DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

------------------------------------------------

Scheme of Instruction

and

Syllabi of

M.Tech (Embedded Systems and Computing )

2017-2018

UNIVERSITY COLLEGE OF ENGINEERING

(AUTONOMOUS)

OSMANIA UNIVERSITY

HYDERABAD – 500 007, TELANGANA
# SCHEME OF INSTRUCTION
M.TECH (EMBEDDED SYSTEMS AND COMPUTING)
Proposed from the Academic year 2017-18

## SEMESTER - I

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Scheme of Instruction</th>
<th>Contact Hrs/Wk</th>
<th>Scheme of Examination</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td># Core</td>
<td>Core</td>
<td>3</td>
<td>3</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td># Core</td>
<td>Core</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td># Core/ *Elective</td>
<td>Core / Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td># Core/ *Elective</td>
<td>Core / Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>*Elective</td>
<td>Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>*Elective</td>
<td>Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
</tbody>
</table>

**Departmental Requirements**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>CS 5321</td>
<td>Software Lab - I</td>
<td>--</td>
<td>3</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>CS 5322</td>
<td>Seminar - I</td>
<td>3</td>
<td>3</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong> 18</td>
<td>6</td>
<td><strong>Total</strong> 24</td>
<td>22</td>
</tr>
</tbody>
</table>

## SEMESTER - II

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Scheme of Instruction</th>
<th>Contact Hrs/Wk</th>
<th>Scheme of Examination</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td># Core</td>
<td>Core</td>
<td>3</td>
<td>3</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td># Core</td>
<td>Core</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td># Core/ *Elective</td>
<td>Core / Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td># Core/ *Elective</td>
<td>Core / Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>*Elective</td>
<td>Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>*Elective</td>
<td>Elective</td>
<td>3</td>
<td>--</td>
<td>30 70</td>
<td>3</td>
</tr>
</tbody>
</table>

**Departmental Requirements**

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>CS 5323</td>
<td>Software Lab - II</td>
<td>--</td>
<td>3</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>CS5324</td>
<td>Seminar - II</td>
<td>--</td>
<td>3</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total</strong> 18</td>
<td>6</td>
<td><strong>Total</strong> 24</td>
<td>22</td>
</tr>
</tbody>
</table>
**SCHEME OF INSTRUCTION**
M.TECH (EMBEDDED SYSTEMS AND COMPUTING)
Proposed from the Academic year 2017-18

### SEMESTER III

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Scheme of Instruction</th>
<th>Contact Hrs/Wk</th>
<th>Scheme of Examination</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CS5325</td>
<td>Project Seminar</td>
<td>--</td>
<td>4</td>
<td>100**</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>--</td>
<td>4</td>
<td>100</td>
<td>8</td>
</tr>
</tbody>
</table>

**Project Seminar Evaluation:** 50 marks to be awarded by Supervisor and 50 marks to be awarded by Viva-Voce committee comprising Head, Supervisor and an Examiner.

### SEMESTER – IV

<table>
<thead>
<tr>
<th>S. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Scheme of Instruction</th>
<th>Contact Hrs/Wk</th>
<th>Scheme of Examination</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CS5326</td>
<td>Dissertation</td>
<td>--</td>
<td>6</td>
<td>200</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total</strong></td>
<td>--</td>
<td>6</td>
<td>200</td>
<td>16</td>
</tr>
</tbody>
</table>

**Note:** Six Core subjects, Six Elective subjects, Two Laboratory Courses and Two Seminars must be offered in Semester I and II.
# List of Core Subjects:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS 5301</td>
<td>Embedded System Design</td>
</tr>
<tr>
<td>2</td>
<td>CS 5302</td>
<td>Digital System Design</td>
</tr>
<tr>
<td>3</td>
<td>CS 5303</td>
<td>Microcontrollers for Embedded Systems</td>
</tr>
<tr>
<td>4</td>
<td>CS 5304</td>
<td>Real Time Operating Systems</td>
</tr>
<tr>
<td>5</td>
<td>CS 5305</td>
<td>Simulation and Modeling</td>
</tr>
<tr>
<td>6</td>
<td>CS 5306</td>
<td>Hardware and Software Co-design</td>
</tr>
</tbody>
</table>

*List of Elective Subjects:

<table>
<thead>
<tr>
<th>S.No</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS5054</td>
<td>Multimedia Technologies</td>
</tr>
<tr>
<td>2</td>
<td>CS 5056</td>
<td>Network Security</td>
</tr>
<tr>
<td>3</td>
<td>CS 5069</td>
<td>Human Computer Interaction</td>
</tr>
<tr>
<td>4</td>
<td>CS5101</td>
<td>Advanced Algorithms</td>
</tr>
<tr>
<td>5</td>
<td>CS 5251</td>
<td>Advanced Computer Networks</td>
</tr>
<tr>
<td>6</td>
<td>CS 5254</td>
<td>Wireless Sensor Networks</td>
</tr>
<tr>
<td>7</td>
<td>CS5351</td>
<td>Advanced Computer Architecture</td>
</tr>
<tr>
<td>8</td>
<td>CS5352</td>
<td>Scripting Languages for Design Automation</td>
</tr>
<tr>
<td>9</td>
<td>CS5353</td>
<td>Software Engineering for Real Time Systems</td>
</tr>
<tr>
<td>10</td>
<td>CS5354</td>
<td>Embedded Programming</td>
</tr>
<tr>
<td>11</td>
<td>CS5355</td>
<td>Field Programmable Gate Arrays</td>
</tr>
<tr>
<td>12</td>
<td>CS5356</td>
<td>System On Chip Architecture</td>
</tr>
<tr>
<td>13</td>
<td>CS5357</td>
<td>Optimization Techniques</td>
</tr>
<tr>
<td>14</td>
<td>CS558</td>
<td>Product Design and Quality Management</td>
</tr>
<tr>
<td>15</td>
<td>CS5359</td>
<td>Design for Testability</td>
</tr>
<tr>
<td></td>
<td>CS5360</td>
<td>DSP Architecture</td>
</tr>
<tr>
<td>----</td>
<td>--------</td>
<td>------------------</td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>CS5361</td>
<td>Graph Theory and its Applications</td>
</tr>
<tr>
<td>18</td>
<td>CS5362</td>
<td>Low Power VLSI Design</td>
</tr>
<tr>
<td>19</td>
<td>CS5363</td>
<td>Reliability and Fault Tolerance</td>
</tr>
<tr>
<td>20</td>
<td>CS5364</td>
<td>Performance Evaluation of Computer Systems</td>
</tr>
</tbody>
</table>

5
CS 5301  

Embedded System Design  

Credits: 3:

Instruction : 3L hrs per week  

Duration of SEE : 3 hours

CIE : 30 Marks  

SEE : 70 Marks

UNIT-I


UNIT-II

Embedded Hardware Design and Development: VLSI and Integrated Circuit Design, EDA tools, usage of EDA tools and PCB layout.

Embedded Firmware Design and Development: Embedded firmware Design approaches and Development languages. Examples of Embedded Systems, Design Metrics in Embedded System

UNIT-III


UNIT-IV

Introduction to Real Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment. OS security issues and Mobile OS.

UNIT-V


Suggested Reading:

CS 5302  
With effect from the Academic year 2017-2018

Digital System Design  
Credits: 3:

Instruction: 3L hrs per week  
Duration of SEE: 3 hours

CIE: 30 Marks  
SEE: 70 Marks

UNIT-I

Analysis & Design of Combinational Logic: Introduction to combinational circuits, code conversions, decoder, encoder, priority encoder, multiplexers as function generators, binary adder, subtractor, BCD adder, Binary comparator, arithmetic logic units.

UNIT-II

Design of Sequential Circuits- Derivation of State diagrams and tables, transition table, excitation table and equations. Analysis of simple synchronous sequential circuits, construction of state diagram, counter design with state equations, Registers, serial in serial out shift registers, tristate register, timing considerations.

UNIT-III


UNIT-IV

Design options of Digital Systems: Programmable logic devices, programmable read only memory, programmable logic arrays and programmable array logic, Design using PLA, PAL, and Field Programmable Gate Arrays. Synthesis: Design flow of ASICs and FPGA based system.

UNIT-V


Suggested Reading:

CS 5303

Microcontrollers for Embedded Systems

Credits: 3:

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT I

Memory Organization, Program Memory, Data Memory, Interrupts, Peripherals: Timers, Serial Port, I/O Port, Addressing Modes, Instruction Set, Programming

UNIT II


UNIT III

Introduction: RISC/ARM Design Philosophy and Functional Block Diagram. Programmers Model: Data Types, Processor modes, Registers, General Purpose Registers, Program Status Register, CP15 Coprocessor, Memory and memory mapped I/O, Pipeline, Exceptions, Interrupts and Vector table, and ARM Processor Families.

UNIT IV

ARM9 Microcontroller Architecture: Block Diagram, Features, Memory Mapping, Memory Controller (MC), External Bus Interface (EBI), Connections to Memory Devices System Timer (ST): Period Interval Timer (PIT), Watchdog Timer (WDT), Real- time Timer (RTT), Real Time Clock (RTC), and Parallel Input/Output Controller (PIO).

UNIT V


Suggested Reading:

Real Time Operating Systems
Credits: 3:

Instruction : 3L hrs per week  Duration of SEE : 3 hours

CIE : 30 Marks  SEE : 70 Marks

UNIT I


Portable Operating System Interface (POSIX) – IEEE Standard 1003.13 & POSIX real time profile. POSIX versus traditional Unix signals, overheads and timing predictability.

UNIT II


UNIT III


UNIT IV

VxWorks – POSIX Real Time Extensions, timeout features, Task Creation, Semaphores (Binary, Counting), Mutex, Mailbox, Message Queues, Memory Management – Virtual to Physical Address Mapping.

UNIT V

Debugging Tools and Cross Development Environment – Software Logic Analyzers, ICEs.

Comparison of RTOS – VxWorks, µC/OS-II and RT Linux for Embedded Applications.

Suggested Reading:
CS 5305  

Simulation and Modelling  

Credits: 3:  

Instruction : 3L hrs per week  
Duration of SEE : 3 hours  

CIE : 30 Marks  
SEE : 70 Marks  

UNIT-I  


UNIT-II  

Overview of Statistical Models and Queuing Systems Programming languages for Simulation: Continuous and discrete Simulation Languages – GPSS, SIMAN, SIMSCRIPT, MATLAB and SIMULINK  

UNIT-III  


UNIT-IV  


UNIT-V  

Suggested Reading:

CS 5306  
With effect from the Academic year 2017-2018

**Hardware and Software Co-design**

*Credits: 3:*

*Instruction : 3L hrs per week*  
*Duration of SEE : 3 hours*  
*CIE : 30 Marks*  
*SEE : 70 Marks*

**UNIT-I**


**UNIT-II**

**Design Space of Custom Architectures:** Finite State Machine with Data Path- Cycle based Bit-parallel Hardware, Hardware Modules, Finite State machines with data path, Simulation and RTL Synthesis of FSMD, Limitations of Finite State Machines.

**Micro programmed Architectures:** Microprogrammed Control, Encoding, Datapath. Implementing Microprogrammed Machine, Interpreters and Pipelining.

**UNIT-III**

**General-Purpose Embedded Cores:** Processors, RISC Pipeline, Program Organization and Analysis of quality of Compiled Code.

**System On Chip:** Concept and Design Principles in SoC Architectures.

**UNIT-IV**


**Hardware/Software Interfaces:** Synchronization Schemes, Memory-mapped Interfaces, CoProcessor Interfaces and Custom-Instruction Interfaces.

**UNIT-V**

**Co Processor Control Shell Design:** CoProcessor Control Shell, Data Design, Control Design, Programmers Model, AES encryption coprocessor.

**Case Study:** Trivium Crypto-Coprocessor and CORDIC Coprocessor.

**Suggested Reading:**

SOFTWARE LAB-I

Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks


I. Implement the following using 8051, ARM7/ARM9 and Embedded C:
   1) Experiments based on I/O Port, Timer, Serial & Interrupt Program using Keil (or equivalent) IDE.
   2) Experiments on:
      i. Digital Interfaces
      ii. LCD Display interfaces
      iii. Analog Interfaces
      iv. Keyboard Interfaces
      v. PC – Interface with RS232, Ethernet etc.,
      vi. Stepper motor, traffic light controller, sensor devices etc.,

   i. Combinational Circuits
   ii. Sequential Circuits and FSMs
   iii. Case study (Complete FPGA design flow including on-chip debugging)

Suggested Tools: Xilinx ISE/Altera Quartus, Modelsim/Active HDL and Target boards.

Note: The students have to submit a report using LaTeX at the end of the semester.

Suggested Reading:


Note: The students have to submit a report at the end of the semester.
SEMINAR - I  
Credits: 2

Instruction: (3L) hrs per week  
CIE: 50 marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad area of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members. Students are to be exposed to following aspects of seminar presentations.  
Literature survey  
Organization of material  
Preparation of Power point Presentation slides  
Technical writing

Each student is required to

1. Submit one page of synopsis of the seminar talk two days before for display on notice board. 
2. Give 20 minutes presentation through MS-PowerPoint Presentation Slides followed by 10 minutes discussion. 
3. Submit a report on the seminar topic with a list of references and slides used within a week.

Seminars are to be scheduled from the 3rd week of the last week of the semester and any change in schedule should be discouraged. The CIE marks will be awarded to the students by atleast 2 faculty members on the basis of oral presentation and report as well as their involvement in the discussion.
SOFTWARE LAB – II

Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks

Programs based on usage of UNIX commands, System Calls, Shell programming.

1. Program that makes a copy of a file using standard I/O and system calls (using command line arguments)
2. Program to implement ‘cat’ command using system calls
3. Program to implement ‘ls’ command using system calls
4. Program that takes one or more file/directory names as command line input and reports the following information on the file.
   A. File type.
   B. Number of links.
   C. Time of last access.
   D. Read, Write and Execute permissions.
5. Program to create a child process and allow the parent to display “parent” and the child to display “child” on the screen.
6. Write a program to create a Zombie process.
7. Write a program that illustrates how an orphan is created.
8. Write a program that illustrates how to execute two commands concurrently with a command pipe.
9. Write a program that illustrates suspending and resuming processes using signals.
10. Write a program to implement IPC using unnamed pipes (anonymous pipe)
11. Write a program to implement half duplex communication between two unrelated processes using named pipe (FIFO)
12. Write programs to demonstrate message queue IPC
13. Write a program that illustrates two processes communicating using shared memory.
14. Write a Program that demonstrate semaphores
15. Write a C program to demonstrate multi threading

Note: The students have to submit a report at the end of the semester.
SEMINAR –II
Credits: 2

Instruction: (3L) hrs per week
CIE: 50 marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of state of the art topics in broad areas of his/her specialization.

Seminar topics can be chosen by the students with the advice from the faculty members.
Students are to be exposed to following aspects of seminar presentation.

Literature Survey

Organization of material

Preparation of Power point Presentation slides and Technical Writing.

Each Student is required to:

1. Submit one page of synopsis of the seminar talk two days before for display on notice board.
2. Give 20 minutes presentation through MS-Power Point presentation slides followed by 10 minutes discussion.
3. Submit a report on the seminar topic with a list of references and slides used within a week

Seminar are to be scheduled from the 3rd week to the last week of the semester and any change in schedule should be discouraged.

The CIE marks will be awarded to the students by at least 2 faculty members on the basis of oral and a written presentation as well as their involvement in the discussion.
Multimedia Technologies

Credits: 3:

Instruction : 3L hrs per week  Duration of SEE : 3 hours
CIE : 30 Marks  SEE : 70 Marks

UNIT-I

Media and Data Streams: Properties of multimedia systems, Data streams characteristics: Digital representation of audio, numeric instruments digital interface Bark concepts, Devices, Messages, Timing Standards Speech generation, analysis and transmission.

UNIT-II

Digital Image: Analysis, recognition, transmission, Video: Representation, Digitalization transmission Animations: Basic concepts, animation languages, animations control transmission

UNIT-III

Data Compression Standards: JPEG, H-261, MPEG DVI
Optical storage devices and Standards: WORHS, CDDA, CDROM, CDWO, CDMO.
Real Time Multimedia, Multimedia file System.

UNIT-IV

Multimedia Communication System: Collaborative computing session management, transport subsystem, QOS, resource management.

Multimedia Databases: Characteristics, data structures, operation, integration in a database model. A Synchronization: Issues, presentation requirements, reference to multimedia synchronization, MHEG

UNIT-V

Multimedia Application: Media preparation, Composition, integration communication, consumption, entertainment.

Suggested Reading:

CS 5056

With effect from the Academic year 2017-2018

NETWORK SECURITY

Credits: 3

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT-I


UNIT-II

Secret Key Cryptography : DES, Triple DES, AES, Key distribution, Attacks

Public Key Cryptography: RSA, ECC, Key Exchange (Diffie-Hellman), Java Cryptography Extensions, Attacks

UNIT-III

Integrity, Authentication and Non-Repudiation : Hash Function (MD5, SHA5), Message Authentication Code (MAC), Digital Signature (RSA, DSA Signatures), Biometric Authentication.

UNIT-IV

PKI Interface: Digital Certificates, Certifying Authorities, POP Key Interface, System Security using Firewalls and VPN’s.

Smart Cards: Application Security using Smart Cards, Zero Knowledge Protocols and their use in Smart Cards, Attacks on Smart Cards

UNIT-V

Applications: Kerberos, Web Security Protocols (SSL), IPSec, Electronic Payments, E-cash, Secure Electronic Transaction (SET), Micro Payments, Case Studies of Enterprise Security (.NET and J2EE)

Suggested Reading:

Human Computer Interaction

Credits: 3

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT- I


UNIT- II

Discovery: Discovery Phase Framework, Collection, Interpretation, Documentation

UNIT- III

Interaction Design Models: Model Human Processor, Keyboard Level Model, GOMS, Modeling Structure, Modeling Dynamics, Physical Models
Usability Testing: Usability, Usability Test, Design the Test, Prepare for the Test, Perform the Test, Process the Data

UNIT- IV

Interface Components: The WIMP Interface, Other Components

UNIT- V

Speech and Hearing: The Human Perceptual System, Using Sound in Interaction Design, Technical Issues Concerning Sound
Suggested Reading:

CS 5101  

With effect from the Academic year 2017-2018

**Advanced Algorithms**  
*Credits: 3:*

*Instruction : 3L  hrs per week*  
*Duration of SEE : 3 hours*

*CIE : 30 Marks*  
*SEE : 70 Marks*

**UNIT-I**

**Algorithm Analysis:** Asymptotic Notation, Amortization.

**Basic Data Structures:** Stacks and Queues, Vectors, Lists and Sequences, Trees, Priority Queues, Heaps, Dictionaries and Hash Tables.

**Search Trees:** Ordered Dictionaries and Binary Search Trees, AVL Trees, Bounded-Depth Search Trees, and Splay Trees.

**UNIT-II**

**Fundamental Techniques:** The Greedy Method, Divide-and-Conquer, and Dynamic Programming.

**Graphs:** The Graph Abstract Data Type, Data Structures for Graphs, Graph Traversal, Directed Graphs.

**UNIT-III**

**Weighted Graphs:** Single-Source Shortest Paths, All-Pairs Shortest Paths, Minimum Spanning Trees.


**UNIT-IV**

**Text Processing:** Strings and Pattern Matching Algorithms, Tries, Text Compression, Text Similarity Testing.


**UNIT-V**

**Computational Geometry:** Range Trees, Priority Search Trees, Quad Trees and k-D Trees, Convex Hulls.
Suggested Reading:

Advanced Computer Networks

Credits: 3

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT I

History of Computer Networks and the Internet: Protocol Layers and Their Service Models
Review of OSI and TCP/IP Delay, Loss, and Throughput in Packet-Switched Networks

UNIT II

Wireless and Mobile Networks: Introduction, Wireless Links and Network Characteristics,
WiFi:802.11 Wireless LANs, Cellular Internet Access, Mobility Management: Principles
Managing Mobility in Cellular Networks, Wireless and Mobility: Impact on Higher-layer
Protocols, Bluetooth, Securing Wireless LANs

UNIT III

The Network Layer: Virtual Circuit and Datagram Networks,
The Internet Protocol (IP):
Forwarding and Addressing in the Internet Routing in the Internet Broadcast and Multicast
Routing, Congestion Control QOS Label Switching and MPLS, Mobile IP, Voice over IP, IPv6,
Network-Layer Security: IPsec

UNIT IV

Transport Layer: Introduction and Transport-Layer Services, Multiplexing and
Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer,
Connection-Oriented Transport: TCP, Principles of Congestion Control, TCP Congestion
Control, Securing TCP Connections: SSL,
Application Layer: Principles of Network Application, The Web and HTTP, HTTPS, File
Transfer: FTP, Electronic Mail in the Internet, Securing E-mail
DNS—The Internet's Directory Service, Peer-to-Peer Applications

UNIT V

Network Management: The Infrastructure for Network Management, The Internet-Standard
Management Framework, ASN.1, Multimedia Networking, Multimedia Networking
Applications, Streaming Stored Audio and Video, Making the Best of the Best-Effort Service,
Protocols for Real-Time Interactive Applications, Providing Multiple Classes of Service,
Providing (QOS) Quality of Service Guarantees.
Suggested Reading:

Wireless Sensor Networks

Credits: 3

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V

Suggested Reading:


CS 5351

Advanced Computer Architecture

Credits: 3:

Instruction : 3L hrs per week

Duration of SEE : 3 hours

CIE : 30 Marks

SEE : 70 Marks

UNIT-I
Measuring Performance and cost: Performance measurement, Enhancements to Uni processor models, Benchmarks, Basic model of advanced computer architectures.

UNIT-II
Pipelining and superscalar techniques: Basic pipelining, data and control hazards, Dynamic instruction scheduling, Branch prediction techniques, Performance evaluation, case study- Sun Microsystems -Microprocessor.

UNIT-III

UNIT-IV

UNIT-V
Multiprocessors and Multi computers: Multiprocessor models, Shared-memory and distributed memory architectures, memory organization, Cache Coherence and Synchronization Mechanisms, parallel computer, performance models.

Suggested Reading:
Scripting Languages for Design Automation

Credits: 3:

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT I
Introduction to Python Programming: Program Development Cycle, Input, Processing, and Output, Variables, Performing Calculations (Operators, Type conversions, Expressions),
Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables.
Repetition Structures: Introduction, while loop, for loop, Input Validation Loops, Nested Loops.

UNIT II
Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions.

UNIT III
File and Exceptions: Introduction to File Input and Output, Using Loops to Process Files, Processing Records, Exceptions.
Strings: Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings
Dictionaries and Sets: Dictionaries, Sets, Serializing Objects.

UNIT IV
UNIT V

GUI Programming: Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets, Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, Using Labels as Output Fields, Radio Buttons, Check Buttons.

Suggested Reading:
CS 5353

Software Engineering for Real Time Systems

Credits: 3:

Instruction : 3L hrs per week

Duration of SEE : 3 hours

CIE : 30 Marks

SEE : 70 Marks

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V


Suggested Reading:

Embedded Programming

Credits: 3

Instruction: 3L hrs per week
Duration of SEE: 3 hours

CIE: 30 Marks
SEE: 70 Marks

UNIT-I

UNIT-II
Embedded C Programming, Review of data types - Scalar types-Primitive types-Enumerated types- Subranges, Structure types-character strings -arrays- Functions Introduction to Embedded C-Introduction, Data types Bit manipulation, Interfacing C with Assembly. Embedded programming issues - Reentrancy, Portability, Optimizing, and testing embedded C programs.

UNIT-III
Embedded Applications using Data structures , Linear data structures- Stacks and Queues Implementation of stacks and Queues- Linked List - Implementation of linked list, Sorting, Searching, Insertion and Deletion, and non-linear structures.

UNIT-IV
Introduction to Object Oriented Concepts, Core Java/Java, Core- Java buzzwords, Overview of Java programming, Data types, variables and arrays, Operators, and Control statements.

UNIT-V
Embedded Java - Understanding J2ME, CDC (Connected Device configuration), CLDC (Connected Limited device configuration), MIDP applications.

Suggested Reading:


5. Tony Gaddis, Rebecca Halsey, *Starting Out with App Inventor for Android (1e)*
CS 5355

Field programmable Gate Arrays

Credits: 3:

Instruction : 3L hrs per week

Duration of SEE : 3 hours

CIE : 30 Marks

SEE : 70 Marks

UNIT-I

Introduction to ASIC: Types of ASIC’s, ASIC design flow, Economics of ASIC’s, Programmable ASIC’s: CPLD and FPGA. Commercially available CPLD’s and FPGA’s: XILINX, ALTERA, ACTEL. FPGA Design cycle, Implementation tools: Simulation and synthesis, and Programming technologies.

UNIT-II

FPGA logic cell for XILINX, ALTERA and ACTEL ACT, Technology trends, AC/DC IO Cells, clock and power inputs, FPGA interconnect: Routing resources, Elmore’s constant, RC delay and parasitic capacitance FPGA design flow, and Low-level design entry.

UNIT-III

FPGA physical design, CAD tools, Power dissipation, FPGA Partitioning, Partitioning methods.Floor planning: Goals and objectives, I/O, Power and clock planning, and Floor Planning tools.

UNIT-IV

Placement: Goals and objectives, Placement algorithms: Min-cut based placement, Iterative Improvement, and simulated annealing.

Routing: Goals and objectives, Global routing methods, Back-annotation. Detailed Routing: Goals and objectives, Channel density, Segmented channel routing, Maze routing, Clock and power routing, Circuit extraction, and DRC.

UNIT-V


Suggested Reading:

CS 5356

System On Chip Architecture

Credits: 3:

Instruction : 3L hrs per week
Duration of SEE : 3 hours

CIE : 30 Marks
SEE : 70 Marks

UNIT-I


UNIT-II


UNIT-III

Memory Hierarchy: Memory size and speed – On-chip memory Caches – Cache design- an example- memory management.

UNIT-IV


UNIT-V


Suggested Reading:

Optimization Techniques

Credits: 3

Instruction: 3L hrs per week

Duration of SEE: 3 hours

CIE: 30 Marks

SEE: 70 Marks

UNIT-I

Use of optimization methods. Introduction to classical optimization techniques, motivation to the simplex method, simplex algorithm, sensitivity analysis.

UNIT-II


UNIT-III

Descent methods, Gradient of function, steepest decent method, conjugate gradient method.


UNIT-IV

Review of a global optimization techniques such as Monte Carlo method, Simulated annealing and Tunneling algorithm.

UNIT V

Generic algorithm - Selection process, Crossover, Mutation, Schema theorem, comparison between binary and floating point implementation.

Suggested Reading:

With effect from the Academic year 2017-2018

Product Design and Quality Management

Credits: 3:

Instruction: 3L hrs per week
Duration of SEE: 3 hours

CIE: 30 Marks
SEE: 70 Marks

UNIT-I


UNIT-II


UNIT-III


UNIT-IV


UNIT-V

Total Quality Management, Quality Function Deployment, Product Liability, Failure Mode and Effect Analysis, Management Tools.

Suggested Reading:

CS 5359  

Design for Testability  

Credits: 3  

Instruction: 3L hrs per week  

Duration of SEE: 3 hours  

CIE: 30 Marks  

SEE: 70 Marks  

UNIT-I  


UNIT –II  


UNIT –III  


UNIT –IV  

Built-In Self-Test: The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.  

UNIT –V  

Boundary Scan Standard: Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.  

Suggested Reading:  
DSP Architecture

Instruction : 3L hrs per week

Credits: 3

Duration of SEE : 3 hours

CIE : 30 Marks

SEE : 70 Marks

UNIT I
Introduction to DSP Processors: Differences between DSP and other \mu p architectures, their comparison and need for special ASPs , RISC & CISC CPUs .

UNIT II
Overview of DSP processor design: fixed point DSPs – Architecture of TMS 320C 5X, C54X Processors, addressing modes, Assembly instructions, Pipelining and on-chip peripherals.

UNIT III
Floating point DSPs: Architecture of TMS 320 – IX- Data formats, Floating Point operations, addressing modes, instructions, pipelining and peripherals.

UNIT IV
DSP interfacing & software development tools: I/O interfacing with A/D converters, PCs, Dual port RAMs, EPGAs, DSP tools – Assembler, debugger, c-compiler, linker, editor, code composer studio.

UNIT V
Applications using DSP adaptive filtering, spectrum analysis, Echo cancellation modems, voice synthesis and recognition. Brief ideas of AD, Motorola DSP CPUs and their comparison with TI CPUs.

Suggested Reading:

Graph Theory and its Applications

Credits: 3

Instruction: 3L hrs per week

Duration of SEE: 3 hours

CIE: 30 Marks

SEE: 70 Marks

UNIT I

Preliminaries: Graphs, isomorphism, subgraphs, matrix representations, degree, operations on graphs, degree sequences

Connected graphs and shortest paths: Walks, trails, paths, connected graphs, distance, cut-vertices, cut-edges, blocks, connectivity, weighted graphs, shortest path algorithms

Trees: Characterizations, number of trees, minimum spanning trees.

UNIT II

Special classes of graphs: Bipartite graphs, line graphs, chordal graphs

Eulerian graphs: Characterization, Fleury’s algorithm, chinese-postman-problem

UNIT III

Hamilton graphs: Necessary conditions and sufficient conditions

Independent sets, coverings, matchings: Basic equations, matchings in bipartite graphs, perfect matchings, greedy and approximation algorithms

UNIT IV

Vertex colorings: Chromatic number and cliques, greedy coloring algorithm, coloring of chordal graphs, Brook’s theorem

Edge colorings: Gupta-Vizing theorem, Class-1 graphs and class-2 graphs, equitable edge-coloring.

UNIT V

Planar graphs: Basic concepts, Eulers formula, polyhedrons and planar graphs, characterizations, planarity testing, 5-color-theorem

Directed graphs: Out-degree, in-degree, connectivity, orientation, Eulerian directed graphs, Hamilton directed graphs, tournaments

Suggested Reading:

4. Douglas B West, Introduction to Graph Theory, Prentice Hall, 2004
CS 5362

With effect from the Academic year 2017-2018

Low power VLSI Design

Credits: 3:

Instruction: 3L hrs per week

Duration of SEE: 3 hours

CIE: 30 Marks

SEE: 70 Marks

UNIT-I
MOS Transistor – Nanometer Transistor and its model – body effect, Channel Length Modulation and short channel effects – velocity saturation, sub-threshold conduction, threshold voltage control, drain induced barrier lowering, gate induced drain leakage, Complete MOS Transistor Model and large and small signal models of BJT and MOSFETs.
CMOS Inverter: Static and Dynamic behavior and Power, Energy and Energy-Delay analysis of CMOS Inverter

UNIT-II
Designing Sequential Logic circuits: Introduction, Static Latches and Registers, Dynamic Latches and Registers

UNIT-III

UNIT-IV

UNIT-V

Suggested Reading:

CS 5363

Reliability and Fault Tolerance

Credits: 3:

Instruction : 3L hrs per week

Duration of SEE : 3 hours

CIE : 30 Marks

SEE : 70 Marks

UNIT-I

Introduction to Reliability Engineering: Reliability, Repairable and Non-repairable Systems, Maintainability and Availability, Desighning, Reliability, Repairable and Non-repairable Systems, MTBF MTBF, MTTF MDT, k out of in systems.

UNIT-II


UNIT-III

Software Reliability Modeling: Introduction to Software Reliability Modeling, Parameter Determination and Estimation, Model Selection, Markovian Models, Finite and Infinite failure category Models, Comparison of Models, Calendar Time Modeling.

UNIT-IV


UNIT-V


Suggested Reading:

CS 5364  

Performance Evaluation of Computer Systems  
Credits: 3:

Instruction : 3L hrs per week  
Duration of SEE : 3 hours

CIE : 30 Marks  
SEE : 70 Marks

UNIT-I  

UNIT-II  

UNIT-III  

UNIT-IV  

UNIT-V  
Analysis of Computer Architectures:  
Case I: Central Server Computer System  
Case II: Multiple Server Computer System  
Case III: Petri Net Example  
Suggested Reading:

