - rotational inertia - stiffness and bearing friction - gear trains - equivalent inertia and friction referred to primary and secondary shafts - dynamic equations for typical mechanical systems - electromechanical analogues - force-current and force-voltage analogue - capacitance and resistance of thermal, hydraulic pneumatic systems - dynamic equations for simple systems - comparison of electrical, electromechanical, hydraulic and pneumatic systems

**Module III: Transfer function and time domain analysis (15 hours)**
Use of laplace transforms - concept of transfer function - impulse response - convolution integral - response to arbitrary inputs - transfer function of typical systems discussed in Module I - time domain analysis - test inputs - step - velocity and ramp inputs - transient and steady state response - first and second order - under damped and over damped responses - maximum overshoot - settling time - rise time and time constant - higher order systems - steady state error - error constants and error different types of inputs - Fourier series expansion of periodic functions - symmetry conditions - exponential form of Fourier series - Fourier integrals and Fourier transform - spectral properties of signals - analysis by Fourier methods

**Module IV: State space analysis and stability of systems (15 hours)**
Concept of state - state space and state variables - advantage over transfer function approach - state equations for typical electrical and mechanical and electromechanical systems - representation for linear time varying and time invariant systems - solution of state equation for typical test inputs - zero state and zero input response - concept of stability - bounded input bounded output stability - Lyapunov's definition of stability - a symptitic stability - Stability in the sense of Lyapunov-Routh Hurwitz criterion of stabilty for Single Input single output linear systems described by transfer function model

Reference books

1. Cheng D.K., *Linear Systems Analysis* , Addison Wesley
2. Tripati J.N., *Linear Systems Analysis* , New Age International

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

## CS2K 606F : INFORMATION THEORY & CODING

3 hours lecture and 1 hour tutorial per week

**Module I (14 hours)**

Information theory - information and entropy - properties of entropy of a binary memory less source - extension of a discrete memory less source - source coding theorem - Shannon-Fano coding - Huffman coding - Lempel ziv coding - discrete memory less source - binary symmetric channel - mutual information - properties - channel capacity - channel coding theorem - information capacity theorem

**Module II (14 hours)**

Coding - linear block codes - generator matrices - parity check matrices - encoder - syndrome and error detection - minimum distance - error correction and error detection capabilities - cyclic codes - coding and decoding

**Module III (14 hours)**

Introduction to algebra - groups - fields - binary field arithmetic - construction of galois field - basic properties - computations - vector spaces - matrices - BCH codes - description - decoding - reed solomon codes

**Module IV (10 hours)**

Coding - convolutional codes - encoder - generator matrix - transform domain representation - state diagram - distance properties - maximum likelihood decoding - Viterbi decoding - sequential decoding - interleaved convolutional codes

**Text books**

1. Simon Haykin, *Communica tion Systems* , John Wiley
2. Shu Lin, Daniel J Costello, *Error Control Coding - Fundamentals and Applications* , Prentice Hall Inc. Englewood Cliffs

**Reference books**

1. Das J., Malik S.K. & Chatterje P.K., *Principles of Digital Communication* , New Age International Limited
2. Shanmugham S., *Digital And Analog Communications* , John Wiley
3. Haykin S., *Digital Communications* , John Wiley
4. Taub & Shilling, *Principles of Communication Systems* , Tata McGraw Hill

| **Sessional work assessment** | |
|---|---|
| Assignments | 2x10 = 20 |
| Tests | 2x15 = 30 |
| Total marks | = 50 |

**University examination pattern**

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Q II - 2 questions of 15marks each from module I with choice to answer any one
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Q IV - 2 questions of 15marks each from module III with choice to answer any one
Q V - 2 questions of 15marks each from module IV with choice to answer any one

## CS2K 607(P) : SYSTEMS LAB

[common with IT2K 607(P)]

3 hours practical per week

**Operating systems**

1. Implementation of dining philosophers problem by multiprogramming using threads, semaphores and shared memory
2. Implementation of ls/dir command of Unix/Dos to display contents of a given floppy disk
3. Program to generate disk usage status report for a given Unix/Dos formatted floppy disk giving details like free space availability etc
4. Implementation of banker's algorithm
5. Inter-process communication using mailboxes and pipes

**Database management systems**

1. Conversion of a given relational scheme to 3NF and BCNF
2. Implementation of B tree and B+ tree
3. Implementation of a database stored in an RDBMS accessible through a web browser
4. Program to convert SQL subset into relational algebra (tools like YACC may be used.)
5. Implementation of optimistic concurrency control algorithm

**Reference books**

1. Nutt G.J., "*Operating Systems - A Modern Perspective* ", Addison Wesley
2. Bach M.J., "*The Design of the Unix Operating System"* , Prentice Hall India
3. Elmasri & Navathe, "*Fundamentals of Database Systems* ", Addison Wesley
4. Ramakrishnan R. & Gehrke J., "*Database Management Systems* ", McGraw Hill

**Sessional work assessment**

| | |
|---|---|
| Laboratory practical and record | = 30 |
| Test/s | = 20 |
| Total marks | = 50 |

## CS2K 608(P) : MINI PROJECT

3 hours practical per week

Each student group (not more than 5 members in a group) is expected to develop a complete software product using the software engineering techniques - the product is to be deployed and should have user manuals - a detailed report is also to be submitted - the students may be assessed individually and in groups.

**Sessional work assessment**

| | |
|---|---|
| Design & development | = 20 |
| Testing and installation | = 20 |
| Report | = 10 |
| Total marks | = 50 |