UNIVERSITY OF CALICUT

SCHEME AND SYLLABI

FOR

SIXTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE & ENGINEERING

FROM 2004 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

SIXTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
CS04 601	Embedded Systems	3	1	-	50	3	100
CS04 602	Database Management System	3	1	-	50	3	100
CS04 603	Computer Networks	3	1	-	50	3	100
CS04 604	Graph Theory and Combinatorics	3	1	-	50	3	100
CS04 605	Compiler Design	3	1	-	50	3	100
CS04 606	Computer Graphics and Multimedia	3	1	-	50	3	100
CS04 607(P)	**Systems Lab**	-	-	3	50	3	100
CS04 608(P)	**Mini Project**	-	-	3	50	-	-
TOTAL		**18**	**6**	**6**	**400**	**-**	**700**

SIXTH SEMESTER

CS04 601 : EMBEDDED SYSTEMS

(common with IT04 601)

3 hours lecture and 1 hour tutorial per week

[Objective of the course is to teach students about architecture, hardware and software elements, programming models and practices and tools for embedded system design and implementation. The syllabus gives thrust on the hardware and real time operating systems used for the embedded systems design. Project works in the concerned field will supplement the learning process.**]**

Module I (10 hours)

Introduction: Definition - Classification - Processors in the system - Other h/w units. Software components - Typical applications - Embedded systems on a chip (SoC) and use of VLSI circuits.

Module II (12 hours)

Hardware organization: Structured units of a processor - Processor selection factors. Common memory devices - Memory selection - Memory map - Internal devices & I/O devices map - Direct memory access - Interfacing the above. Types of I/O devices - Serial devices - Parallel port devices - Sophisticated features - Timer and Counting devices - Advanced serial bus & I/O - High speed Buses - Common types - Advanced Buses.

Module III (15 hours)

Programming: Compiling, cross-compiling - Optimized use of memory - Use of DFG for program analysis - Control Data Flow graph - Use of finite state machines model - Use of Petrinet models - Use of Petri table for Real time programming - Issues in multiprocessor systems.

Real time programming issues during software development process - Distinction between functions, ISR and tasks - Problems of sharing data in RTOS – Inter-process communication in RTOS.

Device drivers - Parallel port driver - Driver for internal programmable timing devices - Interrupt servicing mechanism - Context and periods for context switching - Deadline and Interrupt latency.

Module IV (15 hours)

Real Time Operating Systems: Typical OS structure - RTOS structure - The context of its use - Schedule management for multiple tasks - Scheduling in real time - Interrupt routines in RTOS environment - RTOS task scheduling models - List of basic actions in pre-emptive scheduler and expected time taken - Strategy for synchronization - Discussion using Linux - OS securities issues - Mobile OS.

Case study of RTOS using MUCOS. Case study for RTOS based programming - Coding for Automatic Chocolate vending machine using MUCOS.

Text books

1. Raj Kamal; Embedded systems - architecture, programming and design; Tata McGraw-Hill

.

Reference books

1. J.B. Peatman; Design with Microcontrollers and Microcomputers; McGraw-hill
2. David E. Simon; An embedded software primer; Pearson Education Asia
3. Daniel W. Lewis; Fundamentals of Embedded Software where C and assembly meet; Pearson Education Asia

Sessional work assessment	
Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 602 : DATABASE MANAGEMENT SYSTEMS
(common with IT04 602)

3 hours lecture and 1 hour tutorial per week

[Objective: To introduce basic concepts of data bases connected with software engineering techniques and background information useful for the management of data bases. The syllabus includes the file organization, database design and transaction processing techniques.**]**

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
6. Dubois P., My SQL, Techmedia Publication

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 603 COMPUTER NETWORKS
(common with IT04 603)

3 hours lecture and 1 hour tutorial per week

[Objective: This course is beneficial for the students to understand the mode of operation of different types of Computer networks that are used to interconnect a distributed community of computers and various interfacing standards and protocols. This course includes the essential theory and different techniques associated with Local Area Network (LAN), Wide area Network (WAN) and Inter network.]

Module I (13 hours)

Local Area Networks – Project 802 - Ethernet – Token Bus – Token ring - FDDI, Wireless LANs, Wireless media, Transmission schemes, Medium access control, Switching – circuit switching – packet switching (Data gram & Virtual circuit) – Message switching, Connection oriented & Connectionless services.

Module II (14 hours)

ISDN – services - history – subscriber access - ISDN layers, Broadband ISDN, X.25 – layers – PLP packets – Information packet – Control Packet, Frame relay – layers – operation – implementation, ATM – design goals – topology – protocol architecture, SONET/SDH - layers – frames – multiplexing STS frames.

Module III (13 hours)

Networking devices – Bridges – Routers – Gateways, Routing algorithms – distance vector – link state, Transport layer – duties – connection – OSI transport protocol, Upper OSI layers – session layer – presentation layer – application layer.

Module IV (14 hours)

Overview of TCP/IP, Network layer – IP – ARP – RARP – ICMP – IGMP, Transport layer – UDP – TCP, Application layer – DNS - TELNET – FTP – Electronic Mail – SNMP – HTTP, World Wide Web – URL – browser architecture – WWW documents.

Text books

1. Behrouz Forouzan, *Introduction to data communication and networking*, Tata McGraw- Hill Publishing Company Ltd.

Reference books

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

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 604 : GRAPH THEORY & COMBINATORICS

3 hours lecture and 1 hour tutorial per week

[Objective: This course introduces the basics of graph theory as a modeling and analysis tool in computer science and engineering. It introduces the structures such as graphs and trees and several combinatorial techniques, which are needed in number theory based computing and network security studies in Computer Science.**]**

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 – the max-flow min-cut theorem – maximum bipartite matching – Matchings – matchings and augmenting paths –the personal assignment problem – Networks – flows and cuts – ford and Fulkerson algorithm – separating sets

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 – non-homogeneous recurrence relations – method of generating functions

Text books

1. Grimaldi R.P., *Discrete and Combinatorial Mathematics: An Applied Introduction*, Addison Wesley
2. Clark J. & Holton D.A., *A First Look at Graph Theory*, Allied Publishers (World Scientific)

Reference books

1. Corman T.H., Leiserson C.E. & Rivest R.L., *Introduction to Algorithms*, Prentice Hall India
2. Mott J.L., Kandel A. & Baker T.P., *Discrete Mathematics for Computer Scientists And Mathematicians*, Prentice Hall of India
3. Liu C.L., *Elements of Discrete Mathematics*, McGraw Hill
4. Rosen K.H., *Discrete Mathematics and Its Applications*, McGraw Hill

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 605 : COMPILER DESIGN

3 hours lecture and 1 hour tutorial per week

[Objective: Continuing on the fundamentals laid by Theory of Computation this course aims throwing light on the aspects of compilation and automatic generation of compilers as this is one important example of language conversion and its computability. For adequacy this has to be complemented with additional exercises selected from text/ reference. **]**

Module I (10 hours)
Introduction - analysis of the source program - phases of a compiler - compiler construction tools - lexical analysis - role of the lexical analyzer - 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-attributed 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
5. Kenneth C Lauden, *Compiler Construction – Principles and practice* , Thomson Brooks/Cole – Vikas Publishing House
6. Dick Grune, Henri E Bal, Ceriel J.H Jacobs & Koen G Langendoen, *Modern Compiler design*, Dream - tech

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 606 : COMPUTER GRAPHICS & MULTIMEDIA

3 hours lecture and 1 hour tutorial per week

[Objective: This course is to introduce fundamental principles of computer graphics and different media formats. The subject is very relevant in view of the continuing trend of convergence of media and communication engineering. For adequacy this has to be complemented by exercises appearing in texts and references.**]**

Module I (13 hours)

Introduction to computer graphics – programming in the simple raster graphics package - basic raster graphics algorithms for drawing 2D primitives - scan converting lines - circles - generating characters - geometrical transformations - 2D transformations - homogeneous coordinates and matrix representation of transformations - window-to-view-port transformation

Module II (9 hours)

Viewing in 3D projections - 3D transformations - basics of solid modeling - Input devices and interactive techniques - interaction hardware - basic interaction tasks – computer graphics programming in C/C++.

Module III (13 hours)

Introduction to multimedia - media and data streams - properties of a multimedia system - data stream characteristics - information units Multimedia building blocks - audio - basic sound concepts - music - speech - MIDI versus digital audio - audio file formats - sound for the web - images and graphics - basic concepts - computer image processing - video and animation - basic concepts - animation techniques - animation for the web

Module IV (12 hours)

Data compression - storage space and coding requirements - classification of coding/compression techniques - basic compression techniques like JPEG, H.261, MPEG and DVI - multimedia database systems - characteristics of multimedia database management system - data analysis - data structure - operations on data - integration in a database model

Text books

1. Foley J.D., Van Dam A., Feiner S.K., & Hughes J.F., *Computer Graphics Principles and Practice*, Addison Wesley
2. Steinmetz R. & Nahrstedt K., *Multimedia: Computing, Communications and Applications*, Pearson Education

Reference books

1. Newmann W & Sproull R.F., *Principles of Interactive Computer Graphics*, McGraw Hill
2. Rogers D.F., *Procedural Elements for Computer Graphics*, McGraw Hill
3. Hearn D. & Baker P.M, *Computer Graphics*, Prentice Hall India
4. Koegel Buford J.F., *Multimedia System*, Addison Wesley
5. Vaughan T., *Multimedia: Making it Work*, Tata McGraw Hill

Sessional work assessment

Assignments	2x7.5 = 15
Tests	2x15 = 30
Regularity	= 05
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

CS04 607(P) : SYSTEMS LAB

3 hours practical per week

[Objective: This course is useful to understand the operating system structures and the implementation aspects of various OS functions and schedulers. The data base problems are incorporated to familiarize the students with issues related to data base design.**]**

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
6. Program to find the least common ancestor of two given nodes in a binary tree (Concurrent Programming)
7. Program for the readers and writers problem (Concurrent Programming)

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

Lab practicals & record	= 25
Tests	2x10 = 20
Regularity	= 05
Total marks	= 50

CS04 608(P) : MINI PROJECT

3 hours per week

[Objective: The mini project is aimed at improving the professional competency of the students, touching those areas which otherwise are not covered in the normal course. The work practice here will help student to develop the ability to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research]

Guidelines

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.

The project work may include the use of the following.

OS platforms: Relevant to the current state of the art with support for networked environment, distributed computing and development of multi- platform applications.

Internet technologies: Architectural concepts, XML, Scripting languages, Middleware (Component) technologies

Front end / GUI: Code development or development based on tools.

RDBMS/Back End: Relevant to current state with database connectivity to different platforms.

Languages: Qt, Glade or any similar 4GLs, Scripting languages and C & C++ in Linux (under GNU gcc) etc

Universal n/w applications development platforms such as JAVA, .NET.

OS internals: Device drivers, RPC, Threads, Socket programming etc
Networking: Mechanisms, protocols, security etc
Embedded systems: RTOS, Embedded hardware with software for an application,
Code optimization, security etc.

Sessional work assessment		
Design & development	= 20	
Testing and installation	= 15	
Regularity		= 05
Report		= 10
Total marks		= 50