SCHEME AND SYLLABI FOR

SIXTH SEMESTER

OF

BACHELOR OF

TECHNOLOGY IN
COMPUTER SCIENCE AND ENGINEERING

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM

Semester VI		Hours / Week			Marks		Semester-end duration-hours	Credits
Code	Subject	L	T	D/P	Inte-rnal	S emes ter-end		
CS09 601	Embedded Systems	3	1		30	70	3	4
CS09 602	Compiler Design	4	1		30	70	3	5
CS09 603	Computer Networks	3	1		30	70	3	4
CS09 604	Database Management Systems	3	1		30	70	3	4
CS09 605	Computer Graphics	2	1		30	70	3	3
CS09 606	Elective I	3	1		30	70	3	4
CS09 607(P)	***Systems Lab***			3	50	50	3	2
CS09 608(P)	***Mini Project***			3				2
Total		**18**	**6**	**6**				**28**
Total Marks								

CS09 601 : Embedded Systems

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach students about architecture, hardware and software elements, programming models and practices and tools for embedded system design and implementation.*
- *To focus on the hardware and real time operating systems used for the embedded systems design.*

Pre-requisites: *Knowledge of digital design, computer organization*

Module I (14 hours)
Embedded systems: Overview, Design challenges-Optimising design metrics, Common design metrics-Processor technology-General purpose processors, Single purpose processors and Application specific processors.
IC technology: Full-custom/VLSI, Semi-custom ASIC, Compilation/Synthesis, libraries/IP, Test/Verification, Custom Single-purpose processors: Hardware-Combinational Logic, Transistors and logic gates, Basic combinational and Sequential logic design, Custom single purpose processor design and optimisation.
General-purpose processors: Software: Basic architecture, Datapath, Control unit, Memory, Instruction execution, Pipelining, Superscalar and VLIW architectures, Instruction set, Program and data memory space, Registers, I/O, Interrupts, Operating Systems, Development environment, Design flow and tools, Testing and debugging.
Application-specific instruction-set processors, Microcontrollers, Digital signal processors.
Standard single-purpose processors: Peripherals-some examples such as Timers, counters, Analog-digital converters, etc.

Module II (14 hours)

Memory: Write-ability and storage permanence. Common memory types, Composing memories, memory hierarchy and cache - Cache mapping techniques: replacement, write techniques, Cache impact on system performance, Advanced RAM, the basic DRAM, types of DRAMS, DRAM integration problem, Memory management unit (MMU)
Interfacing: Basic protocol concepts, Microprocessor interfacing: I/O addressing, interrupts, DMA, Arbitration methods, Multi-level bus architectures, Advanced communication principles, Parallel, Serial and Wireless communication, Error detection and correction, Bus standards and protocols.
An example: Digital camera - User's perspective, Designer's perspective, Specification, Informal functional specification, Non-functional specification, Executable specification Design, Implementation alternatives

Module III (13 hours)

State machine and concurrent process models: Models vs. languages, text vs. graphics, A basic state machine model: finite-state machines, FSM with datapath model FSMD, Hierarchical/Concurrent state machine model (HCFSM) and the State charts language, Program-state machine model (PSM),The role of an appropriate model and language
Concurrent process model: Concurrent processes, create, terminate suspend, resume and join, Interprocss Communication and synchronization methods and their implementation
Case studies : Windows CE, QNX

Module IV (11 hours)
Design technology: Automation-The parallel evolution of compilation and synthesis, Synthesis levels, Logic synthesis, Two-level and, Multi-level logic minimization, FSM synthesis, Technology mapping, Integration logic synthesis and physical design, Register-transfer synthesis, Behavioural synthesis, System synthesis and

hardware/software codesign, Intellectual property cores, New challenges posed by cores to processor providers and users.

Text Books

1. Frank Vahid and Tony Givargis, *Embedded System Design: A Unified Hardware/Software Introduction*, Wiley, 2002.

Reference Books

1. Jack Ganssle, *The Art of Designing Embedded Systems*, 2nd ed., Elsevier, 2008.
2. Raj Kamal, *Embedded systems - architecture, programming and design*, Tata McGraw Hill, 2007.
3. Steve Heath, *Embedded Systems Design*, 2nd ed., Elsevier, 2006.
4. Tammy Noergaard, *Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers*, Elsevier, 2008.
5. A.N.Sloss, D. Symes, and C. Wright, *ARM System Developer's Guide: Designing and*

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 602: Compiler Design

Teaching scheme **Credits:** 5
4 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce the various techniques involved in the translation of source programs into object programs by a compiler.*
- *To understand the inner working of a compiler using the various data structures used in the translation process.*

Module I (15 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 (16 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 (16 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 (18 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 Books

1. 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*, Dreamtech.
7. K.D.Cooper and Linda Torczon, *Engineering a Compiler*, Morgan Kaufmann/Elsevier, 2008

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 603: Computer Networks

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To teach 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.*

Module I (13 hours)
Local Area Networks: Ethernet, Token Ring Media Access Control, Token Ring Maintenance, FDDI, Resilient Packet Ring, Wireless: Bluetooth, Wi-Fi, WiMAX, Cell Phone Technologies. Circuit switching, Message switching, Packet Switching - Datagrams, Virtual circuit, source routing, Cell Switching - Cells, Segmentation and Reassembly, Virtual Paths, ATM design goals, Physical Layers for ATM.

Module II (13 hours)
Internetworking - Networking devices - Bridges, Routers, Gateways, Routing- Network as a graph, distance vector (RIP), link state (OSPF), Metrics, Routing for mobile hosts, Global Internet - Subnetting, CIDR, BGP, Routing areas.

Module III (13 hours)
Internetworking - IPv4 and IPv6, Multicast addresses, Multicast routing, DVMRP, PIM, MSDP, Multiprotocol label switching- Destination based forwarding, Explicit routing, virtual private networks and tunnels.

Module IV (13 hours)
End-to-End Protocols: Transport layer – duties, Simple Demultiplexer (UDP), Reliable byte Stream (TCP). end-to-end issues - segment format, connection establishment and termination, Triggering transmission, Adaptive retransmission, record boundaries. TCP extensions, Alternative design choices. Remote Procedure Call Fundamentals, RPC Implementation, Upper OSI layers - session layer, presentation layer, application layer.

Text Books

1. L. Peterson & Bruce S. Davie, *Computer Networks- A systems approach*, 4/e Morgan Kaufmann publishers an imprint of Elsevier

Reference Books

1. Behrouz Forouzan, *Introduction to data communication and networking*, Tata McGraw- Hill Publishing Company Ltd.
2. Halsall F., Data Communication, *Computer Networks and Open Systems*, Addison Wesley.
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.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 604: Database Management Systems

Teaching scheme **Credits:** 4
3 hours lecture and 1 hour tutorial per week

Objectives

- *To introduce the 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 (14 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 (12 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 (13 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 (13 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 Books

1. Elmasri & Navathe, *Fundamentals of Database Systems*, Pearson Education, fourth edition.

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

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 605: Computer Graphics

Teaching scheme **Credits:** 3
2 hours lecture and 1 hour tutorial per week

Objectives

- *To teach the fundamentals of computer graphics including algorithms for drawing 2D and 3D primitives, object transformations and the like.*

Module I (10 hours)
Introduction - Display devices - Random-scan and raster scan monitors - Color CRT - Plasma panel displays - LCD Panels - Plotters - Film Recorders - Graphics Workstations - Display processors - Graphics software - Input/Output Devices - Touch Panels - Light Pens - Graphics Tablets - 2D Drawing Geometry - Mathematics for Computer Graphics - A Brief Concept of Trigonometry - Polar Coordinates - Parametric Functions - Vectors - Scalar Product - Cross Product - Matrices - Scalar Multiplication - Matrix Addition and Multiplication - Matrix Inverse - 2D Transformation - Use of Homogeneous Coordinate Systems, Translation, Scaling, Rotation, Mirror Reflection, Rotation about an arbitrary point - Zooming and Panning - Rubber Band Methods - Dragging - Parametric Representation of a Line Segment

Module II (8 hours)
Graphic Operations - Windowport and viewport - Elimination of totally visible and totally invisible lines with respect to a rectangular window using line and point codes - Explicit line clipping algorithm - Sutherland Cohen Algorithm - Mid-point subdivision algorithm - Filling - Stack based and queue based seed fill algorithms - Scan line seed fill algorithm - Generation of Bar Charts - Pie Charts - Character Generation

Module III (9 hours)
Conics and Curves - Bresenham's Circle Drawing Algorithm – Ellipse drawing algorithm - Generation of Ellipses through transformation on circles - Curve Drawing - Parametric Representation - Cubic Curves - Drawing Cubic Bezier and B-Spline Curves - Beta splines - Rational splines

Module IV (12 hours)
3D Graphics - Transformations - Right handed coordinate system - transformation matrices for translation - Scaling and Rotation around axes - parallel projection - Multiviews - front, top and side views - Oblique view - Projection on xy plane with Rays along a given direction - Perspective projection - Transformation matrix to yield one vanishing point - Perspective view with viewpoint lying on z-axis - effect of Translating the object - Computing the vanishing point - Numerical Examples - Hidden surface removal - Back Face removal - Depth Buffer Method

Text Books

1. Hearn D., Baker P.M, *Computer Graphics*, Prentice Hall India.

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. Foley J. D., Van Dam A., Feiner S. K., & Hughes J. F., *Computer Graphics Principles and Practice*, Second Edition, Addison Wesley.

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: *Short answer questions (one/two sentences)* *5 x 2 marks=10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: *Analytical/Problem solving questions* *4 x 5 marks=20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: *Descriptive/Analytical/Problem solving questions* *4 x 10 marks=40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70

CS09 607(P) : Systems Lab

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To make the learners understand the operating system structures and the implementation aspects of various OS functions and schedulers.*
- *To teach data base technology and familiarize them with issues related to data base design through hands on practice.*

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

Internal Continuous Assessment *(Maximum Marks-50)*

60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination *(Maximum Marks-50)*

70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce

10% - Fair record

CS09 608(P) : Mini Project

Teaching scheme **Credits:** 2
3 hours practical per week

Objectives

- *To estimate the ability of the student in transforming the theoretical knowledge studied so far into a working model of a computer / information system.*
- *For enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year.*

In this practical course, each group consisting of three/four members is expected to design and develop a moderately complex computer / information system with practical applications; this should be a working model. The basic concepts of product design may be taken into consideration while designing the project. A committee consisting of minimum three faculty members specialised in computer science and engineering will perform assessment of the mini project. Students have to submit a report on the mini project and demonstrate the mini project before the evaluation committee.

The division of the total marks is into two namely, 60% of the total marks to be awarded by the guide / Co-ordinator and the remaining 40% by the evaluation committee.

Internal Continuous Assessment *(50 marks)*
40% - Design and development
30% - Final result and Demonstration
20% - Report
10% - Regularity in the class

Semester End Examination *(Maximum Marks-50)*

20% - Demonstration of mini project
50% - Practical test connected with mini project
20% - Viva voce
10% - Fair record