

School of Electronics, Devi Ahilya University, Indore
M. Tech. Mobile Computing Technology, Batch 2021-23 (Scheme)

Semester I

32Credits

Sr. No	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
Core Subjects						
1	EL71109	Wireless Networks	3	1	0	4
2	EL71105	Embedded Microcontrollers	3	1	0	4
3	EL71102	Linux, Scripting and Networking	3	1	0	4
Electives: Discipline Centric						
4	EL71104/ EL71101	Digital Signal Processing/ Database Management Systems	3	1	0	4
Electives: Generic						
5	EL71103	System Programming	3	1	0	4
6	EL71205	Embedded Microcontroller Lab	0	0	4	2
7	EL71202	Linux Lab	0	0	4	2
8	EL71203	System Programming Lab	0	0	4	2
9	EL71204/ EL71201	Digital Signal Processing Lab/ DBMS Lab	0	0	4	2
10	EL71301	Comprehensive Viva Voce (Virtual)	-	-	-	4

Semester II

32 Credits

Sr. No	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
Core Subjects						
1	EL72108	Mobile Computing	3	1	0	4
2	EL72102	Real Time Systems	3	1	0	4
3	EL72103	Wireless Ad hoc Networks	3	1	0	4
Electives: Discipline Centric						
4	EL72106/ EL72104	Digital Image Processing/ Advanced Embedded Microcontroller-ARM	3	1	0	4
Electives: Generic						
5	EL72111	Wireless Computer Networks & IoT	3	1	0	4
6	EL72211	Wireless Computer Networks & IoT Lab	0	0	4	2
7	EL72202	Real Time Systems Lab	0	0	4	2
8	EL72203	Wireless Networks Lab	0	0	4	2
9	EL72206/ EL72204	Digital Image Processing Lab/ Advanced Embedded Microcontroller Lab	0	0	4	2
10	EL72301	Comprehensive Viva Voce (Virtual)	-	-	-	4

Semester III

12 Credits

Sr. No	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL73501	Major Project Phase I	-	-	-	12

Semester IV

12 Credits

Sr. No	Course Code	Course Name	Lecture (L) Hr	Tutorial (T) Hr	Practical (P) Hr	Credit
1	EL74501	Major Project Phase II	-	-	-	12

Total Credits 88Credits

Programme Objectives

Mobile computing is human computer interaction by which computer is expected to be transported during normal usage. Mobile Computing involves mobile and wireless communication, mobile hardware and mobile software. Following are the programme objectives

1. Addresses the modern data communication architecture evolution from several aspects
2. Learn the hardware and software requirement for Mobile Computing
3. Gain practical knowledge and theoretical insights in field of application, services and mobile networking
4. Exposure to the emerging field of Internet of Things

SEMESTER – I

EL71109	Wireless Networks
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Course Objectives

1. To appreciate the contribution of Wireless Communication networks to overall technological growth.
2. To understand the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.
3. To gather knowledge about wireless communication networks and 5G mobile networks
4. To acquire knowledge about 5G architecture

Review of IEEE 802.11 based wireless LAN, their architecture, physical and MAC layer, evolution and current technology perspective.

Overview of Wireless personal area networks (PAN) / IEEE 802.15 and variants their architecture, physical and MAC layer issues Bluetooth layers model and applications. A brief introduction of enablers for wireless networks: OFDM, diversity techniques, smart antenna, MIMO techniques and efficient use of wireless spectrum.

Wireless MAN IEEE 802.16 / WiMAX: protocol layers, different variants and their comparison. WiMAX architecture. WiMAX physical layer and Medium access control layer. WiMAX deployment scenario in India, mobility and handover issues of WiMAX.

IEEE 802.22 Wireless Regional Area Network, its architecture, physical layer and MAC layer. Cognitive radio and OFDM base cognitive radio. Media independent handover in wireless networks and its standards.

Mobile IP: addressing, agents, agent discovery, registration and data transfer. Inefficiencies in mobile IP and their solutions.

IP traffic over legacy cellular technologies and over 3G / 4G networks. Transport layer protocols and Mobility. Cross layer design issues related to transport layer protocols.

Multimedia traffic over networks: various protocols like RTP, RTCP, SIP, H.323 and SCTP to support this traffic. Quality of service and various strategies to provide QoS on networks.

REFERENCES

1. J.G. Proakis, Digital Communication, McGraw Hill, 2000.
2. G.L. Stuber, Principles of Mobile Communications, Kluwer Academic, 1996.
3. T.S. Rappaport, Wireless Communications: Principles and Practice, Prentice Hall, 2002.
4. Kumar, D. Manjunath and J. Kuri, Communication Networking, an Analytical Approach, Elsevier, 2004
5. Paulraj, R. Nabar & D. Gore, Introduction to Space Time Wireless Communications, Cambridge Univ Press, 2003
6. C Sivarama Murthy and B S Manoj, Ad-Hoc Wireless Networks, Architectures and Protocols, PH, 2004.

EL71101	Database Management Systems
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Course Objectives

1. Differentiate database systems from file systems by enumerating the features provided by database systems and describe each in both function and benefit.
2. Define the terminology, features, classifications, and characteristics embodied in database systems.
3. Analyze an information storage problem and derive an information model expressed in the form of an entity relation diagram and other optional analysis forms, such as a data dictionary.
4. Demonstrate an understanding of the relational data model.
5. Transform an information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
6. Formulate, using relational algebra, solutions to a broad range of query problems.
7. Formulate, using SQL, solutions to a broad range of query and data update problems.

Unit 1:Introduction: Advantages of DBMS approach, Various views of data, data independence, schema & sub-schema, primary concept of data models, database languages, transaction management, database administrator & users, data dictionary, database architectures.

E-R model: Basic concepts, design issues, mapping constraint, keys, E-R diagram, weak & strong entity-sets, specialization & generalization, aggregation, inheritance, design of E-R schema, Reduction of ER Schema to tables. Domains, relation, kind of relation, Relational databases, Various types of keys.

Unit 2:Relational Algebra and SQL: Relational algebra with extended operations, modification of database, Idea of relational calculus, basic structure of SQL, Set operation, Aggregate functions, Null values, Nested Sub queries, derived relations, views, Modification of database, join relation, Domain, relation & keys, DDL in SQL. Programming concepts of PL/SQL

Unit 3:

Relational Database Design & Normalization: Basic definitions, Trivial & non-trivial dependencies, Introduction to Normalization, Normal forms, Decomposition, Functional dependencies, non loss

decomposition, FD diagram, First, second & third normal forms, Dependency preservation, BCNF, multivalued dependencies and fourth normal form, join dependencies and fifth normal form, Database Integrity. Transaction, Concurrency & Recovery: Basic concept, ACID properties, transaction state, Implementation of atomicity & durability, Concurrent execution, Basic idea of serializability, Basic idea of concurrency control, basic idea of deadlock, Failure Classification, storage structure-types, stable storage implementation, data access, recovery & Atomicity: log based recovery, deferred database modification, immediate database modification, checkpoints.

Unit 4: Storage Structure & File Organization: Overview of physical storage media, magnetic disk: performance & optimization, RAID, File organization, Organization of records in files, basic concept of Indexing, ordered indices: B+ tree & B tree index files, Query processing, Query optimization.

REFERENCES

1. Database System concepts – Henry F. Korth , Tata McGraw Hill
2. SQL, PL/SQL The programming language of Oracle- Ivan Bayross
3. An introduction to Database System - C.J Date
4. Complete Reference – Oracle 10g

EL71104	Digital Signal Processing
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Course Objectives

1. To learn the theory and practice of Digital Signal Processing
2. To design and implement FIR and IIR digital filters
3. To study the architecture and features of DSP Processor
4. To learn practical applications of Digital Signal Processing

Signal Processing Review: Signals, Systems and Applications, Amplification, distortion, and noise, Linear, time-invariant systems, impulse response and convolution sum, linear constant-coefficient difference equation, Fourier transform and frequency response

The Generic DSP System Introduction: ADCs and DACs / Signal Conditioning, Anti-alias and Reconstructions Filters Distortion, Quantization Error and Noise, The Nyquist Sampling Rate, z-domain representation and transforms Frequency Domain Analysis :Periodic, aperiodic and random signals, The DFT, DTFT and FFT, Signal analysis and synthesis based on DFT, Modern spectral analysis, Time/Frequency Representation

Digital Filtering :FIR and IIR Digital Filters, Digital Filter Design Parameters and methods, All-pass, low-pass, band-pass, comb filters etc., Poles and zeroes and the Z-domain DSP Software/Hardware:The Generic DSP Processor Architecture, Application Specific Integrated Circuits, DSP Design and Analysis Software, Application specific – MATLAB programming. Filter Design: Fundamental structures of digital filters, Internal representation of LTI systems, Digital filter design – I, Digital filter design – II

DSP Audio/Baseband Processing: Over-/under-sampling; Sigma delta ADC/ DACs, Sample rate; decimation & interpolation, Quantization noise shaping Adaptive DSP Algorithms: Least squares (LS) and Least mean squares (LMS), Channel equalisation / Inverse system identification, Echo Control for feedback suppression, Acoustic echo control /noise control DSP Baseband Communications : Information theory, AM/FM/PM modulation; ASK/PSK/FSK Signaling, Pulse shaping / Matched Filtering /Root Raised Cosine , Data equalisation , Error control and coding.

REFERENCES

1. Ashok Ambaradar, Digital Signal Processing - A Modern Introduction
2. Proakis, Digital Signal Processing: Principles, Algorithms, And Applications

EL71105	Embedded Microcontroller
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Course Objectives

1. Understanding microcontroller, microcomputer, embedded system.
2. Understand different components of a micro-controller and their interactions.
3. Become familiar with programming environment used to develop embedded systems
4. Understand key concepts of embedded systems like IO, timers, interrupts, interaction with peripheral devices

Computer Architectures: RISC/CISC and Harvard. Princeton Architectures Introduction: The 8051. Microcontroller, Criteria for choosing a microcontroller, 8051 Family members & block diagram. The 8051 Assembly Language Programming: 8051 internal registers, Structure of Assembly Language, Program Counter & ROM Space, Data types & Directives, PSW, Register Banks & Stack. JMP, LOOP & CALL Instructions: Looping, Conditional & unconditional jump, LCALL, ACALL, PUSH, POP instructions & Subroutines. Time Delay Generation & Calculation. I/O Port Programming: Pin description, I/O Ports, Bit addressability & Read-modify-write feature.

Addressing Modes: Addressing modes, Indexed addressing & Look up tables, SFR registers and their addresses. Arithmetic & Logical Instructions: Addition, subtraction, BCD numbers and DA A instruction, multiplication and division, signed number and overflow problem in arithmetic operations. Logic & Compare Instructions, Rotate & Swap Instructions, BCD & ASCII conversion programs. Single Bit Instructions: Single bit instructions, Registers & bit addressability, Bit addressable RAM, Reading input pins Vs. Port Latch. 8051 Timer /Counter Programming: Timer Registers, TMOD Register, Timer mode 1, mode 2, mode 3 programming. Counter Programming.

8051 Serial Communication: Basics of serial communication, Asynchronous serial communication & data framing, RS 232 standards, MAX 232. Baud rate selection & T1 register, SBUF, SCON Registers, and Serial port Programming to transmit & receive data serially.

8051 Interrupts Programming: 8051 interrupts, IVT for 8051, IE register, TCON register and Timer Interrupts, External H/W Interrupts Programming. Serial Port Interrupts Programming, Interrupt Priority upon reset and IP register.

Real World Interfacing: LED, Switches, LCD, ADC, DAC, Sensors, Stepper Motor, Keyboard, and Memory.

REFERENCES

1. 8051 Microcontroller and Embedded Systems : M.A. Mazidi & J. G. Mazidi. Pearson Education
2. Microcontrollers: Architecture, Programming & System Design: Rajkamal Pearson Education
3. 8051 Microcontrollers Arch., Programming & Applications: K. J. Ayala Penram International

EL71102	Linux Scripting and Networking
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Course Objectives

1. Understand Linux Operating System
2. Use command substitution to capture program output in Linux Operating System
3. Use conditional statements to control the execution of shell scripts.
4. Able to do shell, Awk and perl Programming
5. Understand Embedded Linux System

General Overview of the System: Introduction, Linux and Unix System structure, Features of Unix and Linux System, user perspective, O/S services assumption about Hardware. The Kernel and buffer cache architecture of Unix O/S, System concepts, Kernel data Structure, Kernel functions, System administration, Buffer headers, Structure of the buffer pool, Scenarios for retrieval of the buffer, Reading and writing disk block, Advantage and disadvantage of buffer cache.

Internal Representation of Files: INODES, Structure of File System and Directories, Super block, Inode assignment to a new file, Allocation of disk blocks, File System and Types, Tuning and repairing File Systems.

System Calls for the System: Open read write file and record close, File creation, Operation of special files change directory and change root, change owner and change mode, STAT and FSTAT, PIPES Mounting and unmounting files system, Link Unlink.

Structures of Processes and process control: Process states and transitions layout of system memory, Process attribute, the context of a process, manipulation of process address space, Sleep process creation/termination. The user Id of a process, changing the size of a process. The SHELL, System Security.

Interprocess Communication and multiprocessor system: Process tracing system V IPO network communication sockets problem of multiprocessors systems, solution with master and hare process, and solution with semaphores.

Introduction to shell scripts: shell Bourne shell, C shell, Unix commands, permissions, editors, filters sed, grep family, shell variables, scripts, metacharacters and environment, if and case statements, for while and until loops. Shell programming.

Awk and perl Programming: Awk pattern scanning and processing language, BEGIN and END patterns, Awk arithmetic and variables, Awk built in variable names and operators, arrays, strings, functions, perl; the chop() function, variable and operators, \$_ and \$. , Lists, arrays, regular expression and substitution, file handling, subroutines, formatted printing.

Introduction to Embedded Linux System: Embedded Linux system and structure, storage and kernel based options on embedded system, File structure and develop embedded based environment, Mobile based Linux Operating System.

Case Study: Installation of Linux, Customization of Linux, Installation of SAMBA, APACHE TOMCAT, Send MAIL, Postfix, Implementation of DNS, LDAP services, Firewall, Proxy server

REFERENCES

1. Sumitabha Das., Unix Concepts and Applications., 4th Edition., Tata McGraw Hill
2. Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming- Cengage Learning – India Edition. 2009.

EL71103	System Programming
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Course Objectives

1. Understand Object Oriented Principles.
2. Understand need and importance of JAVA Language
3. Understand and develop Core JAVA Programs.
4. Able to create packages, API and jar files.

5. Develop application using Swing, Applets, AWT and IO Package, database connectivity
6. Develop GUI Application using swing.
7. Develop minor project having GUI front end which fetches the data from backend.

Object Oriented Analysis: Review of object oriented concepts, potential benefits and drawbacks of object oriented. Compare object oriented paradigm with structural/procedural paradigm. What is class, how to Identify them, relationship among objects, relationship among classes.

Introduction to JAVA: Features of Java, How to write simple Java programs, Understanding CLASSPATH, Java keywords, Lexical issues, Comments, Reserved Keywords, Identifiers, Literals, Operators, Separators, Variables, Naming Conventions, Data Type- Numeric types, Integers, Floating point numbers, Casting characters, Boolean, Simple type, Arrays, Multiple dimensional arrays, Type conversion & casting, Operators, Control Statements, Selection Statements, Iteration Statements.

Introducing Class: Class fundamentals, Declaring objects, new and dot operator, this keyword, Introducing methods, Constructors, Garbage collection, Overloading methods and constructor, Nested and Inner class.

Inheritance: Extending classes, Access modifiers, Keywords- super, final, static, finalize method, Method overriding, Dynamic Method Dispatch, Abstract classes, The Object class and Class class.

Packages and Interfaces: Defining a package, Access Protection in packages, importing packages, Access protection, Defining an Interface, Implementing Interfaces, Applying interfaces, Variables in interfaces, Achieving multiple inheritances through interfaces.

String Handling: String Class, String constructors, Special string operations, Character extracting, String comparison, Searching strings, Modifying a string, Strings buffer, Different string methods.

Exception Handling: Fundamentals, Exception types, try and catch, Multiple catch clauses, nested try statements, Throw, throws and finally, Exception subclasses, Creating own exception classes.

Multithreading: Thread basics, Creating and running a thread, The thread life cycle, Thread priorities, Advanced threading, Asynchronization, Messaging, Inter thread communications, Priorities and Scheduling, Daemon threads.

Introduction to Applets, AWT Package : Buttons and Labels, Checkboxes and Radio Buttons, Choices, Lists, Text Fields, **Scanner Class. JDBC and ODBC connectivity**

REFERENCES

1. Herbert Schildt , "Java : The Complete Reference", 7th Edition, Tata McGraw - Hill Education
2. Gready Booch , "Object-Oriented Analysis and Design with Applications", 3rd Edition
3. David Flanagan, "Java in a Nutshell", 3rd Edition, O'Reilly Media

SEMESTER - II

EL72108	Mobile Computing
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Course Objectives

1. Define Mobile Computing and look at current trends
2. Acquire solid knowledge on mobile networks and mobile computing
3. Understanding different Operating Systems for Mobile Devices
4. Mobile device programming using Python
5. Study service discovery, networking, clients.

Embedded Systems: Embedded System Design, Software for Embedded Systems, Characteristics of Embedded Systems, Software for Embedded Systems, Hardware for Embedded Systems, System Architecture.

Introduction to Mobile Computing: Dimensions of mobile computing, conditioner of mobile user, portable computing devices, applications of Mobile Computing, Mobile Computing Architectural Layers, Server Client Architecture, design considerations for Mobile Computing, Middleware, Data Synchronization and Data Dissemination, Limitations of Mobile Devices, Mobile Computing Strategy to overcome the limitation of Mobile Devices, Mobile Client Device features, sensors

Mobile Operating System: Introduction, popular mobile operating systems, functions of mobile operating system, Android Os: Architecture, Android device as a sensor, Android application development, application components. Windows Phone OS: Windows phone architecture, The .NET Framework, Common Language Runtime (CLR)

Python Programming: Introduction, Interpreted Vs. Compiled languages, Python Identifiers, data types in Python, operators, functions in Python, keyboard input functions, Class in Python, Inheritance in Python, Multiple Inheritance, Python for Android, different methods for Android.

Pervasive Computing: Introduction, Pervasive Information Technology, Goals of Pervasive (Ubiquitous) Computing, Smart Objects, Pervasive Computing Enablers,

Mobile Virtual Private Network: Introduction, Different mobile VPN categories

Mobile Agent: Introduction, example, Mobile Computing Architecture, Mobile agent platform, Strong migration vs. weak migration, Locating mobile agents, applications.

Smart Client: Introduction, architecture, DataStore Objects, Uniform Resource Identifier (URI)

Service Discovery: Service Discovery in Mobile Computing, SERVICE DISCOVERY PROTOCOLS: UPnP, Salutation, Bluetooth, Service Location Protocol (SLP), JINI

Mobile SoC (System on Chip): SoC components, Different SoCs: Ax by Apple, Snapdragon by Qualcomm, NVIDIA Tegra, Samsung Exynos, Intel Atom, OMAP by Texas Instruments

REFERENCES

1. REZA B'FAR, "Mobile Computing PRINCIPLES", Cambridge University Press, 2005
2. Rajkamal, "Mobile Computing", Oxford University Press, 1st Edition, Oct. 2007; 2nd Edition, 2012
3. Paul Ferrill, "Pro Android Python with SL4A", Apress , 2011

EL72102	Real Time Systems
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Course Objectives

1. Real-time scheduling and schedulability analysis
2. Formal specification and verification of timing constraints and properties
3. Design methods for real-time systems
4. Development and implementation of new techniques to advance the state-of-the-art real-time systems research

Introduction

Modeling Timing constraints

Scheduling Real-Time Tasks: Types of Schedulers, table-driven, Cyclic, EDF, RMA

Handling Resource sharing among real-time tasks

Scheduling Real-Time Tasks in Multiprocessor and Distributed systems

Commercial Real-time operating systems: General concepts, Unix and

Windows as RTOS

Survey of commercial RTOS

REFERENCES

1. Jane W. Liu, "Real-Time Systems," Pearson Education, 2001.
2. Krishna and Shin, "Real-Time Systems," Tata McGraw Hill, 1999.
3. Alan C. Shaw, Real-Time Systems and Software, Wiley, 2001.
4. Philip Laplante, Real-Time Systems Design and Analysis, 2nd Edition, Prentice Hall of India.

EL72103	Wireless Ad hoc Networks
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Course Objectives

1. Understand basic sensor network concepts
2. Know physical layer issues, understand and analyze Medium Access Control Protocols
3. Comprehend network and transport layer characteristics and protocols and implement conventional protocols
4. To enable the understanding the functioning of different access and routing protocols
5. Understand the network management and Middleware services

INTRODUCTION TO WSN

Introduction to WSN-Challenges for WSNs - Characteristic requirements - Required mechanisms - Single-node architecture -Hardware components Energy consumption of sensor nodes-Operating systems and execution environments-Some examples of sensor nodes.

NETWORK ARCHITECTURE

Sensor network scenarios- Optimization goals and figures of merit- Design principles for WSNs, Service interfaces of WSNs- Gateway concepts.

SENSOR NETWORK IMPLEMENTATION

Sensor Programming- Introduction to TinyOS Programming and fundamentals of Programming sensors using nesC- Algorithms for WSN - Techniques for Protocol Programming.

PROGRAMMING MODELS

An Introduction to the Concept of Cooperating Objects and Sensor Networks- System Architectures and Programming Models.

CASE STUDIES

Wireless sensor networks for environmental monitoring, Wireless sensor networks with mobile nodes, Autonomous robotic teams for surveillance and monitoring, Inter-vehicle communication networks.

REFERENCES

1. Holger karl, Andreas Willig, "Protocols and architectures for wireless sensor networks", John Wiley,2005.
2. Liljana Gavrilovska, Srdjan Krco, Veljko Milutinovic , Ivan Stojmenovic,Roman Trobec, "Application and Multidisciplinary Aspects of Wireless Sensor Networks", Springer-Verlag, London Limited 2011.
3. Michel Banâtre, Pedro José Marrón, Anibal Ollero, Adam Wolisz, "Cooperating Embedded Systems and Wireless Sensor Networks ", John Wiley & Sons, Inc .2008.
4. Seetharaman Iyengar, Nandhan, "Fundamentals of Sensor Network Programming Applications and Technology" , John Wiley & Sons, Inc.2008.

EL72104	Advanced Embedded Microcontroller - ARM
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Course Objectives

1. To provide in-depth knowledge about ARM Architecture and its instruction set.
2. To explain the systems development using ARM target boards.
3. To explain the Memory hierarchy, ARM CPU cores & its applications.
4. To design the system applications using Embedded C programming

Introduction: Evolution of Computers, Technological Trends, Measuring performance Speed up, Amdahl's Law. Computer organization: von Neumann Machine Architecture, Functional units and components, Program development tools. Instruction pipelining and parallel processing: Instruction pipeline, hazards, Data forwarding paths, RISC vs. CISC processors.

The ARM Architecture, ARM assembly language programming, ARM organization and implementation, instruction set, Architectural support for system development, ARM processor cores, Embedded ARM applications.

The Embedded Computing Platform: CPU Bus, Memory Devices, I/O Devices, Component Interfacing

REFERENCES

1. ARM System on Chip Architecture 2nd Ed, Published 2000 : Steve Furber, Addison Wesley.
2. ARM Architecture Reference Manual, 2nd Ed, Published 2001, edited by David Seal, Addison-Wesley.
3. ARM System Developer's Guide, Designing and optimizing System Software: A. N. Sloss, D. Symes, C.Wright, 2004, Morgan Kaufmann Publishers.
4. Computer Architecture : Nicholas Carter and Rajkamal, Tata McGraw-Hill Pub company Limited.
5. Computers as components : Wayne Wolf, Morgan Kaufmann Publishers.

Course Objectives

1. Build your own Android apps
2. Explain the differences between Android and other mobile development environments
Understand Android applications work, their life cycle, manifest, Intents, and using external resources
3. Design and develop useful Android applications with compelling user interfaces by using, extending, and creating your own layouts and Views and using Menus.
4. Take advantage of Android's APIs for data storage, retrieval, user preferences, files, databases, and content providers
5. Tap into location-based services, geocoder, compass sensors, and create rich map-based applications

Basics of Operating System : Component of Computer System, Booting Process, kernel & Evolution of Operating Systems. Real Time Operating Systems, its types-soft real time operating systems, its features and examples, hard real time operating systems its features and examples. Operating Structure: System Call, OS Services, System Program, System Structure, Virtual Machine, and System Design & Implementation. Process Management: Process Concept, Process Scheduling, Process Co-operation, Inter-Process Communication. Memory Management: Paging and Segmentation

Introduction to Android: Background and positioning of the Android platform, including comparisons to other popular platforms such as BlackBerry, iPhone, and Windows Mobile, high-level architecture of Android applications and the operating system environment. Introducing Android, Stacking up Android, Booting Android development, An Android application, Summary

Development environment.: The Android SDK, Fitting the pieces together, Building an Android application in Eclipse, Building an Android application in Eclipse, The Android Emulator, Debugging

User interfaces.: Activity Life Cycle, Creating the Activity, An Overview of User Interfaces

3.4 Using XML Layouts, Selection Widgets, Date and Time Tabs, Hardware & Software Keyboards, Using Menus, Using Fonts, The WebView and the WebKit Browser, Dialog Boxes: AlertDialog & Toast, Using resources

Intents and Services: Working with Intent classes, Listening in with broadcast receivers, Building a Service, Performing Inter-Process Communication

Storing and retrieving data: Using preferences, Using the filesystem, Persisting data to a database, Working with ContentProvider classes

Networking and web services: An overview of networking, Checking the network status, Communicating with a server socket, Working with HTTPPOST, Working with HTTPGET

Notifications and alarms: Introducing Toast, Introducing notifications, Alarms

Multimedia: Introduction to multimedia and OpenCORE, Playing audio, Playing video, Capturing media

Location Services: Simulating your location within the emulator, Using LocationManager and LocationProvider, Working with maps, Converting places and addresses with Geocoder

REFERENCES

1. Operating System Concepts – Silberschtz Galvin Gagne
2. Hello, Android by Ed Burnette

Course Objectives

1. Understand the principles behind the Modern Network approaches such as IoT
2. Ability to analyze topologies and architectures in IoT environment
3. Understand the data traversal over virtualized environment for IoT
4. Design algorithms for enabling IoT
5. Understand the various types of key techniques used in modern networks.

COMPUTER NETWORKING FUNDAMENTALS

OSI Model, Data transfer referred with OSI Model, IP Addressing, Point to Point Data transfer, Point to Multi Point Data transfer & Network Topologies, Sub-netting, Network Topologies referred with Web, Introduction to Web Servers, and Introduction to Cloud Computing. Overview and working principle of Wired Networking equipment's - Router, Switches, Overview and working principle of Wireless Networking equipment's - Access Points, Hubs etc. Linux Network configuration Concepts: Networking configurations in Linux Accessing Hardware & Device Files interactions.

DATA TRANSFER PROTOCOLS

Data transfer between nodes using TCP, UDP and HTTP protocols; DHCP. Programming examples for data transfer through sockets in C++ and Java on Windows and Linux.

WIRELESS LOCAL AREA NETWORKS

(i) Wi-Fi Organizations and Standards: Regulatory Bodies, IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE 802.11 Standards, 802.11- 2007, 802.11a/b/g, 802.11e/h/l, 802.11n (ii) Wi-Fi Hardware & Software: Access Points, WLAN Routers, WLAN Bridges, WLAN Repeaters, WLAN Controllers/Switches, Direct-connect Aps, Distributed connect Aps, PoE Infrastructure, Midspan, Endpoint, Client hardware and software, Antenna types and uses Wi-Fi Security concepts, Wi-Fi Applications

WIRELESS SECURE NETWORKS (WSN) & WIRELESS PERSONAL NETWORKS (WPN)

Wireless Personal Area Networks, Bluetooth, Bluetooth Standards, BlueTooth Protocol Architecture, UWB, IEEE 802.15 standards, ZigBee, Sub1GHz, Sensor Networks, Interfacing problems and co-existence strategies in Sensor Networks, Routing protocols in Wireless Sensor Networks.

IOT PLATFORM OVERVIEW Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards. Network Fundamentals:

IoT ARCHITECTURE: History of IoT, M2M - Machine to Machine, Web of Things, IoT protocols (i) Applications: Remote Monitoring & Sensing, Remote Controlling, Performance Analysis (ii) The Architecture: The Layering concepts, IoT Communication Pattern, IoT protocol Architecture, The 6LoWPAN (iii) Security aspects in IoT

IoT APPLICATION DEVELOPMENT: Application Protocols- MQTT, REST/HTTP, CoAP, MySQL. Sensors and sensor Node and interfacing using any Embedded target boards. (Raspberry Pi / Intel Galileo/ARM Cortex/ Arduino)

REFERENCES

1. Honbo Zhou, "The internet of things in the cloud: a middleware perspective", CRC press, 2012.
2. Architecting the internet of things editors: dieter Uckelmann, Mark Harrison, Florian Michahelles ISBN: 978-3-642-19156-5 (print).

3. "Foundations of modern networking: SDN, NFV, QOE, IOT, and cloud" William Stallings publisher: Addison-Wesley 2015 ISBN: 9780134175393.
4. Network Function virtualization with a touch of sdn by Paresh Shah, Syed Farrukh Hassan, Rajendra Chayapathi.
5. Software Defined Networks a Comprehensive Approach IST Edition by Paul Goransson Chuck Black.

EL72106	Digital Image Processing
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Course Objectives

To understand different types of data models, processing of digital images, extraction of information analysis of digital images

Course Outcomes

At the end of the course the student will able to learn processing of digital data, its enhancement and analyzing it for required object fulfillment

Unit I: Introduction to image processing, analysis and understanding with applications to GIS and pattern recognition. Image perception, sampling and quantization, Image representation, modeling and display.

Unit II: Image enhancement: spatial domain vs frequency domain; Enhancement via point operations - contrast stretching, colormap look-up tables, clipping, thresholding, negation, gray-level slicing, bit-plane slicing, range compression, algebraic operators; Enhancement via histogram modeling - histogram modification, histogram equalization, histogram specification.

Unit III: Processing via algebraic operations - input and output histograms, sums and differences of images, averaging noisy images, background removal, change or motion detection; Processing via spatial operations - weighted local area smoothing or averaging, derivative filters (Roberts, Prewitt, Sobel, Kirsch, Laplacian), sharpening filters, unsharp masking, median filtering, gray level interpolation, spatial transformations, applications of geometric operations (cameral calibration, image registration, map projection, morphing).

Unit IV: Linear systems theory and 2-D convolution for image processing; Frequency domain approach and the 2-D Fourier transform; Discrete Fourier Transform and the FFT; Discrete image transforms- Discrete Cosine Transform, Eigenvector-based Transforms.

Unit V: Image restoration, inverse filtering and deconvolution; Hough Transform. Image segmentation via optimal histogram thresholding methods, connected components; Image and region statistics; Color models and multispectral images.

REFERENCES

1. Anil K. Jain. Fundamentals of Digital Image Processing, Prentice-Hall, 1989.
2. K. R. Castleman. Digital Image Processing (2nd Ed.), Prentice Hall, 1996.
3. W.K Pratt. Digital Image Processing (2nd Ed.), John Wiley, New York, 1991.

Choice Based Courses

NOTICE

The M.Tech. students admitted in one School of Studies can opt a course of minimum 4 credits from M.Tech. programmes being run at other School (s) of Studies. The courses being run in different School (s) of Studies during second semester (2013-14) at M.Tech. level are listed below:

1. School of Computer Science and IT:

(i) Programme: M.Tech. in Computer Science

Courses Offered:

Course Code	Subjects	Credit(L T P)
CS-6418	Advanced Database Management Systems	5(3,1,2)
CS-6516	Advanced Operating Systems	5(3,1,2)
CS-6517	Advanced Compiler Design	5(3,1,2)
CS-6518	Cloud Computing	5(3,1,2)

(ii) Programme: M.Tech. in Network Management and Information Security:

Courses Offered:

Course Code	Subjects	Credit(L T P)
CS-6728	Legal Aspects of Information Security	4(3,1,0)
CS-5718	Network Security	5(3,1,2)
CS-6723	Mobile & Wireless Systems	4(3,1,0)
CS-6727	Web Technology & Java Security	6(3,1,4)

(iii) Programme: M.Tech. in Information Architecture and Software Engineering

Courses Offered:

Course Code	Subjects	Credit(L T P)
CS-6313	Software Testing & Quality Assurance	5(3,1,2)
CS-6316	Software Reuse & Customization	5(3,1,2)
CS-4409	Enterprise Resource Planning	5(3,1,2)
CS-6418	Advanced Database Management Systems	5(3,1,2)

2. School of Electronics:

(i) Programme: M.Tech. in Embedded Systems

Courses Offered:

Course Code	Subjects	Credit(L T P)
MTES 21	VLSI Design	4 (4-0-0)
MTES 22	System / FPGA Architecture	4 (4-0-0)
MTES 23	Real Time Operating Systems & Linux	4 (4-0-0)
MTES 24	Embedded System Programming-.NET framework	4 (4-0-0)
MTES 25	ARM & its Interfacing	4 (4-0-0)

(ii) Programme: M.Tech. in Spatial Information Technology

Courses Offered:

Course Code	Subjects	Credit(L T P)
MTSIT 21	Global Positioning Network	4 (4-0-0)
MTSIT 22	Digital Image Processing	4 (4-0-0)

MTSIT 23	Remote Sensing	4 (4-0-0)
MTSIT 24	VB& .NET Programming (Framework)	4 (4-0-0)
MTSIT 25	J2ME	4 (4-0-0)

(iii) Programme: M.Tech. in Mobile Computing Technology

Courses Offered:

Course Code	Subjects	Credit(L T P)
MTMCT 21	Mobile Computing	4 (4-0-0)
MTMCT 22	Mobile Database	4 (4-0-0)
MTMCT 23	Wireless Networks	4 (4-0-0)
MTMCT 24	Mobile System Programming II -J2ME & Python	4 (4-0-0)
MTMCT 25	ARM & its Interfacing	4 (4-0-0)

3. School of Future Studies and Planning:

(i) Programme: M.Tech. in Future Studies and Planning

Courses Offered:

Course Code	Subjects	Credit(L T P)
FS-721	Technology Forecasting & Assessment	4 (3-1-0)
FS-722	Data Mining for Analytics	4 (3-0-2)
FS-723	Industrial Engineering and Systems	4 (3-1-0)
FS-724	System Dynamics	4 (2-1-2)
FS-725	Innovation Management	4 (3-0-2)
FS-726	Market Research	4 (2-1-2)
FS-727	Policy Design and Analysis	4 (3-0-2)
FS-728	Multivariate Analysis	4 (3-0-2)

(ii) Programme: M.Tech. in Systems Management

Courses Offered:

Course Code	Subjects	Credit(L T P)
SM-721	Mathematical Modelling	4 (3-1-0)
SM-722	System Simulation	4 (2-1-2)
SM-723	Enterprise Resource Planning	4 (3-1-0)
SM-724	Project Management	4 (2-1-2)
SM-725	Data Mining and Data Warehousing	4 (2-1-2)
SM-726	e-Business & e-Governance	4 (3-0-2)
SM-727	Software Quality Management	4 (3-0-2)
SM-728	Artificial Intelligence & Neural Networks	4 (2-1-2)

4. School of Energy and Environmental Studies:

Programme: M.Tech. in Energy Management

Courses Offered:

Course Code	Subjects	Credit(L T P)
EN-703	Heat Transfer And Process Integration	3
EN-704	Engineering Thermodynamics : Quality & Quantity Aspects	3
EN-705	Water and Waste Water: Pollution and Control Technologies	3
EN-710	Environmental Auditing and Environmental Impact Assessment	3
EN-711	Energy Modeling and Project Management	3
EN-717	Computer Applications: Energy Software	3
EN-718	Bio and Fossil Fuels Technology	3

EN-803	Biomass/Biogas laboratory	3
EN-804	Solar Thermal and Photo - Voltaic Laboratory	3

5. School of Instrumentation:

Programme: M.Tech. in Instrumentation

Courses Offered:

Course Code	Subjects	Credit(L T P)
IS-702	Computer Networks	3
IS-704	Computer Controlled and SCADA Systems	4
IS-706	VLSI Design	4
IS-708	Embedded based system design -II (ARM Micro-Controller)	4
IS-710	Bio-Medical Instrumentation	4
IS-712	Digital Control Systems	4
IS-716	Digital Signal Processing	3
IS-718	Instrument Technology Lab-II	8

6. School of Physics:

Programme: M.Tech. in Laser Science and Applications

Courses Offered:

Course Code	Subjects	Credit(L T P)
PHY 902	High Voltage Engineering for LASER	4
PHY 904	LASER Systems	4
PHY 906	LASER Application II	4
PHY 908	Optical Communications	4
PHY 910	Free Electron Lasers	3

Note:

1. The opted course will be named as choice based course and it will be equivalent to an elective course of that programme.
2. Credits earned through choice based course from other department will be counted in calculating CGPA for the award of the degree in which admission is taken.
3. Time table of opted courses will be announced later.
4. Teaching and examination of choice based course will be conducted by the school of studies where this course is being offered.
5. Each course will have 10 additional seats for the students of other departments.