Data Structure Using C++

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART - A

Unit - 1

Introduction: Functions and parameters, Dynamic memory allocation classis, Testing and debugging. Data Representation, Introduction, Linear lists, Formula-based representation linked representation, Indirect addressing simulating pointers.

9 Hours

Unit - 2

Arrays And Matrics: Arrays, Matrices, Special matrices spare matrices.

6 Hours

Unit - 3

Stacks: The abstract data types, Derived classed and inheritance, Formula-based representation, Linked representation, Applications.

5 Hours

Unit - 4

Queues: The abstract data types, Derived classes and inheritance, Formula-based representation, Linked Linked representation, Applications.

6 Hours

PART - B

Unit - 5

Skip Lists And Hashing: Dictionaries, Linear representation, Skip list presentation, Hash table representation.

6 Hours

Unit - 6

Binary And Other Trees: Trees, Binary trees, Properties and representation of binary trees, Common binary tree operations, Binary tree traversal the ADT binary tree, ADT and class extensions.

7 Hours

Unit - 7

Pririty Queues: Linear lists, Heaps, Leftist trees.

6 Hours

Unit-8

Search Trees: Binary search trees, B-trees, Applications.

7 Hours

Text Book:

1. **Data structures, Algorithms, and applications in C++ -** Sartaj Sahni, McGraw Hill.2000.

Reference Books:

1. **Object Oriented Programming in C++** - Balaguruswamy. TMH, 1995.
2. **Programming in C++** - Balaguruswamy. TMH, 1995 .

Real-Time Systems

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART - A

Unit - 1

Introduction to Real-time systems: Historical background, RTS Definition, Classification of Real-time Systems, Time constraints, Classification of Programs.

6 Hours

Unit - 2

Concepts of Computer Control: Introduction, Sequence Control, Loop control, Supervisory control, Centralised computer control, Distributed system, Human-computer interface, Benefits of computer control systems.

6 Hours

Unit - 3

Computer hardware requirements for RTS: Introduction, General purpose computer, Single chip microcontroller, Specialized processors, Process-related Interfaces, Data transfer techniques, Communications, Standard Interface.

6 Hours

Unit - 4

Languages for Real-time Applications: Introduction, Syntax layout and readability, Declaration and Initialization of Variables and Constants, Modularity and Variables, Compilation, Data types, Control Structure, Exception Handling, Low-level facilities, Co routines, Interrupts and Device handling, Concurrency, Real-time support, Overview of real-time languages.

8 Hours

PART - B

Unit - 5 & 6

Operating Systems: Introduction, Real-time multi-tasking OS, Scheduling strategies, Priority Structures, Task management, Scheduler and real-time clock interrupt handles, Memory Management, Code sharing, Resource control, Task co-operation and communication, Mutual exclusion, Data transfer, Liveness, Minimum OS kernel, Examples.

12 Hours

Unit - 7

Design of RTSs – General Introduction: Introduction, Specification documentation, Preliminary design, Single-program approach, Foreground/background, Multi-tasking approach, Mutual exclusion, Monitors.

8 Hours

Unit - 8

RTS Development Methodologies: Introduction, Yourdon Methodology, Requirement definition for Drying Oven, Ward and Mellor Method, Hately and Pirbhai Method.

6 Hours

Text Books:

1. **Real - Time Computer Control- An Introduction**, Stuart Bennet, 2nd Edn. Pearson Education. 2005.

Reference Books:

1. **Real-Time Systems Design and Analysis**, Phillip. A. Laplante, second edition, PHI, 2005.
2. **Real-Time Systems Development**, Rob Williams, Elsevier. 2006.
3. **Embedded Systems**, Raj Kamal, Tata Mc Graw Hill, India, 2005.

Radio Frequency Integrated Circuits

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART - A

Unit - 1

Overview of Wireless Principles: A brief history of wireless systems, Noncellular wireless applications, Shannon, Modulations & Alphabet Soup, Propagation.

Passive RLC Networks: Introduction, Parallel RLC Tank, Series RLC Networks, Other RLC networks, RLC Networks as impedance Transformers.

7 Hours

Unit - 2

Characteristics of passive IC components: Introduction, Interconnect at radio frequencies: Skin effect, resisters, Capacitors, Inductors, Transformers, Interconnect options at high

frequency.

7 Hours

Unit - 3

A review of MOS device physics: Introduction, A little history, FETs, MOSFET physics, The long – channels approximation, operation in weak inversion (sub threshold), MOS device physics in the short – channel regime, Other effects.

Distributed systems: Introduction, Link between lumped and distributed regimes driving-point impedance of iterated structures, Transmission lines in more detail, Behavior of Finite – length transmission lines, summary of transmission line equations, artificial lines.

6 Hours

Unit - 4

The SMITH chart and S-parameters: Introduction, The smith chart, S-parameters, Band Width Estimation Techniques, Introduction, The method of open – circuit time constant, The method of short circuit time constant, Risetime, Delay and bandwidth.

6 Hours

PART - B

Unit - 5

High frequency amplifier design: Introduction, Zeros as bandwidth Enhancers, The shunt –series amplifier, Bandwidth Enhancement with f_T Doublers, Tuned amplifiers, Neutralization and unilateralization, Cascaded amplifiers, AM – PM conversion.

6 Hours

Unit - 6

Voltage references and biasing: Introduction, Review of diode behavior, Diodes and bipolar transistors in CMOS technology, Supply –independent bias circuits, Bandgap voltage reference, Constant g_m bias. **Noise**: Introduction, Thermal noise, Shot noise, Flicker noise, Popcorn noise, Classical two- port noise theory, Examples of noise calculations, A handy rule of thumb, Typical noise performance.

6 Hours

Unit - 7

Low noise amplifier design: Introduction, Derivation of intrinsic MOSFET two-port noise parameters, LNA topologies: Power match versus noise match, Power-constrained noise optimization, Design examples, linearity and large signal performance, Spurious – free Dynamic range. **Mixers:** Introduction, Mixer fundamental, Nonlinear systems as linear mixers.

7 Hours

Unit - 8

Multiplier – based mixers, Sub sampling mixers, Diode ring mixers, RF power amplifiers, Introduction, general considerations, Class A, AB, B and C power amplifier, Class D amplifiers, Class E amplifiers Class F amplifiers, Modulation of power amplifiers, summary of PA characteristics, RF PA design examples, additional design considerations, Design summery.

7 Hours

Text book:

1. **The design of CMOS radio-frequency integrated circuit**, Thomas H. Lee, 2nd edition Cambridge, 2004.

Reference Book:

1. **Design of Analog CMOS integrated circuit**, Behzad Razavi, Tata Mc Graw Hill,

2005.

Wavelet Transforms

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART - A

Unit - 1

Continuous Wavelet Transform: Introduction, C-T wavelets, Definition of CWT, The CWT as a correlation. Constant Q-Factor Filtering Interpolation and time frequency resolution, the CWT as an operator, inverse CWT.

5 Hours

Unit - 2

Introduction to Discrete Wavelet Transform And Orthogonal Wavelet Decomposition: Introduction. Approximation of vectors in nested linear vector spaces, (i) example of approximating vectors in nested subspaces of a finite dimensional liner vector space, (ii) Example of approximating vectors in nested subspaces of an infinite dimensional linear vector space. Example MRA. (i) Bases for the approximations subspaces and Harr scaling function, (ii) Bases for detail subspaces and Haar wavelet.

8 Hours

Unit - 3

Mra, Ortho Normal Wavelets And Their Relationship To Filter Banks: Introduction, Formal definition of an MRA. Construction of a general orthonormal MRA, (i) scaling function and subspaces, (ii) Implication of dilation equation and orthogonality, a wavelet basis for MRA. (i) Two scale relations for (t), (ii) Basis for the detail subspace (iii) Direct sum decomposition, Digital filtering interpolation (i) Decomposition filters, (ii) reconstruction, the signal.

8 Hours

Unit - 4

Examples of Wavelets: Examples of orthogonal basis generating wavelets, (i) Daubechies D_4 scaling function and wavelet. (ii) band

limited wavelets, Interpreting orthonormal MRAs for Discrete time MRA, (iii) Basis functions for DTWT.

5 Hours

PART - B

Unit - 5

Alternative Wavelet Representations: Introduction, Bi-orthogonal wavelet bases, Filtering relationship for bi-orthogonal filters, Examples of bi-orthogonal scaling functions and wavelets. 2-D wavelets.

8 Hours

Unit - 6

Non - separable multidimensional wavelets, wavelet packets. Wavelets Transform and Data Compression: Introduction, transform coding, DTWT for image compression (i) Image compression using DTWT and run-length encoding.

6 Hours

Unit - 7

(i) Embedded tree image coding (ii) compression with JPEG audio compression (iii) Audio masking, (iv) Wavelet based audio coding.

6 Hours

Unit - 8

Construction Of Simple Wavelets: Construction of simple wavelets like Harr and DB1. Other Applications of Wavelet Transforms: Introduction, wavelet de-noising, speckle removal, edge detection and object isolation, Image fusions, Object detection by wavelet transforms of projections.

6 Hours

Text book:

1. **Wavelet transforms- Introduction to theory and applications**, Raghuveer M.Rao and Ajit S. Bapardikar, Person Education, 2000.

Reference Books:

1. **Wavelet transforms,** Prasad and Iyengar, Wiley estern, 2001.
2. **Wave-let and filter banks**, Gilbert Strang and Nguyen Wellesley Cambridge press, 1996

Modeling and Simulation of Data Networks

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART - A

Unit – 1&2

Delay Models in Data Networks: Queuing Models, M/M/1, M/M/m, M/M/¥, M/M/m/m and other Markov System, M/G/1 System, Networks of Transmission Lines, Time Reversibility, Networks of Queues.

14 Hours

Unit – 3&4

Multi-access Communication: Slotted Multi-access and the Aloha System, Splitting Algorithms, Carrier Sensing, Multi-access Reservations, Packet Radio Networks.

12 Hours

PART - B

Unit – 5&6

Routing in Data Networks: Introduction, Network Algorithms and Shortest Path Routing, Broadcasting Routing Information: Coping with Link Failures, Flow models, Optimal Routing, and Topological Design, Characterization of Optimal Routing, Feasible Direction Methods for Optimal Routing, Projection Methods for Optimum Routing, Routing in the Codex Network.

14 Hours

Unit – 7&8

Flow Control: Introduction, Window Flow Control, Rate Control Schemes, Overview of Flow Control in Practice, Rate Adjustment Algorithms.

12 Hours

Reference BOOKs:

1. **"Data Networks"** Dimitri Bertsekas and Robert Gallager, 2nd edition, Prentice Hall of India, 2003.

2. **"High-Speed Networks and Internets"** William Stallings, Pearson Education (Asia) Pte. Ltd, 2004.

3. **"High Performance Communication Networks"** J. Walrand and P. Varaya, 2nd edition, Harcourt India Pvt. Ltd. & Morgan Kaufman, 2000.

Speech Processing

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART - A

Unit - 1

Production and classification of speech sounds: Introduction, mechanism of speech production. Acoustic phonetics: vowels, diphthongs, semivowels, nasals, fricatives, stops and affricates.

7 Hours

Unit - 2

Time-domain methods for speech processing: time dependent processing of speech, short-time energy and average magnitude, short-time average zero crossing rate.

7 Hours

Unit - 3

Speech vs. silence detection, pitch period estimation using parallel processing approach, short-time autocorrelation function.

7 Hours

Unit - 4

Brief Applications of temporal processing of speech signals in synthesis, enhancement, hearing applications and clear speech.

5 Hours

PART - B

Unit - 5

Frequency domain methods for speech processing: Introduction, definitions and properties: Fourier transforms interpretation and linear filter interpretation, sampling rates in time and frequency.

8 Hours

Unit - 6

Filter bank summation and overlap add methods for short-time synthesis of speech, sinusoidal and harmonic plus noise method of analysis/synthesis.

6 Hours

Unit - 7

Homomorphic speech processing: Introduction, homomorphic system for convolution, the complex cepstrum of speech, homomorphic vocoder.

7 Hours

Unit - 8

Applications of speech processing: Brief applications of speech processing in voice response systems hearing aid design and recognition systems.

5 Hours

Text book:

1. **Digital Processing of Speech Signals**, L. R. Rabiner and R. W. Schafer, Pearson Education Asia, 2004.

Reference Books:

1. **Discrete Time Speech Signal Processing**, T. F. Quatieri, Pearson Education Asia, 2004.
2. **Speech and Audio Signal Processing: Processing and Perception of Speech and Music**, B. Gold and N. Morgan, John Wiley, 2004.

Human Resource Management

Subject Code		:

IA Marks		: 25

No. of Lecture Hrs/Week		: 04

Exam Hours		: 03

Total no. of Lecture Hrs.		: 52

Exam Marks		: 100

PART – A

Unit - 1

Understanding the Nature and Scope of HRM, Context of HRM, Integrating HR Strategy with Business Strategy.

8 Hours

Unit - 2 & 3

Human Resource Planning, Analysing Work and Designing Jobs, Recruiting Human Resources, Selecting Human Resources.

12 Hours

Unit - 4

Training, Development and Career Management, Appraising and Managing

Performance, Managing Basic Remuneration.

6 Hours

PART – B

Unit - 5

Incentives and Performance based. Payments, Managing Employee benefits

and services.

6 Hours

Unit - 6

Managing Betterment work, Safe and Healthy Environment.

6 Hours

Unit - 7

Industrial Relations, Trade Unions.

6 Hours

Unit - 8

Managing Ethical Issues in HRM, Evaluating HRM Effectiveness, Contemporary issues in HRM, International issues in HRM. Case studies to be included in all chapters.

8 Hours

Text Book:

1. **Human Resource Management**: K. Ashwathappa, Text and Cases. Fifth Edition (2008) Tata McGraw-Hill Publishing Company Ltd., New Delhi.

Reference Book:

1. **Human Resource Management,** Gary Dessler, Tenth Edition (Indian subcontinent adaptation 2008), Pearson Education, Inc.

MICRO AND SMART SYSTEMS TECHNOLOGY

Subject Code	:	**06MS769**
IA Marks	:	25
No. of Lecture Hrs./ Week		

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

Introduction to micro and smart systems:

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.

5 Hours

UNIT - 2

Micro and smart devices and systems: principles and materials:

a) Definitions and salient features of sensors, actuators, and systems.

b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.

c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator.

d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin.

8 Hours

UNIT - 3

Micromanufacturing and material processing:

a. Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.

b. Silicon micromachining: surface, bulk, moulding, bonding based process flows.

c. Thick-film processing:

d. Smart material processing:

e. Processing of other materials: ceramics, polymers and metals

f. Emerging trends

7 Hours

UNIT - 4

Modeling:

a. Scaling issues.

b. Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.

c. Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators.

6 Hours

PART - B

UNIT - 5

Computer-aided simulation and design:

Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software.

8 Hours

UNIT - 6

Electronics, circuits and control:

Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler.

8 Hours

UNIT - 7

Integration and packaging of microelectro mechanical systems:

Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples.

6 Hours

UNIT - 8

Case studies:

BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

4 Hours

Part – C

UNIT - 9

Mini-projects and class-demonstrations (not for Examination)

9 Hours

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)

b) BEL pressure sensor

c) Thermal-cycler for PCR

d) Active control of a cantilever beam

Text books and a CD-supplement:

1. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Tsu, Tata Mc-Graw-Hill.

Reference books:

1. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

1. **Microsystems Design,** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.

2. **Analysis and Design Principles of MEMS Devices,** Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.

3. **Design and Development Methodologies,** Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.

4. **MEMS-** Nitaigour Premchand Mahalik, TMH 2007